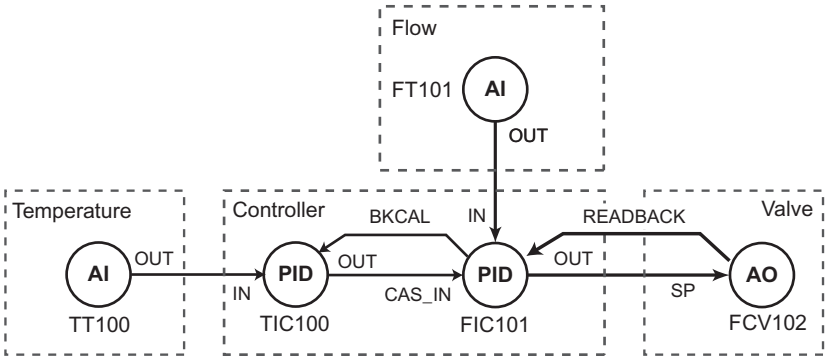
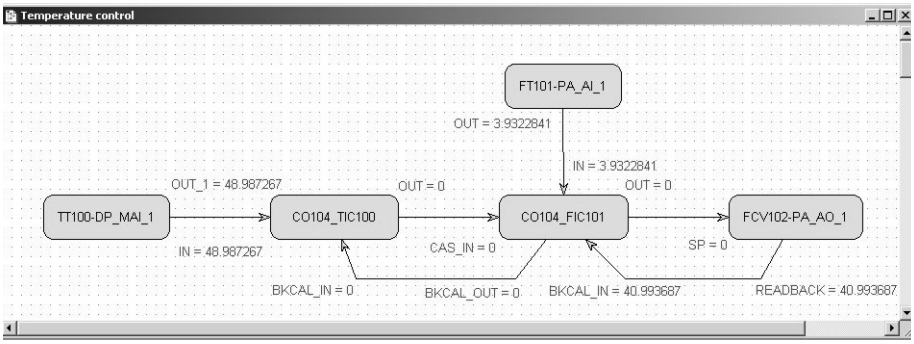
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

ControlCare Application Designer

PROFIBUS Tutorial





BA 036S/04/en/07.06
Software Version 2.02.xx
Nr. 70101152

Endress+Hauser
People for Process Automation

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Revision History

Product version	Manual	Changes	Remarks
2.01.xx	BA036S/04/en/08.05	Original manual	
2.02.xx	BA036S/04/en/07.06	Product	■ FB schedule configured by drag&drop (Chap. 3.10) ■ Incremental Download (Chap.6.3)
		Editorial	■ 3rd party GSDs (Chap. 3.7) ■ Update Product Version and documentation tables

Product Version

The table below indicates the product versions of the main components of ControlCare Field-based Control System. More details on the individual components can be seen in About ControlCare

Product Version	Component	Version
V2.02.xx	ControlCare Application Designer Suite	Version 2.02.xx
	ControlCare PROFIBUS Configurator	Version 2.9xx
	ControlCare Field Control (OPC) Server	Version 3.11.xx
	ControlCare Device Libraries*	Version 2.02.xx
	ControlCare Manuals	Version 2.02.xx
	*Version No. may increase independent of Product Version as the latest devices are added to the library	

Registered Trademarks

PROFIBUS®
Registered trademark of the PROFIBUS User Organisation, Karlsruhe Germany.

FOUNDATION™ Fieldbus
Trademark of the Fieldbus Foundation, Austin, TX 78759, USA

HART®
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1 Safety

1.1 Designated use

ControlCare is a field-based control system comprising hardware and software components. It can be used to visualize, monitor and control production processes. The approved usage of the individual units used in the system can be taken from the corresponding parts of the operating instructions.

The software described in this particular manual allows a network connected to a ControlCare SFC173 PROFIBUS Field Controller to be engineered, configured and commissioned. In addition, appropriate control strategies can be built using the function blocks contained in the controller and connected devices.

1.2 Installation, commissioning and operation

ControlCare Field Controllers have been designed to operate safely in accordance with current technical safety and EU directives. Essential to their use is the ControlCare Application Designer software suite, which allows control strategies to be created for FOUNDATION Fieldbus and PROFIBUS I/O applications. Field devices, links, junction boxes, cables and other hardware comprising the Fieldbus sytem must also be designed to operate safely in accordance with current technical safety and EU directives.

If devices are installed incorrectly or used for applications for which they are not intended, or if the controller is not configured correctly, it is possible that dangers may arise. For this reason, the system must be installed, connected, configured, operated and maintained according to the instructions in this and the associated manuals: personnel must be authorised and suitably qualified.

1.3 Operational safety

Location

Field Controllers must be mounted in a permanent and weather-protected location in a safe area. The environment shall be a metal cabinet or an installation frame with a well grounded mounting plane. The environment shall be protected.

Hazardous areas

The controller must be connected to networks operating in explosion hazardous areas via barriers or other safety components. When installing components in explosion hazardous areas:

- Ensure that all installion and maintenance personnel are suitably qualified
- Check that all equipment has the appropriate safety certificates
- Observe the specifications in the device certificates as well as national and local regulations.

This topic is discussed in BA013S (FF Guidelines) and BA034S (PROFIBUS Guidelines).

EMC

All modules are suitable for industrial use and conform with the following standard, see Appendix:

- EN 61326: 1997/A1: 1998
  Interference emmision: Class A apparatus
  Interference immunity: as per Annex A, industrial environment

Depending upon the environment in which the bus is operating, particular attention should be paid to the grounding of the bus cables. This topic is discussed in BA013S (FF Guidelines) and BA034S (PROFIBUS Guidelines).

IP Address

A ControlCare Field Controller is normally configured from a workstation connected into the control system backbone. You will require a unique IP address to set it up.

Warning
The use of IP addresses is strictly controlled. Usually your system administrator will be authorised to allocate unique addresses. Assigning an unauthorised address to a Field Controller may result in conflicts within your system and the failure of the associated devices!

Since the system can be accessed and manipulated through the various ControlCare tools, it is advisable to control access both to the workstation and the folders in which the configuration is stored. Always make a back-up of the project.

Technical improvement

Endress+Hauser reserves the right to make technical improvements to its software and equipment at any time and without prior notification. Where such improvements have no effect on the operation of the equipment, they are not documentated. If the improvements effect operation, a new version of the operating instructions is normally issued.

1.4 Conventions and icons

In order to highlight safety relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.

Safety conventions

Icon	Meaning
	A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned
	Caution! Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument
	Warning! A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument

1.5 ControlCare documents

Table 1.1 indicates the documents, planned and realized, containing safety relevant information, installation, commissioning and operating instructions for the equipment and software associated with ControlCare.

All documentation available at the time of release is included on the ControlCare CD-ROM and is installed in **Start=>Programs=>Endress+Hauser=ControlCare=Manuals** during set-up.

Component	Description	Document type	Designation	Order No.
System	ControlCare System Overview	Operating manual	BA016S/04/en	56004883
	ControlCare System Design	Operating manual	BA039S/04/en	Planned
	ControlCare System Specifications	Operating manual	BA040S/04/en	56004888
Software	Application Designer Overview	Operating manual	BA017S/04/en	71014301
	Application Designer Drawing Tool	Operating manual	BA032S/04/en	Planned
	Application Designer: FF Tutorial	Operating manual	BA019S/04/en	70101151
	Application Designer: PROFIBUS Tutorial	Operating manual	BA036S/04/en	70101152
	Application Designer: MODBUS Tutorial	Operating manual	BA037S/04/en	70101153
	Application Designer: IEC 61131 Tutorial	Operating manual	BA038S/04/en	70101386
	Field Control (OPC) Servers	Operating manual	BA018S/04/en	71031428
Field Controller	Hardware Installation Guide	Operating manual	BA021S/04/en	56004885
	Commissioning and Configuration	Operating manual	BA035S/04/en	56004887
Function Blocks	Function Block Manual	Operating manual	BA022S/04/en	56004886
Set-Up	Getting Started	Operating manual	BA020S/04/en	56004884
General	FOUNDATION Fieldbus Guidelines	Operating manual	BA013S/04/en	70100707
	PROFIBUS Guidelines	Operating manual	BA034S/04/en	56004242

Tab. 1-1: ControlCare Documentation

2 Task Description

This tutorial describes all steps necessary for setting up the project described below. It does not aim to give an exhaustive account of Application Designer functions, but rather shows you one of a number of methods to reach your goal. The tags and names used in the tutorial are imaginary and will be different in a proper application. A full description of Application Designer functions is to be found in Application Designer Overview BA017S/04/en and Drawing Tool BA032S/04/en (in preparation). Function block descriptions are to be found in BA022/04/en, Function Block manual.

2.1 Application

For this tutorial, the case of cascade control for a heat exchanger will be used, see Fig. 2-1.

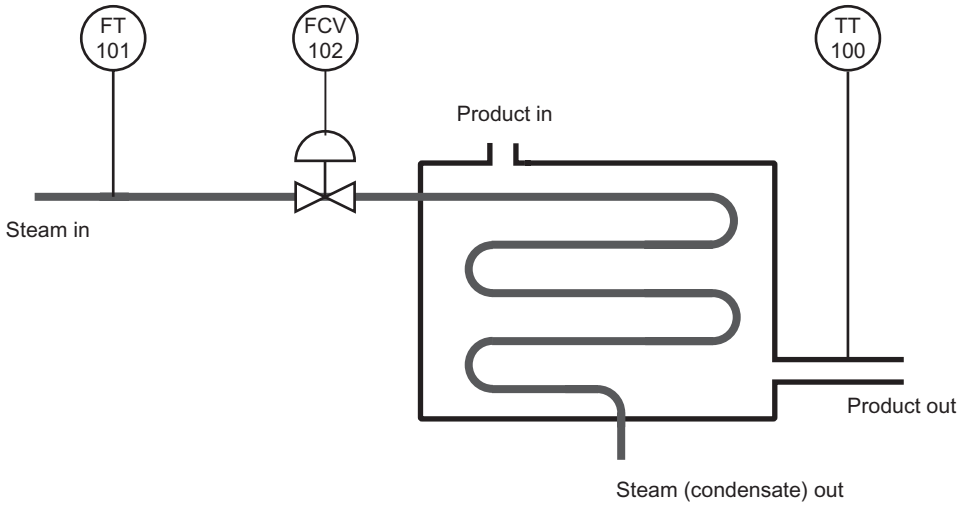


Fig. 2-1: Schemetic diagram of heat exchanger application

A liquid flows through the heat exchanger and is heated by condensing steam. The controlled variable is the exit temperature of the liquid flowing through the exchanger. The manipulated variable is the steam flow to the exchanger. The temperature of the product defines the set point of the steam flow, which is controlled by a valve in order to avoid excessive waste of energy (=steam).

The corresponding control strategy is shown in Fig. 2-2.

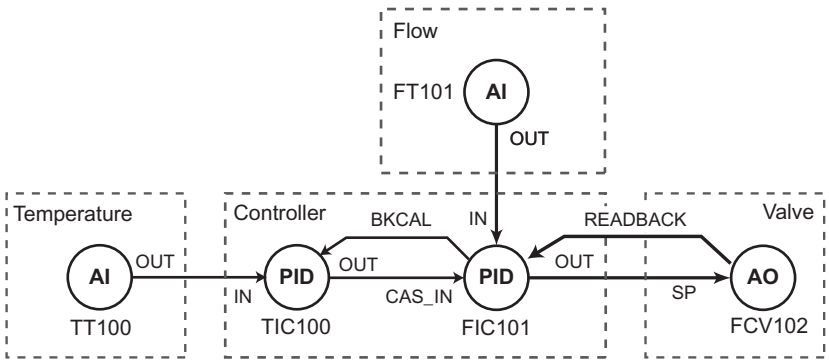


Fig. 2-2 Cascade control strategy for heat exchanger application

2.2 Network

For the purposes of demonstrating as many aspects of PROFIBUS engineering as possible, the network is assumed to be constructed as shown in Fig. 2-3.

- The flowmeter is assumed to be a PROFIBUS DP device
- The valve is assumed to be a PROFIBUS PA device connected to the PROFIBUS DP network via a segment coupler
- The temperature transmitter is assumed to be an analog device connected to the PROFIBUS DP network via a Remote I/O unit.

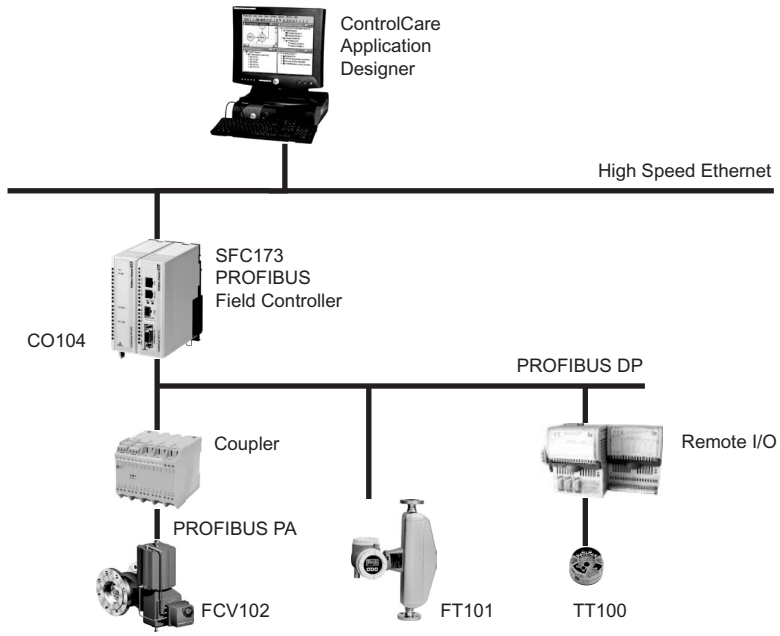


Fig. 2-3 Network for application example

In the case chosen, the connection to the PROFIBUS PA segment is made via a transparent P+F SK1 segment coupler. This does not have to be engineered in the PROFIBUS configurator because the default settings are used. For a Siemens Link or P+F SK2 Power Link, however, the bus parameters have to be changed to conform with those used by the SFC173 PROFIBUS Field Controller. Instructions on how to do this are to be found in the operating instructions supplied by the manufacturer. More information on PROFIBUS DP/PA communcation is to be found in operating instructions BA034S/04/en, PROFIBUS Guidelines.

2.3 Preliminaries

2.3.1 Installation and commissioning

Before you can start the PROFIBUS tutorial, Application Designer must be installed on your computer, the SFC173 PROFIBUS Controller installed and commissioned and a connection made to your computer. Instructions on how to do this are to be found in:

- Operating Instructions BA020S/04/en, Getting Started
- Operating Instructions BA021S/04/en, Field Controller: Hardware Installion
- Operating Instructions BA035S/04/en, Field Controller: Commissioning and Configuration

2.3.2 Address and tag list

For a PROFIBUS system, each device that communicates must have a unique bus address. It is recommended that the addresses are set at the DIP switches on the devices or via software, e.g. FieldCare, before they are installed in the plant.

- SFC173 Field Controller is supported in FieldCare via the SFC173 CommDTM. Chapter 7 gives a short description of its use. Additional information is to be found in the FieldCare and DeviceDTM online helps.

A PROFIBUS address must also be assigned to the master before it can become active on the bus. The address of the SFC173 Field Controller is set by software. Normally, it is set off-line in Application Designer and implemented when the project is downloaded to the controller.

To aid the engineering of the network, it is necessary to keep a record of the device addresses and tags, often as an Excel sheet. Table 2-1 below provides an example of how this might look for the application at hand.

Tab. 2-1: Address and tag list for tutorial application

Area/Process Cell/ Control Module	**Device**	**Vendor**	**Tag**	**Unit**	**Address**	**Task**
Pasteurization Heat Exchanger Temperature control	TMT162 HART /Pt100	E+H	TT100	°C	119	Product temperature
	Promass 73 DP	E+H	FT101	t/h	5	Steam flow
	ND9000PA	Metso	FCV102	%	6	Steam valve positioner
	SFC173	E+H	CO104 -TIC100 -FIC101		1	Controller Temperature PID Flow PID

2.3.3 PROFIBUS parameters

The SFC173 Field Controller can be used with both P+F and Siemens couplers and links. The bus parameters differ according to the equipment used.

This tutorial describes the parameters of the P+F SK1 coupler and P+F SK2 power link. If you are using Siemens equipment, please consult the manufacturer's instructions regarding suitable parameters. They are set as described in Chapter 3.5.

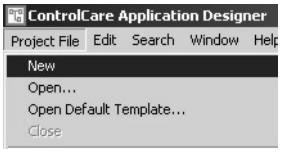
Another case in which bus parameters may differ from those descibed in this tutorial is when a Fieldgate FXA720 is operating as a Class II master in the network. Again, the manufacturer's instructions should be consulted regarding suitable bus parameters.

3 Create a PROFIBUS Network

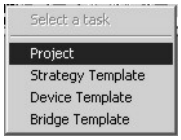
3.1 Create a new project

1 Start ControlCare Application Designer by clicking on the icon on your destop or via **Start => Programs => Endress+Hauser => ControlCare => ControlCare Application Designer**

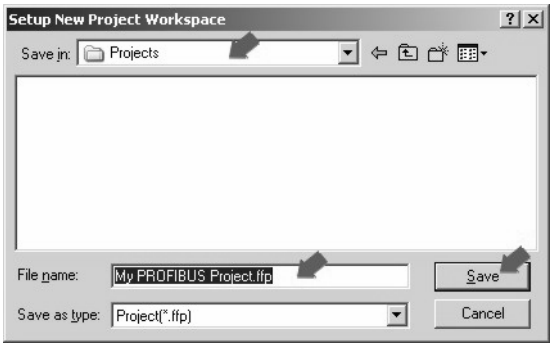
2 The project starts from a blank application screen
– With the right mouse key select **Project File=>New**



3 The **Document Type** box appears: Click the option **Project**



4 The **New Project** dialog box opens:



1. Choose the folder where the project will be saved.
2. Type the name of the project in the File Name box.
3. Click **Save.**

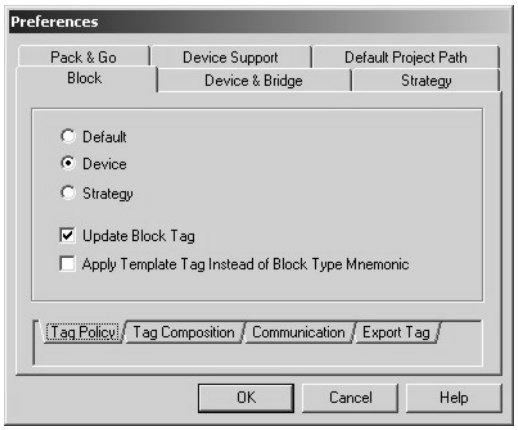
If the new project is not to be created, click **Cancel.**

5 ControlCare Application Designer automatically creates a folder with the entered file name within the selected folder.

3.2 Determine the naming preferences

Before you start, you can set preferences for the way your project is created. Of particular interest at this stage is the labelling of the function blocks.

1 Press **Project File** => **Preferences**
– The **Preferences** Dialog appears



Tag Policy

Tag Policy determines how the blocks are labelled by default if no tag names are entered

1 Select the folder **Block** and the subfolder **Tag Policy**, then check the following buttons
– **Device**
– **Update Block Tag**

2 Press **OK** to confirm your selection
– Application Designer will now automatically rename any blocks created in the control strategy window as they are assigned to the devices by adding the device tag as prefix.

Tag Composition

Tag Composition determines how the block identifiers are added to the block tag if no block name is entered.

1 Select the subfolder **Tab Composition**:
– Enter a mnemonic separator: for this manual the setting was "-"
Default setting is "_" and mandatory if flexible function blocks are to be used
– Check **Prefix**

2 Press **OK** to confirm your selection
– Application Designer will now automatically compose the blocks according to your selection, e.g. TagName-Block-n or TagName_Block_n.

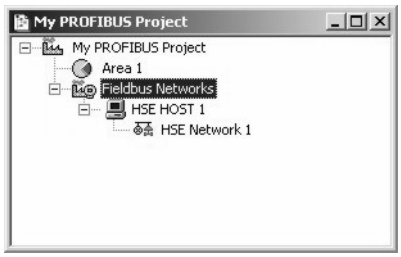
Export Tag

Export Tag causes tags to be automatically exported every time the project goes online

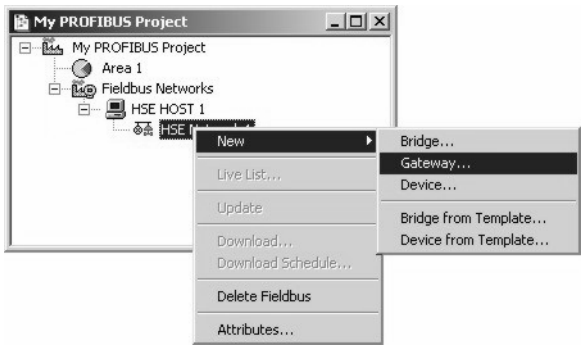
1 Select the subfolder **Export Tag**
– Check the **Automatic** button
– Press **OK** to confirm your selection

3.3 Add a gateway (SFC173)

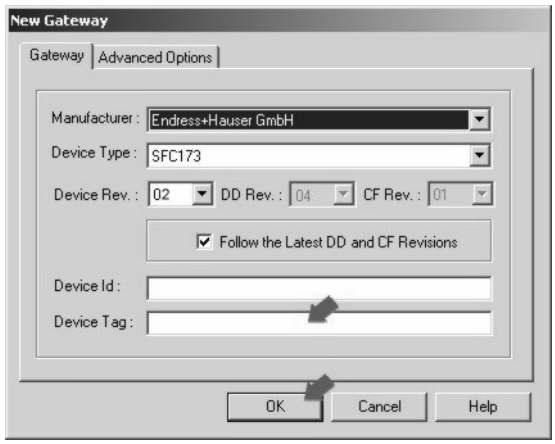
1 On saving, ControlCare Application Designer automatically creates a project, adding the HSE fieldbus network and the HSE Host
– Click on **+** to expand the tree:



2 Now right-click on the **HSE Network** leaf and select **New=>Gateway**



3 The **New Gateway** dialog box appears:
Select the SFC173 Field Controller and type in a device TAG = **CO104**

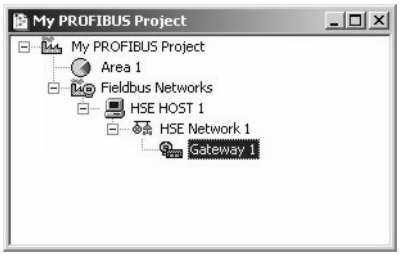


If you do not type in a tag, the default will be "Gateway n", where n is a consecutive number. At this point, the Fieldbus Network does not have a direct correspondence to any of the existing controllers.

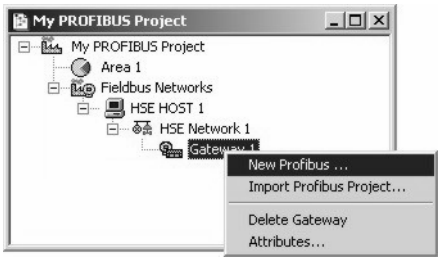
4 Press **OK** to create the Gateway.

3.4 Add a PROFIBUS segment

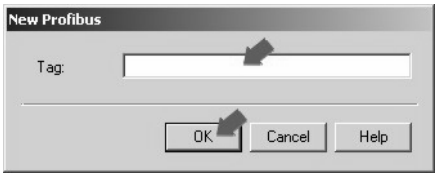
1 The project now looks like this:



2 Right click on the gateway you just created, here **"Gateway 1"**, and select **New Profibus**.



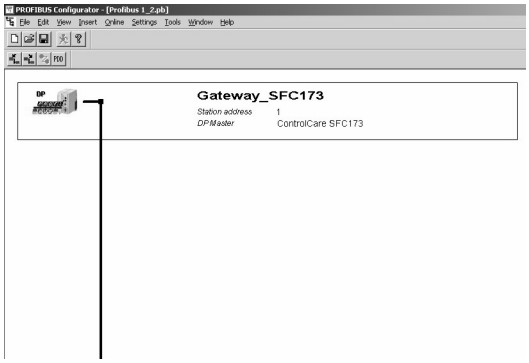
3 The **New Profibus** dialog box appears:



- At this point you can enter a PROFIBUS segment TAG
- If you do not type in a tag, the default will be "Profibus n", where n is a consecutive number. At this point, the Fieldbus Network does not have a direct correspondence to any of the existing controllers.

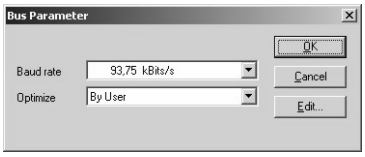
4 Press **OK** to create the PROFIBUS segment.

5 The **ControlCare PROFIBUS Configurator** opens with the SFC173 Controller inserted as PROFIBUS master/host with the default address 1

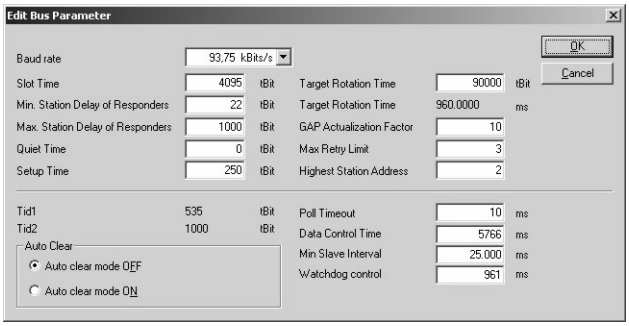


3.5 Set the PROFIBUS parameters

1 Click on the SFC173 master, select the menu **Settings => Profibus Settings...**
– The **Bus Parameter** dialog appears



2 For the SK1 coupler select **93.75 kbit/s** (default) and optimize **By User**, then press **Edit**
– The **Edit Bus Parameters** dialog appears



3 Check and if necessary enter the following parameters (P+F SK1 coupler):

– Slot time: **4095**
– Min station delay: **22**
– Max station delay: **1000**
– Set-up time: **250**
– GAP update factor: **100**
– Max retry limit: **3**
– Token rotation time: **90000**
– Press **OK** to store the parameters followed by **OK** to exit the **Edit** dialog

4 As devices are added to the bus, see Chapter 3.7, the Master checks whether they support the selected baudrate

– **PROFIBUS DP slaves** normally listen to the bus and adjust automatically to the baudrate. If this is not the case, their baudrate must be changed to that of the coupler.
– Standard GSD files for **PROFIBUS PA slaves** support baudrates 93.75 kbit/s (P+F SK1) and 45.45 kbit/s (Siemens coupler) by default
– If a **PROFIBUS DP master** is added to the bus, e.g. FXA720 Class 2 Master, then its bus parameters must be set to those of the Field Controller.

P+F SK2 Power Link

1 For the P+F SK2 power link device.

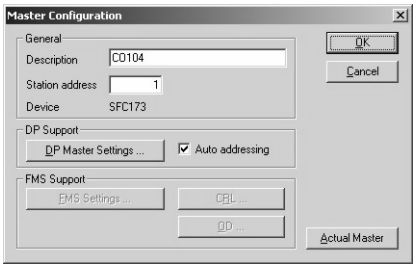
– Select the **Baudrate** you require
– Select optimise **Standard** to automatically set the SK2 parameters for the selected baudrate.

2 As devices are added to the bus, see Chapter 3.7, the Master checks whether they support the selected baudrate

– A warning message appears if a device does not support the selected rate
– For **PROFIBUS PA** devices the special GSD file "Yxxx ...." must be used
– For **PROFIBUS DP devices**, a master baudrate supported by all devices must be selected

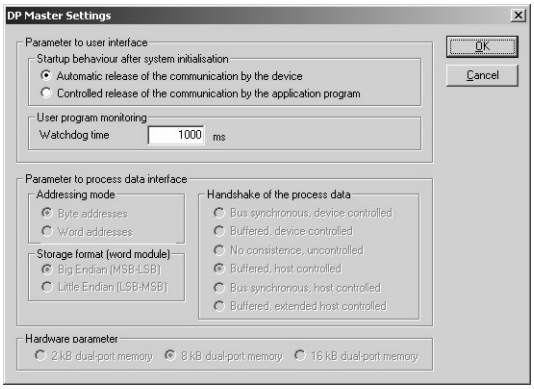
3.6 Configure the PROFIBUS master

1 Double-click on the SFC173 Node, the **Master Configuration** dialog box opens:



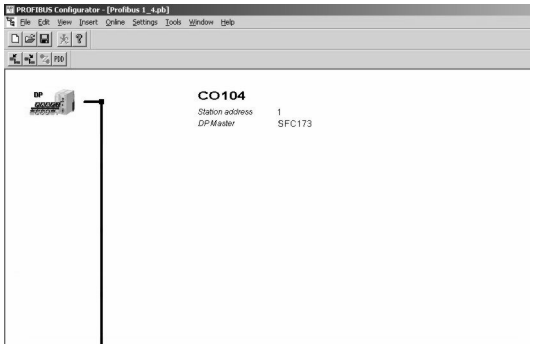
– Enter the controller tag in the **Description,** i.e. **CO104**
– Set the **Station Address** to 1

2 A click on the **DP Master Settings...** button opens the **DP Master Settings** dialog:



– A description of the parameters is to be found in the on-line help
– For our application no changes need be made
– Press **OK** to close the dialog and return to the **Master Configuration** dialog

3 Press **OK** to confirm the changes in the configuration and to return to the **PROFIBUS Configurator** workspace

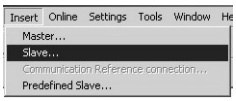


3.7 Add the PROFIBUS devices

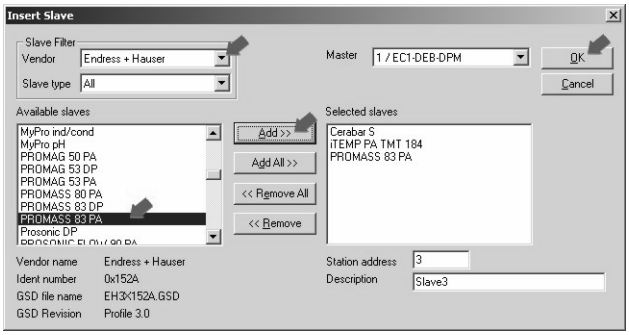
Note!

- GSD files of 3rd party devices can be added to the library by selecting **File=>Copy GSD**

1 Select **Insert =>Slave...** a large S appears as cursor.
Move this to the position on the PROFIBUS line, below the SFC173 Field Controller icon, where you want to place the device.



2 Right-click to begin placing: the **Insert Slave** dialog box appears

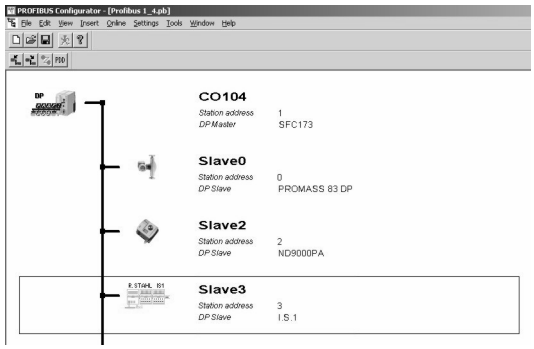


– Select the **Vendor** and if required **Type of Slave** (All, General, I/O Slave)
– Select a device from the **Available Slaves** list
– Press **Add** to move it to the **Selected Slaves** list
– Designate a unique **slave address** >3 (0 - 2 are reserved for masters)
– Enter a symbolic **slave name**, e.g. Slave 1
– Press **OK** to add the slave to the segment

3 For the tutorial, add a Promass 83 DP device, a Metso ND9000PA device and a Stahl Remote I/O IS1

– For the SK1 (and Siemens) coupler, select the normal files (PROFIBUS DP or PA)
– You can also configure the slave, see Chapter 3.8, before adding the next one.

4 Your project should now look something like this:



P+F SK2 Power Link

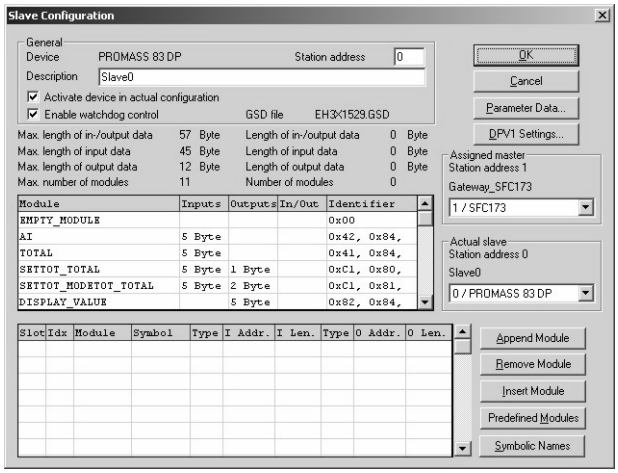
The P+F SK2 link requires special GSD files for PROFIBUS PA devices
– Select the files with the suffix "Yxxx" or "SK2"
– For information on GSD files, see the PDF **ContentCC_GSD_Library** which installed automatically during setup in the **Manuals** folder

3.8 Configure the PROFIBUS slaves

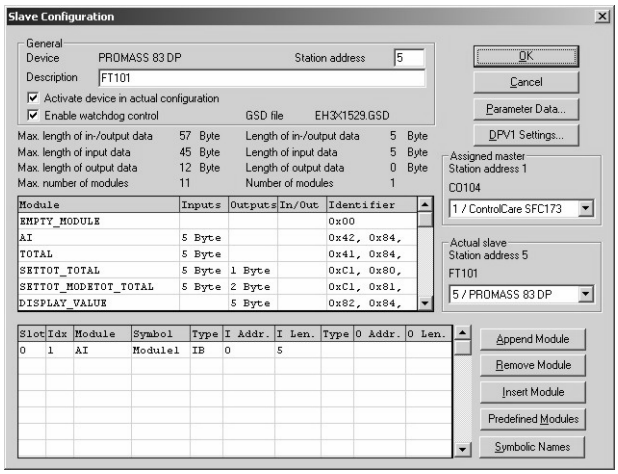
The device configuration is done in the **Slave Configuration** dialog box. Although the basic actions are identical, it varies slightly according to the type of slave.

3.8.1 Transmitter configuration

1 Double-click on the Promass Node, the **Slave Configuration** dialog box opens:



- The **General** box contains the parameters as set in the **Insert Slave** dialog (these can be changed if required - use underscores instead of spaces, as the latter and invalid characters)
  – Enter the preset **Station Address = 5**
  – Enter the device tag as **Decription = FT101**
- In the Parameter Box you can select the GSD modules to be sent to and from the Controller
  – The parameters for the Promass 83 must be configured in a fixed order, see BA064F
  – Use Empty_Module/Free_Space parameters to fill gaps made by unused parameters
- Select the **AI** parameter (= Mass flow in t/h) and press the **Append Module** button, the parameter is added to the I/O parameters box

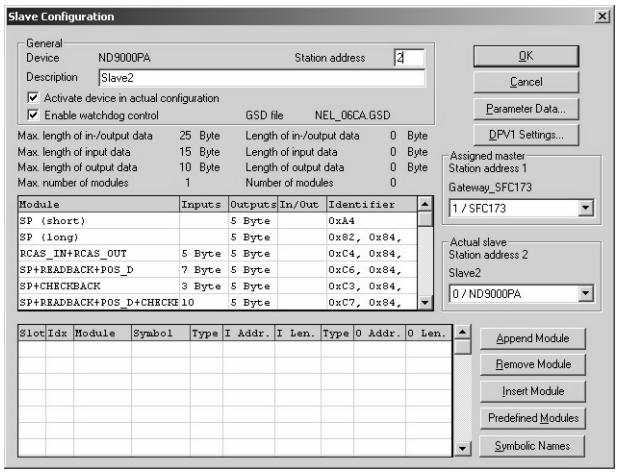


2 Press **DPV1 Settings...** and make sure that **DPV1 Activated** checkbox is **not** checked
– Press **OK** to confirm your settings

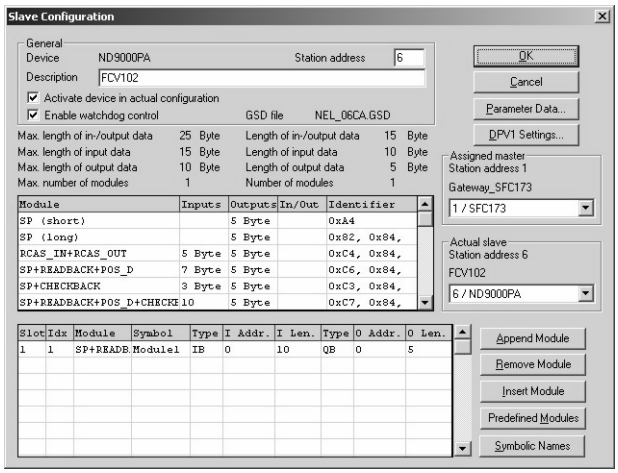
3 Press **OK** to complete the configuration

3.8.2 Positioner configuration

1 Double-click on the ND9000PA Node, the **Slave Configuration** dialog box opens:



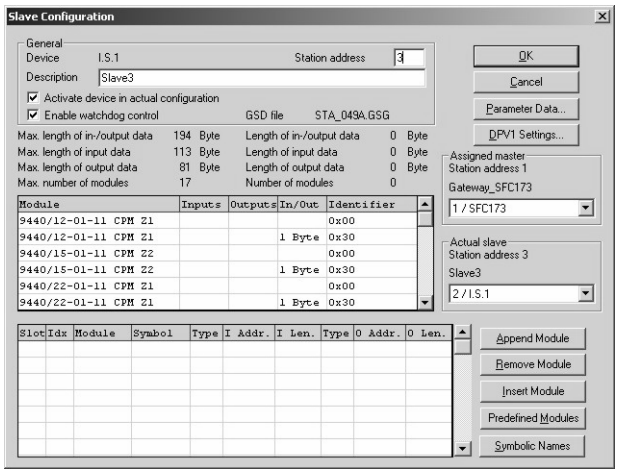
– The **General** box contains the parameters as set in the **Insert Slave** dialog (these can be changed if required - use underscores instead of spaces, as the latter and invalid characters)
  – Enter the preset **Station Address = 6**
  – Enter the device tag as **Decription = FCV102**
– In the Parameter Box select the GSD modules to be sent to the Controller
  Select the **SP+READBACK+POS_D+CHECKBACK** parameter and press the **Append Module** button: the parameter is added to the I/O parameters box
  Note: PROFIBUS Configurator uses PROFIBUS notation here, the FF equivalents are shown in brackets when the function block is opened in the control strategy window
– Press **DPV1 Settings**... and make sure that **DPV1 Activated** checkbox is **not** checked
  – Press **OK** to confirm your settings



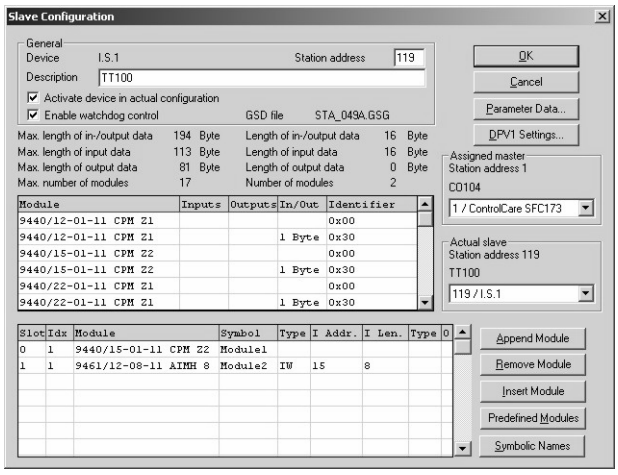
2 Press **OK** to complete the configuration

3.8.3 Remote I/O configuration

1 Double-click on the STAHL IS1 Node, the **Slave Configuration** dialog box opens:



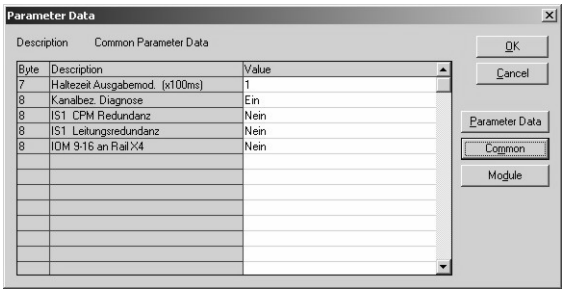
– The **General** box contains the parameters as set in the **Insert Slave** dialog (these can be changed if required - use underscores instead of spaces, as the latter are invalid characters)
– Enter the preset **Station Address = 4**
– Enter the device tag as **Decription = TT100**
– In the Parameter Box select all modules that are used in the Remote I/O:
In our example select:
1) **9440/15-01-11CPM Z2** (no status byte) and press the **Append Module** button:
2) **9461/12-08-11 AIMH 8** and press the **Append Module** button:
the modules are added to the I/O parameters box
– Press **DPV1 Settings**... and make sure that **DPV1 Activated** checkbox is **not** checked
– Press **OK** to confirm your settings



2 Now select the **AIMH module** in the I/O parameter list and press the **Parameter Data** button, the **Parameter Data** dialog appears

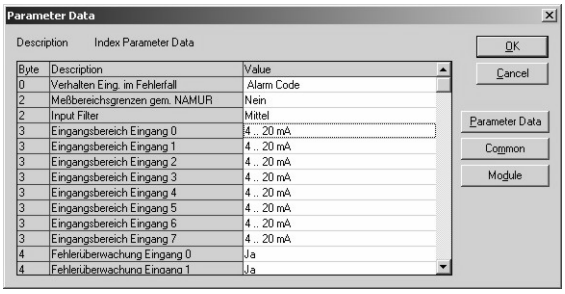
– This has no relevance to the Parametrization, but can be used later to check the raw data offered by the Remote I/O when the project is on-line.

3 Press the **Common** button – the parameters common to the entire I/O can be modified, e.g. redundancy of CPM or wiring: see manufacturer's instructions for more details

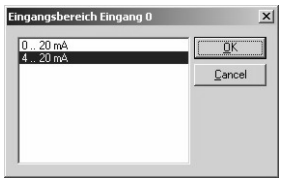


– A double-click on the parameter calls a list of possible options
– Press **OK** to confirm your choice
– After all common parameters have been configured, press **OK** to confirm your selections

4 Now press the **Module** button

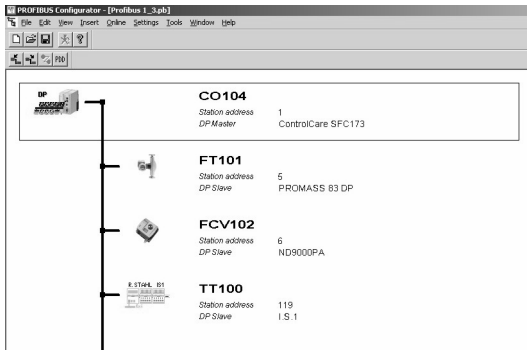


– Set the I/O module parameters, see Remote I/O manufacturer's instructions
– A double-click on the parameter calls a list of possible options, e.g. 0..20 mA or 4..20 mA



– For our example set Input 0 = 4 .. 20 mA; Fault Monitoring Input 0 = yes, 1–7 = no
– Press **OK** to confirm your choice
– After the module has been configured, press **OK** to confirm your selections and close the **Parameter Data** dialog

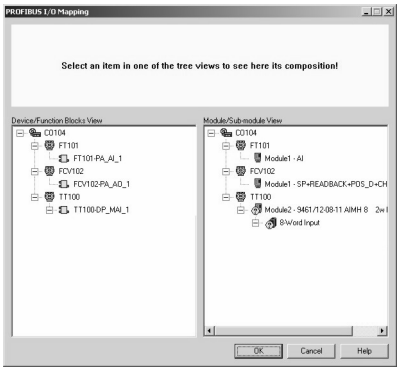
5 Press **OK** to complete the configuration: your project should now look like this:
– Select **Save** then **Exit** to close PROFIBUS configuration



3.9 PROFIBUS I/O mapping

The PROFIBUS I/O mapping connects the GSD modules, which are responsible for cyclic communication with the PROFIBUS devices, to function blocks. Depending upon device type these may be simple Input/Output blocks with one OUT or IN value, or Multiple Input/Output blocks with several OUT or IN values. In the latter case, the values are connected the order they appear in the Mapping dialog, i.e. Value 1 = OUT_1/IN_1 etc. ThePROFIBUS function blocks can then be used to create the control strategy, see Chapter 4.

6 The PROFIBUS I/O Mapping dialog appears, showing Device/Function Block and Module/ Submodule views

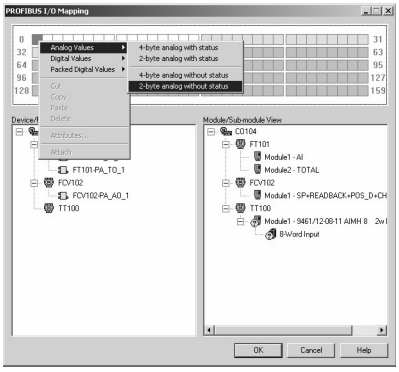


– For most PROFIBUS PA and PROFIBUS DP devices, the function blocks are preconfigured and appear in the Device/Function Block View as yellow boxes. If the parameter in the right-hand pane has a question mark, it must be configured, see Chapter 3.9.1.
– For Remote I/Os you will always see a series of question marks: this means that the submodule data format must be configured

3.9.1 Configuring the Remote I/O

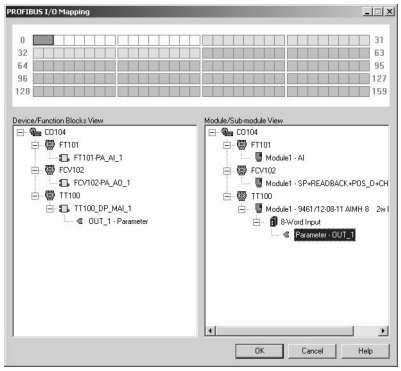
Before you begin to map a component, it is important that you read the appropriate operating manual, since it is necessary to know what parameters are offered by the device and in what format they are transmitted across the PROFIBUS network.

1 Click on the first submodule leaf of the Remote I/O – a bit map appears at the top of the page

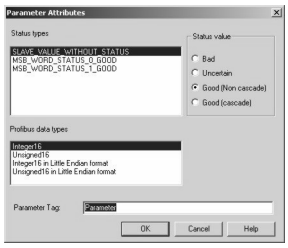


– Click on Bit 0, then right-click over the bit map and select the output type and data format
– For **9461/12-08-11 AIMH** select **Analog Values** and **2 byte value without status** ("Without status" means no status bytes are sent – the status may still be present as a bit)
– Repeat for all other submodules

2 On selection, the question mark disappears and the appropriate Function Block appears in the Device/Function Block view



3 Now right-click on 2 Byte bar (green) and select **Attributes** - the **Parameter Attributes** dialog box appears:



- Select Slave Status: **MSB_WORD_STATUS_0_GOOD** (see Remote I/O manual)
- Select the data format: **Integer 16** (see Remote I/O manual)
- You can also enter a Parameter Tag - this will appear in the project tree
- Press **OK** to confirm your choice and close the dialog box.

Note!

- If the slave sends no status bit or byte
  - Select Slave Status = SLAVE_VALUE_WITHOUT_STATUS
  - Select Status Value = Good NonCascade or Good Cascade, depending on role in loop

4 Select **OK** to close the dialog - the project data is imported to Application Designer

- The mapped devices are added to the Profibus network
- The block TT100-DP_MAI_1 is added to the TT100 device
  The block FT101-PA_AI_1 is added to the FT101 device
  The block FCV102-PA_AO_1 is added to the FCV102 device
- The temperature value is mapped to OUT_1 of the TT100-DP_MAI_1 block
  The flow value is mapped to the OUT value of the FT101-PA_AI_1 block
  The position value is mapped to the READBACK value of the FCV102-PA_AO_1 block

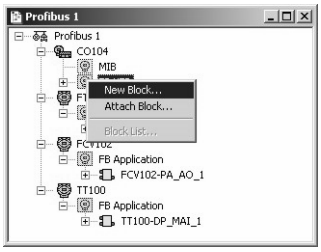
5 Open **Project File**, then press **Save**, to save the project.

3.10 Add Function Blocks to the Controller

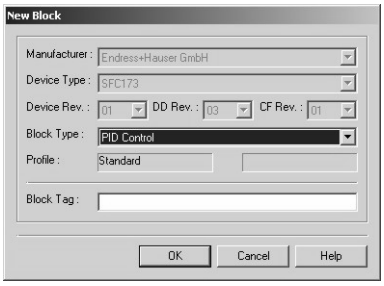
The blocks that are always necessary for the Field Controller (RS, PBTR0, HC and DIAG) are created automatically when it is added to the Fieldbus Network. Do not delete these blocks!

Application-specific blocks are created manually as shown below. They can also be created in the Control Strategy window for later assignment to a field device or Field Controller. The order of assignation determines the order of execution (can be changed by drag&drop).

1 In the Profibus workspace expand the Profibus tree until you see all function blocks



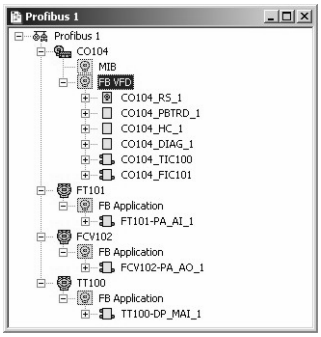
2 Now right-click on the **FB VFD** leaf of the SFC173 Controller and select **New Block**
– The **New Block** dialog for the SFC173 appears



– Select Block Type **PID Control** from the the dropdown menu
– Enter a **Block Tag**, e.g. **CO104-TIC100** (Default is TAG_Description-PID-n)
– Press **OK** to confirm your choice

3 Repeat the procedure to add a second PID Block wth the Block Tag **CO104-FIC102**

4 Open **Project File**, then press **Save**, to save the project, it should look like this

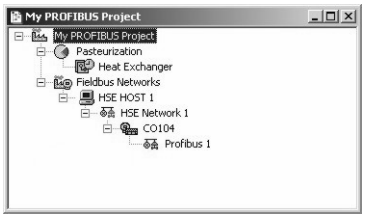


3.11 Export tags

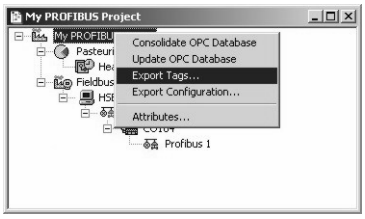
Note!

- You should use the Export Tags function everytime you change the configuration of the project, so that the OPC server information is always up-to-date.
- Application Designer can be set to automatically export the tags every time the project goes online, see Chapter 3.2.

1 Activate the project view by clicking in its workspace



2 Right click on the project name, a context menu appears



3 Select the option **Export Tags...**.
– The Export Tags dialog confirms the successful export

– Press **OK** to close the dialog

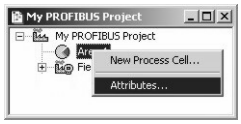
4 Open **Project File**, then press **Save** to save the project

4 Create a Control Strategy

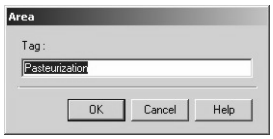
Having created a physical view of the process instrumentation, the next step is to create control strategy. This is done in the logical view of the plant. This represents the plant as Areas/Process Cells in accordance with ISA S88/IEC 61518. Only one Area is allowed in the project, but this may have any number of Process Cells.

4.1 Add a Process Cell

1 Click on the "**Area 1**" leaf in the project and select **Attributes...**

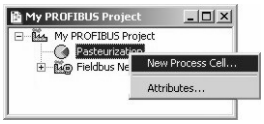


2 The **Attributes** dialog box appears

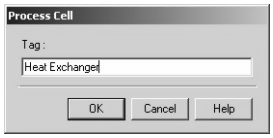


– Enter a name for the area, e.g. Pasteurization (see Table 2-1, Chapter 2.3)
– Click **OK** to store your changes

3 Click on the Area leaf again and select **New Process Cell...**

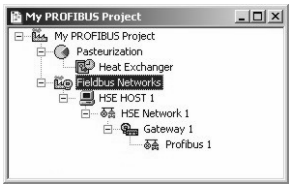


4 The **Process Cell** dialog box appears



– Enter a name for the process cell, e.g. Heat Exchanger (see Table 2-1, Chapter 2.3)
– Click **OK** to store your changes

5 Your project should now look something like this:

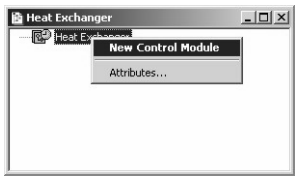


6 Open **Project File**, then press **Save Entire Configuration**, to save the project.

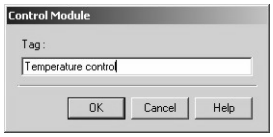
4.2 Add a Control Module

1 Double-click on the Process Cell leaf – a new window with the name of the leaf opens

2 Right-click on the top leaf and select **New Control Module**

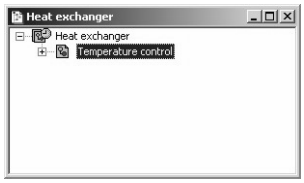


3 The **Control Module** dialog box appears



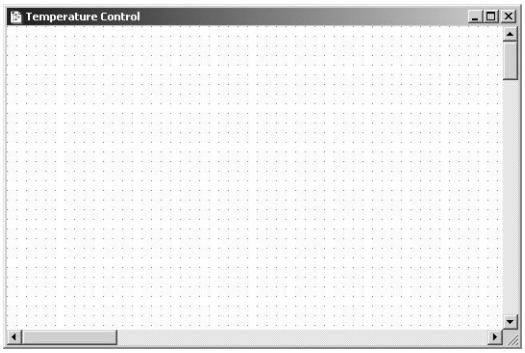
– Enter a name for the control module, e.g. Temperature Control (see Table 2-1, Chapter 2.3)
– Click **OK** to store your changes

4 The project now looks something like this:



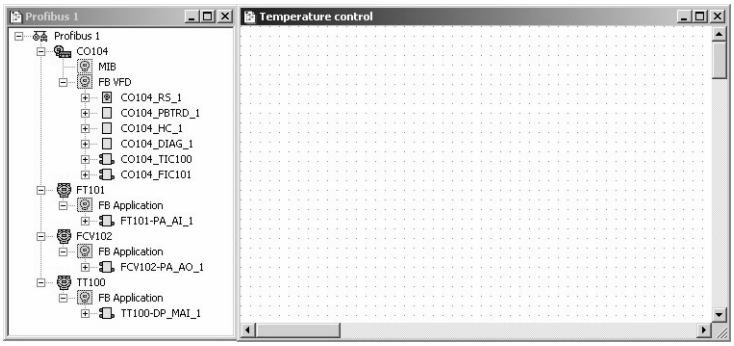
5 For a real project, Step 2 and 3 would be repeated until all the required control modules for a particular process cell have been added. This allows each control loop or control loop group to be set up and viewed in its own control strategy window.

6 Double-click on the control module leaf to open the **Control Strategy** workspace – this has the same name as the leaf



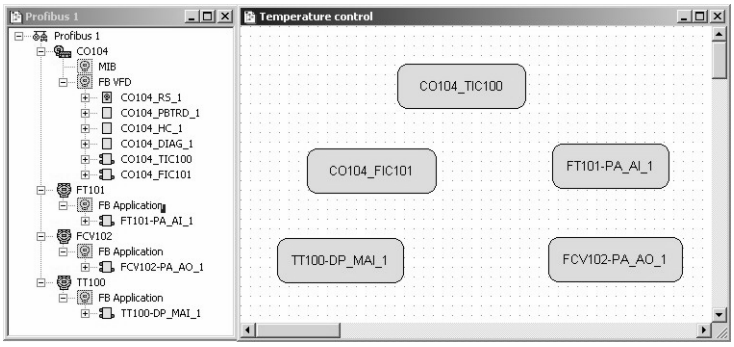
4.3 Add Function Blocks to the Control Strategy

1 Take the **Profibus** workspace and expand the Profibus tree until you see all function blocks. Place the workspace next to the **Control Strategy** workspace

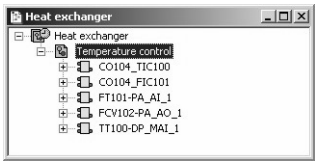


2 Now drag and drop the following function blocks from the **Profibus** tree into the **Control Strategy** workspace

- TT100 analog input block: TT100-DP_MAI_1
- FT101 analog input block: FT101-PA_AI_1
- FCV102 analog output block: FCV102-PA_AO_1
- 2x Controller PID blocks: CO104-TIC100, CO104-FIC101



3 As you do this, you will see that the function blocks also appear in the **Control Module** workspace

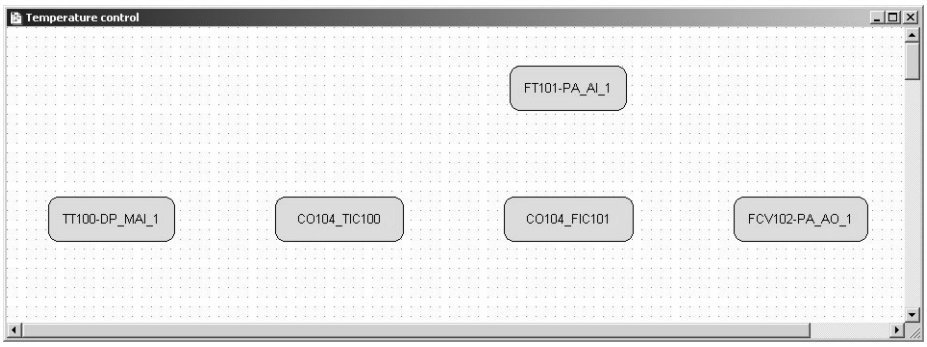


4 Open **Project File**, then press **Save Entire Configuration**, to save the project.

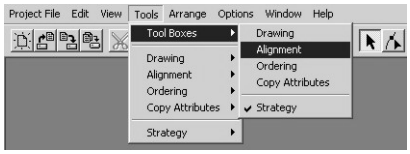
4.4 Add the Function Block links

When you are adding the links you will notice that some AO parameters have two names. The main name is that provided in the PROFIBUS GSD, the one in parentheses is the corresponding parameter in the FOUNDATION Fieldbus Function Block standard.

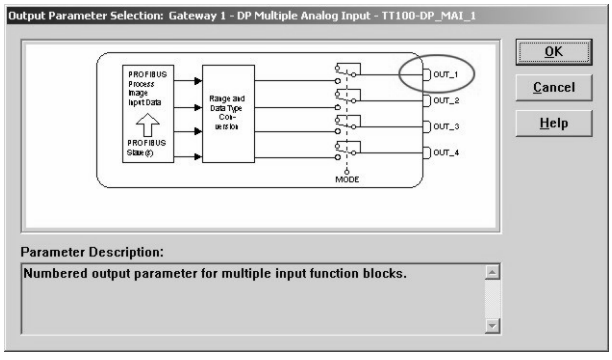
1 In the Control Strategy workspace position the blocks according to your strategy



- The blocks can be dragged and dropped by selecting and holding down the right mouse key
- The blocks can be aligned by selecting, then via **Tools => Alignment => e.g. Middle** followed by a click on the block to which the alignment is to be made
- The **Tools** menu also contains other standard drawing functions such as toolbars, standard shapes, line thickness, colours etc.



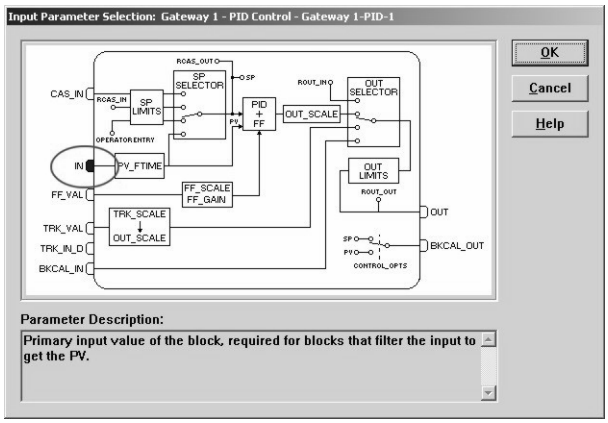
2 Click on **Function Block Link** button in the tool bar, the cursor changes to a cross
- Select the **TT100-DP_MAI_1 block** (Temperature AI block) with the cross: the **Output Parameter Selection** dialog appears



- OUT_1 contains the temperature value, see Chapter 3.9

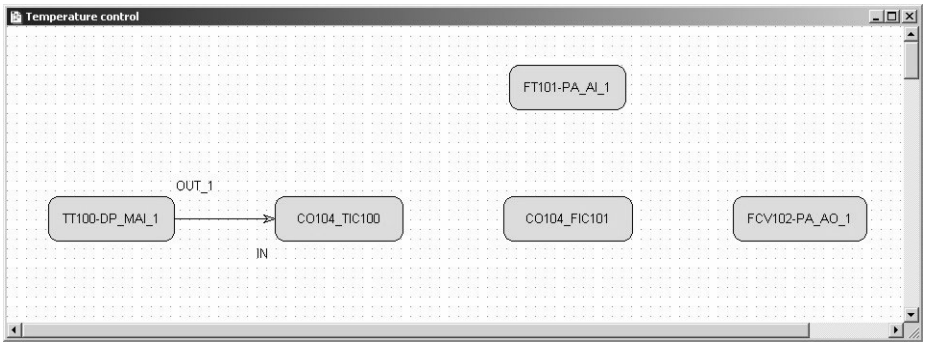
3 Click the box next to **OUT_1** – it changes color – then click on **OK**
- The **Output Parameter Selection** dialog closes
- The cursor is now connected to a blue dotted line
- Place the Cursor in the Controller PID Block 1 and click to make the link

4 When the link is made, the **Input Parameter Selection** dialog for the PID block appears



– Click the box next to **IN** – it changes color – then click on **OK**

5 When the **Input Parameter Selection** dialog changes, the link is made and appears as below:

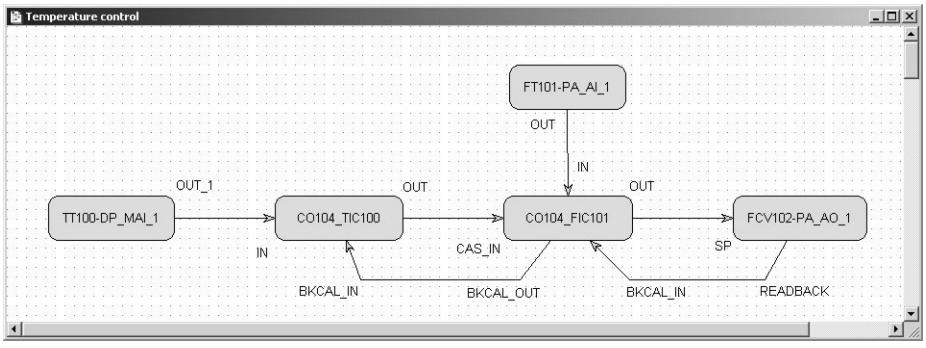


– You may have to move the parameter legends "IN" and "OUT" by selecting and positioning with the left mouse key depressed

6 Repeat steps 2 to 5 and make the following links between the function blocks

– PID1 and PID2 = **OUT** to **CAS_IN** (RCAS_IN)
– PID2 and PID1 = **BKCAL_OUT to BKCAL_IN**
– Flow AI to PID2 = **OUT_1** to **IN**
– PID2 to Valve AO = **OUT** to **SP** (CAS_IN)
– Valve AO to PID2 = **READBACK** (BKCAL_OUT) to **BKCAL_IN**

7 Your Control Strategy now looks something like this



8 Click on the **Project View** workspace and **Export Tags**..., see Chapter 3.10
– Open **Project File**, then press **Save Entire Configuration**, to save the project.

5 Characterize the Devices

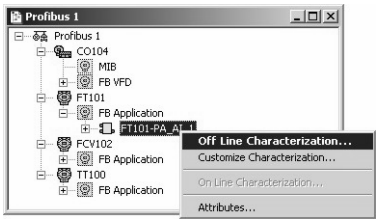
How the devices are characterized (set up) depends upon their type:

- For both PROFIBUS DP and PROFIBUS PA devices, the essential step is made in the selection Analog Input and/or Analog Data to be transmitted across the bus, see Chapter 3.7.
- The devices are then parameterized (zero, span, unit etc.) using the device display, service software or e.g. FieldCare, see Chapter 7.
- For Remote I/O the inputs and outputs must be scaled: this is done in Application Designer
- For all devices the Mode Block Target must be set according to their role in the cascade loop.

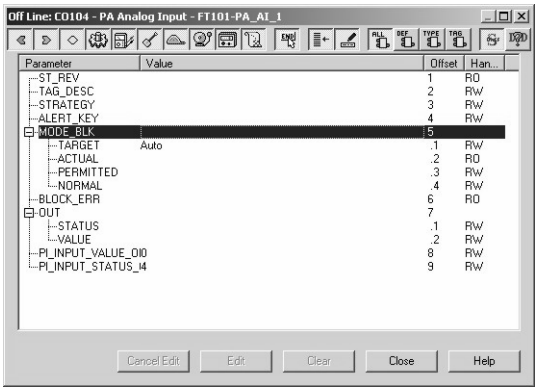
5.1 Profibus DP device (flow)

For the Tutorial, we must check that the Mode Block Target has the status "**Auto**"

1 In the Profibus network workspace, expand the FT101 tree
   – Right click on the **FT101-PA-AI-1** block and select **Off Line Characterization...**



2 The **Off Line Characterization** dialog opens
   – Expand the **Mode Block** parameter tree



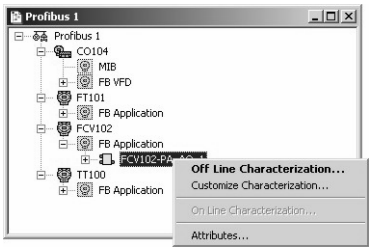
3 The Mode Block **Target** must be set to **Auto**. If this is not the case
   – Double-click on the "Value space" next to the **Target** parameter
   – Select **"Auto"** from the drop-down menu
   – Press **End Edit** to register your change
   – Press **Close** to quit the Characterization dialog

4 Open **Project File**, then press **Save Entire Configuration**, to save the project

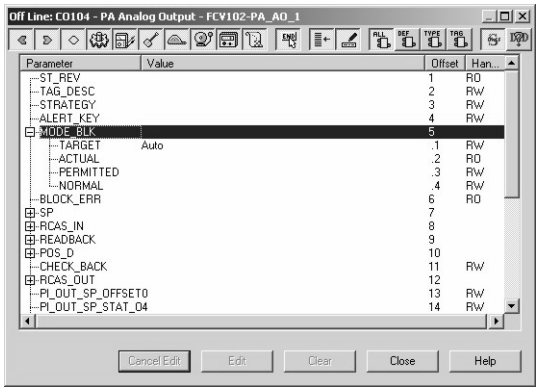
5.2 PROFIBUS PA device (positioner)

For the Tutorial, we must change the Mode Block Target to "**Auto**"

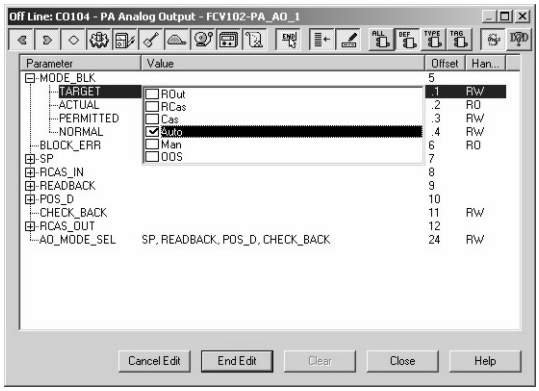
1 In the Profibus network workspace, expand the FCV102 tree
– Right click on the **FCV102-PA-AO-1** block and select **Off Line Characterization...**



2 The **Off Line Characterization** dialog opens
– Expand the **Mode Block** parameter tree



3 Set the Mode Block **Target** to **Auto**.



– Double-click on the "Value space" next to the **Target** parameter
– Select **"Auto"** from the drop-down menu
– Press **End Edit** to register your change
– Press **Close** to quit the Characterization dialog

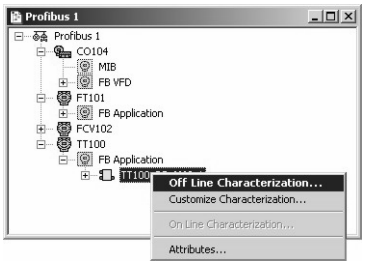
4 Open **Project File**, then press **Save Entire Configuration**, to save the project.

5.3 Remote I/O (temperature)

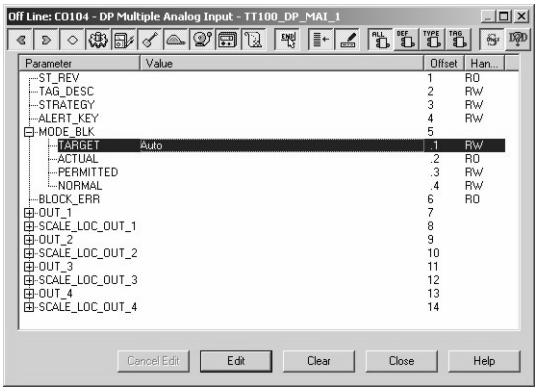
For the Tutorial, we must check that the Mode Block Target has the status "**Auto**" and scale the input parameter **TT100 DP-MAI-1**

5.3.1 Set the Block Mode Target

1 In the Profibus network workspace, expand the TT100 tree
   – Right click on the **TT100 DP-MAI-1** block and select **Off Line Characterization...**



2 The **Off Line Characterization** dialog opens
   – Click on **All** to display all available parameters
   – Expand the **Mode Block** parameter tree



3 Check that the Mode Block **Target** is set to **Auto**. If this is not the case
   – Double-click on the "Value space" next to the **Target** parameter
   – Select **"Auto"** from the drop-down menu
   – Press **End Edit** to register your change

5.3.2 Scale the output

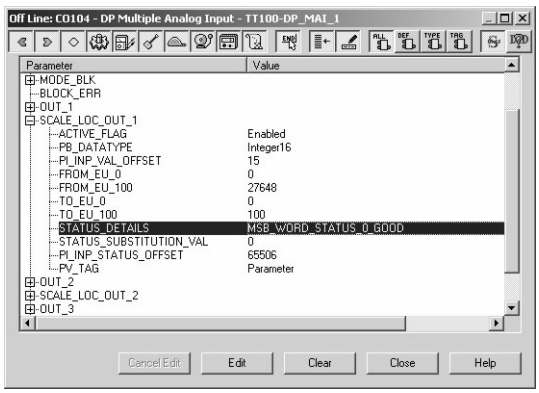
In the manufacturer's instructions for the Remote I/O you will find a table of parameters showing how the signals are transported across the PROFIBUS DP bus. Table 5.1 below is an extract:

Tab. 5-1: Relationship between 4–20 mA signal and PROFIBUIS DP parameter

Range 4–20 mA	**Units**		**%**	**Parameter Range limits to NAMUR**	**Range**	**Alarm/ Diagnosis**
	decimal	**Hex**				
>22.814 mA > 21 mA	see instructions	see instructions		No (Nein) Yes (Ja)		Short-cicuit
22.814 mA 21 mA	32511 29376	7EFF 72C0	117.6% 106.25%	No (Nein) Yes (Ja)	Overrange	
20 mA 12 mA **4 mA**	**27648** 13824 **0**	6C00 3600 0	100% 50% 0%		Nominal range	
3.999 mA 3.6 mA 2.4 mA	-1 -691 -2765	FFFF FD4D F533	-2.5% -10%	Yes (Ja) No (Nein)	Underrange	
<3.6 mA <2.4 mA	see instructions)	see instructions		Yes (Ja) No (Nein)		Broken wire

The output must be scaled according to the binary values for 4 mA and 20 mA.

1 Expand the **SCALE_LOC_OUT_1** parameter



2 Set the following parameters:
- **FROM_EU_0** = 0
- **FROM_EU_100** = 27648
- **TO_EU_0** = 0 (temperature that corresponds to 4 mA)
- **TO_EU_100** = 100 (temperature that corresponds to 20 mA)
- The other parameters were set during the mapping process, do not change them

Double-click on the "Value space" next to the parameter => Enter the value => Press **End Edit** to register your change

3 Press **Close** to quit the Characterization dialog

4 Click on the **Project View** workspace and **Export Tags**..., see Chapter 3.10
- Open **Project File**, then press **Save Entire Configuration**, to save the project.

5.4 Field Controller (PID blocks)

5.4.1 Basic parameters

The Field Controller PID blocks must now be characterized. In practice, the values for the GAIN, RESET and RATE as well as the setpoint value SP for the temperature loop must be calculated or will be known to the process engineer. The other values determine the the way the PID cascade control is handled when the block moves from auto/cas or a process value has a bad status. See also ControlCare Function Block manual BA022S/04/en.

Tab. 5-2: Basic parameters for temperature and flow PID blocks

Parameter Nmenomic	**Function**	**Value Temperature CO104-TC100**	**Value Flow CO104-FC101**
MODE BLOCK/TARGET	Normal operating mode of block	AUTO	CAS
SP/VALUE	Setpoint for product temperature	40%	–
PV_SCALE/EU_100 PV_SCALE/EU_0 PV_SCALE/UNITS_INDEX	Upper range limit for process variable Lower range limit for process variable Unit of process variable	100 0 %	18 (URL) 0 (LRL) t/h (unit)
OUTSCALE/EU_100 OUTSCALE/EU_0 OUTSCALE/UNITS_INDEX	Upper range limit for output variable Lower range limit for output variable Unit of output variable	100 0 %	100 0 %
CONTROL_OPTS	Sets control options for bad input	Bypass Enable	Bypass Enable
BYPASS	When ON, SP value is transferred to the OUT without the calculation of PID terms.	OFF	OFF
SP_RATE_DN SP_RATE_UP	Rate of change from old to new, higher SP Rate of change from old to new, lower SP	0 0	0 0
GAIN RESET RATE	Tuning constants for the P, I and D terms, of the PID block respectively.	1.5 0.1 0.5	2 0.2 0.6
SHED_OPT	Behaviour when shedding from remote mode	Normal shed, normal return	Normal shed, normal return

Note!

- A full description of the PID function block parameters is to be found in Operating Instructions BA022S/04/en, ControlCare Function Blocks.

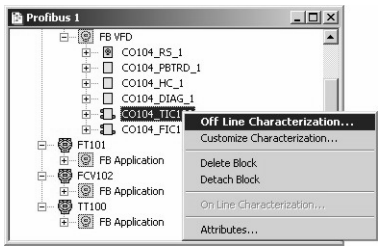
5.4.2 Order of parameters

Some block parameters have a write check based on the value of others parameters. It is therefore important to set the parameters in the order shown in Table 5-2 (the same order in which they are displayed in the **Off Line Characterization** dialog.

After characterization of the block, the parameters will appear in the PROFIBUS tree. If you find a parameter in the wrong position, it can be move by dragging and dropping to the correct one.

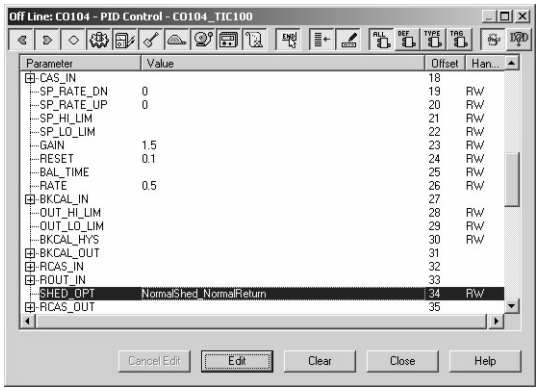
5.4.3 Characterize the function block

1 In the PROFIBUS network workspace, expand the **CO104** tree
– Right click on the **CO104-TIC100** block and select **Off Line Characterization...**



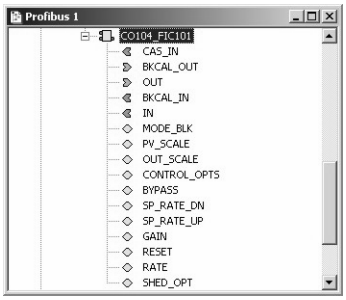
2 The **Off Line Characterization** dialog opens
– Click on **All** to display all available parameters

3 Set the parameters according to the values in Table 5-2. For each parameter:
– Double-click on the "Value space" next to the parameter
– Enter the value or select a parameter from the dropdown menu
– Press **End Edit** to register your change



– Press **Close** when all parameters have been entered

4 Now repeat the procedure for the **CO104-FIC101** block**.**
– At the end the parameters appear in the Profibus tree



5 Click on the **Project View** workspace and **Export Tags**..., see Chapter 3.10
– Open **Project File**, then press **Save Entire Configuration**, to save the project.

6 Go On-line

6.1 Connect to the Field Controller

After the Field Controller and other components have been physically installed in the Fieldbus network (subnet), connection must be established.

The Field Controller SFC173 is delivered with a default IP address of 192.168.164.101. For the purpose of this tutorial, it is suffience to connect to this address, however in practice it would be normal to change this address to one allocated by your IT system administrator.

Warning

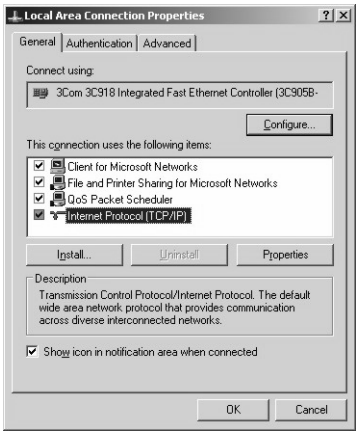
- The use of IP addresses is strictly controlled. Usually your system administrator will be authorised to allocate unique addresses. Assigning an unauthorised address to a Field Controller may result in conflicts within your system and the failure of the associated devices!

6.1.1 Change the IP address of your computer

1 Open the Windows Control Panel by pressing **Start => Settings => Control Panel** and choose the option **Network Connections**

2 Double-click on **Local Area Connection** and in the **Local Area Connection Status** dialog select **Properties**

3 Select **Internet Protocol TCP/IP** then select **Properties** again

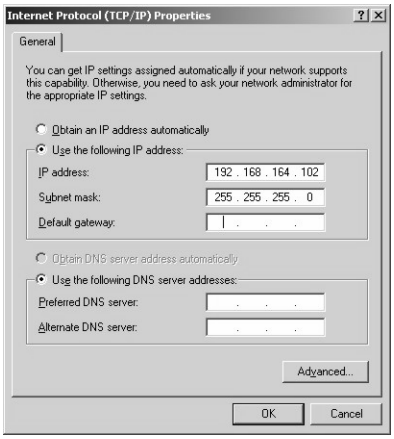


Note!
If "TCP/IP protocol" is not included in the Network, it must be installed by using the Windows setup before you proceed with Step 4.

4 Note the original property settings (e.g. make a screen shot and store it in a Word document) of so that they can be restored at end of the operation.

5 Change the IP address and the Subnet Mask of the computer, so that it is in the same subnet as the Field Controller.

– IP Address 192.168.164.XXX and network mask (Subnet Mask) 255.255.255.0.
– Do not use the addresses 192.168.164.100 or 101,as these are reserved as default addresses for the Field Controllers SFC162 and SFC173 respectively

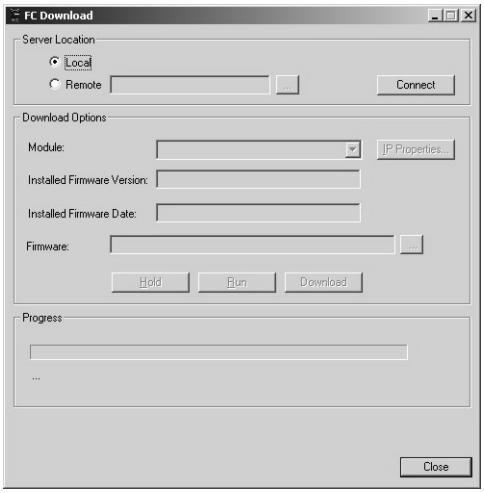


– Click on the **OK** button to confirm your settings

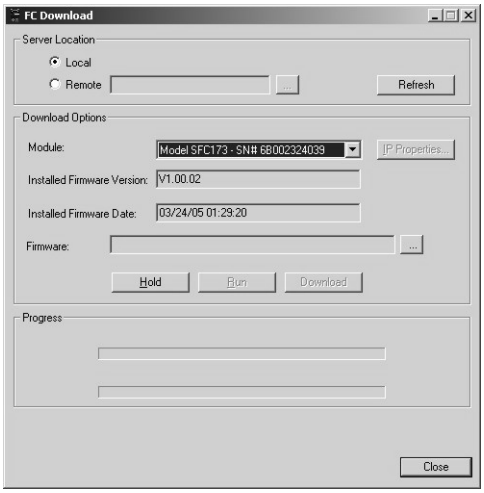
6.1.2 Set the Field Controller IP address

1 Now call FC Tools: **Programs =>Endress+Hauser=>ControlCare=>Tools=>FC Tools**

2 Choose the Field Control (OPC) Server path, default **Local,** then press **Connect**



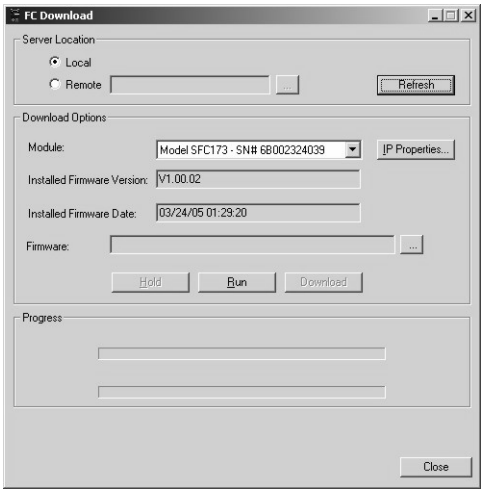
3 Select the desired Field Controller module option **Module** using its serial number as reference. The serial number is printed on the inside of the module door.



4 Press the **Hold** button to interrupt any control activities being executed in the module

– A confirmation window appears, press **Yes** to continue
– Any application running on the Field Controller will be stopped at this point

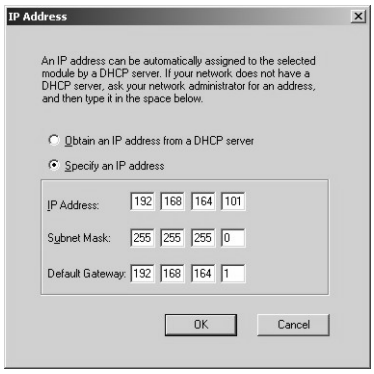
5 Check that the HOLD LED on the Controller module is lit, then press **Connect** to continue with the procedure.



– If the HOLD LED does not light, there is a communication problem:
Type PING 192.168.164.101 in the DOS command window and check whether the Field Controller is found. If there is a reply, replace the Ethernet cable by a cross-cable and try Step 4 again.

6 Reselect the desired Controller module, then click on the **IP Properties** button.
Now check the option **Specify an IP address**, then enter the IP Address and the Subnet Mask

- Answer **Yes** to the confirmation box
- Now enter the Field Controller address given to you by your system administrator (in our example we have kept the default address 196.168.164.101)
- Make a note of the IP addesses and the corresponding Controller serial number. This will help in the identification and diagnosis of possible faults.



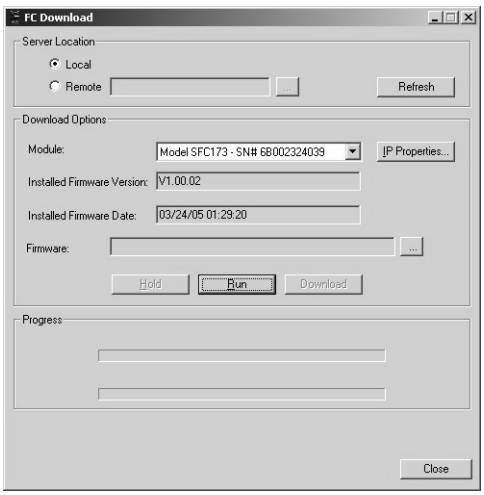
7 Click on **OK** to finish the operation

8 Now change the address of your computer as described in Chapter 6.1.1 to the new domain, so that it can continue to communicate with the Field Controller at its new address:
(Note: if the address domain has not changed, the computer address does not need resetting)

- **Start =>Settings =>Control Panel =>Network Connections**
- **Local Area Connection => Properties**
- **Protocol (TCP/IP)=>Properties**
- Enter an unused IP address and the subnet work address of the new domain
- Press **OK** to finish the process

9 Now return to FC Tools and click on **Refresh**

10 When the Refresh is complete, press **Run** to start the execution of the Field Controller firmware
- Confirm the action with **Yes**



11 Check that the HOLD LED on the Field Controller has extinguished, then press **Close**.

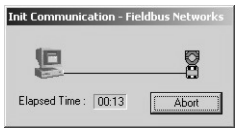
12 The Computer is now connected to the Field Controller

6.2 Generate the live lists

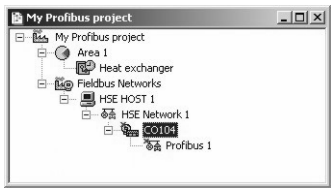
6.2.1 HSE live list

Once the Computer and Field Controller are able to communicate with each other, the connection to the network can be checked by creating a live list.

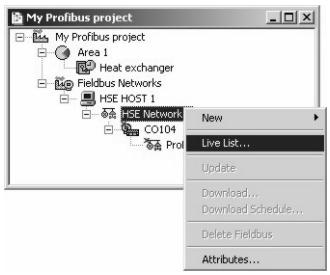
1 Press the **On-Line** button in the menu toolbar
   – The project goes on on-line



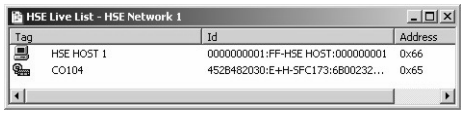
   – Red crosses appear against the Field Controller and PROFIBUS network in the Project workspace



2 In the Project workspace, right click on **HSE Network** and select **Live List**



   – A live list is generated of the devices on the HSE network

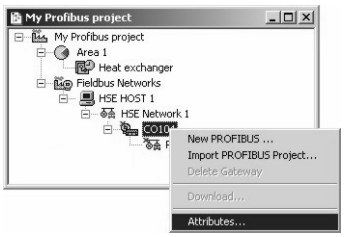


Note!

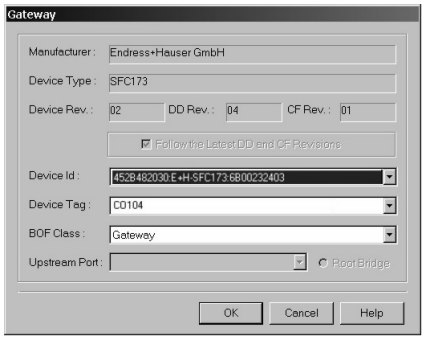
- It may take sometime to generate the live list.
  – The devices found first go grey.
  – They are then assigned a HSE address after which the live list is refreshed with the new data.
  – Address shows the last three digits of the IP address in hexadecimal format
  – The devices then appear in full color.

6.2.2 Assign the Field Controller tag

1 In the project workspace, right click on the **Field Controller** (CO104) and select **Attributes**...



2 The **Attributes** dialog opens
- Open the drop-down menu of the **Device ID** and select the Field Controller associated with the displayed TAG (in our case CO104) - the serial number is on the front panel
- Do this even though the correct ID is already displayed - the program expects it!

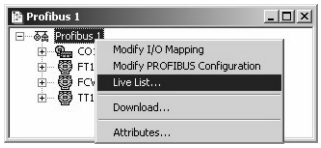


- Confirm your choice with **OK**
- After a period of time, the red crosses disappear from the devices in the Profibus network
- If several SFC173 were in use, Steps 1 and 2 would be repeated for all.

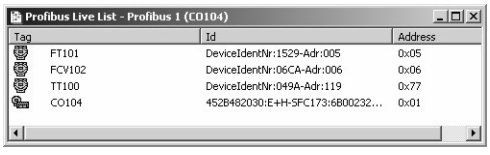
3 Open **Project File**, then press **Save**, to save the project

6.2.3 PROFIBUS live list

1 In the PROFIBUS network workspace, right-click on **Profibus 1**and select the option **Live List**



2 The PROFIBUS live list is created



- Check that all the devices in your project appear and that the addresses (shown in hexadecimal format) correspond to those used in your project.

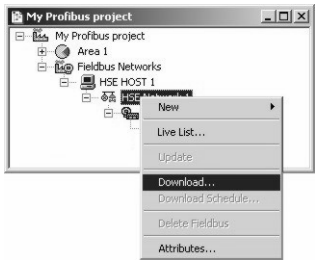
6.3 Download the project

Note!

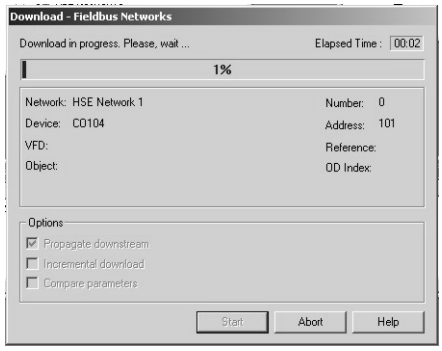
- The procedure below describes the initial download for the entire HSE network.
- Partial downloads can be made later from lower leaves, when changes are confined to this level
- Incremental downloads can be made to a running project by checking the boxes **Incremental Download** and **Compare Parameters**: Unaffected Local I/Os will hold their last values.

When the devices in the PROFIBUS live list correspond to those configured in the project, the download can begin.

1 In the Project workspace right-click on **HSE Network** and select **Download**



2 The **Download dialog** appears



– Press **Start** to start the download

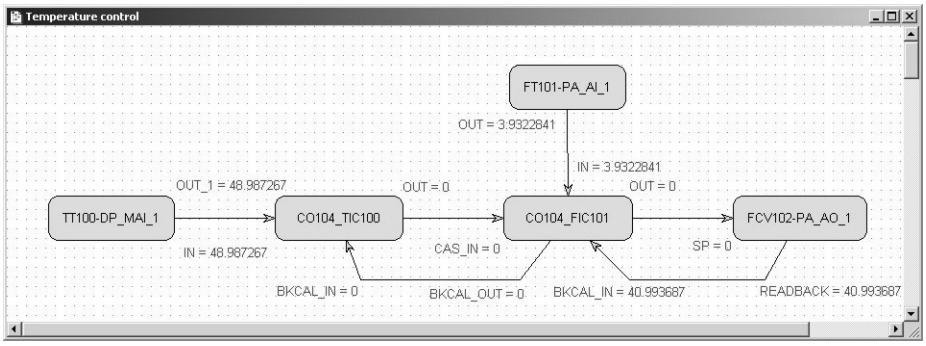
3 The download will be interrupted if the project has not been configured properly, e.g.

– The Project tags are not up-to-date => Export Tags, Chapter 3.10
– The Controller Tag has not been assigned correctly => Assign Field Controller tags, Chapter 6.2.2
– The "DPV1 activated" box in the PROFIBUS Configurator has been checked for a device, Chapter 3.8.1 etc.

4 When the download is successfully completed, the dialog is closed, and you are ready to test the control strategy

6.4 Check the control stategy

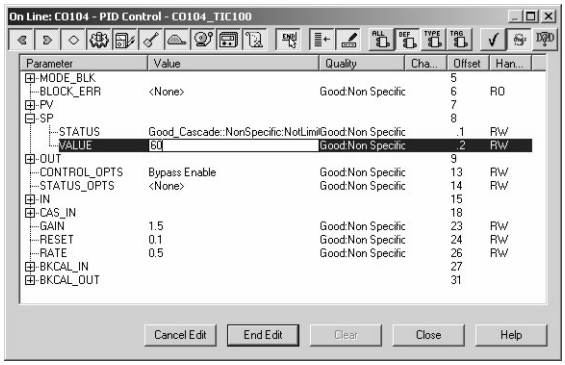
1 Click in the Control Strategy workspace (Temperature control) and press the button in the menu toolbar – the control strategy also goes "on-line"



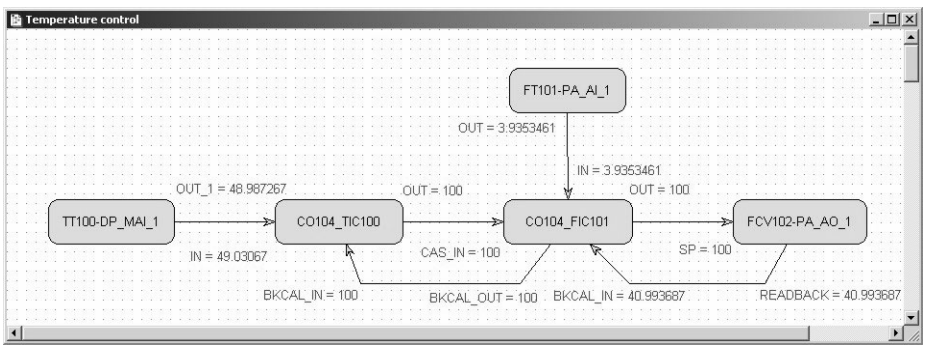
– Values appear in green when the status is good
– Values appear in red if the status is bad – at this stage this is an indication of a communiction, PROFIBUS configuration, strategy configuration or device parametrization error

2 Check that the loop is working by changing the Setpoint parameter in the temperature PID CO104-TT100

– Double-click on the **Temperature PID block** CO104-TT100 (Master/Primary PID), the **On-line Characterization** dialog appears
– Press the **All** icon to reveal all parameters
– Open the **SP** leaf and double-click in the space next to **Value**
– Enter a new SP value – for T > SP, set SP < T or vice versa
– Click **End Edit** to set the parameter
– Press **Close** to store the value (if you are prompted – answer with **Yes**)



3 Now check that the control loop has responded properly



6.5 Modify the project

Warning

- Do not change the PROFIBUS configuration parameters in the PROFIBUS Function Blocks. These may be changed with the PROFIBUS Configurator only. Application Designer then extracts the information it requires from the device GSD files.
- If you change the PROFIBUS configuration in PROFIBUS Configurator, the project must be downloaded again

6.5.1 On-line characterization

Once the project is on-line you may want to change parameters to e.g. tune the control-loop or eliminate configuration errors. With the exception of the **SP** parameter, the function block must be put out of service before the parameter is changed:

1 In the Control strategy workspace double-click on the function block you want to modify, or in the PROFIBUS network or Control module workspace, right-click on the function block and select **On-line Characterization**

2 The function block **On-line Characterization** dialog appears:

- Open the **Mode** leaf and double-click in the space next to **Target**
- Set the Target to **OOS** (Out of Service)
- Click **End Edit** to set the parameter

3 Change the parameters you wish to modify

- If appropriate, open the parameter leaf and double-click in the space next to the parameter you require
- Enter the new parameter or select it from the drop-down menu
- Click **End Edit** to set the parameter
- Repeat the procedure for all the parameters you wish to modify

4 Put the function block back into standard operating mode

- Open the **Mode** leaf and double-click in the space next to **Target**
- Set the Target back to the original value (**Auto** (Automatic) or **Cas** (Cascade))
- Click **End Edit** to set the parameter
- Check that the **Mode** really changes to the Target Mode (failure to do so indicates a configuration error)
- Press **Close** to store the values (if you are prompted - answer with **Yes**)

5 Click on the **Project View** workspace and **Export Tags...**, see Chapter 3.10
- Open **Project File**, then press **Save Entire Project** to save the project

6 Put the Control stategy back "on-line" to check the results of your modification, Chapter 6.4.

6.5.2 Off-line characterization

You may prefer to change parameters off-line, e.g. when modifying the control strategy or adding new functions to the project.

1 If you are on-line, press the **Off-line** button in the menu toolbar
alternatively, in the PROFIBUS network or Control module workspace, right-click on the function block and select **Off-line Characterization**
– The function block **Off-line Characterization** dialog appears

2 Change the parameters you wish to modify

- If appropriate, open the parameter leaf and double-click in the space next to the parameter you require
- Enter the new parameter or select it from the drop-down menu
- Click **End Edit** to set the parameter
- Repeat the procedure for all the parameters you wish to modify
- Press **Close** to store the values

3 Click on the **Project View** workspace and **Export Tags**..., see Chapter 3.10
– Open **Project File**, then press **Save Entire Project** to save the project

4 Press the **On-line** button in the menu toolbar to go on-line again

5 Download the modified project
– In the Project workspace right-click on **HSE Network** and select **Download**
– Follow the procedure in Chapter 6.3

6 Put the Control stategy back "on-line" to check the results of your modification, Chapter 6.4.

6.6 Pack and Go

In order to install the project at the customer's site, the project can be packed and unpacked. It is important to remember, especially if you have not been using the actual project devices to test your project, that the instruments on site may be have newer (or even older) DD/CFF/GSD files than the ones you use. The latest DD/CFF/GSD files must then be uploaded to the project and corresponding corrections must be made to configuration, before it is downloaded to the SFC173 Field Controller.

6.6.1 Pack the project

1 Select **Project File => Pack Project...**

2 Answer "**OK**" to the query about missing DD/CFF files

3 **Browse** to the place where you want the packed files folder, e.g. **Endress+Hauser => ControlCare**

4 Press **OK** to pack the project

6.6.2 Unpack the project

1 Select **Project File => Unpack Project...**

2 **Browse** to the packed files folder, e.g. **Endress+Hauser => ControlCare**

3 **Browse** to the desination folder

4 Press **GO** to start unpacking

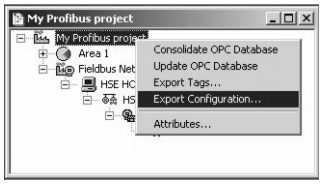
6.7 Export the configuration

For documentation purposes, the project configuration can be exported to an existing ODBC file data source, e.g. Oracle, a machine database, e.g. Excel to provide a record of the current status of the project or to an XML sheet for viewing with a browser.

6.7.1 File data source folder

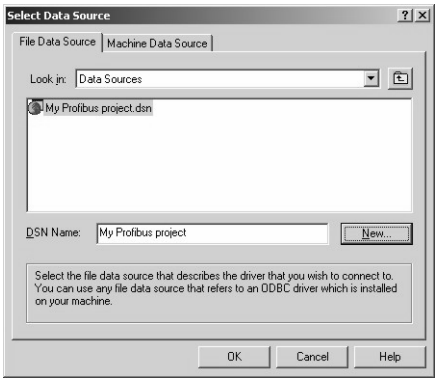
The file data source must have been created before the export.

1 In the Project window, right-click on the Project icon and select **Export Configuration**:



2 The **Select Data Source** dialog box appears

3 In the **File Data Source** folder, select the source that describes the driver that you wish to connect to. You can use any file data source that refers to an ODBC driver which is installed on your machine.
- Use the **New...** button and **Look In** dropdown menu to browse or
- Click the data source icon to select the driver:



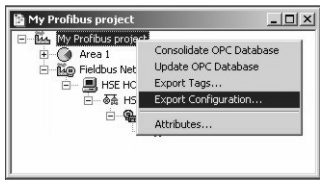
- Press **OK** to make the connection

6.7.2 Machine data source folder

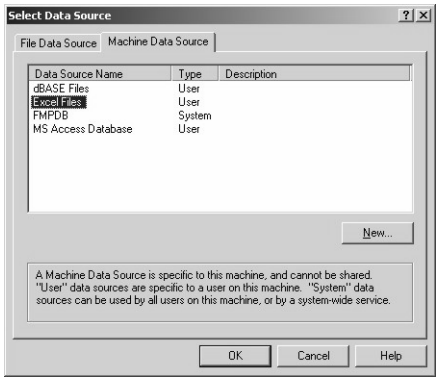
The **Machine Data Source** is specific to the machine, and cannot be shared. "User" data sources are specific to a user on the machine; "System" data sources can be used by all users on the machine, or by a system-wide service. The Machine Data Source must have been created before export.

Procedure

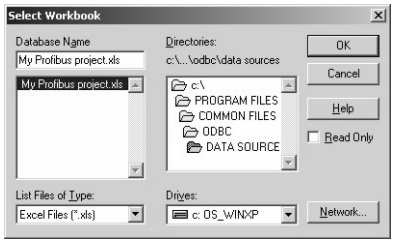
1 In the Project window, right-click on the Project icon and select **Export Configuration**:



2 The **Select Data Source** dialog box appears
- Click on the **Machine Data Source** tab to open the folder
- Double-click the data source name to select the machine, e.g. Excel:

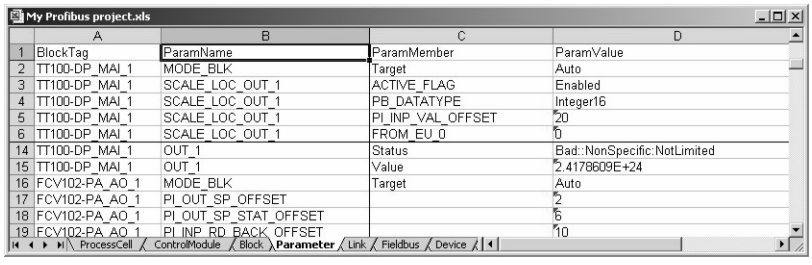


3 The **Select Workbook** dialog box will appear:
- Select the folder where the data file is and double-click the workbook icon.



- Your project configuration will be exported to the workbook file.
- A message box appears on completion - press OK

4 Open the Excel file to check the result:

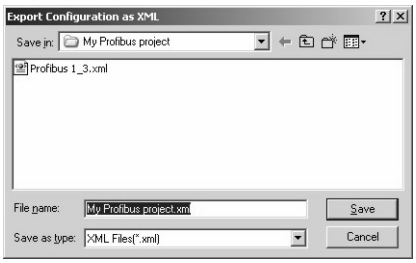


	A	B	C	D
1	BlockTag	ParamName	ParamMember	ParamValue
2	TT100-DP_MAI_1	MODE_BLK	Target	Auto
3	TT100-DP_MAI_1	SCALE_LOC_OUT_1	ACTIVE_FLAG	Enabled
4	TT100-DP_MAI_1	SCALE_LOC_OUT_1	PB_DATATYPE	Integer16
5	TT100-DP_MAI_1	SCALE_LOC_OUT_1	PI_INP_VAL_OFFSET	20
6	TT100-DP_MAI_1	SCALE_LOC_OUT_1	FROM_EU_0	0
14	TT100-DP_MAI_1	OUT_1	Status	Bad::NonSpecific:NotLimited
15	TT100-DP_MAI_1	OUT_1	Value	2.4178609E+24
16	FCV102-PA_AO_1	MODE_BLK	Target	Auto
17	FCV102-PA_AO_1	PI_OUT_SP_OFFSET		2
18	FCV102-PA_AO_1	PI_OUT_SP_STAT_OFFSET		6
19	FCV102-PA_AO_1	PI_INP_RD_BACK_OFFSET		10

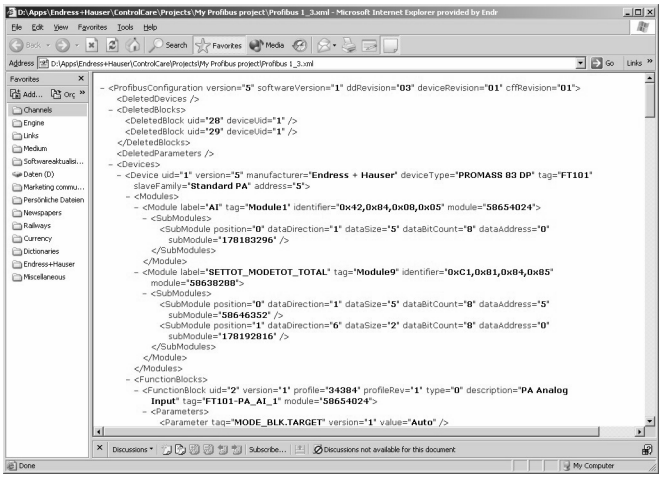
ProcessCell / ControlModule / Block / Parameter / Link / Fieldbus / Device

6.7.3 XML file

1 Click in the Project workspace and select **Project File =>Export => Configuration as XML**
– The **Export Configuration as XML dialog** appears



2 Enter a **File Name** and **Save In** location, then press **Save**
– The project is saved as an XML file at the selected location



6.8 Close Application Designer

When you have completed your session, close Application Designer

1 If you are on-line, press the **Off-line** button in the menu toolbar

2 If you have made any modifications while you were on line, you will be prompted to store them
   – If appropriate answer with **Yes**

3 Close the project by clicking on **Project File => Close**

4 Exit Application Designer by clicking on **Project File => Exit**

5 The Field Controller continues to operate with the project configured according to the last download/on-line correction
   – If you switch off the Controller, the project remains stored in its memory
   – It is initialized and re-executed as soon as the Controller is switched on again

6.8.1 Reconnecting

Provided your computer is operating in the same IP address domain as the Field Controller, you can reconnect at any time.

1 Start up Application Designer and select the Project you require

2 Press the **On-line** button in the menu toolbar

3 Expand the various workplaces as required

4 Click in the **Control Strategy** workspace and press the button in the menu toolbar – the control strategy goes "on-line" with the last configuration that was downloaded.

7 Parametering Devices with FieldCare

The SFC173 CommDTM allows the SFC173 Field Controller to use PROFIBUS acyclic services to access the device parameters of the connected PROFIBUS devices. By using FieldCare as FDT frame application, it is then possible to configure the devices centrally by using the device DTMs.

7.1 Installing the SFC173 CommDTM

7.1.1 Setup

The SFC173 CommDTM is supplied with the FieldCare CD.

- It is installed as a separate component from the setup dialog.
- Follow the setup instructions to install it on your computer.

7.1.2 Adding to DTM library

1 Start FieldCare and **Login** with Administrator rights

2 Open a new project by double-clicking on the new project icon, enter a **Name** and press **OK**
   – FieldCare opens up with a Network View and Plant View

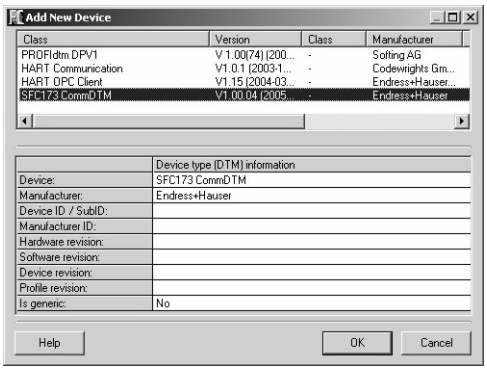
3 Right-click on the menu **DTM Catalog** select the option **Update...**
   – The Catalog dialog opens, press the **Update** button
   – The computer searches for new DTMs, and finds SFC173 CommDTM
   – The new DTMs are listed in the left-hand pane
   – Click on the SFC173 CommDTM (and any others you require), then press **Move>>**
   – Press **OK** to confirm the changes and exit the catalog

4 The SFC173 CommDTM is now installed and can be used in FieldCare projects involving the SFC173 Field Controller.

7.2 Creating a SFC173 Project

1 In **Network View**, right-click on the Host Icon and select **Add Device**

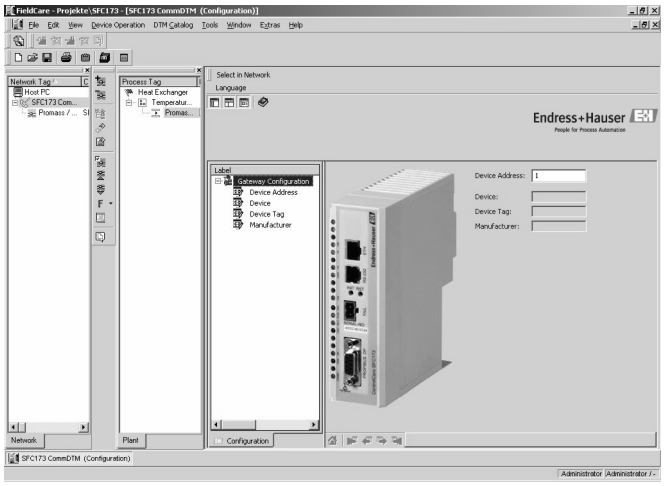
– A dialog offering CommDTMs opens, select **SFC173 CommDTM** and press **OK**



– The SFC173 CommDTM is added to the Host
– You can change the name by overwriting and pressing **Enter** on your keyboard

2 Right-click on the **SFC173 CommDTM** leaf and select **Configuration**

– The SFC CommDTM opens



3 Enter the **last three digits** of the Field Controller **IP address** in the Device Address box
– Press **Enter** to register the change
– The language of the DTM can be changed by clicking on **Language**
– Close the DTM by clicking on the **X** in the top corner of the DTM window

4 Now right-click on the **SFC173 CommDTM** leaf and select **Generate Device List**

– The network is scanned for all connected PROFIBUS devices
– You are asked to confirm the assignment of the Device DTMs to the devices found on the bus (Since the DTM catalog is updated regularly, in most cases the correct DTM will be found)
– On confirmation, the devices appear below the SFC173 with the PROFIBUS addresses assigned to them by Application Designer

5 Select each device in turn, go **Online** and parametrize each device according to the operating instructions of the device manufacturer. Close the DeviceDTM after use.

7.3 Additional Functions

The SFC173 CommDTM offers a number of functions that can be accessed when it is put online.

1 Right-click on the **SFC173 CommDTM** leaf and select **Go Online**

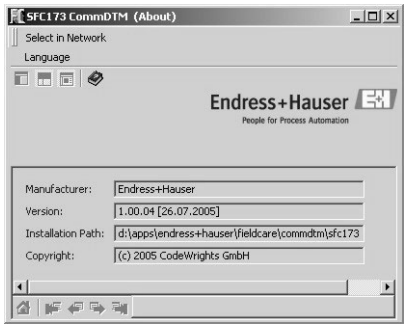
- The SFC CommDTM opens
- You will notice that the Device, Device Tag and Manufacturer boxes are now filled

2 Right-click on the **SFC173 CommDTM** leaf and select **Additional Functions**

- Select one of the options **About, HSE Live List, PROFIBUS Live List** or **Master Configuration**

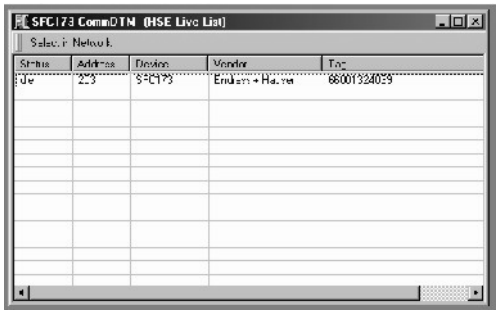
7.3.1 About

About contains information about the SFC173 CommDTM



7.3.2 HSE Live List

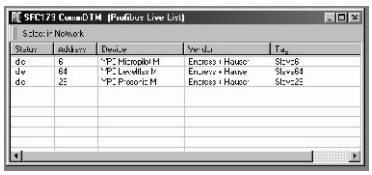
HSE Live List shows the HSE devices connected to the HSE network



- **Status** shows if the Gateway is already online for other CommDTM. (Gateway can be online for only one CommDTM at any given time)
- **Address** contains the HSE node address of the Gateway (last three digits).
- **Device** indicates the device type
- **Vendor** shows the vendor description
- **Tag** shows the tag name of the device

7.3.3 PROFIBUS Live List

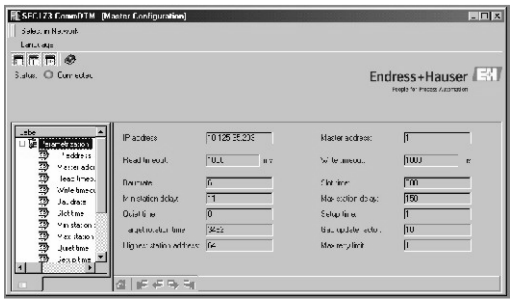
The PROFIBUS live list shows the devices currently connected to the PROFIBUS DP network.



- **Status** shows if the PROFIBUS device is already online
- **Address** contains the PROFiBUS address of the Gateway.
- **Device** indicates the device type (GSD)
- **Vendor** shows the vendor description
- **Tag** shows the tag name of the device

7.3.4 Master Configuration

Master Configuration shows the settings of the PROFIBUS DP parameters. It is read-only: the parameters themselves are set in PROFIBUS Configurator, Chapter 3.6

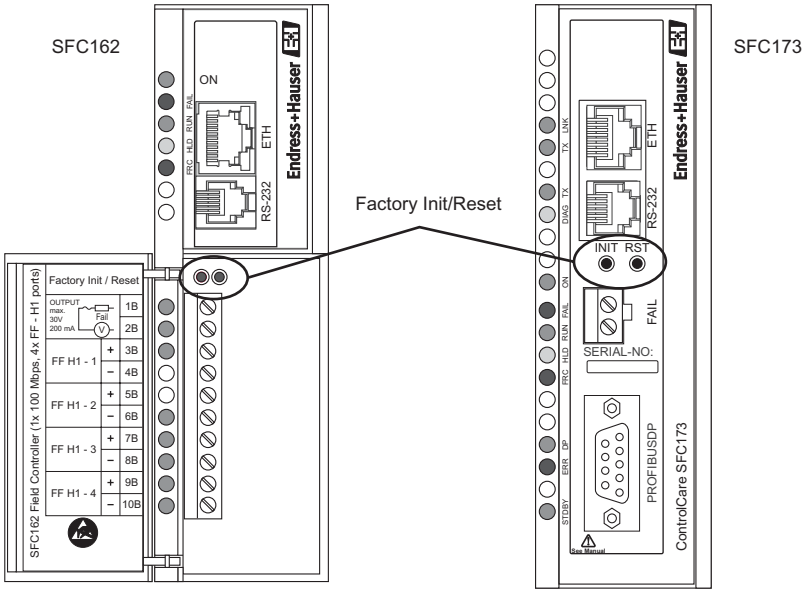


8 Trouble-Shooting

8.1 Factory initialisation and reset

Warning!

- Do not use the pushbuttons located in the Field Controller unless you are certain that you want to reset the system.



Two pushbuttons located on the SFC173 module, see Fig 8.1, allow the system to be initialised and reset. The function and effect of the buttons is described in the table below.

- To "click " the pushbuttons use a pointed instrument (e.g. a ballpoint pen).

Other functions of the two buttons are to be found Chapter 7 of the Operating Instructions BA035S/04/en, Field Controller: Commissioning and Configuration..

Function	Effect	Procedure
Reset	Resets system: the last configured IP Address is used	▪ Click the right pushbutton - the system **resets (takes several seconds)** ▪ If no IP Address is found, a new one is assigned automatically ▪ Verify that the **RUN** and **ETH LNK** LEDs are lit.
Factory Init	Deletes application, the last configured IP Address is retained	▪ Keeping the left pushbutton pressed, click the right pushbutton ▪ Check that the **FORCE** LED flashes once a second. ▪ Release the left push button. The system resets, see above.

8.2 Field Controller

Problem	Remedy
FC Tools does not show all the Field Controllers that are in the sub-network	There is probably an IP address conflict in this sub-Network. ■ Disconnect all the Field Controllers from the sub-Network and execute the procedure "Connecting the Field Controller to its Sub-Network" for each module, assuring that the address to be used is not associated with other equipment of the network.
FC Tools does not find the Field Controller	■ Make sure that the initial connection procedure was followed and the Field Controller is operating in the same subnet and not with the default address 192.168.164.100/101 ■ Check that the Ethernet cable, see above ■ Check if the network adapter is on and OK: Execure a PING command to its own IP, via DOS PROMPT. ■ Check if the Ethernet connection is OK: Execute a PING command to the Field Controller.
FC Tools does not put the Field Controller in **HOLD**	Use the Mode **HOLD** procedure of Factory Init/Reset. ■ With the Field Controller in **HOLD** mode, execute the firmware update procedure, Section 7.3, using the steps of item 2. ■ If the problem persists, check the related TCP/IP connection (check the cables and **ETH LNK** LED)
Firmware begins to execute but after a certain time it stops	It might be a configuration problem. ■ Use the **Factory Init** procedure and configure the Field Controller again. ■ If the problem persists, download the firmware again as described in Chapter 7.3
HOLD LED remains lit	If the **HOLD** LED remains lit after the Field Controller has been turned on, the firmware may be invalid. ■ Update the firmware as described in Chapter 7.3
ETH LNK LED does not light	Check if the cable is connected correctly, or that the cable is not damaged. Check the specification of the cables: ■ SFC 954 - Cable Standard. To be used in a network between the Field Controller and a Switch/HUB. ■ SFC 955 - Crossed Cable (Cross). To be used point to point between a PC and the Field Controller
ERR LED is lit	PROFIBUS DP error ■ PROFIBUS DP connection has been lost, check connections ■ One or more slaves have not been correctly configured for cyclic data exchange, see BA036S/04/en, Application Designer, PROFIBUS tutorial
FRC LED is flashing (Force)	Field Controller is in reset mode ■ Complete the **RESET** procedure
STDBY LED is lit	Field Controller is in stand-by mode (redundant application)

8.3 PROFIBUS Configurator

Problem	Remedy
Error message on trying to leave the configuration dialog	Configuration not correct ■ Device name has spaces instead of underscores
How are the cyclic I/O data configured?	■ For Endress+Huaser devices each parameter has a fixed position in the confuguration list, see the manuals. If you want to see Parameters 1 and 5 only, for example, free spaces must be appended at slots 2, 3 and 4. ■ For other devices, see operators instructions
What baudrates are supported?	The SFC173 Field Controller supports all baudrates
What baudrate should I use?	Only baudrates supported by all devices can be used: ■ For a P+F SK1 coupler = 93.75kbit/s ■ For a Siemens coupler = 45.45 kbit/s ■ For a P+F or Siemens link, check what baudrates are supported by all DP devices
Where do I set the device baudrates?	Only PROFIBUS DP devices must be set ■ Most PROFIBUS DP slaves sense the baudrate and do not need to be set up ■ For others, check the manufacturer's instructions
What bus parameters should I use?	Use the parameters recommended by the coupler/link manufacturer or those in this manual ■ For the P+F SK2, the parameters are automatically set according to the rate selected in the Configurator ■ For the P+F SK1 use the ones in this tutorial
Can I go on-line in PROFIBUS Configurator?	Yes. ■ Select the appropriate menu, enter the IP address of the Field Controller and generate a live list
Can I change a bus address in the PROFIBUS configurator?	Yes. ■ You can go online and change a bus address by selecting the device followed by the the appropriate menu and typing in the old, then the new address ■ The device must support software address setting ■ Software address setting must be enabled ■ The address must be unique to the bus
A device does not appear in the live list	Communication error ■ Another device has the same address ■ The device is not powered up

8.4 Application Designer

Problem	Remedy
Field Controller does not appear in HSE live list	No connection to Field Controller ■ Field Controller is on HOLD, set it to RUN mode ■ IP address is not configured correctly, use PING to check, see above
Red cross appears on HSE Network	No connection to Field Controller ■ Field Controller is on HOLD, set it to RUN mode ■ IP address is not configured correctly, use PING to check, see above
A device does not appear in the live list	Communication error ■ Another device has the same address ■ The device is not powered up ■ The project has been updated but no download has been made yet
Configuration will not download, why?	You have either a communication problem or the configuration is not complete ■ Check that you are on-line - press the On-line button ■ Check that your computer is in the same address domain ■ Check that you have assigned the Field Controller tag ■ Check that you have exported all tags OPC server ■ Check that the parameters are in the recommended order ■ Check that the OPC server is running (look for icon in bottom line) ■ Check that DPV1 has not been activated in the device, see Chapter 3.7
A parameter appears red in my on-line control strategy, why?	The parameter has a bad status ■ Check that the Block Mode is Auto (or Cas) ■ Check that the block has been correctly configured ■ Check that the device is still live (live list) ■ Check that the device address is the same as that you have in your configuration (live list) ■ Check that the parameter has been correctly configured in the PROFIBUS Configurator

For your notes

For your notes

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