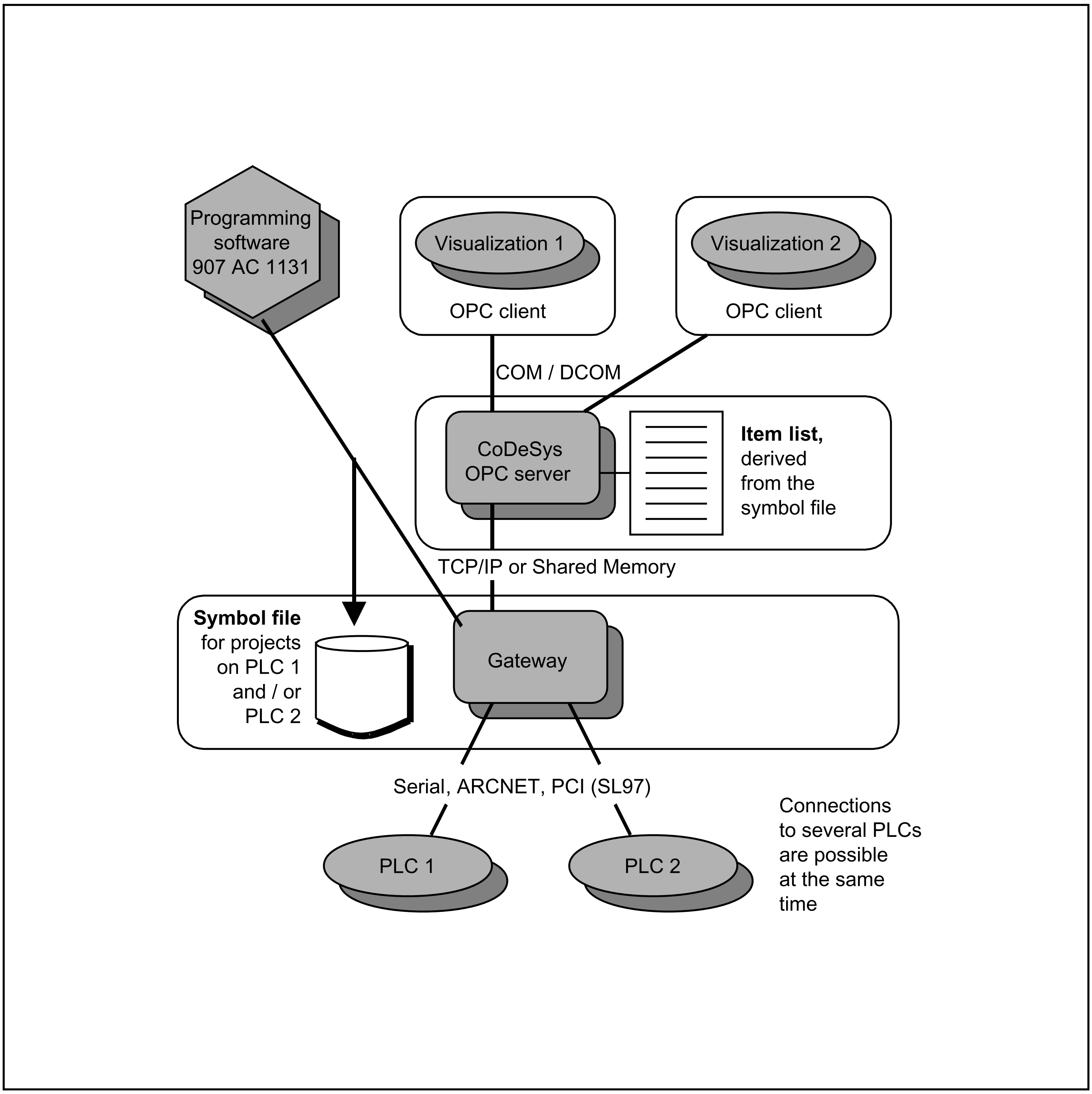
System Description

Advant Controller 31

Intelligent Decentralized Automation System

OPC Series 90
(OLE for Process Control)



Programming software 907 AC 1131
Visualization 1
OPC client
Visualization 2
OPC client
COM / DCOM
CoDeSys OPC server
Item list, derived from the symbol file
TCP/IP or Shared Memory
Symbol file for projects on PLC 1 and / or PLC 2
Gateway
Serial, ARCNET, PCI (SL97)
PLC 1
PLC 2
Connections to several PLCs are possible at the same time

Contents

1 OPC overview

1.1 General information about the OPC server

OPC[1] is a standardized interface for the access to process data. It is based on the Microsoft COM/DCOM[2] standard and was extended according to the needs for data access in the automation technology. Here, it is primarily used to read and write values from the controller. Typical OPC clients are visualizations or programs for the acquisition of operating data, etc. OPC servers are normally used for PLC systems and field bus cards.

The OPC server is not a passive subprogram library, but an executable program which is started when the connection between client and server is established. This is why it is able to notify the client when the value or status of a variable has changed.

Due to the characteristics of DCOM, even an OPC server can be accessed which is running on another computer. Furthermore, using OPC a data source can be simultaneously accessed by more than one client. Another advantage OPC gains by the usage of COM is that different programming languages (C++, Visual Basic, Delphi, Java) can be used. However, a resulting disadvantage is the considerably higher usage of resources (memory and CPU time).

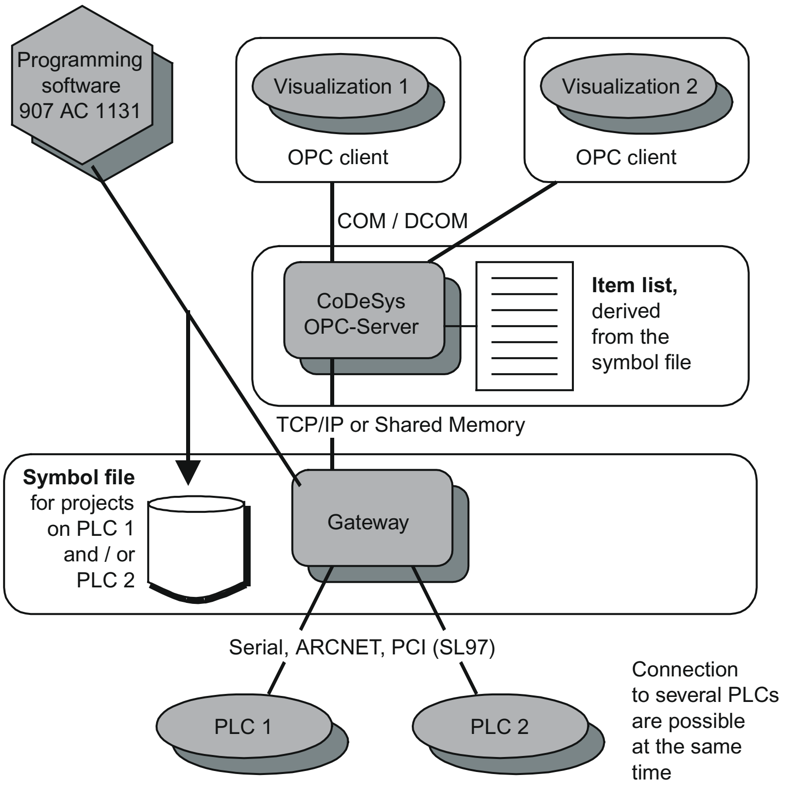
Note:
CoDeSys OPC server V2.0 is able to communicate with the controllers mentioned in section 1.2 Fields of application for the OPC server. It meets the requirements of OPC standard V2.0.

[1] OPC = OLE for Process Control;
OLE = Object Linking and Embedding

See also www.opcfoundation.org and www.opc_europe.org for further information.

[2] COM = Component Object Model (basis for OLE);
DCOM = Distributed Component Object Model

Architecture of the CoDeSys OPC server V2.0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The CoDeSys OPC server uses the CoDeSys gateway server (gateway).

Caution
The basis for the data exchange via the CoDeSys OPC server is the symbol file.

When a project is loaded from the programming system 907 AC 1131 to the controller, it is possible to simultaneously create a **symbol file** (*.sym or *.sdb) and store it in the gateway. The symbol file contains so-called items. An item (data object) exactly corresponds to one variable in the controller program. Using these items the variable values on the controller can be called. The OPC server requests the content of the symbol file from the gateway and creates an **item list** from it. Because the content of the item list is determined by the variables available in the controller, it cannot be influenced by the OPC client. The OPC server reads the symbol file last loaded for a project via the gateway channel.

The item list in the OPC server is updated in definable intervals with the values from the controller(s). Compared with the direct access to the controller, reading and writing the variable values via this cache list has the advantage of fast access times (max. approx. 1 ms per item).

A figure drawn from past experience for the amount which can be handled by the OPC without problems when taking over variables into the item list is approx. 15 000 items, symbol files size approx. 1.5 MB. The utilization for reading and writing the variable values naturally depends on the number of items which are set to 'active' and therefore are to be considered when updating the values. The OPC server supports a categorization of the data to groups. Here it is distinguished between "public groups" which are allocated by the OPC server and "private groups" which can be composed by a client.

If the corresponding option is activated in the configuration, the OPC server groups the items (i.e. the variables of a project) in a block wise way. Then, one 'public group' is created per block.

'Private groups' can be combined of individual items as desired in the client. First, they do not affect the grouping in the OPC server but if required they can be made to 'public groups'. For example, private groups are suitable to activate or deactivate specific variable groups with only one command depending on whether they are to be accessed or not.

Grouped data should be read by the OPC server in a consistent way, i.e. all variables at the same time. Please note that this is not always possible for target systems with limited communication buffers!

Note
It is possible to operate an OPC server which is running on another computer in the network even if an OPC server is also running on the local computer.

What's new compared to CoDeSys OPC server V1.0:

- The symbol list can be updated without the need to stop a client.

- Multi-PLC configuration is possible, i.e. simultaneous connection of one client to several controllers.

- Exporting and importing OPC configurations is possible (text file *.ini).

1.2 Fields of application for the OPC server

The OPC server represents the connection between the client (e.g. the visualization software) and the controller. The data (items) are read from the controller via the gateway server. The OPC server makes all read items available for the clients. The client software (visualization) displays the required items.

The following AC31 controllers can be operated via the OPC server using the corresponding drivers:

- 07KT95 serial
- 07KT96 serial
- 07KT97 serial
- 07KT97 ARCNET
- 07KT98 serial
- 07KT98 ARCNET
- 07SL97 serial
- 07SL97 ARCNET
- 07SL97 PCI
- ARCNET routed via 07SL97 PCI

Note
For more detailed information please refer to the 907 AC 1131 documentation / volume 10 / chapter 4 "The individual components" / "Online communication parameters for the use of gateways" as well as volume 15 / "System technology of the basic units" / "Programming and testing".

Note
Only the listed controllers and drivers can be used. All controllers with EBS (e.g. 07 KR 91, 07 KT 92-94, series 40/50) cannot be operated with the OPC server.

1.3 What has to be observed

1.3.1 System requirements

When using the OPC server, the used PC plays a major role. Particularly for extensive configurations (multiple users, many items (variables)) a fast PC should be used in order to guarantee rapid communication and stable function.

The PC should meet the following minimum requirements:

- Pentium II
- Clock frequency: 500 MHz
- 128 MB RAM memory
- Operating system: WinNT 4.0 Service Pack 5 or higher

Note
The better the system, the faster and more stable the communication with the OPC server is. Particularly for extensive configurations with multiple users and many items a fast PC should be used. Fast systems also guarantee that the transmission times listed in section 4.2 Timing behavior of the OPC server are met.

1.3.2 Preparing the AC1131 project

First, the OPC variables (items) must be defined in the AC1131 project. For this, either all variables of the entire project can be defined or the variables of individual program parts (e.g. programs, defined functions and function blocks) can be enabled.

Note
Particularly for extensive systems the selection of the variables which are to be enabled is important. The more variables are enabled the higher is the load to the system and the slower becomes the communication. In order not to load the system with an unnecessarily high utilization only those variables (items) should be enabled which are used in the visualization software (client). The corresponding variables must be grouped during the project planning (e.g. Var_Global: visualization or in individual subgroups, functions or function blocks).

The definition of the OPC variables is described in section 3.2 Settings in the programming software 907 AC 1131.

During this process, a file named <projectname>.sym is created which contains all enabled OPC variables (items). Now this project must be sent via the current gateway to the PLC and stored there in the **Flash** memory.

Note
It is important to meet this procedure because the OPC server compares the project settings in the gateway with the settings in the PLC. If there are any differences, the items are not displayed or updated in the OPC server.

Caution
Some libraries for earlier versions of 907 AC 1131 have too many symbol entries. Using these libraries would result in a definition of too many items in the OPC server. Therefore, only use the libraries listed below for your OPC project:

- ABB-Bib4.lib
- ANAI4_20.lib
- ARCNET_S90_V41.lib
- Base_S90_V41.lib
- COM_S90_V42.lib
- Coupler_S90_V41.lib
- CS31_S90_V41.lib
- Datenablage_S90_V41.lib
- DeviceNet_Master_S90_V43.lib
- IEC_S90_V42.lib
- IECSFC_S90_V41.lib
- Interbus_Master_S90_V43.lib
- PROFIBUS_Master_S90_V43.lib
- Profibus_S90_V41.lib
- Profibus_S90_V42.lib
- PROFIBUS_Slave_S90_V43.lib
- RCOM_S90_V41.lib
- Systeminfo_S90_V41.lib

1.3.3 Configuring the OPC server

In the OPC configuration (OPCConfig.exe) all subscribers are defined from which the items shall be read. Here, it is important that the program name matches the set gateway driver (e.g. node address). If this is not the case, no items can be read.

In the OPC configuration also the transmission rate for the items is set. For each subscriber an individual timeout can be set.

Caution
The following settings must be observed in any case for the AC31 controllers.
Otherwise communication is not possible.

- Buffer size = 4800
- No login service = enabled
- For multi-PLC configurations a mixed usage of a local gateway and TCP/IP is not possible.

Note
For more detailed information refer to section 3.3 Configuring the OPC server using OPCconfig.exe.

Note
If the project name and the gateway driver do not match, no items are available for the client.
If the transmission rate and the timeout settings are not correct, the items cannot be updated. The status BAD is displayed.

1.3.4 Planning the client

For the client, either a client test software (for testing the availability of the items) or a visualization software supporting OPC can be used.

The OPC server is automatically started when the client software is started and the communication is established. The corresponding variables are selected from the item list.

When planning the client (visualization software) the communication must be optimized. For this, the items are divided into individual groups. These groups are defined this way that they only contain items which have to be updated at the same time. The groups are only activated when they are needed.

Example:

-	Group 1:	all failure messages	* always active
-	Group 2:	measurement data (e.g. diagram)	* always active
-	Group 3:	variables fig. 1	* only active, if fig. 1 is displayed
-	Group 4:	variables fig. 2	* only active, if fig. 2 is displayed
-	...		
-	Group n:	variables fig. n	* only active, if fig. n is displayed

2 Installing the CoDeSys OPC server

2.1 Required files

2.1.1 Gateway files

The gateway files are automatically installed together with the programming software 907 AC 1131. All corresponding files are located in the system directory WINNT\system32:

Arcnet32.dll	ARCNET DLL for Windows NT4.0
ArcnetN.dll	
Commsym.dll	Communication DLL
Commusr.dll	Communication DLL
GArcnet3F4F.dll	ARCNET DLL ARCNET route driver
(is suitable for use with several ARCNET participants)	
Gateway.exe	Gateway for communication protocol
GatewayDDE.dll	
Gclient.dll	Communication DLL
GDrvABBArcnet.dll	ABB ARCNET driver DLL
(can be used only with one ARCNET participant)	
GDrvABBRS232.dll	ABB RS232 driver DLL
GDrvABBRS232Route.dll	ABB RS232(routed) driver DLL
GDrvBase.dll	Communication DLL
GDrvSL97.dll	ABB SL97 PCI driver DLL
GDrvStd.dll	Communication DLL
Ghandle.dll	Communication DLL
Gsymbol.dll	Communication DLL
Gutil.dll	Communication DLL

The OPC server 2.0 requires the gateway from the 907 AC 1131 CD-ROM, version V4.3 or higher.

After the first start of the gateway the path for the 'Gateway Files' directory is set in the registry (default: C:\WINNT\Gateway Files). When the connection to the controller is established, the symbol files created by 907 AC 1131 and stored in the project directory are copied to this directory. These files are either the symbol files *.sym or their binary version *.sdb. The latter can be read faster by the OPC server.

2.1.2 OPC server files

The OPC server is installed via the installation menu of the 907 AC 1131 CD-ROM. The files can be saved to any directory where the DLLs and the file OPCenum.exe must be kept in a subdirectory named REDIST.

CoDeSysOPC.EXE	OPC server
DiagnosticOPCClient.exe	Client test software
OPCCommonSetup.EXE	Setup for the files listed below
OPCConfig.exe	Configuration of the OPC server
OPCConfig_e.exe	Configuration of the OPC server

Subdirectory REDIST (standard OPC 2.0 files):

- CALLRPROXY.DLL
- OCSDAAuto.DLL
- OCSSpy_PS.DLL
- OPCCOMN_PS.DLL
- OPCenum.EXE
- OPCPROXY.DLL

2.1.3 Other files

DCOMCNFG.EXE (C:\WinNT\System32):
This file is used to establish a connection to an OPC server which is installed on another computer (refer to OPC documentation, chapter 4 Behavior of the OPC server).

2.2 Installation and registration

2.2.1 Installing the gateway and the OPC server

The gateway is automatically installed and registered together with the programming software 907 AC 1131. The OPC server is installed and registered by clicking on the button "Installation OPC Server" in the installation menu of the 907 AC 1131 CD-ROM. Follow the instructions given in the setup.

2.2.2 Installation and registration of the OPC server

If you are installing the OPC server afterwards, make sure that the correct gateway server is used (from 907 AC 1131 CD-ROM, version V4.3 or higher). On the computer, a separate directory path is created for the program files of the OPC server (e.g. C:\Programs\AC1131\OPC). All OPC server files (including the subdirectory REDIST) must be stored to this path.

Using the command

"CoDeSysOPC /Install" (if necessary, the path to the exe file must be entered)

in the 'Run' dialog box, a setup program is started which executes the installation of the OPC files. Follow the instructions given on the screen. Then the OPC server performs an automatic registration. A message is displayed, which informs you about the success of the registration process.

2.2.3 Registration of the OPC server (update)

The possibility of a separate registration is important for program updates or the creation of a setup. All files of the OPC server update are copied to the present program path.

Using the command

"CoDeSysOPC /RegServer" (if necessary, the path to the exe file must be entered)

only the registration of the OPC server is initiated. The installation of the required files must have been finished before. If no message is displayed, the registration was carried out successfully.

(For more information refer to section 3.3.5 Registry entries (example))

2.2.4 Uninstalling the OPC server

The registration of the OPC server is deleted using the following command:

"CoDeSysOPC /UnRegServer" or "CoDeSysOPC /DeInstall".

This deletes the entries in the registry. However, the installed files are not deleted by this command!

3 Use of the CoDeSys OPC server

3.1 General notes

After the OPC server is installed, it should be offered by the OPC client (e.g. visualization) for selection.

The gateway and the OPC server are automatically started by the operating system as soon as one of the clients (visualization software) establishes a connection. The OPC server is automatically exited as soon as all clients have cleared the connection. The gateway stays still open, but it is inactive.

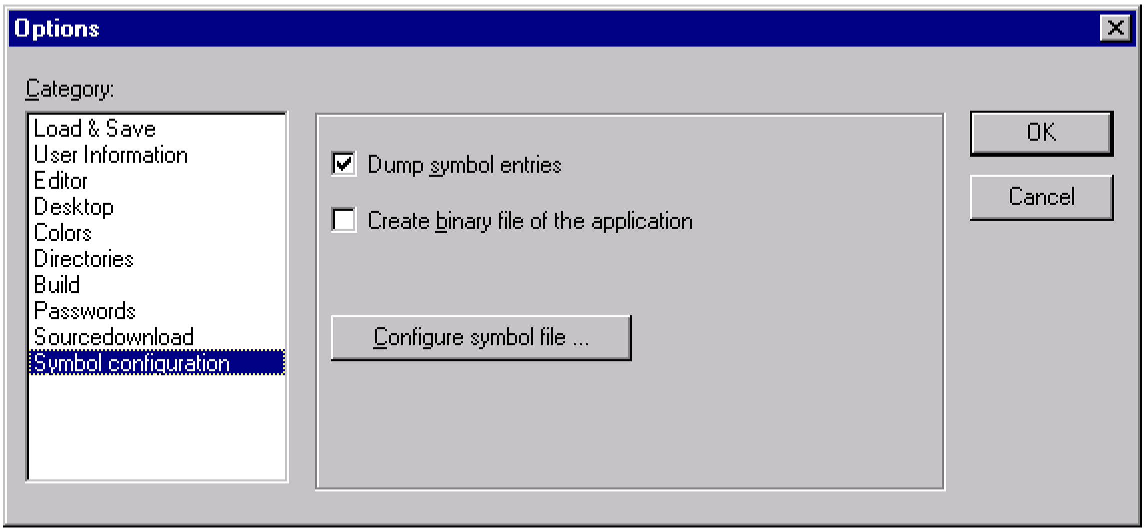
The steps 3.2.1 to 3.2.3 described below must be carried out to make data objects of a project in the programming system 907 AC 1131 available for the OPC server and to establish a connection via OPC.

3.2 Settings in the programming software 907 AC 1131

To enable the OPC server to access the data objects of a project, a symbol file must be created. For this, start the programming software 907 AC 1131 and open the project.

3.2.1 Step 1: Creating the data objects

The gateway does not use a project file, but a symbol file of the same name with the file name extension "sym" or "sdb" (binary). This file contains the symbol entries (item list) for the project variables (refer to OPC documentation, section 2.1.1 Gateway files). To automatically create this symbol file with each compilation process, the option "Dump symbol entries" must be selected. The corresponding settings can be made by calling the menu item <Project><Options>. The automatic creation of the symbol file is set by selecting the category <Symbol configuration> and then checking the checkbox 'Dump symbol entries'. The dialog stays open for entering further settings.



Options

Category:
- Load & Save
- User Information
- Editor
- Desktop
- Colors
- Directories
- Build
- Passwords
- Sourcedownload
- Symbol configuration

☑ Dump symbol entries

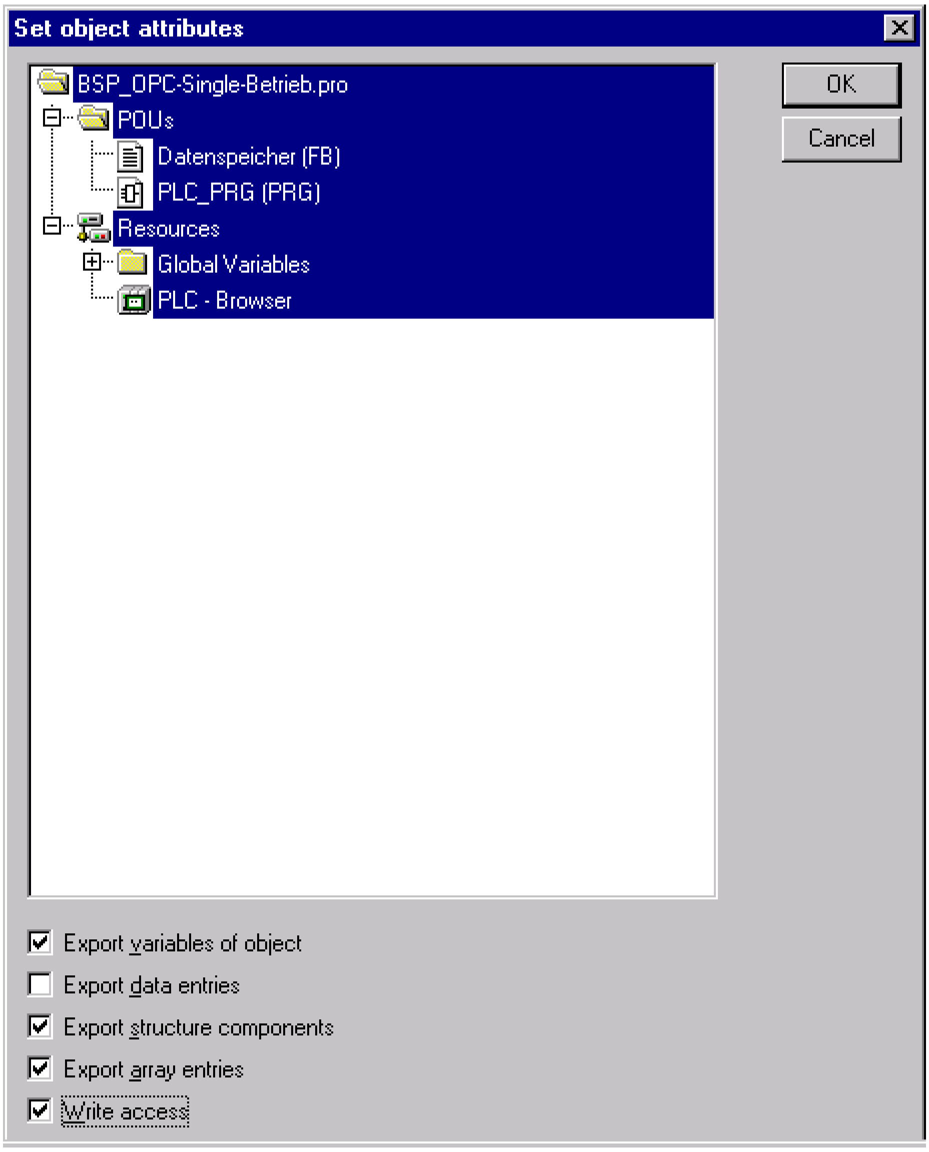
☐ Create binary file of the application

3.2.2 Step 2: Configuring the symbol file

In the 'Set object attributes' dialog, the POUs for which the symbol options shall be set can be selected in the project structure tree. For this, click on the <Configure symbol file> button in the presently open dialog or select <Project> <Options> from the menu and then <Symbol configuration> <Configure symbol file>.

Configuring all POUs (Program Organization Units, User Program Units)

If all project variables shall be defined with the same properties, all POUs must be selected. The desired attributes are activated by clicking on the checkboxes. When an attribute is active, the checkbox is filled with a black checkmark. Inactive attributes must be unchecked (white). Grey checkmarks are not allowed.


Set object attributes

- BSP_OPC-Single-Betrieb.pro
  - POUs
    - Datenspeicher (FB)
    - PLC_PRG (PRG)
  - Resources
    - Global Variables
    - PLC - Browser

☑ Export variables of object
□ Export data entries
☑ Export structure components
☑ Export array entries
☑ Write access

Configuring individual POUs

If only variables of individual POUs shall be defined, first all attributes of the entire project must be deactivated. To do so, select all POUs and deactivate all attribute checkboxes. Now, all checkboxes must be white.

Caution
The deletion of object attributes becomes only effective after it is confirmed with the <OK> button. Each deletion must be confirmed with the <OK> button before further settings can be made. Otherwise, the object attributes are not deleted.

The dialog 'Set object attributes' must be opened again. Now, the individual project POUs can be selected and set with the desired attributes.

The following attributes can be set:

Export variables of object: The variables of the desired object are written to the symbol file.

Export data entries: Entries for accessing the total variables are created for structures and arrays of the object. Assumption: "Export variables of object" is activated.

Export structure components: For the structures of the object one entry is created for each component of the variable. Assumption: "Export variables of object" is activated.

Export array entries: For the arrays of the object one entry is created for each component of the variable. Assumption: "Export variables of object" is activated.

Write access: The OPC server can modify the variables of the object.

3.2.3 Step 3: Setting the communication parameters in the project

The channel of the used gateway is set in the dialog <Online> <Communication Parameters>. (For more detailed information about the gateway configuration please refer to the 907 AC 1131 documentation / volume 10 / chapter 4 "The individual components" / "Online communication parameters for the use of gateways" as well as volume 15 / "System technology of the basic units" / "Programming and testing".) This setting must match the setting configured in the OPC server (refer to section 3.3 Configuring the OPC server using OPCconfig.exe).

Note
For single PLC configuration:
The OPC server automatically starts with the connection settings last used (these settings are kept in the registry). These settings can be verified or changed in the file OPCconfig.exe prior to the start of the OPC server. This means that the setting of the gateway is automatically updated in the configuration. Each time a project is sent to the PLC, the corresponding gateway settings are applied.

The gateway connection can be set to local or TCP/IP. A local connection is used, if the OPC server and the used gateway reside on the same computer. A TCP/IP connection is used, if the gateway of another computer is accessed by the OPC server via a network.

Note

A TCP/IP connection can also be used, if the OPC server and the gateway reside on the same computer. However, with this setting, raised transmission times must be expected compared to the setting 'local'.

Caution

The following must be observed for multi-PLC configuration:
If the variable values on several controllers shall be accessed via the OPC server, the corresponding projects must be loaded to these controllers using the same gateway channel (either local or TCP/IP). A parallel usage of local connection and TCP/IP connection is not allowed!

Caution

With multi-PLC configuration via ARCNET the following must be considered:
The driver GDrvABBArcnet.dll (ARCNET-Treiber) can only be used for one ARCNET participant. If several ARCNET participants are employed, the driver GArcnet3f4f.dll (ARCNET Route) must be used, as it is a multi-PLC driver.

Caution

It is important, that the drivers GDrvABBArcnet.dll (ARCNET) and GArcnet3f4f.dll (ARCNET Route driver) never can be used at the same time (e.g. GDrvABBArcnet.dll in the OPC configuration and GArcnet3f4f.dll in the 907AC1131). In this situation, a system breakdown will occur.

3.2.4 Step 4 (optional): Saving the project

The communication parameters are saved with the project and, after a login, also in the gateway.

3.2.5 Step 5: Creating the symbol file and transmitting it to the gateway

When compiling the project, the symbol file is created and stored to the project directory. When downloading the project (<Online> <Login> -> 'Download'), the symbol file (*.sym or *.sdb) with the present settings is additionally loaded to the gateway (directory 'Gateway Files'). The communication with the OPC server uses the settings of the symbol file located in the path \WinNT\Gateway Files\, for example.

The number of symbols should not exceed approx. 15 000 (corresponds to a symbol file size (*.sym) of approx. 1.5 MB). Please refer to chapter 4 Behavior of the OPC server.

The representation of the variables in the symbol file is the same as in the watch window.

Example:

PLC_PRG.A
PLC_PRG.Struktur.X[4]
.GlobVar1

Caution

Direct addresses cannot be accessed.

3.3 Configuring the OPC server using OPCconfig.exe

With the configuration it is determined which controllers shall read the symbol entries. For this, the gateway channel must be determined, the project name must be entered and the individual parameters (e.g. transmission rate, timeout values, etc.) must be defined. The OPC standard does not include an interface for the transmission of this information. This is why the project identifier is written to the registry on each download of a project (refer to section 3.3.5 Registry entries (example)). The OPC server reads this identifier and searches the symbol file with the same name.

Caution
Primarily it is important that in the OPC server configuration the project name corresponds to the used communication driver (i.e. if the communication channel is set to ARCNET_Node1 and the project name is OPC_Test_program, the ARCNET subscriber with the Node 1 must have the project OPC_Test_program).

Caution
The following must be observed for a multi-PLC configuration:
If the variable values on several controllers shall be accessed via the OPC server, the corresponding projects must be loaded to these controllers using the same gateway channel (either local or TCP/IP). A parallel usage of local connection and TCP/IP connection is not allowed.

For information about the setting refer to section 3.2.3 Step 3: Setting the communication parameters in the project or refer to the 907 AC 1131 documentation.

First, it must be determined which mode is used: single PLC or multi PLC. The mode of operation depends on the following factors:

Mode of operation	Factors
Single PLC	- This mode is used, if the symbol entries are read by only **one controller**. **Note** In the single-PLC mode the configuration of the gateway channel is adapted automatically, i.e. each time a project is sent to the PLC, the corresponding gateway settings are applied to the OPC configuration. **Caution** Single-PLC mode should only be used if it is wanted that the configuration is automatically adapted. - Generally, we recommend to use the setting multi PLC.

Multi PLC

- Multi PLC must always be used, if the symbol entries are read by **at least 2 controllers**.
- Multi-PLC mode is also used if the symbol entries are only read by **one controller** but the **configuration shall not be adapted automatically**, i.e. if the OPC configuration settings shall be adapted manually. For instance, this is important if you have set up an ARCNET network with several controllers and the symbol file shall only be read by one controller (head controller). Otherwise, if the programming of the other controllers is performed via the same gateway, the OPC configuration was changed with each program download.

The following notes should be observed for the use:

Note
A download of the desired project to the corresponding target controller should be performed immediately before using the OPC server.

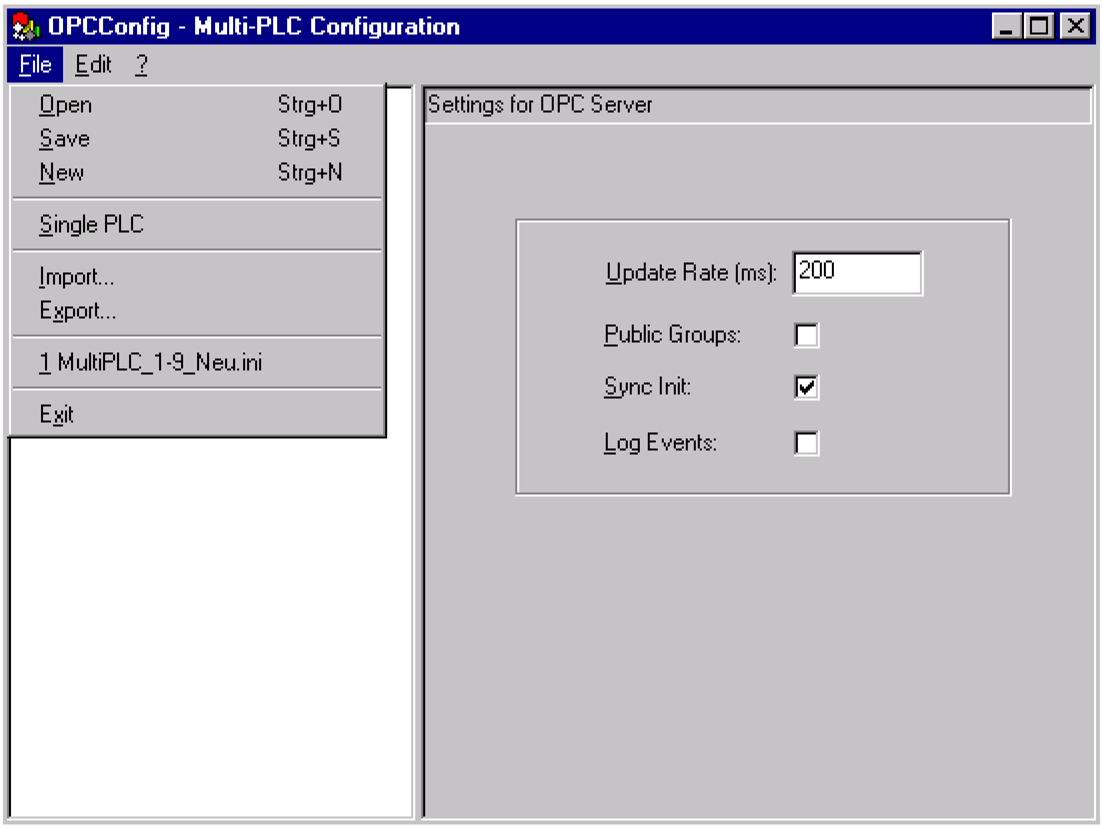
Note
When adding or deleting variables in the project, the item list can be updated without the need to exit the OPC client and OPC server by carrying out a download once again (with the activated option 'Dump symbol entries'). For instance, the client then receives a corresponding message (status "bad") when it tries to access a deleted variable.

Note
Please note that a possibly existing boot project does no longer match a project which was changed and downloaded again. This is why it is recommended to store the program in the Flash memory of the PLC each time it is downloaded.

For the configuration of the OPC server and the modification of the registry entries of the server, the configurator OPCconfig.exe is started (refer to OPC documentation 3.3.5 Registry entries (example)).

The following sections describe the commands of the <File> and <Edit> menus as well as the specific dialogs for the single-PLC or multi-PLC configuration.

3.3.1 <File> menu



Settings for OPC Server

Update Rate (ms): 200

Public Groups: □

Sync Init: ☑

Log Events: □

Open This command opens the configuration last saved using <File> <Save>.

Save If the configuration of the server, the PLC(s) and the connection(s) is finished, it must be saved using this command in order to become valid.

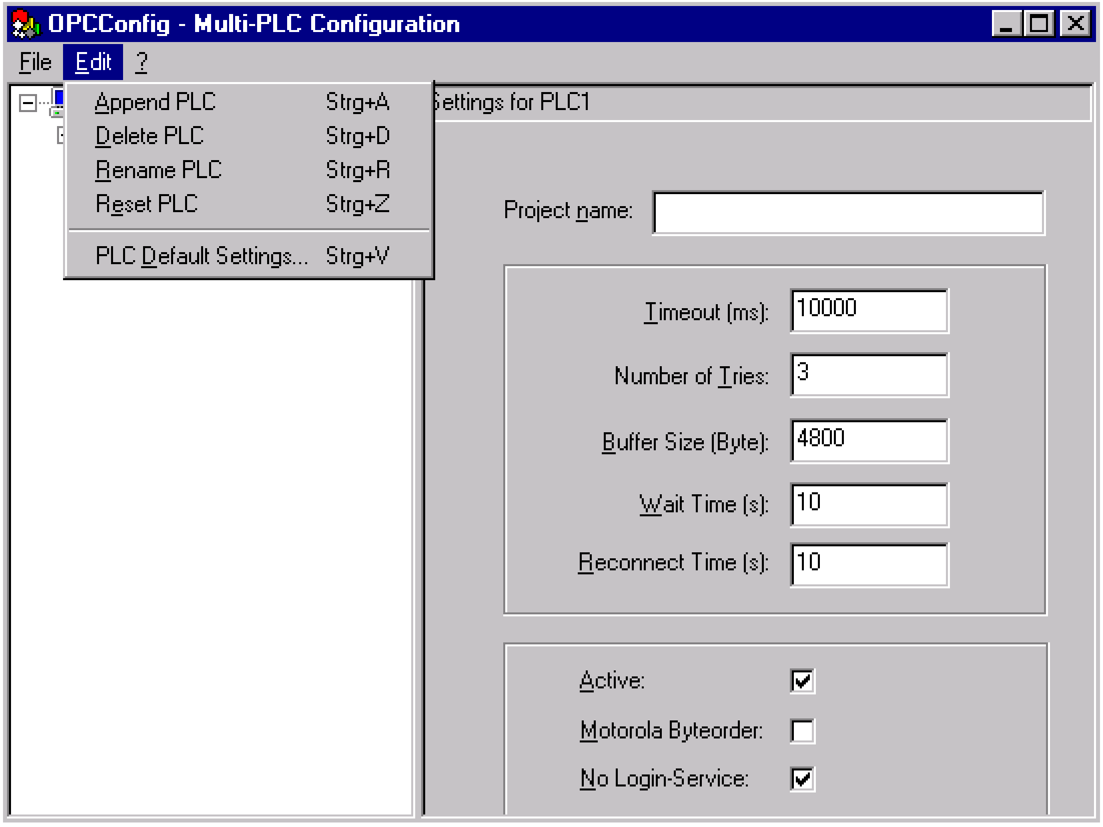
New This command opens a new configuration, i.e. the dialogs contain the default settings or empty input fields.

Single PLC Using this option, the mode single PLC or multi PLC is selected. If the menu entry **'Single PLC'** is displayed, **multi-PLC** mode is active. If the menu entry **' Single PLC'** is displayed, **single-PLC** mode is active.

Export
Import Using the <Export> command, the current configuration can be exported to a text file. For this, the 'Save file as' standard dialog is opened where you can enter a file name. The default file name extension ".ini" is appended automatically. The ini file contains the configuration parameters and can be edited and re-imported using the command <File> <Import>. When importing a file, the existing ini files are offered in the 'File open' standard dialog.

3.3.2 <Edit> menu

The following commands are available depending on the selection in the configuration tree ('Server', 'PLC' or 'Connection') or depending on the type of configuration (single PLC or multi PLC).



Settings for PLC1

Project name:

Timeout (ms): 10000

Number of Tries: 3

Buffer Size (Byte): 4800

Wait Time (s): 10

Reconnect Time (s): 10

Active: ☑

Motorola Byteorder: □

No Login-Service: ☑

Append PLC Multi-PLC mode, settings for the OPC server:
Using this option, another controller is inserted to the configuration, refer to section 3.3.4 Multi-PLC configuration in the OPC documentation.

Rename PLC Multi-PLC mode, settings for the OPC server:
Using this option, a controller previously inserted to the configuration can be renamed, refer to section 3.3.4 Multi-PLC configuration in the OPC documentation.

Delete PLC Multi-PLC mode, settings for the OPC server:
Using this option, a controller previously inserted to the configuration can be removed, refer to section 3.3.4 Multi-PLC configuration in the OPC documentation.

Reset PLC Single PLC and multi-PLC mode, settings for the PLC:
The configuration parameters set with <Edit> <PLC Default Settings> are loaded from the registry.

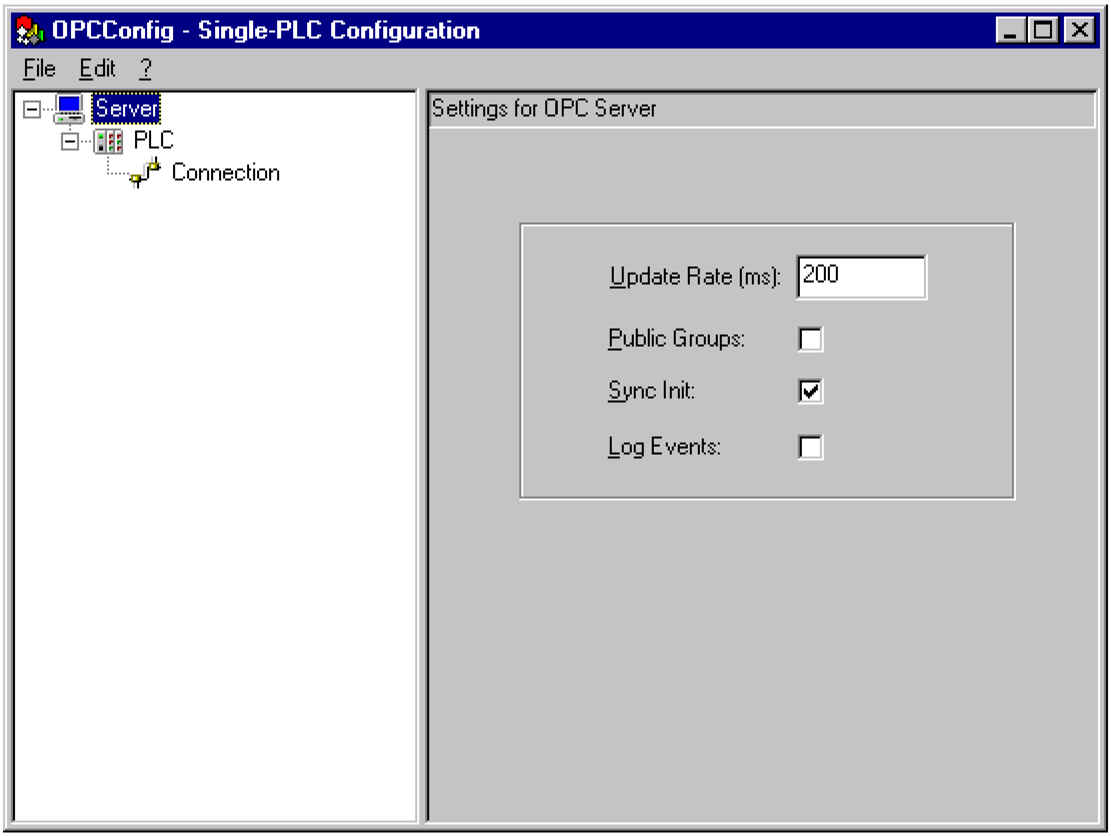
PLC Default Settings Always available:
The dialog 'PLC Default Settings' is opened where you can enter your own values for the PLC configuration settings. This dialog corresponds to the 'Settings for PLC' dialog (refer to OPC documentation, section 3.3.3 Single-PLC configuration). The values set in this dialog are saved to the registry after the dialog is confirmed with <OK>. Using the command <Edit> <Reset PLC>, these settings can be re-loaded for a PLC which is selected in the configuration tree.

3.3.3 Single-PLC configuration

Generally, we recommend to use the setting multi PLC. Proceed as follows to configure an OPC server for single PLC mode:

Note
Possibly appearing dialogs for saving are not mentioned in the following procedure.

Start the program OPCconfig.exe. First, activate the single-PLC mode by selecting the option <Single PLC> from the <File> menu. The menu entry is then marked with a checkmark (**Single PLC**). Select the menu option <File> <New> to open the following default dialog.



OPCConfig - Single-PLC Configuration

Settings for OPC Server

Update Rate (ms): 200

Public Groups: □

Sync Init: ☑

Log Events: □

In the left area of the window, the **server**, the controller (**PLC**) and the **connection** are represented in a tree structure and can be selected by clicking with the mouse. The right part of the window displays the corresponding configuration dialog for the entry selected in the tree structure. The <Edit> menu is not used for the single-PLC configuration.

The following server settings can be made in the right part of the window, if the topmost entry 'Server' is selected in the configuration tree.

Update Rate (ms): Default: 200

> Basic update rate of the OPC server in milliseconds = Cycle time used for reading all item values from the controller. These values are written to the cache the client communicates with using a separately defined update rate.

Caution
If the update rate is set too low, no communication can be established to the controller. The status of the items is displayed as BAD in the client. Also refer to chapter 4 Behavior of the OPC server.

Public Groups: Default: deactivated (no checkmark)

The OPC server establishes one public group for each IEC block as well as for the global variables.

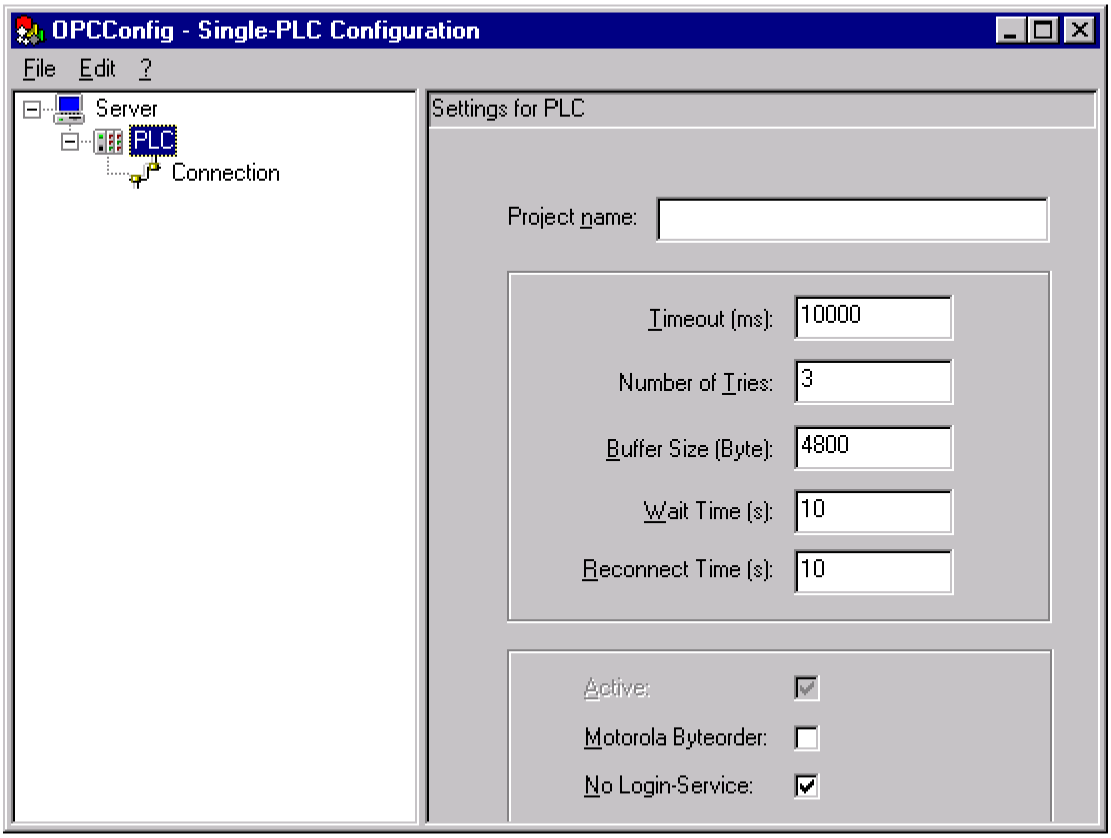
Sync Init: Default: activated (checkmark)

Synchronous initialization: When starting, the OPC server does not react until the symbol configuration is loaded.

Log Events: Default: deactivated (no checkmark)

When this option is activated, the actions performed and the errors occurred at the OPC server are logged and saved to a log file. The file is saved to the project directory and named OPCServer.log. The messages of several OPC sessions are subsequently listed in a log file.

The following settings for PLC can be made in the right part of the window, if the entry 'PLC' under 'Server' is selected in the configuration tree.



Settings for PLC

Project name:

Timeout (ms): 10000

Number of Tries: 3

Buffer Size (Byte): 4800

Wait Time (s): 10

Reconnect Time (s): 10

Active: ☑

Motorola Byteorder: □

No Login-Service: ☑

Project name:

Name of the project currently loaded. For single-PLC mode, this entry is not mandatory.

Note
If the communication with the OPC server is performed via the gateway channel which was used for downloading the program to the PLC, no project name must be entered. The project name must be entered here, if another gateway channel is used for the OPC server.

Timeout (ms): Default: 10000

The OPC server exits automatically after this time period if it does not receive an answer from the controller to a transmitted service.

Number of Tries: Default: 3

Number of attempts the OPC server tries to re-establish the connection to the controller after a timeout. The time interval between the re-establishment attempts is defined at 'Reconnect Time'.

Buffer Size [Bytes]: Default: 4800

Communication buffer size on the target system. For all AC31 controllers, a buffer size of < 5000 must be entered.

Wait Time [s]: Default: 10

Time in seconds that the OPC server waits until the controller is ready (important for controller autostart).
After the OPC server is started, it tries to communicate with the configured controllers. Then it notifies the client whether communication to the controllers is possible or not. The controllers must log in within the set wait time, otherwise the status is passed to the client.

Note
The wait time must be set long enough to enable all subscribers to log in. If this time is set too short it could happen that some subscribers cannot log in during the start. In this case, the wait time setting should be increased.

This time depends on the number of subscribers and the number of items defined in the symbol file.

Note
If the AC1131 project is modified and new items are added to the symbol configuration, it can happen that the previously set parameters are no longer correct. In this case the parameters must be adapted (i.e. the wait time must be increased).

Reconnect Time [s]: Default: 10

Time interval during which the OPC server attempts (as often as set at 'Number of Tries') to re-establish the connection to the controller via the gateway after a communication break-off.

Active: Not available (only available in multi-PLC mode)

Motorola Byteorder: Default: deactivated (no checkmark)

The target system of the project does not use the Motorola byte order.

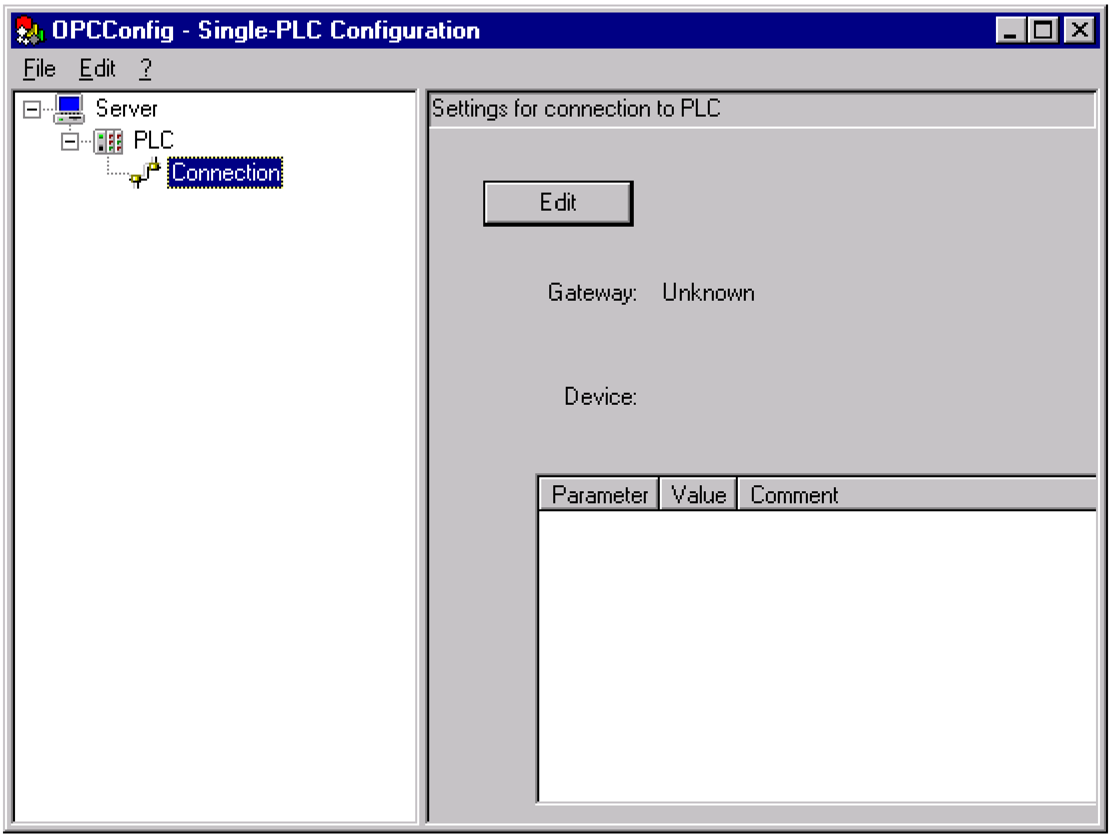
Note
This function is not active for all AC31 controllers.

No Login-Service: Default: activated (checkmark)

This option must be deactivated for specific target systems which require the transmission of a login service.

Note
The login service may not be transmitted for all ABB controllers. This function must be activated.

The following settings for connection to PLC can be made in the right part of the window, if the entry 'Connection' is selected in the configuration tree.



Settings for connection to PLC

Gateway: Unknown

Device:

If no settings are made yet or if the existing settings shall be modified, the **Communication Parameters** dialog can be opened by clicking on the button **Edit**. This dialog is identical to the gateway settings available in the programming software 907 AC 1131 when selecting <Online> <Communication Parameters>.

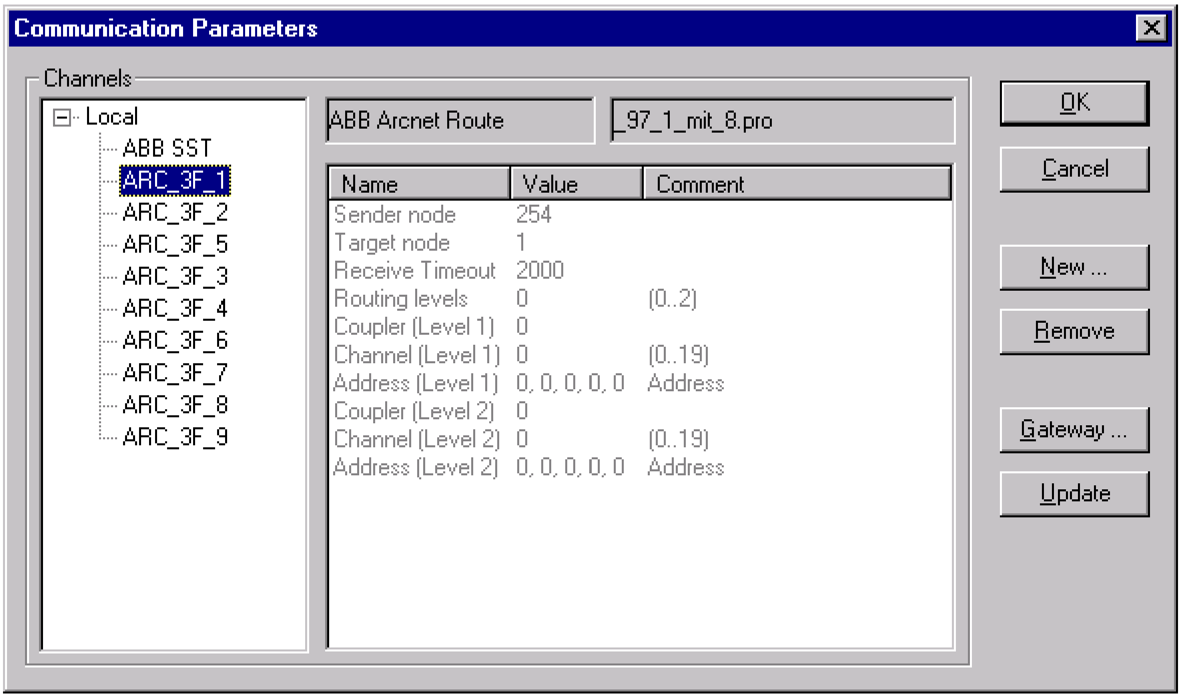


ABB Arcnet Route | _97_1_mit_8.pro

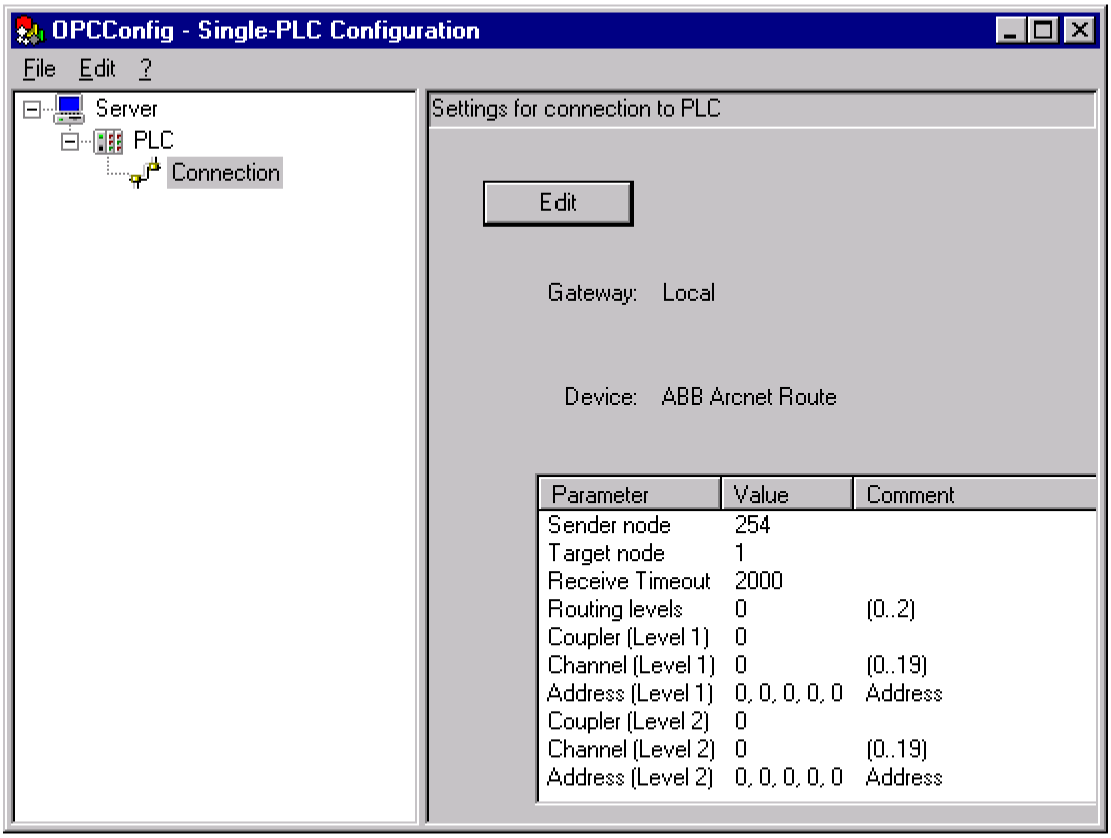
Name	Value	Comment
Sender node	254	
Target node	1	
Receive Timeout	2000	
Routing levels	0	(0..2)
Coupler (Level 1)	0	
Channel (Level 1)	0	(0..19)
Address (Level 1)	0, 0, 0, 0, 0	Address
Coupler (Level 2)	0	
Channel (Level 2)	0	(0..19)
Address (Level 2)	0, 0, 0, 0, 0	Address

First it is set whether the communication shall use a local or a TCP/IP gateway channel. In addition, a list of all driver settings is displayed which were loaded via the gateway up to now.

Here, the driver must be selected with which the OPC server shall communicate. Confirm the settings with <OK>.

For operating information refer to section 3.2.3 Step 3: Setting the communication parameters in the project or refer to the 907 AC 1131 documentation.

Now, your selections must have been applied and the dialog box looks as follows:


OPCConfig - Single-PLC Configuration
File
Edit
?
Server
PLC
Connection
Settings for connection to PLC
Edit

Gateway: Local

Device: ABB Arcnet Route

Parameter	Value	Comment
Sender node	254	
Target node	1	
Receive Timeout	2000	
Routing levels	0	(0..2)
Coupler (Level 1)	0	
Channel (Level 1)	0	(0..19)
Address (Level 1)	0, 0, 0, 0, 0	Address
Coupler (Level 2)	0	
Channel (Level 2)	0	(0..19)
Address (Level 2)	0, 0, 0, 0, 0	Address

3.3.4 Multi-PLC configuration

If several controllers shall be configured, the option 'Single PLC' must be deactivated in the <File> menu.

First, only the entry 'Server' is displayed in the left part of the window. The desired controllers must be inserted using the command <Edit> <Append PLC>. Then they can be configured individually as already described for the single PLC configuration.

Differences compared to the single PLC configuration:

In the **Edit** menu, the following commands are additionally available for the PLC currently selected in the configuration tree:

Append PLC A new 'PLC' entry is inserted. Additional PLCs are always inserted below the currently highlighted entry. The name "PLC<n>" is automatically assigned, where n is counted up beginning with 1.

Delete PLC The highlighted entry is removed from the configuration.

Rename PLC Each PLC can be assigned a user defined name. To do so, highlight the desired PLC entry and then select <Edit> <Rename PLC>. An editing field is opened where you can enter the name.

The name of the project which was downloaded to this controller via the gateway can be entered to the **Project name** input field of the 'Settings for PLC' dialog.

Note
If the communication with the OPC server is performed via the gateway channel which was used for downloading the program to the PLC, it is not required to assign a project name. The project name must be entered, if another gateway channel is used for the OPC server.

By selecting or deselecting the option **Active** in the 'Settings for PLC' dialog it can be defined whether the controller shall be considered by the OPC server or not.

Caution
It must be observed that the communication is not performed via different gateway connections. If the variable values on several controllers shall be accessed via the OPC server, the corresponding projects must be loaded to these controllers using the same gateway channel (either local or TCP/IP). A parallel usage of local connection and TCP/IP connection is not allowed.

Caution
With multi-PLC configuration via ARCNET the following must be considered:
The driver GDrvABBArcnet.dll (ARCNET-Treiber) can only be used for one ARCNET participant. If several ARCNET participants are employed, the driver GArcnet3f4f.dll (ARCNET Route) must be used, as it is a multi-PLC driver.

Caution
It is important, that the drivers GDrvABBArcnet.dll (ARCNET) and GArcnet3f4f.dll (ARCNET Route driver) never can be used at the same time (e.g. GDrvABBArcnet.dll in the OPC configuration and GArcnet3f4f.dll in the 907AC1131). In this situation, a system breakdown will occur.

3.3.5 Registry entries (example)

The registry can be displayed using the command "*regedit*" in the command prompt.

Entries for the 'Settings for OPC server' dialog of the OPC configurator:

[HKEY_CURRENT_USER\Software\3S-Smart Software Solutions GmbH\CoDeSys OPC\Connections]
* corresponds to the values set in the 'Settings for PLC dialog' of the OPC configurator (refer to sections 3.3.3 Single-PLC configuration and 3.3.4 Multi-PLC configuration in the OPC documentation). *

- "Buffersize"="0x000012c0 (4800)"
- "Instances"="00 00 00 00 00 00 00 00
- "Motorola0"="No"
- "Name0"=""
- "NoLogin0"="No"
- "Project0"=hex (current communication parameters for the OPC server and project identification)
- "Timeout0"="0x00002710 (1000)"
- "Tries0"="0x00000003 (3)"

[HKEY_LOKAL_MACHINE\SOFTWARE\3S-Smart Software Solutions GmbH\CoDeSys OPC\Config]
* corresponds to the values set in the 'Settings for OPC server' dialog of the OPC configurator (refer to section 3.3.3 Single-PLC configuration in the OPC documentation). *

- "LogEvents"="No"
- "Multi"="no"
- "Public groups"="No"
- "Reconnect Interval"="0x00000005 (5)"
- "Sync startup"="yes"
- "Updaterate"="0x00000064 (100)"
- "Wait for target"="0x0000000a (10)"

[HKEY_LOCAL_MACHINE\SOFTWARE\3S-Smart Software Solutions GmbH\CoDeSys OPC\PLCDefaults]
* corresponds to the values set under <Edit> <PLC Default Settings> in the OPC configurator (refer to section 3.3.2 <Edit> menu) *

- "Activ"="true"
- "Buffersize"="4800"
- "Motorola"="false"
- "Nologin"="true"
- "project"=""
- "Reconnecttime"=10"
- "Timeout"="10000"
- "Tries"="3"
- "Waittime"="10"

3.4 Starting CoDeSysOPC.exe

The OPC server (and the gateway server) is automatically started by the operating system as soon as one of the clients establishes a connection. It is not necessary to start it explicitly. If an OPC server has already been started manually, the client connects automatically to the running server.

The server is automatically exited again as soon as all clients have cleared the connection.

While the OPC server is running, the icon is displayed on the right side of the status bar on the bottom of the screen.

Right-clicking on this icon displays information about the version of the OPC server.

Starting in test mode:

The connection between the OPC server and the client can also be tested if no controller is linked. For this purpose, the OPC server must be started explicitly using the command

```
CoDeSysOPC.exe /TestMode
```

Then it runs in test mode and automatically generates a series of test items which are used to test the communication to the client.

Caution
The items generated in test mode are only test variables. They are not the variables from the symbol file of your project.

The OPC icon in the status bar is also displayed while the simulation mode is running.

3.5 Exiting CoDeSysOPC.exe

The OPC server is automatically exited as soon as all clients have cleared the connection.

3.6 Starting and exiting Gateway.exe

The gateway is automatically started by the operating system as soon as one of the subscribers (e.g. 907 AC 1131, OPC server, OPCConfig or similar) tries to access the gateway server.

The icon on the right side of the status bar on the bottom of the screen indicates that the gateway was started and whether it is in use or not.

Once the gateway is started, it stays opened. However, it is indicated whether it is in use or not. When the gateway is inactive, the icon is shaded in gray . It is not necessary to close the gateway.

If required, the gateway can be exited manually. To do so, right-click on the gateway icon to open the context menu. Select <Exit> to close the gateway server.

4 Behavior of the OPC server

4.1 General recommendations

The configuration should be optimized as well as possible to enable shortest possible update times. This is influenced by the following:

- **Number of subscribers (controllers):**
  This setting is performed in the OPC configuration. The lower the number of subscribers, the faster the communication.

- **Number of items:**
  This setting is performed in the 907 AC 1131 project (creation of symbol file). Only variables which can be visualized later should be added to the symbol file. The lower the number of variables, the faster the configuration.

- **Number of active items:**
  This setting is performed in the client (visualization software). The items should be assigned to individual groups which are updated at the same time. The groups are only released when they are needed, i.e. not all items of the project must be updated simultaneously. As a result, only the currently needed items are read.

- **Correct parameter assignment when setting the OPC configuration:**
  *****The setting of the following parameters is absolutely necessary for AC31 controllers:
  - Buffer Size: 4800
  - Motorola Byteorder: deactivated
  - No Login Service: activated
  - The gateway channels for multi PLC mode may not be mixed (do not use local and TCP/IP in parallel)

  * Parameters to be set in order to optimize the communication:
  In order to reach a stable communication, the following parameters must be set high enough.
  - Update rate
  - Timeout value
  - Wait time
  - Reconnect time

4.2 Timing behavior of the OPC server

For serial connection it is recommended to use the single-PLC mode.

For ARCNET connections generally the multi PLC mode could be used (this depends on the function of the automatic configuration adaptation, refer to section 3.3 Configuring the OPC server using OPCconfig.exe). The more subscribers and items are configured, the slower is the communication.

Caution
If the transmission rate is set too low in the configuration, the communication becomes considerably slower or is no longer performed. The transmission rate should be set approximately to the value which can be reached.

Note
For configurations with several subscribers, the transmission rates between the individual subscribers can differ. The value set in the configuration must be adjusted to the subscriber with the slowest communication.

	Serial				**ARCNET**			
	Single PLC		**Multi PLC**		**Single PLC**		**Multi PLC**	
	Up-date rate [ms]	**Measured time approx. [s]**	**Up-date rate [ms]**	**Measured time approx. [s]**	**Up-date rate [ms]**	**Measured time approx. [s]**	**Up-date rate [ms]**	**Measured time approx. [s]**
1 subscriber								
4 items	50	0.1	50	0.2	50	0.05	50	0.05
100 items	500	1	500	1	100	0.5	100	0.5
500 items	1000	3	1000	3	500	2	500	2
800 items	1000	7	1000	7	500	3	500	3
6 subscribers								
24 items	-	-	-	-	-	-	100	0.2
100 items							100	0.5
1000 items							500	2
4800 items							2000	7
9 subscribers								
36 items	-	-	-	-	-	-	1000	1
100 items							1000	2-4
1000 items							1000	4-7
7200 items							3000	7-12

5 Connection with an OPC server on another computer

5.1 DCOMCNFG.EXE

Using DCOMCNFG.EXE from the system directory, a connection to an OPC server on another computer can be established. For this purpose, select the entry 'OPC server for CoDeSys...' in the 'Applications' tab and then click on the 'Properties' button. In the properties dialog, open the 'Location' tab, activate the option 'Run application on the following computer' and then enter the desired computer.

For such a connection it is assumed that an OPC server is also running on the local computer.

6 Example of an ini file for the OPC server configuration

6.1 Example for a multi-PLC configuration

The ini file of the OPC server configuration can be exported from OPCConfig.exe to a text file and then edited and re-imported again to OPCConfig.

The following is an example of ini file entries (multi-PLC mode with 2 subscribers):

Entry	Meaning
[Server]	Settings for the OPC server
updaterate=200	Transmission rate [200ms]
publicgroups=0	Public Groups [deactivated]
logevents=1	Create log file [activated]
syncinit=1	Sync Init [activated]
PLCs=2	Number of subscribers [2]
PLC0=PLC1	PLC name subscriber 1 [PLC1]
PLC1=PLC2	PLC name subscriber 2 [PLC2]
[PLC:PLC1]	Settings for PLC1
active=1	Subscriber active [activated]
motorola=0	Motorola byte order [deactivated]
nologin=1	No login service [deactivated]
timeout=10000	Timeout value [10s]
tries=3	Number of reconnect attempts [3]
waittime=10	Wait time [10s]
reconnecttime=10	Reconnect time [10s]
buffersize=4800	Buffer size [4800]
project=PLC1.pro	Project name [PLC1.pro]
gateway=Local	Gateway channel [local]
device=ABB Arcnet Route	Parameters for the gateway connection to PCL1 (driver setting): - gateway driver [ABB ARCNET Route] - driver name [ARC_3F_1] - node number 1
instance=ARC_3F_1	
parameters=10	
parameter0=Sender node	
value0=254	
parameter1=Target node	
value1=1	
parameter2=Receive Timeout	
value2=2000	
parameter3=Routing levels	
value3=0	
parameter4=Coupler (Level 1)	
value4=0	
parameter5=Channel (Level 1)	
value5=0	
parameter6=Address (Level 1)	
value6=0, 0, 0, 0, 0	

Entry	Meaning
parameter7=Coupler (Level 2)	
value7=0	
parameter8=Channel (Level 2)	
value8=0	
parameter9=Address (Level 2)	
value9=0, 0, 0, 0, 0	
[PLC:PLC2]	Settings for PLC2
active=1	Subscriber active [activated]
motorola=0	Motorola byte order [deactivated]
nologin=1	No login service [deactivated]
timeout=10000	Timeout value [10s]
tries=3	Number of reconnect attempts [3]
waittime=10	Wait time [10s]
reconnecttime=10	Reconnect time [10s]
buffersize=4800	Buffer size [4800]
project=PLC2.pro	Project name [PLC2.pro]
gateway=Local	Gateway channel [local]
device=ABB Arcnet Route	Parameters for the gateway connection to PLC1 (driver setting): - gateway driver [ABB ARCNET Route] - driver name [ARC_3F_2] - node number 2
instance=ARC_3F_2	
parameters=10	
parameter0=Sender node	
value0=254	
parameter1=Target node	
value1=2	
parameter2=Receive Timeout	
value2=2000	
parameter3=Routing levels	
value3=0	
parameter4=Coupler (Level 1)	
value4=0	
parameter5=Channel (Level 1)	
value5=0	
parameter6=Address (Level 1)	
value6=0, 0, 0, 0, 0	
parameter7=Coupler (Level 2)	
value7=0	
parameter8=Channel (Level 2)	
value8=0	
parameter9=Address (Level 2)	
value9=0, 0, 0, 0, 0	

7 Brief checklist

7.1 Brief checklist

Please check the following if the communication via OPC does not work:

1. Gateway installed and running? Icon in the taskbar (right side on the bottom) active?
2. Installation and registration of the OPC server ok?
   Is automatically performed when "CoDeSysOPC /Install" (installation + registration) or "CoDeSysOPC /RegServer" (registration only) are executed.
3. Project preparation / settings in the AC1131 programming system ok?
   <Project> <Options>: 'Dump symbol entries' selected?
   Communication parameters: Selected gateway channel ok?
   Project saved, compiled and download performed?
   The symbol files *.sym and *.sdb must exist in the path WinNT\Gateway Files.
4. If OPC shall be used on another computer (only possible if the OPC server is also running on the local computer and if the AC1131 project is not additionally accessed (currently logged in) on the other computer):
   Establish a connection to the other computer using DCOMCNFG.EXE (in the system directory):
   - select the entry 'OPC server for CoDeSys...' in the 'Applications' tab,
   - click on the 'Properties' button, open the 'Location' tab, activate 'Run application on the following computer' and then enter the desired computer.
5. Verify the connection and the server settings: OPCCFG.EXE:
   - Connection: (entry must correspond to the valid gateway channel set in the AC1131 communication parameters)
   - Usual server settings: Update Rate 200ms, Public Groups: No, Sync Init: No
     Usual PLC settings: Communication Timeout 10 s (10000)
     Number of (Reconnect) Tries: 3, Buffer Size: 4800, Wait Time (target system): 10s
     Reconnect Time: 10s, Active: yes, Motorola Byteorder: no, No Login Service: yes
     Connection settings for PLC: Caution: For multi PLC mode, local and TCP/IP cannot be mixed, verify driver settings
   - Save -> The new configuration becomes effective when a new connection to the OPC server is established.
6. Verify whether symbol entries are available: DiagnosticOPCClient.exe
   Establish connection (Connect OPC-Server) -> in the right-hand window, right-click on Private Groups, confirm the dialog with OK, right-click on the created group entry -> add all items -> all created symbol entries (variables) should be displayed now.

The OPC server is automatically exited as soon as all clients have cleared the connection to it.

The OPC server is displayed in the Task Manager as a process.

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