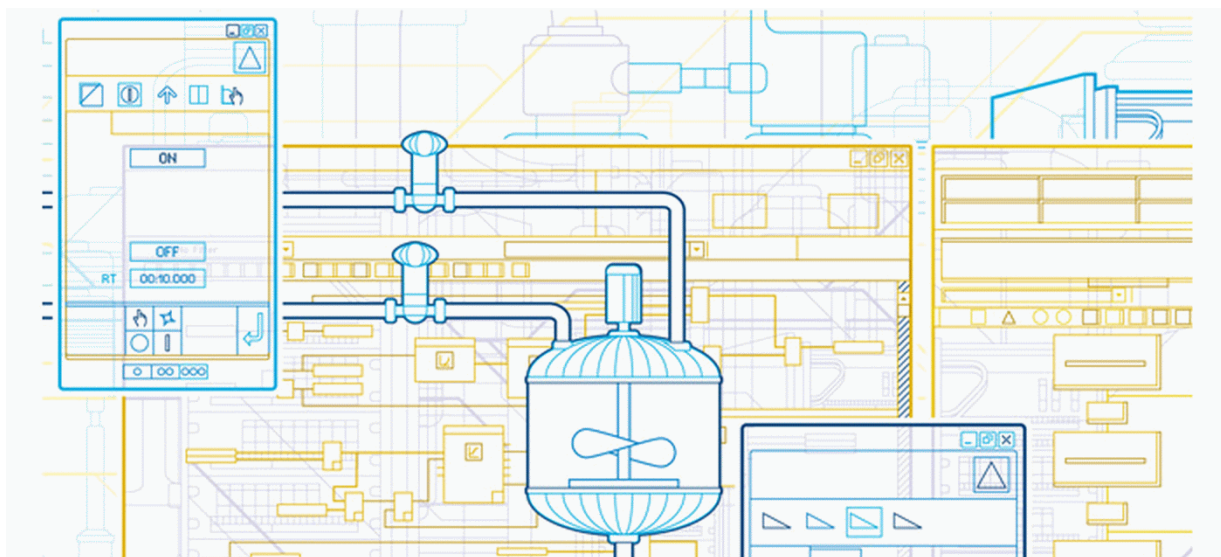


Freelance OPC Server F

Engineering Manual



Industrial^{IT}
enabled™

ABB

**Freelance
OPC Server F**

Engineering Manual

Version 9.2 SP1

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About This Book

Use of Warning, Caution, Information, and Tip Icons

This publication includes **Warning**, **Caution**, and **Information** where appropriate to point out safety related or other important information. It also includes **Tip** to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:



Electrical warning icon indicates the presence of a hazard which could result in *electrical shock*.



Warning icon indicates the presence of a hazard which could result in *personal injury*.



Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in *corruption of software or damage to equipment/property*.



Information icon alerts the reader to pertinent facts and conditions.



Tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result

in degraded process performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

Terminology

The Glossary contains terms and abbreviations that are unique to ABB or have a usage or definition that is different from standard industry usage. Please make yourself familiar to that.

You will find the glossary at the end of the [Engineering Manual System Configuration](#).

Related Documentation

The following list gives an overview of the documentation relating to the Freelance system.

Title	Number
Mounting and Installation Instructions, Control IT, AC 800F	3BDD012501Rxxxx
Mounting and Installation Instructions, Control IT, AC 700F	2PAA103858Rxxxx
Mounting and Installation Instructions, FieldController	3BDD012602Rxxxx
Mounting and Installation Instructions, Rack-System	3BDD012603Rxxxx
DigiVis, Operators Manual, Operator Station, Conventional Design	3BDD012600Rxxxx
DigiVis, Operators Manual, Operator Station, New Design	3BDD011932Rxxxx
DigiBrowse, Operators Manual	3BDD012601Rxxxx
Getting Started	3BDD012560Rxxxx
New Features History	3BDD011933Rxxxx
Engineering Manual, System Configuration	3BDD012503Rxxxx
Engineering Manual, DigiVis Operator Station Configuration	3BDD012518Rxxxx
Engineering Manual, Process Station - AC 800F	3BDD012505Rxxxx

Title	Number
Engineering Manual, Process Station - AC 700F	2PAA103857Rxxxx
Engineering Manual, Process Station - FieldController	3BDD012519Rxxxx
Engineering Manual, Process-Station - Rack System	3BDD012520Rxxxx
Engineering Manual, S700 Modules	2PAA105800Rxxxx
Engineering Manual, OPC-Server F	3BDD012511Rxxxx
Engineering Manual, Trend-Server	3BDD012527Rxxxx
Engineering Manual, IEC 61131-3 Programming	3BDD012504Rxxxx
Engineering Manual, Integration Process Portal B1	3BDD012521Rxxxx
Engineering Manual, User Access	3BDD012513Rxxxx
Engineering Reference Manual, Functions and Function Blocks	3BDD012514Rxxxx
Engineering Reference Manual, Communication and Fieldbusses	3BDD012515Rxxxx
Engineering Manual, Protronic Remote Control	3BDD012506Rxxxx
Engineering Manual, DDE32	3BDD012507Rxxxx
Engineering Manual, IEC 60870-5 Telecontrol Library	3BDD012509Rxxxx
Engineering Manual, Interbus Blocks	3BDD012510Rxxxx
Engineering Manual, Coupling Sartorius Scales	3BDD012512Rxxxx
Reference Manual, DMS / API	3BDD012508Rxxxx
Engineering Manual, Freelance Bulk Data Manager	2PAA105801Rxxxx

Section 1 General description

OPC is the abbreviation for OLE for process control. This is an open interface standard based on the Windows-based technology of OLE (Object Linking and Embedding) and COM (Component Object Model); it enables data to be exchanged simply and in a standard way between applications from the fields of industry and commerce as well as manufacturing.

Data from the AC 800F and Freelance process stations as well as the connected field bus instruments is transmitted to other systems with an OPC client interface via an **OPC server** interface.

Via the **OPC client** interface, Freelance (Control Builder F and DigiVis), with its operation and observation functions, can display data from automation instruments and systems from other manufacturers.

Data from OPC server is transferred to Control Builder F and DigiVis through ABB OPC tunnel.

- OPC is faster and offers better availability than DDE.



DDE is supported with Freelance Systems running on Windows XP and not supported with Freelance Systems running on Windows 7.



Freelance 9.2 SP1 is compatible for Windows 7 operating system.

- Every value acquired via OPC has a time stamp and a status.
- OPC uses a block format for communication, and in a single call it can send several requests and receive several values.
- OPC allows client applications to specify required scan rates.

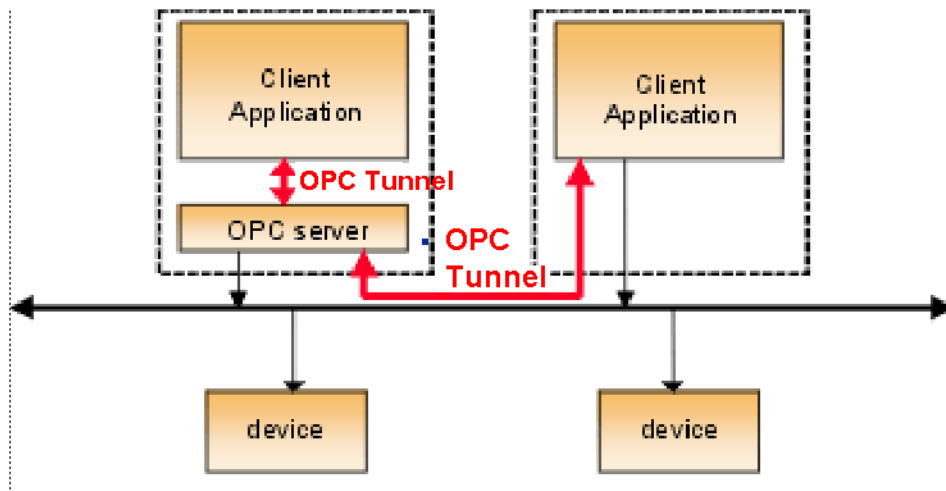
- Unlike DDE, OPC uses binary data representations (IEEE floating-point numbers, integers ...)
- The variables for a server can be viewed and selected using a browser.
- The concept of creating groups allows different sets of variables with different scan rates.

Two interfaces are implemented:

1. Custom Interface Data Access 1.0A Freelance 2000 Version 3.3 and later
 Data Access 2.0 Freelance 2000 Version 5.1 and later
 Alarms&Events 1.0 Freelance 2000 Version 6.1 and later
2. Automation Interface Data Access 1.0A Freelance 2000 Version 3.3 and later

The functions identified as 'required' in the OPC specifications have been implemented for all interfaces. The *browser interface* has also been implemented. These functions enable a remote client to read the list of known variables in an OPC-Server F.

OPC overview: OPC server coupled directly with COM and distributed with OPC Tunnel.



OPC.bmp

Term	Explanation
OPC	OPC stands for 'OLE for Process Control' and is based on Microsoft's core OLE technologies COM.
COM	When objects have been implemented on different platforms or computer architectures it is necessary to establish how these platforms interpret an object before the objects can be made mutually compatible. A so-called object model is required for this purpose. OLE uses the model COM (Component Object Model). This model defines the standard for the working relationship between the components. COM enables calls to be made within a process and to another process.
ABB OPC tunnel	Links the OPC server to the Control Builder F and DigiVis.

OPC client

Control Builder F allows variable lists from other OPC servers to be read and imported. The imported data can be used for configuring graphic displays, trends and logs.

During commissioning, the imported variables can be displayed in the values window and trend window in exactly the same way as the variables from the process stations.

Using the **DigiVis** (Freelance) OPC client functionality, other systems' variables can be read from their OPC server. As soon as a graphic object, a trend or a log is called up in DigiVis that requires variables from remote OPC servers, the OPC client that is integrated in DigiVis retrieves them from the OPC server as a group.

OPC server

With the OPC-Server F, data from a Control Builder F project is made available to other systems. As a result, e.g. other visualization packages, such as Operate IT, PlantConnect, InTouch, The Fix, etc., can access data from AC 800F, AC 700F, the Freelance process stations and the connected field bus instruments.

The OPC-Server F is a stand-alone program which is installed on any PC within the system network. An OPC type gateway is configured in the Control Builder F project. During commissioning the data that is to be made available to the remote system is downloaded to the gateway station.

Thus any OPC compatible Windows program (with client function) can read and write the values of all the variables available in the gateway (inputs, outputs and parameters of function blocks and variables) "online" from the connected process stations and field instruments.

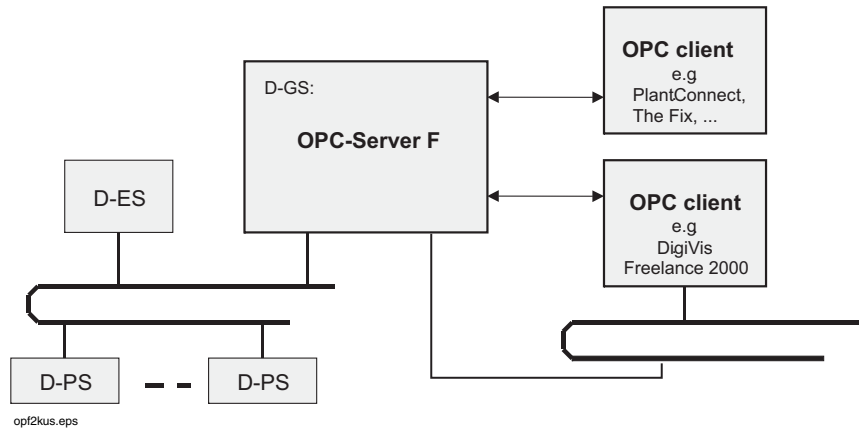
Using "MS Visual Basic" or "MS Visual Basic for Applications" in MS Excel v. 5.0 and later, users can generate their own programs and thus read and write OPC data "online". This data can then be displayed, recorded and evaluated.

System structure

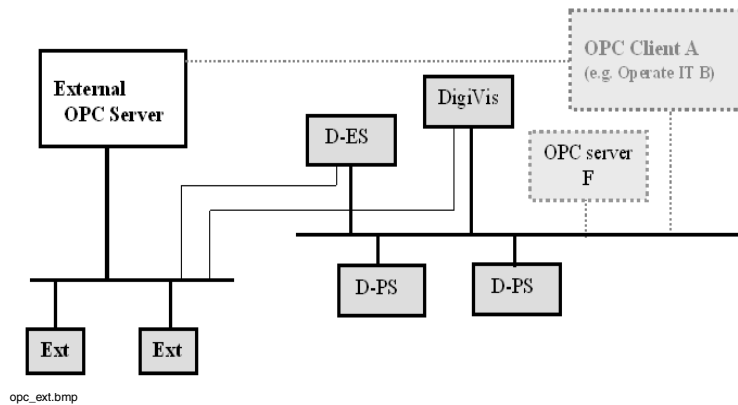


Note the different function of Control Builder F (D-ES) in the two diagrams.

OPC Server F:



External OPC Server:



Resources, maximum values and performance

OPC gateway stations in a Control Builder F project:
 Unlimited

OPC gateway stations per process station:

Max.: 10

Each process station can communicate with max. 10 operator stations and/or gateway stations.

OPC servers per gateway PC:

Dependent on the performance of the PC

Communication volume per connection:

OPC server to a process station:

Max.: approx. 2500 REAL variables

with a max. of 10 possible connections;

1400 bytes per connection = approx. 250 variables per connection to a process station.

Update time for OPC server: Default = 1000 ms

The cycle time should be configured in accordance with the client.

Throughput capacity:

- dependent on the gateway PC

- dependent on the client (Most efficient when programmed in "C"; Excel and Visual Basic cannot achieve the same level of performance).

- from a process station,

which performs communication exclusively

Up to 5000 variables/sec can be sent to the OPC server.

If the time zone has not been set or has been set incorrectly, the server synchronizes the client's system time cyclically. The time synchronization can be enabled or disabled in the program start up command "ABB Industrial IT\Freelance V9.2" in the program "Configure".

Section 2 OPC Server

An OPC server is used to make process data from a Control Builder F project available to other systems via the OPC interface.

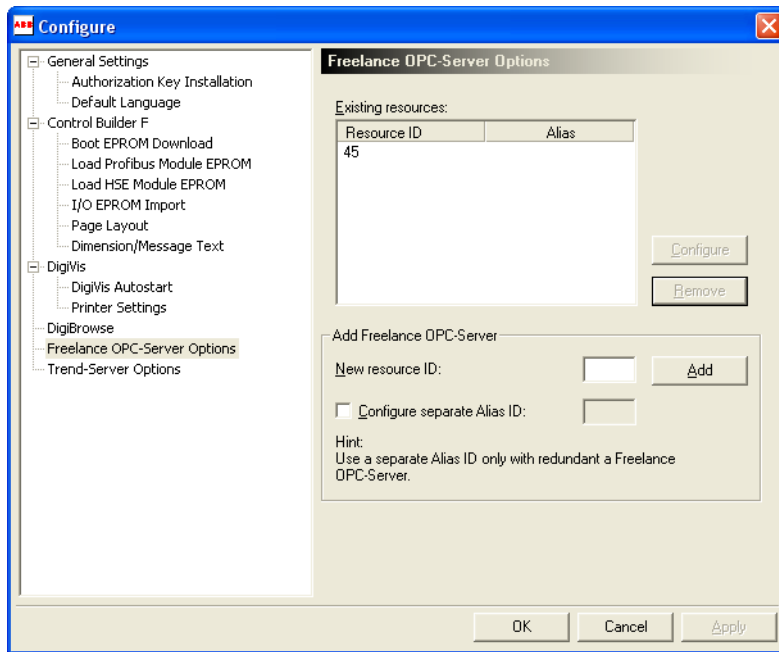
Installation of OPC Server

In the Freelance set up, if the OPC Server is selected in the “Workplace type”, OPC Server is installed,

For further details refer to **Getting Started**

Configure window.

The OPC server is configured in the Configure window with a unique resource ID. OPC server is downloaded to the Process station.



ABB_config_OPC



Select > Start > Programs > ABB Industrial IT > Freelance V9.2 > Configure

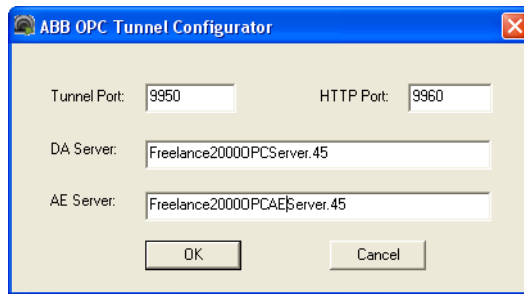


Select > Start > Programs > ABB Industrial IT > Freelance V9.2 > ABB Configure > OPC- Server Options > New resource ID

New resource ID

Current version of the OPC server is downloaded to the process station with the unique resource ID.

ABB OPC Tunnel Configuration

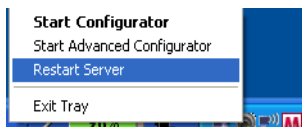


The Resource ID for the OPC Server is set in **Configure**. In order to start the OPC Tunnel the PROG ID for the server has to be configured in ABB OPC Tunnel Configurator as 'Freelance2000OPCServer.xxx', where xxx is the Resource ID of the OPC Server(s)



Select > Start > Programs > ABB Industrial IT > Freelance > OPC Tunnel > Configurator

ABB OPC Tunnel Configurator appears as an icon in the right bottom side of the system. ABB OPC Tunnel Configurator provides 'Restart server' to restart the Server.



Configuration using Control Builder F

In order to make the data from a project available to other systems, a gateway must be configured in the Control Builder F project. A gateway resource is entered and subsequently configured in the project tree to determine which tags and variables can be accessed via this gateway.

Server software must be installed on the gateway station. This software communicates with the AC 800F and the Freelance process stations and supplies the data 'to the outside' over the OPC interface.

In order to implement an OPC server interface, a gateway of type OPC is configured in the Control Builder F project tree. The OPC-Server F software is installed on the OPC gateway computer. Following this, the configured project data is downloaded to the OPC gateway with Control Builder F in commissioning mode. Immediately after downloading, the Freelance data can be accessed via the OPC interface.

Adding a gateway station



Add the station resource **Gateway Station D-GS** in the project tree > Set up an OPC type gateway

op004us.bmp

Name Name of the gateway station, max. 4 characters

Short text max. 12 characters

Version Date and time the object was created

Drawing footer/ Drawing header

Enter the drawing footer or header, see [Engineering Manual System Configuration, Documentation](#).

Access Rights Read and/or write rights for the gateway; default access for new variables / tags

Type Type of gateway station. Select **OPC gateway**. Additional the following types are available: DCP gateway, DDE gateway and UNI gateway.



DDE is supported with Freelance Systems running on Windows XP and not supported with Freelance Systems running on Windows 7.

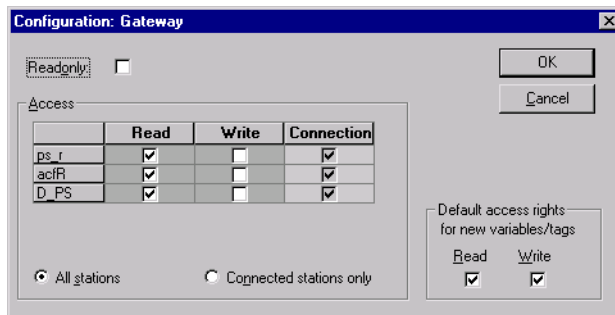


Freelance 9.2 SP1 is compatible for Windows 7 operating system.

Port number Port number for the ABB OPC tunnel communication. Default value is 9950.

Short comment Enter the short comment, see [Engineering Manual System Configuration](#).

Access rights for a gateway



op005us.bmp

Read only The gateway is only allowed read access to the process variables. Any write accesses that are configured on the process stations, variables and tags are ignored.

Access A parameter is set for every process station that is already configured in the project to specify whether read-only access or read/write access is permitted. If read-only (not write) access is specified for a process station here, then any write accesses that are configured on the variables and tags are ignored. The parameter *read-only* for the entire gateway overrides any write access that is defined here.

Default access for new variables / tags

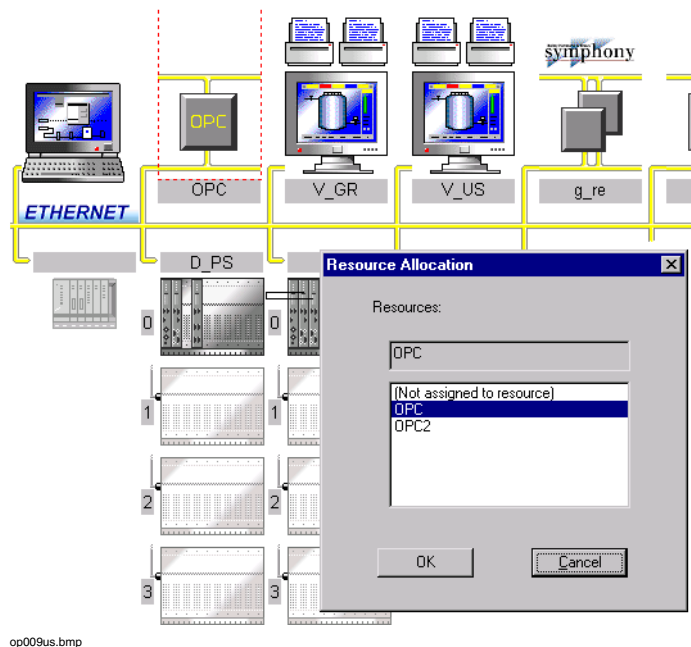
All newly-created variables and tags are by default assigned the access rights defined here for this gateway.



Variables that are written via a gateway may not be simultaneously written via the process image. The values of such variables are thus not capable of redundant operation. If these variables are used in a redundant task, then they should be duplicated to other variables.

Adding the gateway station to the hardware structure

A free space within the control level must be selected in the hardware editor's system view, and this must be assigned to a gateway resource that has already been created in the project tree.



op009us.bmp

Network addresses

Within the hardware editor, the stations' IP addresses and resource IDs are configured under *Network*. The values specified here must correspond to the parameters defined during the installation of the OPC server software.

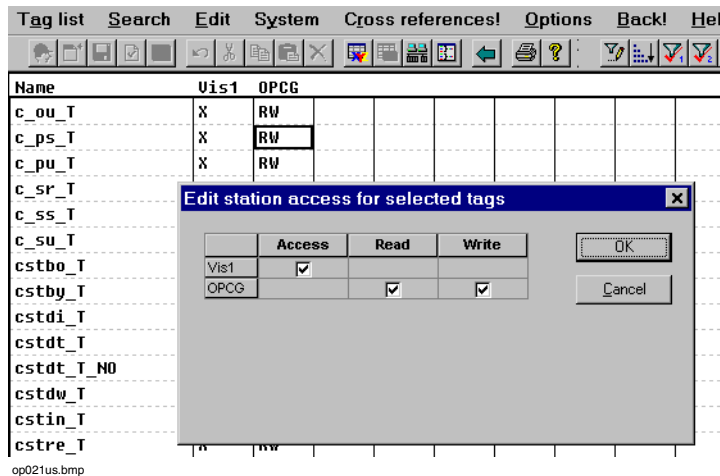
Enabling tags and variables for OPC access

A parameter is defined for every tag and every variable in the project to specify whether the data from the process station can be only read or read/written via the gateway.

In station view (*Tag list or Variable list > Station view*), the permitted access modes through a gateway can be defined for each list entry. The station accesses that have been defined are indicated in the variable list and tag list by single letters:

- R Read
- W Write

A double-click with the left mouse button in a gateway column or positioning the cursor in a line and choosing the menu item **Edit /Station access...** brings up the dialog for configuring the access rights. The station access for more than one list entry can be changed at the same time: select more than one entry in the list by means of Shift + arrow keys before choosing (Station access...) from the menu.



Left-hand column

List of all the operator stations and gateway stations that have been set up; in the variable list only the gateway stations are shown;

Read

The previously selected variable(s) and/or tag(s) data can be read from the process station via the gateway,

Write The previously selected variable(s) and/or tag(s) data can be modified in the process station via the gateway (only user-defined variables can be written to, while pre-defined process station variables can only be read).



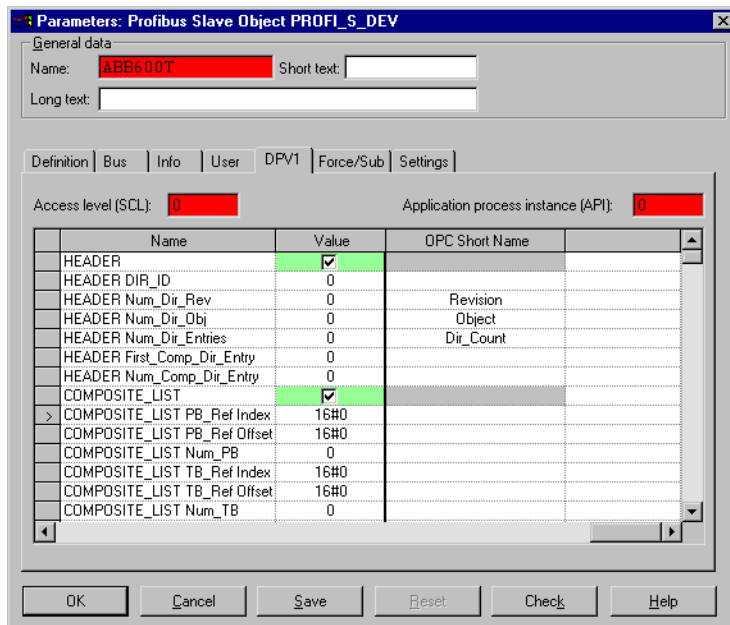
Variables that are written via a gateway may not be simultaneously written via the process image. When the process image is used, a variable that has been modified by the OPC server can be overwritten again by the task.

Variables with no process image are not capable of redundant operation. If such variables are used in a redundant task, then they should be duplicated to other variables

Enabling Profibus parameters for OPC access

The Profibus DPV1 and user parameters are configured to determine whether the data is available via the OPC gateway.

There are two columns for configuring **OPC access** in the overlays of the DPV1 parameters and the user parameters. A check-box in the OPC access column is used to configure whether the parameter is loaded into the OPC gateway or not. The corresponding parameter can be accessed in the gateway under **<tag name >/<component name>**. If a name is entered in the **OPC short name** column, this name will be used in the gateway instead of the component name.



op050gr.bmp

OPC access The parameter can be accessed via an OPC gateway

OPC short name The parameter is not addressed in the OPC gateway by the component name in the **Name** column, but by the name entered here. This name must be unique within an object.

The components of a Profibus object which are available via an OPC gateway are defined by means of these dialogs. The gateway station through which this data can be accessed is configured in the tag list for the object.

Initiating communication

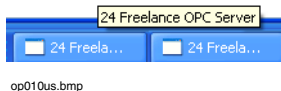
An OPC server is started automatically when requested by an OPC client.

It can be started manually by calling the command window in Windows from the installation default directory, e.g. c:\Program Files\ABB IndustrialIT\Freelance\Control Builder F\EXE\... :

```
OPCSRV.EXE /xx
```

xx = assign resource ID no., e.g. 45 as in Setup

When an OPC server has started, the following icon appears in the Windows taskbar:



Several OPC servers can be started simultaneously on one PC as long as they have different resource IDs.

Downloading project data to the gateway station

Like the process stations, a gateway station also needs to be commissioned.

After the project has been checked for plausibility and all the process stations loaded, the project data must also be downloaded to the gateway station. The first time a gateway is commissioned, *Load > Whole station* must be executed. Configuration changes are transferred to the gateway station through *Load > Changed objects*.

In the course of the downloading process from Control Builder F, the gateway station receives notification about all variables and tags that can be accessed via this gateway. The variable data and tag data can be read and written from the external client.

Addressing the Freelance variables

A **variable** is addressed using the same name within the system and over the OPC interface.

Input pins, output pins and parameters of a **tag** are addressed using the tag name and the pin or parameter name:

<Tag name> / <Pin name or parameter name>

Example: TIC123/SP Read the set-point input of controller TIC123

TIC123/Wi Read the set-point input of controller TIC123

The component and parameter names of the **user-defined function blocks** can be found in the class definition of the block. All the elements of the block interface that reside in the process station can be accessed through the OPC server.

The component names of the Profibus objects can be modified, see [Enabling Profibus parameters for OPC access](#) on page 27. The current names can be found in the associated configuration dialogs.



The OPC interface is case-sensitive. The variable names must therefore be identical in OPC and in the Control Builder F project.

Data types of the variables

The procedures for the OPC interface are based on the definitions for COM. Canonical data types are used for data transmission within these definitions. The data types involved here are those which the Microsoft environment supports as basic data types.

A data request via OPC can be issued either with or without data type. In the case of data requests with no data type (variant type), the AC 800 F / Freelance system data types are mapped as follows:



Data transmission for **unsigned data types has been changed with version 6**. The unsigned data types must be read in Visual Basic applications as Long (VT_UI2) or as Single (VT_UI4). The optional parameter “RequestedDataTypes” of the AddItems method must be set to VT_I4 where the default Variant datatype is VT_UI2 and to VT_R4 where the default is VT_UI4.

Data type in Control Builder F/ Freelance	Canonical data types in OPC		Visual Basic data type	
	up to V5	since V6	up to V5	since V6
BOOL	VT_BOOL		Boolean	
BYTE	VT_UI1		Byte	
WORD	VT_I2	VT_UI2	Integer	Long
UINT	VT_I2	VT_UI2	Integer	Long
INT	VT_I2		Integer	
DWORD	VT_I4	VT_UI4	Long	Single
UDINT	VT_I4	VT_UI4	Long	Single

Data type in Control Builder F/ Freelance	Canonical data types in OPC		Visual Basic data type	
	up to V5	since V6	up to V5	since V6
DINT	VT_I4		Long	
REAL	VT_R4		Single	
TIME	VT_I4		Long	
DT	VT_DATE		Date	
STRING8.. STRING256	VT_BSTR		String	

The AC 800 F, AC 700F, Freelance data types are described in the [Engineering Manual IEC 61131-3 Programming, Variables, Overview of Data Types](#).

Data requests with a specific data type (requested data type) were always accepted in versions up to 6.1 as long as it was in principle possible to convert the AC 800 F /AC 700F, Freelance data type into the requested data type. If it was ascertained during this process that one or more values lay outside the range of valid values, then the value concerned was sent out with the attribute 'Bad Quality'.

In version V6.2 and later versions, only data types in which it is always possible to perform a conversion are accepted. The possible combinations are shown in the table below:

	Conversion is possible to VT_xx										
Control Builder F	BOOL	UI1	UI2	UI4	I1	I2	I4	R4	R8	DATE	BSTR
BOOL	X	X	X	X	X	X	X	X	X		X
BYTE	X	X	X	X		X	X	X	X		X
WORD	X		X	X				X	X		X
UINT	X		X	X				X	X		X
INT	X					X	X	X	X		X
DWORD	X			X				X	X		X

	Conversion is possible to VT_xx										
Control Builder F	BOOL	UI1	UI2	UI4	I1	I2	I4	R4	R8	DATE	BSTR
UDINT	X			X				X	X		X
DINT	X						X	X	X		X
REAL	X							X	X		X
TIME	X						X	X	X		X
DT	X									X	X
STRINGx											X

The system response with regard to the data type conversion requested can be set in the registry:

[HKEY_LOCAL_MACHINE\SOFTWARE\Hartmann & Braun\Freelance\OPCServer]

With the setting “**OptimisticDataConversion = 1**” the OPC Server behaves as in the earlier versions.

With the setting “**OptimisticDataConversion = 0**” (Default setting from version 6.2) the more restrictive form of data conversion is implemented.

Message priorities, severity

Control Builder F incorporates the message priorities 0 to 5. Message types are linked to these priorities. The system messages (priority 0) are also subdivided between “system message groups” S1, S2 and S3. These groups become visible at the operator interface and can be used for filtering and initiating actions.

In order to display a message priority there is the **severity** attribute within the OPC server. Severity values can range from 1 to 1000, whereby 1000 represents the highest priority. Incoming and outgoing messages are reported with the same severity. The value 0 is reserved: In response to a query of alarm status, severity value 0 is sent for an inactive, acknowledged message.

The priorities of the AC 800 F / Freelance messages are mapped to the following severity values:

AC 800 F / Freelance		OPC
Prio	Type	Severity
0	System S1	900
0	System S2	500
0	System S3	100
1	Fault	1000
2	Fault	800
3	Fault	600
4	Switch	400
5	Hint	200

Message types, category and condition

The message types of the AC 800 F / Freelance system are mapped to the attributes **category**, **condition** and **subcondition** in the OPC server.

The **process messages** of an AC 800 F / Freelance system are subdivided into **categories** and **conditions** of OPC alarms. There are no subconditions for these alarms. In accordance with the OPC specifications, the strings which are then delivered for condition and subcondition are identical.

The index of the associated alarm point in the function block (starting with '0' for the first alarm point) has been added to the list of strings in the table in the appendix. If a high-level alarm is configured for the first alarm point in a function block, then this alarm is reported with the string "H_0" for condition and subcondition. See [Appendix B, Representation of the Freelance message types](#).

The **system messages** of an AC 800 F / Freelance system are all reported with the **category OPC_CATEGORY_SYSTEM**. The text contents correspond to the messages on a DigiVis station. See [Appendix D, System messages](#) for a list of the system messages.

The system messages are transmitted in the language in which the OPC server was installed. All other text, e.g. conditions and subconditions, are available only in English.

Depending on the message category, various attributes of the OPC message are supplied with current data from the AC 800 F / Freelance system.

Attribute	Description	Data type	Category							
			Level	RateOfChange	Deviation	Duration	Discrete	User	Limit	System
Area	System area	VT_BSTR	X	X	X	X	X	X	X	X
Hint	Hint text	VT_BSTR	X	X	X	X	X	X	X	X
WaveFile	WAV file	VT_BSTR	X	X	X	X	X	X	X	X
LongText	Long text		X	X	X	X	X	X	X	X
ShortText	Short text	VT_BSTR	X	X	X	X	X	X	X	X
CV	Current value	VT_VARIANT	X	X	X	X	X	X	X	X
Dimension	Dimension	VT_BSTR	X	X	X	X	X	X	X	X
AcknowledgeRule	Acknowledgement rule	VT_BSTR	X	X	X	X	X	X	X	X
ResourceID	Resource ID	VT_I2	X	X	X	X	X	X	X	X
ObjectNumber	Object number	VT_I2	X	X	X	X	X	X	X	X
AlarmIndex	Index of message point	VT_I2	X	X	X	X	X	X	X	X
ConditionSubType		VT_BSTR	X	X						
ErrorString	Error text	VT_BSTR								X

Attribute	Description	Data type	Category								
			Level	RateOfChange	Deviation	Duration	Discrete	User	Limit	System	
ErrorCode	Error number	VT_I4									X
SystemMessageGroup	Message group S1..S3	VT_BSTR									X

Project version control

When data is accessed within the OPC server for reading and writing, the internal project version is compared with that in the process stations. The response in the event of a version error is defined in the PC's registry entries. In this way it is possible to ensure that no read/write operations are carried out on a process station that has been reconfigured using Control Builder F unless the OPC server has been reloaded.



In general, following a configuration change to and subsequent loading of a process station, the OPC server must also be loaded. If no OPC related data has been modified, then only the project version number needs to be updated. This modification is post-loaded automatically from Control Builder F.

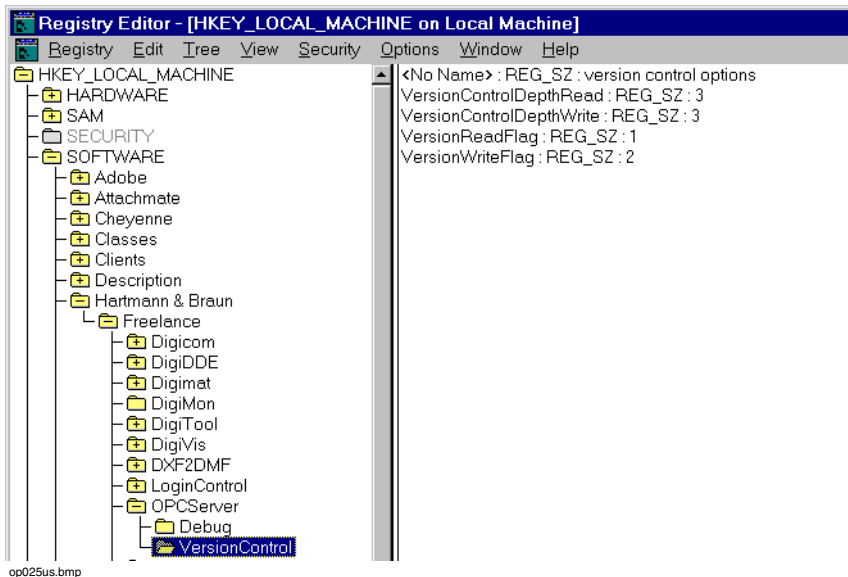
The version control for writing via the OPC server is by default set more restrictively than for reading. This means that, in the event of a version conflict, data can be read but not written.

No version controls of any kind are carried out for transmitting alarms and alarm acknowledgements. This means that every alarm message from the Freelance system is forwarded to the OPC client, and every acknowledgement of an alarm is likewise forwarded from a client to the process stations.

Registry entries for the OPC server:

The version monitoring entries are located in the following path:

[HKEY_LOCAL_MACHINE\SOFTWARE\Hartmann & Braun\Freelance
 \VersionControl]



VersionControlDepthRead / Write

Specifies the differences between process stations and gateway stations that produce a version error.

- 0: No version control,
- 1: Project names are checked,
- 2: Project names + MajorVersionNo are checked,
- 3: Project names + MajorVersionNo + MinorVersionNo are checked,
- 4: Project names + MajorVersionNo + MinorVersionNo + PatchVersionNo are checked.

The default value is 3, i.e. the name, MajorVersionNo and MinorVersion-No of the project must be identical on the process station and the gateway in order to avoid having a version error reported when a variable is accessed.

VersionReadFlag / WriteFlag

Defines the response when a version error is detected (corresponds to the “VersionControlDepth” setting).

- 1: The variable is read or written even if a version error is detected.
- 2: Any version error that is detected will be reported, while the read- or write access requested is not carried out.

Defaults:

The default value for **read accesses is 1**, in other words the read command will be carried out even when a version error has been detected.

The default value for **write accesses is 2**, in other words if a version error is detected, it is reported and the write command is not carried out.

Alarm messages from the OPC server

In version 6.2 and later the OPC server generates its own alarm messages. These messages indicate a fault in the connection state between the OPC server and the subordinate process station. The gateway name from the project tree is used as the source for these messages. These alarms are always single-value alarms, i.e. no acknowledgement is expected.

The following alarm messages are implemented:

Status of the connection with a process station

Source: <Gateway name from P-tree>

Condition: <Name of PS in P-tree>_CONNECTION_STATE_0

with the following subconditions:

NOT_CONNECTED	"No connection to station %d"
ESTABLISHING_CONNECTION	"Establishing connection to station %d"
PROJECT_VERSION_ERROR	"Version error, project name different in station %d"

MAJOR_VERSION_ERROR	"Version error, major version number different in station %d"
MINOR_VERSION_ERROR	"Version error, minor version number different in station %d"

Read/write status of the individual process stations

The connection status and the registry values are evaluated for the version control system.

Source: <Gateway name from P-tree>

Condition : <Name of PS in P-tree>_READ_WRITE_STATE_1

with the following subconditions:

NO_READ_ACCESS	"No read access to station %d"
NO_WRITE_ACCESS	"No write access to station %d"
NO_ACCESS	"No access to station %d"

OPC server offline:

This is activated if the OPC server has lost its connection to all process stations.

Source: <Gateway name from P-tree>

Condition : **OPC_SERVER_OFFLINE**

with the following subcondition:

OPC_SERVER_OFFLINE_0	"OPC server %d offline"
-----------------------------	-------------------------

Handling of NOT_CONNECTED with redundant process stations

If a connection is lost with a redundant resource, it is assumed that a redundancy transfer is taking place. Only if the connection has still not been re-established after 4 seconds does the disconnection have an effect on the quality of items and alarms. The relevant internal alarms are also generated at this point.

The system response can be set in the registry:

[HKEY_LOCAL_MACHINE\SOFTWARE\Hartmann & Braun\Freelance\OPCServer]

“**RedToggleQualityGood = 0**” Disconnection is reported immediately,

“**RedToggleQualityGood = 1**” Disconnection is only reported after a timeout (default setting)

The length of the timeout can likewise be set in the registry:

[HKEY_LOCAL_MACHINE\SOFTWARE\Hartmann & Braun\Freelance\OPCServer]

“**RedToggleTimeOut**” Value in seconds (default setting = 4)

Tools and utilities for error diagnosis

Testing on the process station

The connection monitoring block M_CONN can be used to check from a process station the connection to the OPC server. In the event of a disruption to the connection, specific safety values can be adopted in the process, or a message can also be generated for other operator stations that are not connected via this OPC server.

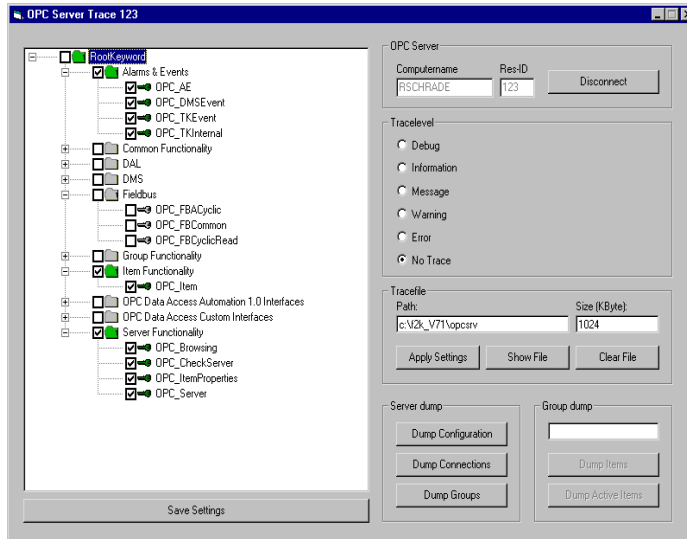
Testing the PC on which the OPC server is executed

If the OPC server has been installed for an interactive Windows user, a running OPC server can be detected on the gateway PC by an entry in the taskbar.



op010gr.bmp

A dialog for monitoring the various sequences of the OPC server can be started in the context menu of this entry. The trace dialog is invoked by means of “Trace...” from the context menu or from the start menu via ... / Control Builder F / OPC Server / OPC Server Trace:



op500gr.bmp

OPC Server

Computer name, Res-ID

The linked OPC server is described by means of the two entries. The two fields can be edited after actuation of the **Disconnect** button. A connection to the registered OPC server is established by means of the **Connect** button.

Keyword trace

The various functions of the OPC server can be hierarchically selected in the left-hand half of the dialog. Depending on the entries selected, the respective function calls in the OPC server are recorded together with the current parameters. As a result, it is possible to track specifically defined functions or functional groups of the OPC server. See [Appendix C, OPC Keyword Tracing](#).

Trace level

The degree of detail of the trace outputs is specified by means of the trace level.

Trace file

Path

The directory for the trace file is specified. A file named **opc<Res-ID>.trc** is created in the specified directory.

Size [KByte]

The maximum size of the trace file in KBytes.

If the size of the trace file reaches maximum, the file is renamed **opc<Res-ID>.bak** and a new **opc<Res-ID>.trc** file is created.

Apply Settings The settings for directory and size of the trace file are transferred.

Show File The current trace file is displayed in the standard Windows editor. If information from the *.bak file is required, the latter has to be called separately.

Clear File The current trace file is deleted. the *.bak file is not affected by this action.

*Server dump***Dump Configuration**

All the configuration data of the OPC server is written to the trace file.

The entries are marked with the text **Dumping configuration data...** and **...configuration dump finished.**

Dump Connections

An entry is generated in the trace file for all active connections.

The entries are marked with the text **Dumping server objects...** and **...server object dump finished.**

Dump Groups

An entry is generated in the trace file for all installed groups of the OPC server.

The entries are marked with the text **Dumping group objects...** and **...group object dump finished.**

Save Settings All settings of the dialog are stored and preset on the start of a new trace dialog or restart of the OPC server.

Example of a trace file

```

opc123.trc - Notepad
File Edit Format Help
09/06/2002 13:37:22.512 [774] DEB OPC_Server HDIGIMAT.OPC.OPCSRWSRDC.OPCSRV.CPP 1116 Dumping server objects...
09/06/2002 13:37:22.512 [774] DEB OPC_Server HDIGIMAT.OPC.OPCSRWSRDC.SRWMTG.CPP 413 Server handle: 0, Client name: , Group count: 0
09/06/2002 13:37:22.512 [774] DEB OPC_Server HDIGIMAT.OPC.OPCSRWSRDC.SRWMTG.CPP 413 Server handle: 1, Client name: , Group count: 0
09/06/2002 13:37:22.512 [774] DEB OPC_Server HDIGIMAT.OPC.OPCSRWSRDC.SRWMTG.CPP 413 Server handle: 2, Client name: , Group count: 0
09/06/2002 13:40:36.864 [774] DEB OPC_Server HDIGIMAT.OPC.OPCSRWSRDC.SRWMTG.CPP 1119 ...server object dump finished.
09/06/2002 13:40:36.864 [774] DEB OPC_Group HDIGIMAT.OPC.OPCSRWSRDC.OPCSRV.CPP 1124 Dumping group objects...
09/06/2002 13:40:36.864 [774] DEB OPC_Server HDIGIMAT.OPC.OPCSRWSRDC.SRWMTG.CPP 432 Server handle: 0, Client name: , Group count: 0
09/06/2002 13:40:36.880 [774] DEB OPC_Server HDIGIMAT.OPC.OPCSRWSRDC.SRWMTG.CPP 432 Server handle: 1, Client name: , Group count: 0
09/06/2002 13:40:36.880 [774] DEB OPC_Server HDIGIMAT.OPC.OPCSRWSRDC.SRWMTG.CPP 432 Server handle: 2, Client name: , Group count: 0
09/06/2002 13:40:36.880 [774] DEB OPC_Group HDIGIMAT.OPC.OPCSRWSRDC.OPCSRV.CPP 1128 ...group object dump finished.
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.OPCSRV.CPP 1106 Dumping configuration data...
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/INIT/RunTime Type: TIME AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/INIT/StartTime Type: DT AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/INIT/TMO Type: BOOLEAN AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/INIT/Status Type: BYTE AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/INIT/TwA Type: TIME AccessRights: READWRITE
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/INIT/RunTime Type: TIME AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S01/StartTime Type: DT AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S01/Status Type: BOOLEAN AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S01/TMO Type: BOOLEAN AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S01/Status Type: BYTE AccessRights: READWRITE
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S01/TwA Type: TIME AccessRights: READWRITE
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S02/RunTime Type: TIME AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S02/StartTime Type: DT AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S02/TMO Type: BOOLEAN AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S02/Status Type: BYTE AccessRights: READONLY
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S02/TwA Type: TIME AccessRights: READWRITE
09/06/2002 13:43:30.800 [4#0] DEB OPC_Configuration HDIGIMAT.OPC.OPCSRWSRDC.CONFIG.CPP 524 Item: ABL/S03/RunTime Type: TIME AccessRights: READONLY
op028gr.bmp

```

Testing in Control Builder F

During commissioning, like the process station variables, the OPC variables can also be displayed in Control Builder F value window and trend window.

System monitor for OPC

A system monitor (Performance Monitor) is included in the Windows standard package. This can be used to check and monitor the performance of the Windows PC. The software package from Microsoft allows all **general variables**, e.g. free disk space, CPU workload to be displayed and monitored.

An add-on component also allows **application-specific AC 800F and Freelance process station variables**, such as statistical data on read/write errors, to be displayed on the OPC server.

The system monitor is called up from the Start menu:



> **Start** > **Settings** > **Control Panel** > **Administrative Tools** > **Performance**

Selecting the display type and entering variables

The display type is selected by means of the buttons in the toolbar.

Variables for the monitoring can be selected after invoking the '+' button in the performance monitor:

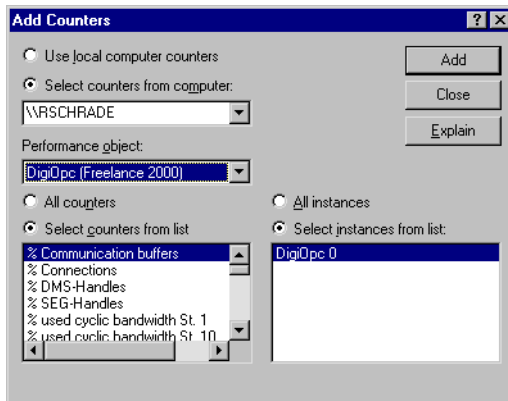


In the **AddCounters** dialog:

- Select the Control Builder F computer (remote operation is possible) >
- Select the **Freelance** object >
- Select the desired variables via **Select counters from list** and exit the dialog with **Add** and **Close**



If Freelance is not displayed in the 'Performance object' window you should check whether the correct language setting has been configured for your Windows installation. The language settings of Windows and Control Builder F must be the same.



op402us.bmp

Chart display

Once the data sources have been defined, the current values are displayed in a chart. The display parameters can be set in the **Properties** the performance monitor dialog.

Meaning of the variables**General variables**

Name	Description
% Communication buffers	% Communication buffers is the percent amount of "in use" communication buffers. Normally this value is 0.
Communication buffers	Total amount of "in use" communication buffers. Normally this value is 0.
% Connections	% Connections is the percent amount of active connections.
Connections	Total number of active connections.
% DMS-Handles	% DMS-Handles is the percent amount of "in use" DMS-Resources. These value includes the dynamic SEG-Handles.
DMS-Handles	Total amount of "in use" DMS-Resources. These value includes all dynamic SEG-Handles.
% SEG-Handles	% SEG-Handles is the percent amount of "in-use" DMS-Resources for cyclic requests.
SEG-Handles	Total amount of "in-use" DMS-Resources for cyclic requests.
Process-ID	PID of the running process.
Station-Number	First station number

OPC variables

Name	Description
Item No	Number of configured items.
Event No	Number of configured event points.

Name	Description
Client connections	Number of OPC Data Access client connections.
Groups	Number of OPC Groups.
Active items	Number of active OPC Items, the same item in different groups is counted once.
AddItem failures (bandwidth)	Number of OPC Items which could not added due to limited bandwidth.
AddItem failures (interaction)	Number of OPC Items which could not added due to wrong interaction between client and server.
AddItem failures (configuration)	Number of OPC Items which could not added due to configuration errors.
Pending jobs	Number of pending acyclic jobs.
Acyclic read errors	Number of failed acyclic reads, counted on item base
Acyclic write errors.	Number of failed writes, counted on item base
Station No. for Station n	Station No. for Station n.
% used cyclic bandwidth St. N	Percentage of used cyclic bandwidth for Station n. If this value reaches 100% it is not possible to communicate additional cyclic values from this Station. This could also happen due to fragmentation when the value is a little bit below 100%.
Changed cyclic items/second	Number of changed cyclic items per second, items sent to different clients are counted once.
Acyclic reads/second	Number of successfully acyclic read items from device per second.
Acyclic writes/second	Number of successfully written items per second.

Section 3 OPC client

OPC client functionality is implemented both in Control Builder F and DigiVis. There is no need for any special setup.

During the configuration process in **Control Builder F**, the variable lists from external OPC servers can be read via the OPC browser interface. The variables that are to be displayed or logged in DigiVis are selected from a list and imported into Control Builder F. This data can then be used in the configuration of graphic displays, trend displays and logs.

When an operator station is loaded, all the necessary data is transferred into DigiVis. The variables from the external OPC servers are read and, if necessary, also written via the OPC client interface that forms an integral part of DigiVis.

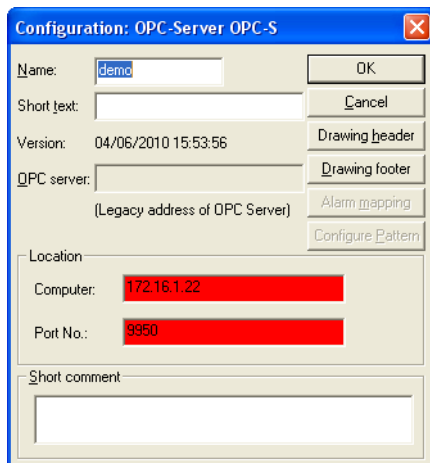
Integrating an external OPC server

Adding the "OPC server" function to the project tree

A new resource of type **OPC server** is created in the project tree. The name of the external OPC server is entered in the associated parameter mask.



> **Edit** > **Insert next level** > Select OPC server > **OK**



op007us

<i>Name</i>	Name of the OPC Server-resource in the Project Tree
<i>Short text</i>	max. 12 characters
<i>Version</i>	Date and time of object creation
<i>Location</i>	Specifies the computer on which the OPC software is installed.
<i>Computer</i>	Name of the computer where OPC Server is running.
<i>Port No</i>	Port of the computer.
<i>Short comment</i>	Max. 159 characters

Drawing Header and Footer

See [Engineering Manual System Configuration, Documentation](#).

For further details, refer to **Engineering Manual System Configuration, Project Tree**

Importing OPC Variables

The OPC Variables (OPC Items) can be imported from the OPC Server resource after the it is configured in Project Tree of Control Builder F and can then be used for configuration in the Operator Station. These variables are associated to the OPC Server resource and not to any Process Station.

Refer to Engineering-Manual IEC 61131-3 Programming, OPC Item List

Enabling for OPC access

With external OPC servers, enabling for read and/or write access is performed in the external systems.

Initiating communication

An external OPC server should be already started, or able to be started automatically when requested by an OPC client.

Example of the OPC linking of two systems with AC 800F and Freelance process stations

System 1 should make data available to system 2.

1. An OPC gateway is configured in system 1.
2. The OPC server is installed and started on the PC that is intended to serve as a gateway for System 1.
3. The appropriate configured data from System 1 is downloaded to the OPC gateway station.
4. In System 2, the OPC server from System 1 is configured as an external OPC server.
5. A 'Remote OPC server setup' is carried out on the Control Builder F PC from System 2. See [ABB OPC Tunnel Configuration](#) on page 22. This enables communication to take place between the OPC server from System 1 and Control Builder F from system 2.
6. The 'Remote OPC server setup' is carried out on all the operator stations of System 2 on which data from the OPC server is to be read.
7. It may sometimes be possible to omit the 'Remote OPC server setup' if the same Windows user is logged in on all the PCs.
8. The data from the external OPC server can be imported into the System 2 project via the browse interface.
9. The imported variables are used in the configuration.

10. The operator stations from System 2 are loaded.
11. In accordance with the logs and/or displays that have been started on the System 2 operator stations, the necessary variables are read from the System 1 OPC server.

Section 4 OPC related parameters

The pins and parameters of the function blocks that are available via the OPC interface are described in the [Engineering Reference Manual Functions and Function Blocks](#).

Appendix A Example of OPC access from MS-Excel and MS-Visual Basic

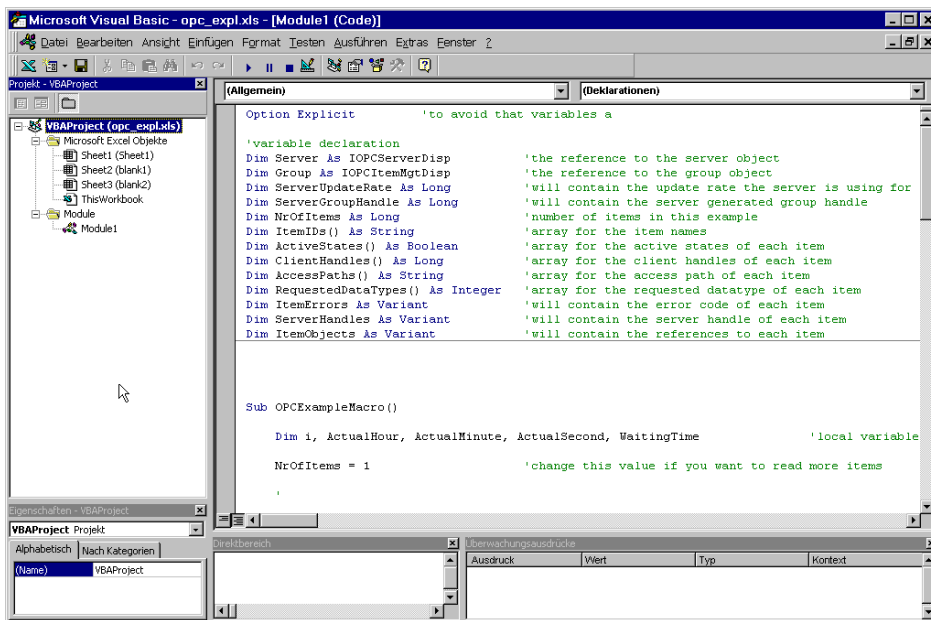
Overview of the Excel example

Overview of the example file “opc_expl.xls”:

	B	C	D
1			Test example OPC-Server Freelance 2000
2			
3			Freelance2000OPCServer.86
4		int01	Transmitted Values
5		3	1 = Read, 2 = Write, 3 = RW
6		13249	
7		192	192 = good, 0 = bad
8		11.02.98 15:04	
9			
10			
11			
12			Start:
13			Menue "Extras", "Macro", "Macros...", "Execute"
14			
15			Finish:
16			Press the keys "Cntl" and "Pause" at the same time
17			"Finish"
18			
19			Adapt:
20			Menue "Extras", "Macro", "Visual Basic-Editor",
21			(General) OPCexample Macro
22			
23			' start the specified server, change the name for your configuration
24			ServerName = "Freelance2000OPCServer.86"
25			
26			'set the name of the item
27			ItemIDs(0) = "in01"

opc200us.bmp

Program overview



op0201us.bmp

Main program

Main program in Visual Basic (in this case in “Module1”):



The library/class “OPCDisp” must be loaded beforehand via **Tools > Reference** so that “IOPCServerDisp” is known.

Attribute VB_Name = "Module1"

```

Option Explicit 'to avoid that variables automatically
'variable declaration

Dim Server As IOPCServerDisp 'the reference to the server object
Dim ServerName As String ' name of the server'
Dim Group As IOPCItemMgtDisp 'the reference to the group object
Dim ServerUpdateRate As Long 'contains update rate, server is using for groups
Dim ServerGroupHandle As Long 'will contain the server generated group handle
Dim NrOfItems As Long 'number of items in this example
Dim ItemIDs() As String 'array for the item names
    
```

```
Dim ActiveStates() As Boolean 'array for the active states of each item
Dim ClientHandles() As Long 'array for the client handles of each item
Dim AccessPaths() As String 'array for the access path of each item
Dim RequestedDataTypes() As Integer 'array for the requested datatype of each item
Dim ItemErrors As Variant 'will contain the error code of each item
Dim ServerHandles As Variant 'will contain the server handle of each item
Dim ItemObjects As Variant 'will contain the references to each item

Sub OPCEXampleMacro()

Dim i, ActualHour, ActualMinute, ActualSecond, WaitingTime 'local variables

NrOfItems = 1 'change this value if you want to read more items
,
'resize all arrays to the necessary size
,
ReDim ItemIDs(NrOfItems)
ReDim ActiveStates(NrOfItems)
ReDim ClientHandles(NrOfItems)
ReDim AccessPaths(NrOfItems)
ReDim RequestedDataTypes(NrOfItems)
,
' start the specified server, change the name for your configuration
,
ServerName = " ... " ' i.e. "Freelance2000PCServer.86")
Set Server = CreateObject("ServerName")
,
' add a group to the server
,
Set Group = Server.AddGroup( _
    "Group 1", _
    True, _
    1000, _
    1, _
    0, _
    &H409, _
    ServerGroupHandle, _
    ServerUpdateRate)
,
'set the name of the item
,
ItemIDs(0) = "int01" 'change the name for your configuration
,
'set client handles and active state of the items
```

```
'
For i = 0 To (NrOfItems - 1)
    ClientHandles(i) = i + 1      'use a different client handle for each item
    ActiveStates(i) = True      'all items are active
Next
'
'add items to the group
Group.AddItems _
    NrOfItems, _
    ItemIDs, _
    ActiveStates, _
    ClientHandles, _
    ServerHandles, _
    ItemErrors, _
    ItemObjects, _
    AccessPaths, _
    RequestedDataTypes

'as long as CTRL-BREAK is not pressed update every 2 seconds the sheet
'
Worksheets(1).Visible = True
While True
    ActualHour = Hour(Now())
    ActualMinute = Minute(Now())
    ActualSecond = Second(Now()) + 2 'change 2 to x if you want faster execution
    WaitingTime = TimeSerial(ActualHour, ActualMinute, ActualSecond)
    Application.Wait WaitingTime

    For i = 0 To (NrOfItems - 1)
        Worksheets(1).Cells(1 + 2, i + 1) = "Server:"
        Worksheets(1).Cells(1 + 2, i + 2) = ServerName
        Worksheets(1).Cells(1 + 3, i + 1) = "Name:"
        Worksheets(1).Cells(1 + 3, i + 2) = ItemObjects(i).ItemID
        Worksheets(1).Cells(2 + 3, i + 1) = "Access Rights:"
        Worksheets(1).Cells(2 + 3, i + 2) = ItemObjects(i).AccessRights
        Worksheets(1).Cells(3 + 3, i + 1) = "Value:"
        Worksheets(1).Cells(3 + 3, i + 2) = ItemObjects(i).Value
        Worksheets(1).Cells(4 + 3, i + 1) = "Quality:"
        Worksheets(1).Cells(4 + 3, i + 2) = ItemObjects(i).Quality
        Worksheets(1).Cells(5 + 3, i + 1) = "Timestamp:"
        Worksheets(1).Cells(5 + 3, i + 2) = ItemObjects(i).Timestamp
    Next
Wend
End Sub
```

Appendix B Representation of the Freelance message types

The *process messages* of a Freelance system are subdivided into various **categories**. The **condition** and **subcondition** are always identical for a process alarm. The index of the initiating message point is added to the condition/subcondition strings.

Freelance message type	CATEGORY “OPC_CATEGORY_xxx”	CONDITION = SUBCONDITION (String)
No configuration	UNKNOWN	UNKNOWN
H L HH LL	LEVEL	H L HH LL
DHs, DHm, DHh DLs, DLm, DLh DHHs, DHHm, DHHh DLLs, DLLm, DLLh	RATE_OF_CHANGE	DH DL DHH DLL
H_XD L_XD HH_XD LL_XD LH_XD	DEVIATION	H_CE L_CE HH_CE LL_CE LH_CE

Freelance message type	CATEGORY “OPC_CATEGORY_xxx ”	CONDITION = SUBCONDITION (String)
H_V	LEVEL	H
L_V		L
HH_V		HH
LL_V		LL
FLT_TIME	DURATION	FLT_TIME
END_POS	DISCRETE	END_POS
ERROR	DISCRETE	ERROR
PROTECT	DISCRETE	PROTECT
LOC_OP	DISCRETE	LOC_OP
MAN/AUTO	DISCRETE	MAN/AUTO
TORQUE	DISCRETE	TORQUE
TIME	DISCRETE	TIME
BINARY	DISCRETE	BINARY
LH	LEVEL	LH
USER	USERDEFINED	USER
TIME_OV	DURATION	TIME_OV
NOISE	LIMIT	NOISE
STAT	LIMIT	STAT
MOVE	LIMIT	MOVE
Y_LIMIT	LIMIT	PIV_LIMIT
TASK_OVERLOAD	LIMIT	TASK_OVERLOAD
MSR_SFC_TUE	DURATION	SFC_TUE

Appendix C OPC Keyword Tracing

Structure of the Trace entries

Each entry of the trace file contains the following information:

- current date and time of the trace entry
- internal number - not relevant for the user
- Trace level (depending on the selected trace level more (Debug) or less (No trace) entries are generated in the trace file)
- Keyword, that caused this entry
- name of the source file - not relevant for the user
- internal number - not relevant for the user
- Function with parameters

Example:

05/12/2003	Date
14:56:15.853	Time
[764]	internal number
DEB	Trace level = Debug
OPC_DALCyclicNotification	Keyword
I:\DIGIMAT\OPC\OPCSRV\SRC\OPCSRV.CPP	File name
1115	internal number
ValueChangedCB(): ShelfID: 2, Magic: 15, Value: 820, TimeStamp: 05/12/2003 13:56:58.705, ProtocolQuality: 0,0x0	Function with parameters; in this case a value has changed to value 820.

Trace of Keyword selection

Selection or de-selection of a keyword is traced with

Keyword <name> switched on or

Keyword <name> switched off.

With <name> = keyword, like shown in the tree structure.

It is not necessary to start or stop the trace functionality. Immediately after selection or de-selection of a keyword the accompanying functions are traced or the trace is stopped.

Traced functions

With the section of the keywords the different functions of the OPC server can be traced. All keywords and the accompanying functions are listed below.

Keyword: Alarms & Events

OPC_AE: Creating and deleting of alarm tags,
 Creating of alarm conditions,
 Activating of the alarm lists.

OPC_DMSEvent:
 Update of alarm conditions,
 Acknowledgement handling,
 Functionality of the resource table.

OPC_TKEvent: not used

OPC_TKInternal:
 not used

Keyword: Common Functionality

OPC_Common:
 General functionality like
 * Initialization of logs,
 * Import of the configuration data,
 * Generation of event log entries.

OPC_Configuration:

Changes of OPC server configuration after download.

OPC_Shelf: Items, that are read from a client, are located in the shelf.

All operations at this shelf, e.g:

- * Add,
- * Remove,
- * Clean Up,
- * Value Changed,
- * Set Value.

Keyword: DAL

The Data Acquisition Layer DAL is the protocol layer within the OPC server which is positioned above the different field bus protocols and the controller protocol (DMS).

DAL Notification:

- **OPC_DALCyclicNotification:**
Cyclic information to value changes (ValueChanged Callback).
- **OPC_DALReadNotification:**
Log of asynchronous Read Callback
- **OPC_DALWriteNotification:**
Log of asynchronous Write Callback

OPC_DALCyclicRead:

Adding and removing of OPC items.

OPC_DALJob: All operations which are called during a Job:

- * Start/Finish Job,
- * Read/Write Job,
- * Sync/Async Read/Write.

Keyword: DMS

The DMS protocol is used for communication from OPC server to the process stations.

OPC_DMSACyclic:

Acyclic read and write operations.

OPC_DMSCCommon:

Information about the state of the process stations.

OPC_DMSCyclicRead:

Cyclic read and write actions, and connecting and de-connecting of process stations and variables.

Keyword: Fieldbus

Fieldbus protocols (Profibus, HART) are used for communication from OPC server to the field devices.

OPC_FBACyclic:

Asynchronous read and write at the fieldbus.

OPC_FBCommon:

Mapping of error numbers from Profibus or HART communication into OPC error numbers.

OPC_FBCyclicRead:

Connecting and de-connecting of cyclic fieldbus variables.

Keyword: Group Functionality

OPC_AsyncNotification:

Notifications of the group, like read and write of the cache, refresh and append.

OPC_Group: Operations with the OPC groups, e.g.:

- * Add item
- * Remove item
- * Refresh
- * Read action finished (on read complete)
- * Write action finished (on write complete)
- * configuration changes.

Keyword: Item Functionality

OPC_Item: Configuration change of an item,
Activation and de-activation of an item,
Status change of a superior object.

Keyword: OPC Data Access Automation 1.0 Interfaces

These keywords are used for clients which support OPC Specification Version 1.0 only.

Group Object (Automation 1.0):

- IOPCAsyncIODisp:
Adding and deleting of callbacks,
Asynchronous read and write,
Refresh of the OPC groups.
- IOPCGroupStateMgtDisp:
Status information about the OPC groups.
- IOPCItemMgtDisp:
Adding and deleting items into a group,
Setting the data type,
Activating and de-activating of items and the accompanying enumerators.
- IOPCSyncIODisp:
Synchronous Read and Write at OPC groups.

Item Object (Automation 1.0):

- IOPCItemDisp:
Operation at OPC items, e.g.:
 - * Read and Write values (get/put Value),
 - * Read access rights (get AccessRights),
 - * Read access path (get AccessPath),
 - * Read internal association number (GetItemID).

ServerObject (Automation 1.0):

- IOPCBrowseServerAddressSpaceDisp:
Browsing operations,
all OPC items, that are accessed with the browse operation.
- IOPCServerDisp:
All operations that are performed at the server, like e.g.:
Adding and removing groups,
State of the OPC server.

Keyword: OPC Data Access Custom Interfaces

Client Interfaces:

- IAdviseSink:
Value change within a group. (Function of OPC Spec 1.0)
- IOPCDataCallback:
Finished read and write operations,
Value changes.
- IOPCShutdown:
not used.

GroupObject:

- IDataObject:
Adding and removing groups.
- IEnumOPCAttributes:
All operations of item enumerator.
- IOPCAsyncIO:
Asynchronous read and write of groups,
Refresh and cancel of a group (following OPC Spec Version 1.0).
- IOPCAsyncIO2:
Asynchronous read and write of groups,
Refresh and cancel of a group.
- IOPCGroupeStateMgt:
Renaming of groups,
Status of groups,
Multiplying of groups.

- **IOPCItemMgt:**
Adding and removing items within a group,
setting the data type,
Activating and de-activating of items and the accompanying
enumerators.
- **IOPCAsyncIO:**
Synchronous read and write to groups.

IConnectionPointContainer:

Adding and removing of groups.

ServerObject:

- **IOPCBrowseServerAdressSpace:**
All operations that are used during browsing the configuration of an
OPC server, e.g.:
 - * Change of internal position (ChangeBrowsePosition)
 - * internal assignments of the OPC items (BrowseOPCItemIds).
- **IOPCCCommon:**
Information about available OPC server,
Setting of the client name.
- **IOPCItemProperties:**
All operations that are done with the OPC item properties, e.g.:
 - * QueryAvailableProperities,
 - * GetItemProperties,
 - * LookUpItemIDs
- **IOPCServer:**
All operations that are carried out at the server, like e.g.:
 - * Adding and removing groups,
 - * Status of the OPC server.

Keyword: Server Functionality

OPC_Browsing:

Information about the browsing enumerator.

OPC_CheckServer:

not used.

OPC_ItemProperties:

Handling of the item properties:

- * GetItemProperties,
- * IsItemValid,
- * GetConfProperties.

OPC_Server: Information about the OPC server state:

- * CheckServer,
- * GetNumberOfObjects,
- * GetLockStateOfGroup,
- * OPCServerManagement,
- * GetStart/CurrentTime

Examples of use

Which values are sent from OPC server to OPC client?

With selecting **Common Functionality / OPC_Shelf** value changes are logged in this way:

```
COPCItemShelf::ValueChanged() Item: TIC1623gr/SP Index: 1  
Magic: 7 Value: 918 Time stamp: 05/09/2003 10:42:47.310 rc:  
0x0
```

Item = name of the variable (OPC item name)

Index = internal index

Magic = internal assignment number

Value = value of variable

Time = time stamp of value change (Local time)

In this example the variable 'TIC1623gr/SP' has changed to value 918.

With selecting **DAL / DAL Notification / OPC_DALCyclicNotification** value changes are logged in this way:

```
ValueChangedCB(): ShelfID: 1, Magic: 15, Value: 720,  
TimeStamp: 05/12/2003 13:56:58.705, ProtocolQuality: 0,0x0
```

In this example a variable has changed to value 720.

Which OPC items belong to the OPC groups?

Building of the OPC groups is traced with the keyword selection **Group Functionality / OPC_Group**:

```
COPCGroupRoot::COPCGroupRoot() called (actual number=1)
```

For each variable that is added into a group this entry is generated:

```
COPCGroupRoot::InternalAddItems(): add item 'F705/SP' of  
canonical type VT_R4, requested type VT_R4 to group 'G3'  
successful, client handle: 0
```

Each sending action to the client is traced with:

```
COPCGroupCust::SendCust() for group G3 called
```

Which variables are requested by the client?

With the keyword selection **Common Functionality / OPC_Shelf** new client requests are traced.

For each variable to remove:

```
COPCItemShelf::Remove(0) called
```

```
COPCItemShelf::Remove(): UnadviseVariable: remove Item  
F705/SP at index 0
```

For each variable to add:

```
COPCItemShelf::Add(F705/SP) called
```

```
COPCItemShelf::Add(): AdviseVariable() for item 'F705/SP'  
returns 0x0,0 Index: 0
```

```
COPCItemShelf::SetValue() Item: F705/SP Index: 0 Value: 0 Time  
stamp: 05/09/2003 10:47:20.150 rc: 0x0
```

Which client connections exist to the OPC server and how long do these connections exist?

With the keyword selection **OPC Data Access Custom Interface / Server Object / IOPCServer** these three messages are generated each second for each client connection:

```
GetStatus() called
```

GetStatus() succeeded, return S_OK

```
GetStatus(ftStartTime=05/09/2003 09:45:57.348,  
ftCurrentTime=05/09/2003 10:04:00.053,  
ftLastUpdateTime=05/09/2003 10:03:40.178, dwServerState=0x1,  
dwGroupCount=1, dwBandWidth=0, wMajorVersion=7,  
wMinorVersion=1, wBuildNumber=2494, szVendorInfo=Freelance  
2000 DigiOpc - V7.1 BETA Station 123) returns S_OK
```

StartTime = Start time of this connection (When was the connection to the client established?)

CurrentTime = current time

LastUpdateTime = time stamp, when the last data communication was done.

All time stamps are generated with GMT time.

Appendix D System messages

Taken from the [Operators Manual Operator Station](#).

Message text: The text is displayed in the message list or the signal sequence log
 Pr Priority level S1, S2 or S3
 MR Message rate:
 1 = Message with one state, e.g. 'Redundancy toggle occurred'
 2 = Message with two states, e.g. first state 'Battery low', second state 'Battery low is gone'
 [...] The text in the brackets is not displayed in every case.

Message text	Pr	MR	Cause of message	Remedy
Archiving of a trend has been stopped	S1	1	An unexpected error occurred while writing trend archive data, e.g. the hard disk is full	Create more space on the disk in question, or switch the storage of log files etc. to a disk with more space available
Battery low of CPU module	S2	2	CPU module battery is flat or disconnected	Replace or connect battery
Battery low of link module	S2	2	Link module battery is flat or disconnected	Replace or connect battery
Battery low: module in slot E1/E2 [IP1 / IP2]	S2	2	Battery of the AC 800F module in slot E1 or E2 is flat or disconnected	Replace or connect battery
Counter overrun of channel 'xxx'	S2	2	The internal counter in the frequency input module has overrun	Contact your authorized service engineer

Message text	Pr	MR	Cause of message	Remedy
Channel xxx, edge detection	S1	2	In a DDI01 a change of edge of the input signal was detected from channel xxx and reported with the accompanying time stamp. The report is written only in the record and not in the report page.	
CPU module of high temperature	S2	2	The temperature of the CPU module is more than 70 °C.	The ambient temperature is probably more than 50 °C. Reduce ambient temperature
Data lost for all modules DigiNet P 1 [to 3]	S2	1	Data may have been lost by all subscribers as a result of a CAN bus error	Check the terminating resistors and the cable lengths or contact your authorized service engineer
Daylight saving time information not up to date	S1	1		Contact your authorized service engineer
DCL 'xxx' stopped, all files in use	S1	1	The disturbance course log 'xxx' has been halted automatically. The maximum volume of data for this log has been reached, and automatic deletion has not been configured	Delete or export log data and restart the log. You can also configure automatic deletion
DCL 'xxx' was not printed	S1	1	The print job for the disturbance course log could not be carried out. Presumably the printer driver is not installed or the printer queue is full	Check your system installation, or check that the printer is online
Diagnosis fault for unit	S2	2	A Profibus unit has sent diagnosis faults.	Check the connected Profibus units or contact your authorized service engineer.

Message text	Pr	MR	Cause of message	Remedy
DDI01 module not exist	S2	2	Internal error when invoking the module method.	Check the configuration or contact your service technician.
Diag. fault for module n l m	S3	2	Diagnosis faults were reported for the specified module.	Check the associated Profibus module or contact the slave manufacturer's service technician.
Diag. fault for unit n l m	S3	2	Diagnosis status information was reported for the specified module.	Check the associated Profibus module or contact the slave manufacturer's service technician.
Diff. versions of communication Software (DMS)	S1	1	Components with incompatible software versions are linked in the same (system bus) system network	Check the system structure and install matching versions
Different time zones for project and DigiVis-PC	S1	1		Contact your authorized service engineer
DigiNet P 1 [to 3] data lost: Reception overload	S2	1	The CPU-module has been unable to process the data it has been sent quickly enough	Check the terminating resistors and the cable lengths or contact your authorized service engineer
DigiNet P 1 [to 3] data lost: Sending overload	S2	1	The CPU-module was unable to send any data for a certain length of time	Contact your authorized service engineer
DigiNet P data lost while receiving	S2	1	The module was unable to process the data sent quickly enough	Check the terminating resistors and the cable lengths or contact your authorized service engineer
DigiNet P data lost while sending	S2	1	For a certain period of time the module was unable to send any data	Check the terminating resistors and the cable lengths or contact your authorized service engineer

Message text	Pr	MR	Cause of message	Remedy
DigiNet P data lost while sending: Distance	S2	1	For a certain period of time the module was unable to send any data. It is likely that the connection distance to the supplementary racks is too great	Reduce the distance or contact your authorized service engineer
DigiNet S network connection failure	S1	11	Error in the system bus network connection	Check the system bus connection of the CPU modules
DigiNet S network connection failure IP1 / IP2	S1	1	The network connection system bus of the AC 800F designated IP1 / IP2 is incorrect.	Check the system bus connection of the AC 800F.
DigiVis configuration changing failed	S1	1	An error has occurred while loading new project data to the DigiVis station	Contact your authorized service engineer
DigiVis connection to 'xxx' aborted	S1	2	The link to station 'xxx' has been disturbed	Check that the station in question is functioning correctly, and check its system bus connection
Duplicate internet address	S1	1		Contact your authorized service engineer
Duplicate station ID	S1	1		Contact your authorized service engineer
EN-Wire break of channel %s	S3	2	The cable connection for the control input EN (Enable) is faulty	Check the relevant process signal cable
Environment variable TZ is set	S1	1	Under Windows 3.11 this variable was used to define the time zone. It can no longer be used under Windows NT as this system manages the time zones differently	Remove the Environment variable from the system settings or user settings or, if necessary, from an AUTOEXEC.BAT which is still being used

Message text	Pr	MR	Cause of message	Remedy
Export failed due to copy file	S1	1	FTP export: Failure to save export file in temporary storage in the Temp directory of the sending PC	Increase size of Temp directory or delete unnecessary files from it
Export queue full	S1	1	The export of log data requires a certain length of time, depending on the type of network connection to the FTP server and on the volume of data The DigiVis station is producing send jobs faster than they can be processed	Use a faster network connection to the FTP server, or a more powerful server. Alternatively, reduce the number of send tasks per unit of time
Export: FTP connection to 'xxx' failed	S1	1	No connection could be established to the export target device addressed 'xxx'	Check the target device
Export: FTP not accepted by 'xxx'	S1	1	Access to the export target device addressed 'xxx' was denied due to an incorrect password	Check the password
Export: General FTP error ('xxx')	S1	1	A general error has occurred while exporting the archive data	Check the amount of storage available on the target device
Extended diagnostic data overflow	S3	2	A Profibus slave has given an overflow of diagnostic data. Probably a 'flutter' signal.	Check the Profibus slave or contact slave manufacturer's service technician.
Fault in output channel 'xxx'	S2	2	There is a short circuit on output channel 'xxx'	Check the process signal connection, eliminate short-circuit
FC module of high temperature	S2	2	The temperature of the AC 800F module is over 70 °C.	The ambient temperature is probably more than 50 °C Reduce ambient temperature
FC module IP1 / IP2 of high temperature	S2	2	The temperature of the AC 800F module designated IP1 / IP2 is above 70 °C.	The ambient temperature is probably more than 50 °C. Reduce ambient temperature.

Message text	Pr	MR	Cause of message	Remedy
FF configuration identity mismatch	S2	2	The configuration that is to be loaded into the Foundation Fieldbus devices is not suitable for the devices which are physically present.	Adapt the configuration in ControlBuilder F according to the physical conditions.
FF data exchange	S2	2		
FF FIO already active	S2	2	The FIO coupler module has already been activated.	
FF no configuration in FIO	S2	2	The FIO coupler module does not contain any configuration.	Load the configuration from Control Builder F into the FIO coupler module.
FF PNA error	S2	2	An internal software error has occurred in one of the Foundation Fieldbus devices	Check the fieldbus devices and replace the defective device.
FF protocol error	S2	2	An error has been detected in the communication protocol of the Foundation Fieldbus line.	
FF state not ready	S2	2		
FF wrong configuration in FIO	S2	2	The configuration contained in the FIO coupler module cannot be executed along with the Foundation Fieldbus configuration.	Load the appropriate configuration from Control Builder F into the coupler module, and then update your fieldbus devices.
First adjustment not finished	S1	2	An internal error has occurred on the secondary CPU during data balancing between the CPU modules	Contact your authorized service engineer
Frame-Error of channel 'xxx'	S2	2	An error has occurred in the measurement timing on the channels indicated	The time sequence of input signals at the frequency input module DFI 01 should be checked, depending on operating mode

Message text	Pr	MR	Cause of message	Remedy
Hardkey not found	S1	2	The hard key required for operating the software was not found	Check that the hard key is installed, and/or check its connection. Otherwise, contact your authorized service engineer.
HW module assembly is different	S1	1	The processing station cannot accept 'sync' state, because the assembly of the two AC 800F modules is different.	Check the assembly of the two AC 800F modules.
High temperature on I/O module	S2	2	The temperature at the I/O module is above 70 °C	Reduce ambient temperature. The ambient temperature is probably more than 50 °C.
IN-Wire break of channel 'xxx'	S3	2	The cable connection for the input signal IN is faulty	Check the relevant process signal cable.
Lateral communic: Timeout from station 'xxx'	S2	2	Station 'xxx' has sent its data in the specified interval time	Check that the station in question is functioning correctly, and check its system bus connection. Check the possibility that the station may be operating under overload and therefore be unable to send its lateral data in the specified interval.
Less than 'xxx' KB free disk space on drive "yyyy":	S1	2	Hard disk "yyyy" on the DigiVis PC no longer has sufficient free space (less than 'xxx')	Create more space on the disk in question, or switch the storage of log files etc. to a disk with more space available.
Maximum of redundancy data exceeded	S1	2	The volume of redundancy data per task is limited to 64 KB. One of the tasks has exceeded this limit, and the redundancy has been completely deactivated.	Dividing the program of the task in question into several parts reduces the volume of redundancy data.
Message connection to station 'xxx' lost	S1	2	The message connection for logs and messages to station 'xxx' is lost	Check that station 'xxx' is functioning correctly and/or check its system bus connection.

Message text	Pr	MR	Cause of message	Remedy
Messages lost: overflow for prio 'xxx'	S1	1	The internal buffers for messages of priority 'xxxx' are no longer large enough	A DigiVis station is unable to process the messages as quickly as they are generated. Reduce the number of messages
Miss. extern. power supply output channel 'xxx'	S3	2	No auxiliary power, or disrupted auxiliary power to the frequency input module in question	Check the connection for this auxiliary power supply, or the supply itself
Miss. external power supply channel group 1 [to 4]	S3	2	No auxiliary power, or disrupted auxiliary power to the channel group in question	Check the connection for this auxiliary power supply, or the supply itself
Missing transmitter supply channel group 1 [to 2]	S3	2	No external power supply for the channel in question	Check the connection for this power supply, or the voltage itself
Module: Number self test errors nnn"	S1	2	The number of self test errors (1-5) detected in the module of an AC 800F is output. If the number of self test errors reaches 5, then the module will no longer boot up.	Contact your authorized service engineer.
Module fault	S2	2	Errors occurred in the module	Change the module or contact your authorized service engineer
Module fault: Boot test error	S2	2	Errors occurred in the module's boot test	Change the module or contact your authorized service engineer
Module fault: Communication error	S2	2	The module has not communicated properly for a specified length of time	Change the module or contact your authorized service engineer
Module fault: Configuration error	S2	2	The configuration of the module is not valid	Change the configuration or contact your authorized service engineer

Message text	Pr	MR	Cause of message	Remedy
Module fault: Parameter error on master	S2	2	The configuration of Profibus master do not match to the connected device	Change the configuration or contact your authorized service engineer
Module fault: Parameter error on slave	S2	2	The configuration of Profibus slave do not match to the connected device	Change the configuration or contact your authorized service engineer
Module fault: Self test error	S2	2	In its cyclical self-test the module has detected a fatal error	Contact your authorized service engineer
Module fault: Slave not exist	S2	2	The configured Profibus slave cannot be connected	Change the configuration or contact your authorized service engineer
Module fault: Slave not ready	S2	2	The configured Profibus slave does not communicate correctly.	Change the configuration or contact your authorized service engineer
Module fault: Slot empty	S2	2	A specific module type has been configured for a slot, but no module has been plugged in	Alter the configuration to match the hardware installed
Module fault: Wrong firmware version	S2	2	The module has an incorrect firmware version.	Load a new firmware version in the module, change the module, or contact your service technician.
Module fault: Identification error	S2	2	The module cannot be identified.	Change the module or contact your service technician.
Module fault: no master	S2	2	No master can be found on the Profibus.	Check the Profibus connection.
Module IP1/2: Number self test errors nnn"	S1	2	The number of self test errors detected in the module of an AC 800F is output. If the number of self test errors reaches 5, then the module will no longer boot up.	Contact your authorized service engineer.

Message text	Pr	MR	Cause of message	Remedy
No RED Link connection	S1	2	Communication disruption on the RED link, possibly a faulty cable, or cable not plugged in	Check cable connection
No valid daylight saving time defined	S2	2	Time cannot be converted to summer time. The summer-time table's period of validity has expired, or the table does not contain any times in standard chronological order. Another possible cause is that the time to be converted lies precisely within the one undefined hour when summer time starts	Correct or extend your summer-time table, or check the time to be converted against the last error source declared
Object error, first adjustment not possible	S1	2	The user program could not be loaded fully	Do not load user program with "Load selected objects". Instead, update the project data with "Load entire station" or at least with "Load changed objects"
OPL 'xxx' stopped, all files in use	S1	1	The operation log 'xxx' has been halted automatically. The maximum volume of data for this log has been reached, and automatic deletion has not been configured	Delete or export log data and restart the log. You can also configure automatic deletion
OPL 'xxx' was not printed	S1	1	The print job for the operation log could not be carried out. Presumably the printer driver is not installed or the printer queue is full	Check your system installation, or check that the printer is online
Over / underranging / wire break channel 0 [to 7]	S3	2	The measuring range has been over/under-ranged for the channel in question, or the cable is damaged there	Ensure that values remain within the permissible measuring range and/or check the process signal cable

Message text	Pr	MR	Cause of message	Remedy
Overflow of the message list	S1	1	The system is producing more messages than the DigiVis message list can accommodate	In the message list configuration, increase the number of messages (up to 2000 are possible). If this parameter is already at the maximum, try reducing the number of messages or changing the acknowledge levels
Overload of DigiVis PC	S1	2	The DigiVis station is overloaded	Distribute the active logs and trends over several stations, or install more powerful hardware
Overload, first adjustment not possible	S1	2	The CPU-module is operating with an overload, with the result that redundant operation cannot be initiated. The redundancy has been completely deactivated	Rectify the overload by altering the task interval times or splitting up the program
Power fail of power supply 1 [to 2]	S1	2	The power supply in question has failed	Check cable connection and the supply itself
Prim/Sec toggle by fieldbus communication	S1	1	Failure of the fieldbus communication has triggered a redundancy transfer.	Check the connection and configuration of the fieldbus devices.
Prim/Sec toggle by function	S1	1	Redundancy transfer caused by user function call PRIM/SEC in the normal program	Normal operation
Prim/Sec toggle by HW module failure	S1	1	Redundancy transfer through failure of a module of the AC 800F.	Replace the defective module or check for other causes.
Prim/Sec toggle by network error	S1	1	Redundancy transfer through detection of an error in the system bus network connection	Check the system bus connection of the CPU modules, in particular that of the current secondary

Message text	Pr	MR	Cause of message	Remedy
Prim/Sec toggle by primary failure	S1	1	Redundancy transfer caused by failure of the primary CPU-module	Replace faulty CPU, or investigate other causes
Prim/Sec toggle by toggle button	S1	1	Redundancy transfer by operating the toggle button in Control Builder F	Normal operation
Prim/Sec toggle by toggle switch	S1	1	Redundancy transfer by operating the toggle button on the primary CPU-module	Normal operation
Profibus DP Master Bus Cycle Timeout	S2	2	The maximum bus cycling time of the Profibus communication was exceeded. The Profibus master was reset.	Check the configuration and connections of all Profibus devices or contact your service technician.
Profibus DP Master in State OFFLINE	S2	2	The Profibus DP Master is in the OFFLINE state.	Check the configuration and connection to the Profibus master and the status of the Profibus module.
Profibus DP Master in State STOP	S2	2	Profibus DP Master is in the STOP state.	Check the configuration, connection and status of all Profibus devices.
Profibus DP Master in State CLEAR	S2	2	Profibus DP Master is in the CLEAR state.	Check the configuration, connection and status of all Profibus devices.
Profibus DPM Diagnosis Buffer Overflow	S2	2	The Profibus slaves have given an overflow of diagnosis data. Probably 'flutter' signals.	Check the Profibus configuration and, if possible, increase the number of the Profibus diagnosis buffers of the master. Check the Profibus slaves or contact the slave manufacturer's service technician.

Message text	Pr	MR	Cause of message	Remedy
Profibus DPM duplicate master address detected	S2	2	The Profibus master software has detected that another Profibus master with an identical address is active on the same Profibus line.	Check the configuration of the Profibus line.
Profibus DPM firmware API malfunction	S2	2	The Profibus master software has detected an error in the protocol stack. Depending on the nature of the error, a reset of the protocol stack is initiated and Profibus communication is resumed.	
Profibus DPM firmware API timeout	S2	2	The Profibus master software has detected a timeout in the protocol stack. Depending on the nature of the error, a reset of the protocol stack is initiated and Profibus communication is resumed.	
Profibus DPM Firmware Error (xxx)	S2	2	An internal error has occurred in the communications software of the Profibus Master.	Contact your service technician.
Profibus DPM Firmware Version Error	S2	2	The Firmware version of the Profibus module is outdated.	Load a new Firmware version into the module, change the module or contact your service technician.
Profibus DPM physical layer malfunction	S2	2	The Profibus master software has detected a physical error on the line, and it is no longer possible to perform error-free communication.	Check the configuration of the Profibus line.
Readback fault in output channel	S2	2	An error has occurred during signal readback on an output channel	Contact your authorized service engineer

Message text	Pr	MR	Cause of message	Remedy
Red. startup without current process values	S1	1	After redundancy toggling, the new primary CPU is not receiving any current input data within the configured waiting time.	Check the configuration of the processing station, in particular, the parameter "Toggle timeout for field bus inputs".
Redundant fieldbus comm. not available	S1	1	The redundant communication of a fieldbus has failed.	Check the connections and configuration of the connected fieldbuses.
RS-Wire break of channel 'xxx'	S3	2	The cable connection for the input signal RS (Run/Stop) is faulty	Check the relevant process signal cable
RUN / STOP mismatch P-RUN <-> S-STOP	S1	2	Mismatched positions of RUN/STOP switches on CPU-modules, with current positions displayed	Adjust switch positions
RUN / STOP mismatch P-STOP <-> S-RUN	S1	2	Mismatched positions of RUN/STOP switches on CPU-modules, with current positions displayed	Adjust switch positions
RUN/STOP mismatch switch <-> state	S1	2	The positions of the RUN / STOP-switches of the Primary and Secondary are different. After redundancy toggling, the switch position and state (RUN / STOP) on the new primary do not correspond.	Match the switch positions.
Sec boot cause: CPU fault detected	S1	1	A fatal software error has occurred on the module	Contact your authorized service engineer
Sec boot cause: Critical error	S1	1	A critical software error has triggered a new synchronization by the primary CPU-module	Contact your authorized service engineer

Message text	Pr	MR	Cause of message	Remedy
Sec boot cause: Power fail	S1	1	A new synchronization has been triggered on the CPU-module by the reset button. Reset button pressed for longer than 5 seconds	Normal operation, check your power supply if necessary
Sec boot cause: Reset switch	S1	1	A new synchronization has been triggered on the CPU-module by the reset button. Reset button pressed for longer than 5 seconds	Normal operation
Sec boot cause: Software error	S1	1	A fatal software error has occurred on the module	Contact your authorized service engineer
Sec boot cause: Watchdog	S1	1	The CPU-module watchdog has triggered a new synchronization by the primary CPU-module	Contact your authorized service engineer
Secondary has an invalid operating system	S1	1	The station cannot accept the 'sync' state, because the operating system of the secondary does not correspond to that of the primary.	Load the operating system of the secondary using the "Control Builder F Configure".
Secondary failure	S1	2	In the course of synchronous operation, the secondary has failed	Check that the CPU module is fully functional. Also occurs when there is a fault in the RED link connection
Secondary not found	S1	2	The redundancy partner (secondary) cannot be found, and consequently cannot be loaded	Check whether there is a secondary CPU, and whether the RED link is connected correctly
Secondary not reachable after boot	S1	2	After the operating system has been loaded, the secondary cannot be accessed	Check whether the secondary was unable to terminate the boot-up of its operating system

Message text	Pr	MR	Cause of message	Remedy
Shortcut of channel 'xxx'	S3	2	The cable connection for the analog input has a short circuit	Check the relevant process signal cable
Slave was parameterized from another Master	S2	2	The Profibus device was configured from another master. A different master has parameterized the slave	Check the configuration of the other Profibus master.
SSL 'xxx' stopped, all files in use	S1	1	The signal sequence log 'xxx' has been halted automatically. The maximum volume of data for this log has been reached, and automatic deletion has not been configured	Delete or export log data and restart the log. You can also configure automatic deletion
SSL 'xxx' was not printed	S1	1	The print job for the signal sequence log could not be carried out. Presumably the printer driver is not installed or the printer queue is full	Check your system installation, or check that the printer is online
Stat. boot cause: Bootstrap by operator	S1	1	An operator action (in Control Builder F) has caused Bootstrap on the CPU-module	Normal operation
Stat. boot cause: Cold start by operator	S1	1	An operator action (in Control Builder F) has caused a cold start on the process station	Normal operation
Stat. boot cause: Cold start by reset switch	S1	1	A cold start has been triggered on the CPU-MODULE by the reset button. Reset button pressed for longer than 5 sec's	Normal operation
Stat. boot cause: CPU fault detected	S1	1	A fatal software error has occurred on the CPU-module	Contact your authorized service engineer

Message text	Pr	MR	Cause of message	Remedy
Stat. boot cause: Default configuration only	S1	1	No boot configuration is present in the process station. The process station has been initialized since it does not contain a boot configuration. The standard (default) configuration has been reverted to.	Contact your authorized service engineer.
Stat. boot cause: Enter recover mode	S1	1	A warm start has been activated on a process station.	Contact your authorized service engineer.
Stat. boot cause: Initialization by operator	S1	1	An operator action (in Control Builder F) has caused an Initialize on the process station	Normal operation
Stat. boot cause: Software error	S1	1	A fatal software error has occurred on the CPU-module	Contact your authorized service engineer
Stat. boot cause: Warm start / critical error	S1	1	A critical software error has triggered a warm start on the CPU-module	Contact your authorized service engineer
Stat. boot cause: Warm start by operator	S1	1	An operator action (in Control Builder F) has caused a warm start on the CPU-module	Normal operation
Stat. boot cause: Watchdog	S1	1	The CPU-module watchdog has triggered a boot	Contact your authorized service engineer
Stat. boot cause: Warm start by reset switch	S1	1	A warm start has been triggered on the CPU-module by the reset button. Reset button pressed for less than 5 seconds	Normal operation
Stat. warm start down time 'xxx'	S1	1	The CPU-module has been restarted, and has performed a warm start following a power failure. 'xxx' contains the time of the power failure	Normal operation, check power supply if necessary

Message text	Pr	MR	Cause of message	Remedy
Station Ethernet overload of interface xxx	S1	1	The communication load on interface xxx is too high. The Ethernet controller was temporarily switched off.	Check the configuration and the associated Ethernet devices.
Station FPGA image error xxx	S1	1	An error has occurred in the FPGA of the controller's CPU	Contact your authorized service engineer
Station radio clock failed	S1	1	A radio clock linked to the process station has failed	Check radio clock and/or connection
Station software error 'xxx'	S1	1	A fatal error has occurred on the CPU-module, 'xxx' contains its ID	Contact your authorized service engineer
Station stopped	S1	1	Station resource has been stopped	Normal operation, start the resource
Station task break point activated	S2	1	A user task in the station has reached a break point	In commissioning mode, debugger: deactivate or remove the break point. Allow task to continue running
Station task idle	S2	1	The user task in question is ready to be started	Normal operation
Station task stopped	S2	1	The user task in question has been stopped	Normal operation
Stop archiving	S1	1	An unexpected error occurred while writing archive data, e.g. the hard disk is full	Create more space on the disk in question, or switch the storage of log files etc. to a disk with more space available
Sys. time set at 'xxx'	S1	1	The system time in the process or Gateway station has been changed by an operator action (in Control Builder F), 'xxx' contains the original time (local)	Normal operation

Message text	Pr	MR	Cause of message	Remedy
Task unrunnable: DT overflow	S1	1	The program of the user task in question has caused a DT arithmetic error	Correct problem in user program
Task unrunnable: DT underflow	S1	1	The program of the user task in question has caused a DT arithmetic error	Correct problem in user program
Task unrunnable: Illegal array index	S1	1	An illegal array index has been calculated in the user program	Check and correct the user program
Task unrunnable: Invalid debug command	S1	1	If the resource is halted while a task is at a break point, the task switches to state 'unrunnable'. The error task is not initiated	The resource must not be halted whilst one of the tasks is at a break point
Task unrunnable: INT div. by 0	S1	1	The program of the user task in question has caused an integer arithmetic error	Correct problem in user program
Task unrunnable: INT FB error	S1	1	The program of the user task in question has caused an arithmetic error within an H&B function block	Contact your authorized service engineer
Task unrunnable: INT overflow	S1	1	The program of the user task in question has caused an integer arithmetic error	Correct problem in user program
Task unrunnable: INT overflow (store)	S1	1	The program of the user task in question has caused an integer overflow on saving	Correct problem in user program
Task unrunnable: INT underflow	S1	1	The program of the user task in question has caused an integer arithmetic error	Correct problem in user program

Message text	Pr	MR	Cause of message	Remedy
Task unrunnable: Proc. image read	S1	1	The program of the user task in question has caused an error on reading in the process values	The configuration has not been loaded correctly, presumably because of an operator error. Either "Load entire station" or "Load changed objects" and load the objects individually
Task unrunnable: Proc. image write	S1	1	The program of the user task in question has caused an error on outputting the process values	The configuration has not been loaded correctly, presumably because of an operator error. Either "Load entire station" or "Load changed objects" and load the objects individually
Task unrunnable: Prog. execution abort	S1	1	The program in the user task concerned has been interrupted. A task is running in an endless loop	Correct problem in user program
Task unrunnable: Prog. execution error	S1	1	The program of the user task in question has caused a program execution error	Correct problem in user program
Task unrunnable: REAL div. by 0	S1	1	The program of the user task in question has caused a real arithmetic error	Correct problem in user program
Task unrunnable: REAL FB error	S1	1	The program of the user task in question has caused an arithmetic error within an H&B function block	Contact your authorized service engineer
Task unrunnable: REAL no valid float	S1	1	The program of the user task in question is attempting to process an illegal real value	Correct problem in user program
Task unrunnable: REAL overflow	S1	1	The program of the user task in question has caused a real arithmetic error	Correct problem in user program

Message text	Pr	MR	Cause of message	Remedy
Task unrunnable: REAL underflow	S1	1	The program of the user task in question has caused a real arithmetic error	Correct problem in user program
Task unrunnable: UINT div. by 0	S1	1	The program of the user task in question has caused an integer arithmetic error	Correct problem in user program
Time stamp is off in module DDI01	S2	2	The "Time-stamp" mode is switched off in DDI01.	To record the initial values, the "Time stamp" function in DDO01 must be activated.
Wave file not found	S1	1	A wave file can be configured for each process alarm	Contact your authorized service engineer
Wire break of analog input	S3	2	The process signal cable at the analog input is faulty	Check the process signal cable
Wire break of channel 'xxx'	S3	2	The cable connection for the analog input is faulty	Check the relevant process signal cable
Wrong module type plugged [IPx]	S2	2	The block type configured is incompatible with the module plugged in. (IPx = IP address of the redundant AC 800F)	Alter the configuration to match the hardware installed

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