ROBOTICS

Application manual

PROFIBUS Controller

Trace back information:
Workspace 19D version a3
Checked in 2019-12-04
Skribenta version 5.3.033

Application manual
PROFIBUS Controller
RobotWare 6.10.01

Document ID: 3HAC050966-001
Revision: C

The information in this manual is subject to change without notice and should not be construed as a commitment by ABB. ABB assumes no responsibility for any errors that may appear in this manual.

Except as may be expressly stated anywhere in this manual, nothing herein shall be construed as any kind of guarantee or warranty by ABB for losses, damages to persons or property, fitness for a specific purpose or the like.

In no event shall ABB be liable for incidental or consequential damages arising from use of this manual and products described herein.

This manual and parts thereof must not be reproduced or copied without ABB's written permission.

Keep for future reference.

Additional copies of this manual may be obtained from ABB.

Original instructions.

Table of contents

This page is intentionally left blank

Overview of this manual

About this manual

This manual describes the option *969-1 PROFIBUS Controller* and contains instructions for the configuration.

Usage

This manual should be used during installation and configuration of the PROFIBUS, as well as during upgrading of the PROFIBUS option.

Who should read this manual?

This manual is intended for

- personnel that are responsible for installations and configurations of industrial network hardware/software
- personnel that configure the I/O system
- system integrators.

Prerequisites

The reader should have the required knowledge of

- the PROFIBUS system
- I/O system configuration

References

ABB documents

References	Document ID
Application manual - PROFIBUS Anybus Device	*3HAC050965-001*
Application manual - Controller software IRC5	*3HAC050798-001*
Operating manual - IRC5 with FlexPendant	*3HAC050941-001*
Operating manual - RobotStudio	*3HAC032104-001*
Product manual - IRC5	*3HAC047136-001*
Product manual - IRC5 Panel Mounted Controller	*3HAC047137-001*
Technical reference manual - RAPID Instructions, Functions and Data types	*3HAC050917-001*
Technical reference manual - RAPID Overview	*3HAC050947-001*
Technical reference manual - RAPID kernel	*3HAC050946-001*
Technical reference manual - System parameters	*3HAC050948-001*

Other references

References	Description
International standard IEC 61158 Type 3 International standard IEC 61784	The PROFIBUS industrial network standard is described in the international standards.
PROFIBUS Technical Guideline	Installation Guideline for PROFIBUS-DP/FMS (Version 1.0, September 1998)

Continues on next page

Continued

References	Description
User Manual PROFIBUS Configurator	Manual for the PROFIBUS configuration tool (PC software)
ET200S Distributed I/O System Manual	Manual from Siemens
www.profibus.com	The web site of PROFIBUS International

Revisions

Revision	Description
-	First edition. Released with RobotWare 6.0.
A	Released with RobotWare 6.01. • Added step 9 in *PROFIBUS configurator setup on page 39* of section 4. • Minor corrections. • System parameter *Connection* removed from *Industrial Network*.
B	Released with RobotWare 6.02. • Updated the path to the GSD files, see *GSD files on page 27*.
C	Released with RobotWare 6.10.01. • Cfg name removed from entire manual.

Product documentation

Categories for user documentation from ABB Robotics

The user documentation from ABB Robotics is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.

All documents can be found via myABB Business Portal, *www.myportal.abb.com*.

Product manuals

Manipulators, controllers, DressPack/SpotPack, and most other hardware is delivered with a **Product manual** that generally contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation or electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals and expected life time of parts).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Calibration.
- Decommissioning.
- Reference information (safety standards, unit conversions, screw joints, lists of tools).
- Spare parts list with corresponding figures (or references to separate spare parts lists).
- References to circuit diagrams.

Technical reference manuals

The technical reference manuals describe reference information for robotics products, for example lubrication, the RAPID language, and system parameters.

Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, software).
- How to install included or required hardware.
- How to use the application.
- Examples of how to use the application.

Continues on next page

Continued

Operating manuals

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and troubleshooters.

Safety

Safety of personnel

When working inside the robot controller it is necessary to be aware of voltage-related risks.

A danger of high voltage is associated with the following parts:

- Devices inside the controller, for example I/O devices, can be supplied with power from an external source.
- The mains supply/mains switch.
- The power unit.
- The power supply unit for the computer system (230 VAC).
- The rectifier unit (400-480 VAC and 700 VDC). Capacitors!
- The drive unit (700 VDC).
- The service outlets (115/230 VAC).
- The power supply unit for tools, or special power supply units for the machining process.
- The external voltage connected to the controller remains live even when the robot is disconnected from the mains.
- Additional connections.

Therefore, it is important that all safety regulations are followed when doing mechanical and electrical installation work.

Safety regulations

Before beginning mechanical and/or electrical installations, ensure you are familiar with the safety regulations described in *Operating manual - General safety information*[1].

[1] This manual contains all safety instructions from the product manuals for the manipulators and the controllers.

Network security

Network security

This product is designed to be connected to and to communicate information and data via a network interface. It is your sole responsibility to provide, and continuously ensure, a secure connection between the product and to your network or any other network (as the case may be).

You shall establish and maintain any appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Ltd and its entities are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Terminology

Terms

Term	Explanation
Controller	The *PROFIBUS master* is referred to as *PROFIBUS controller*.
Device	In this manual the term *device* is used to describe a physical unit.
External Controller or Device	The term *external* is used to describe a controller or device on the PROFIBUS network connected to the IRC5 controller.
GSD file	A GSD file contains information about a PROFIBUS device.
Internal master	The term *internal* is used to describe when the IRC5 controller acts as a controller on the PROFIBUS network.
LAN	Port/connector for Local Area Network.
Master	See term *Controller*
PROFIBUS configuration file	The GSD file created using an external PROFIBUS configuration tool.
Slave	See term *Device*
Softing PROFIBUS Configurator	An external PROFIBUS configuration tool to configure PROFIBUS network. This tool is recommended by ABB.
WAN	Port/connector for Wide Area Network.

This page is intentionally left blank

1 Introduction

1.1 What is PROFIBUS?

General

PROFIBUS is a vendor independent open industrial network standard for a wide range of applications, particularly in the fields of factory and process automation. It is maintained, updated and marketed by PROFIBUS International.

PROFIBUS is suitable for high-speed time critical applications as well as for complex communication tasks.

Standardization

The PROFIBUS communication is specified in the international standard *IEC 61158 Type 3*, which includes the entire range of PROFIBUS versions. All PROFIBUS devices should be certified by the PROFIBUS User Organization (PNO) to ensure interoperability and conformance.

Communication protocols

DP (Decentralized Periphery) is the simple, fast, cyclic and deterministic communication protocol between a network controller and the assigned devices. The forerunner of DP was FMS (Fieldbus Message Specification), which is obsolete today.

The original version of DP, DP-V0, provides cyclic data exchange and diagnostics. DP-V1 extends DP-V0 with acyclic data exchange and DP-V2 offers direct device-to-device data exchange and clock synchronization. These versions are all backward compatible.

The following table specifies a number of PROFIBUS-DP data.

Network type	Multi-Controller/Device communication system
Installation	Linear network, terminated at both ends. Shielded twisted pair cables. 9-pin D-sub or M12 connectors.
Speed	9.6 Kbps - 12 Mbps

Electronic device data sheet

The configuration process is based on electronic device data sheet (GSD files), which are required for each PROFIBUS device. GSD files are provided by the device manufacturers and contain electronic descriptions of all relevant communication parameters of the PROFIBUS device.

1.2 PROFIBUS for IRC5

General

The PROFIBUS network for IRC5 is running on a single channel PCI Express board in the IRC5 main computer.

The PROFIBUS board, DSQC1005, requires the main computer DSQC1000.

Hardware overview

The hardware of the PROFIBUS-DP industrial network consists of a master unit, DSQC1005, and distributed devices.

The DSQC1005 unit is connected to the PCIe network of the IRC5 robot controller. The slave devices are attached to the industrial network. The DSQC1005 unit supports PROFIBUS-DP with DP-V0, which means that DP-V1 is *not* supported.

Note

Slave functionality is not supported by the PCI express board. If PROFIBUS slave functionality is required, then the option *PROFIBUS Anybus Device* can be used.

For more information see *Application manual - PROFIBUS Anybus Device*.

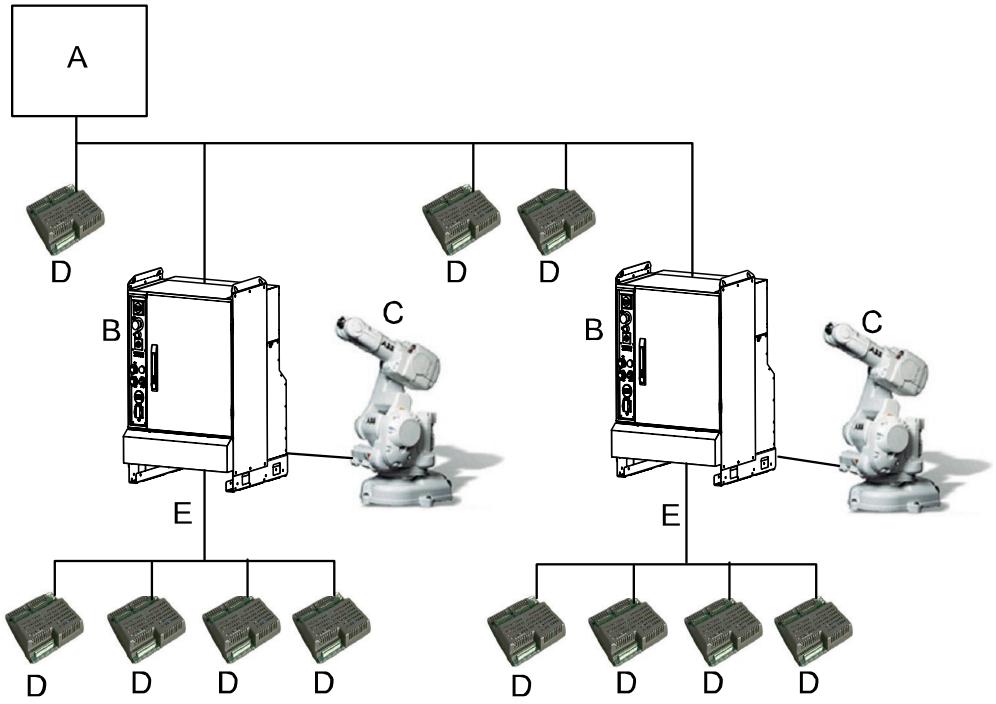
Slave devices

The slave devices can be I/O devices with digital and/or analog signals. They are all controlled via the DSQC1005 unit.

Continues on next page

The PROFIBUS-DP network

The illustration below is an overview of the hardware, and shows the PROFIBUS network.



xx1300000689

A	Line PLC, DP-Master
B	IRC5 controller
C	Robot
D	I/O device, DP-Slave
E	DP-Master (IRC5 - DSQC1005)

Configuration program

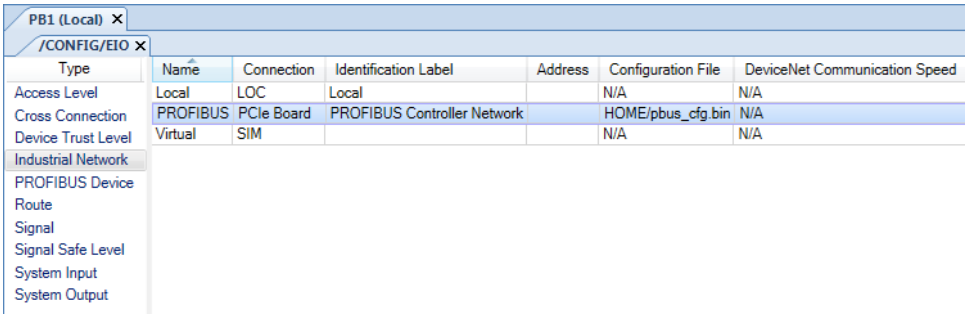
The configuration program *PROFIBUS Configurator* (from Softing), together with RobotStudio is used for the correct configuration of the industrial network.

The configuration program must be executed on a PC according to the manual for the program.

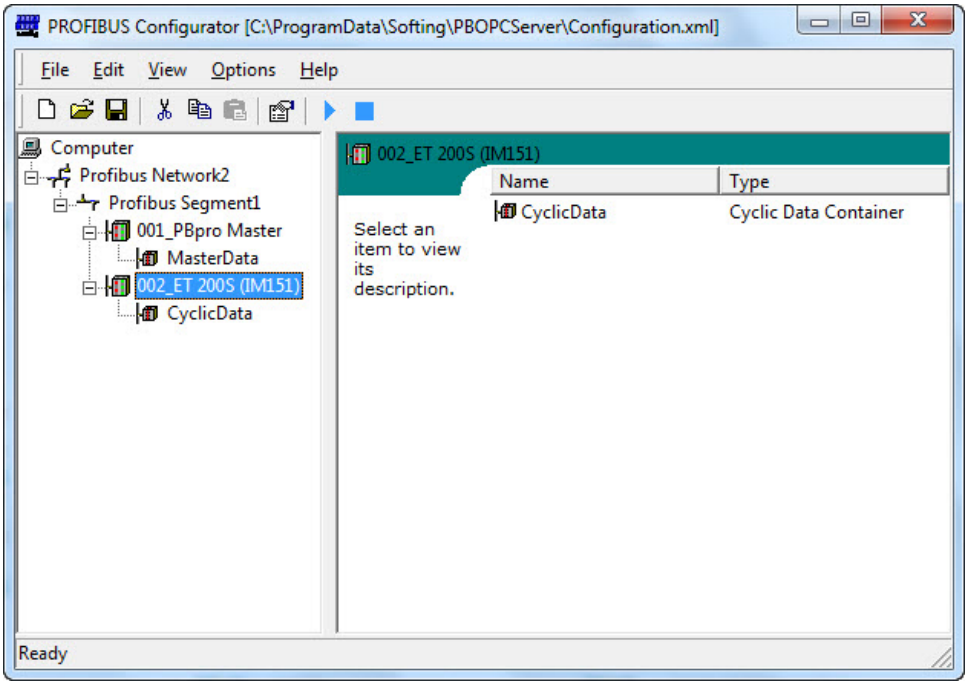
Some of the Profibus network settings will have to be done twice, both in PROFIBUS Configurator and in RobotStudio. PROFIBUS Configurator can generate a binary

Continues on next page

configuration file that can be interpreted by the PROFIBUS board. RobotStudio will create the system parameters to be interpreted by RobotWare.



xx1300000724



en1300000723

Specification overview, Master

Item	Specification
Industrial Network	PROFIBUS-DP master with DP-V0
Addressing	1-125
Number of devices connected to master	Maximum 20 I/O devices, see *Technical reference manual - System parameters*.
Number of signals	Maximum 12000 I/O signals, see *Technical reference manual - System parameters*.
Baudrate	The PROFIBUS Controller is configurable for all baudrates up to 12 Mbits.
PROFIBUS product ID	0x0BAA

1.3 Definition of I/O devices

General

It is possible to connect any type of PROFIBUS DP-V0 compliant I/O device on the DSQC1005 master network. All devices should comply with the PROFIBUS standard and be conformance tested by PNO/PI (PROFIBUS Nützer Organisation/PROFIBUS International).

For information about the available system parameter and settings, see *System parameters on page 53* and *Technical reference manual - System parameters*.

This page is intentionally left blank

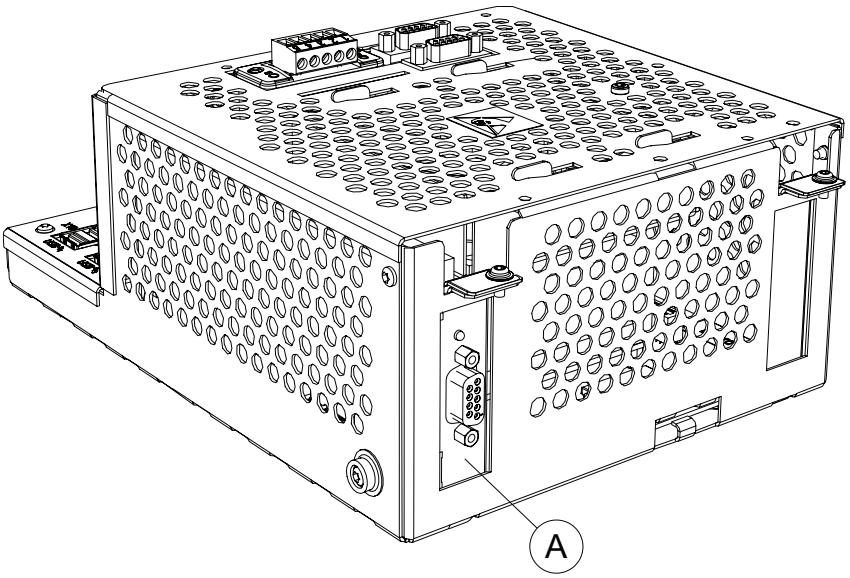
2 Hardware overview

2.1 Main computer DSQC1000

Connections

The I/O network is connected to the PROFIBUS PCI Express board, DSQC1005, on the main computer.

The following figure illustrates the location of the PCI Express board in the main computer unit.



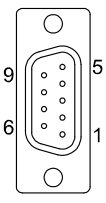
xx1300000691

	Description	Designation	Art. no.
A	PROFIBUS DP Master	DSQC1005	3HAC044872-001

Installation of PCI Express board

For information on how to install and replace the PCI Express board, see *Product manual - IRC5*.

The PROFIBUS connector



xx0700000507

The following table describes the connections to the DSQC1005 board.

Pin	Signal	Description
1	Not used	

Continues on next page

Pin	Signal	Description
2	Not used	
3	RxD/TxD-P	Receive/Transmit data; line B (red)
4	CNTR-P	Control of repeater direction
5	DGND	Data ground (reference voltage to VP)
6	VP	Power supply +5V (for example bus termination)
7	Not used	
8	RxD/TxD-N	Receive/Transmit data; line A (green)
9	Not used	
Housing	Cable shield	Internally connected to the protective earth via cable shield filters according to the PROFIBUS standard.

2.2 Cables and connections

2.2.1 Connections

General

All devices are connected in a network structure. Each network segment can have a maximum of 32 active devices. In order to connect a larger number of stations (controllers and devices), the network must be segmented. The segments are then interconnected with repeaters that amplify and refresh the data signals. Each repeater allows the PROFIBUS system to be extended by an additonal network segment.

The start and end of each segment is fitted with an active network terminator, see illustration in section *Termination on page 24*.

Cables and connectors

Cables used for connecting the PROFIBUS network must be according to the PROFIBUS specification, *IEC 61158 Type 3*. See also the *Installation Guideline for PROFIBUS-DP/FMS* published by the user organization of PROFIBUS (PNO).

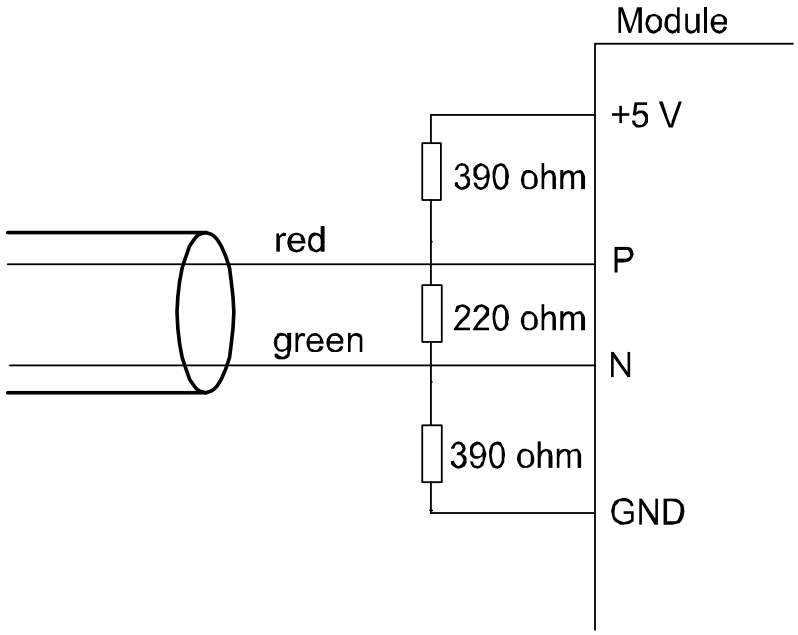
Drop cables are not allowed for PROFIBUS, so special D-subs must be used when the PROFIBUS device is not the last in line. The connector must have the possibility to insert two PROFIBUS cables in the same D-sub.

2.2.2 Termination

General

To reduce the reflections on the data lines, it is very important that both ends of the PROFIBUS network are terminated.

The termination used by PROFIBUS is an active termination as showed in the following figure.



en0400001144

After connecting the PROFIBUS network always check that the termination is in place on both ends of the network, and that there are no other terminations on the network. If a termination is missing or an extra termination is added somewhere in the PROFIBUS network the communication will probably fail.

2.2.3 Selecting cables

Cable parameters, PROFIBUS-DP

The cable parameters for the standard network cables result in the maximum length of each network segment for the respective data transfer rate. See details for cable type A in the following tables.

Segment lengths and data rates, cable type A

Data rate in kbit/s	Maximum segment length in m
9.6	1200
19.2	1200
45.45	1200
93.75	1200
187.5	1000
500	400
1500	200
3000	100
6000	100
12 000	100

Other parameters, cable type A

Parameter	Value
Impedance	135 to 165 Ω
Capacity	≤ 30 pF/m
Loop resistance	≤ 110 Ω/km
Conductor cross-sectional area	≥ 0.34 mm^2 (AWG 22)

This page is intentionally left blank

3 Software overview

3.1 Information about the internal controller

General

To use the PROFIBUS internal controller, the IRC5 controller must be installed with the option *969-1 PROFIBUS Controller*.

The PROFIBUS internal controller can be used to:

- connect PROFIBUS device to the IRC5 controller.
- connect the IRC5 controller to another IRC5 controller which acts as a device.

Predefined network

When the robot system is installed with the PROFIBUS Controller option, a predefined network with the name *PROFIBUS* is created at system startup.

GSD files

In order to configure a PROFIBUS network with an external PROFIBUS configuration tool, a GSD file for each device needs to be imported into the tool. These files contains vital information about the PROFIBUS device and they shall be supplied by the vendor/manufacturer of the specific PROFIBUS module.

The GSD files for the IRC5 controller are available at the following locations:

- **In the RobotWare installation folder in RobotStudio**: *...\RobotPackages\RobotWare_RPK_<version>\utility\service\ioconfig\PROFIBUS*
- **On the IRC5 Controller**: *<SystemName>\PRODUCTS\<RobotWare_xx.xx.xxxx>\utility\service\GSD*

Note

Navigate to the RobotWare installation folder from the RobotStudio **Add-Ins** tab, by right-clicking on the installed RobotWare version in the **Add-Ins** browser and selecting **Open Package Folder**.

The directory contains the following files:

GSD-file	Description
soft0baa.gsd	Softing DP-Master PBpro (DSQC1005)
HMS_1811.gsd	PROFIBUS Anybus Device (DSQC 667)

Continues on next page

DSQC1005 firmware update

The firmware that is executing on the DSQC1005 board is included in the RobotWare software package. During a RobotWare upgrade, the DSQC1005 is automatically updated. No manual procedure is needed.

Note

During an automatic firmware upgrade of the board, lock-files are created on the flash disk. The lock-files have names of the format *firmwareXY.lock*, where X and Y are figures in the range 0-9.

These are reserved filenames that must not be used by the user.

3.2 Software for configuring the master

3.2.1 Softing PROFIBUS configurator

Description

Softing PROFIBUS configurator is an external PROFIBUS configuration PC tool. The usage of the tool is described below.

Installation

For installation instructions refer to the *Softing PROFIBUS Configurator Manual*.

Bus parameter set - changing parameters

All the parameters that are defined in the "PROFIBUS Bus parameter set" are possible to modify by using the *Softing PROFIBUS Configurator*. These parameters and default values for them (depending on the baudrate) are defined in the PROFIBUS specification. The default values are recommended and it is rarely necessary to modify these parameters.

By selecting the desired baudrate, the *Softing PROFIBUS Configurator* can automatically select the default "PROFIBUS Bus parameter set" for the selected baudrate, either by clicking the **Standard** button on the bus parameter window or by using the **Calculate**/**Check** function.

When the configuration of the master and all slaves is completed, it is recommended to use the **Calculate**/**Check** function in *Softing PROFIBUS Configurator*, and perform any changes that might be suggested. The **Calculate**/**Check** function can be executed by right-clicking the segment node in the treeview.

Slave parameter set - changing parameters

By using the *Softing PROFIBUS Configurator* it is possible to change the parameters that are defined in the "Slave parameter set" according to the PROFIBUS specification. It is usually not necessary to modify the parameters in the "Slave parameter set", but in some cases it can be interesting to change parameters (like the `Watchdog Time` and the `UserPrm Data`).

Description of how the parameters in the "Slave parameter sets" are modified is found in the manual for the *Softing PROFIBUS Configurator*.

Note

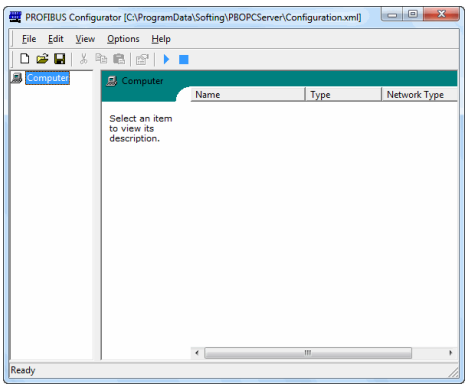
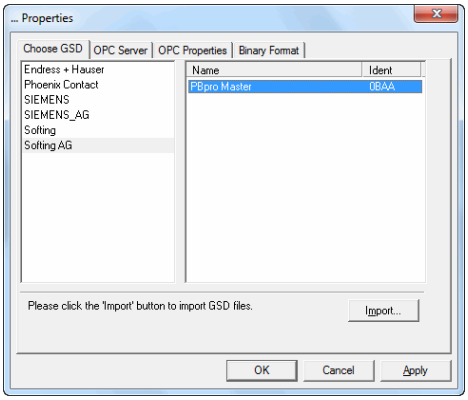
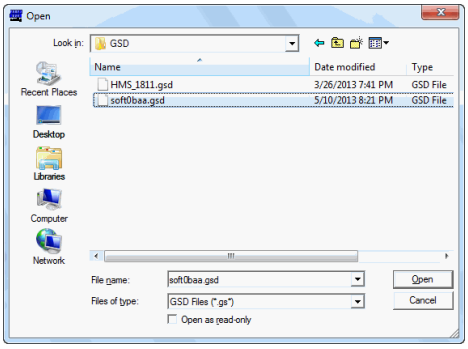
It is recommended *not* to change any of the parameters without a knowledge on PROFIBUS and how the changes affect the communication.

Continues on next page

3.2.1 Softing PROFIBUS configurator
Continued

Importing GSD files

Use the following procedure to import a GSD file to the *Softing PROFIBUS Configurator*.

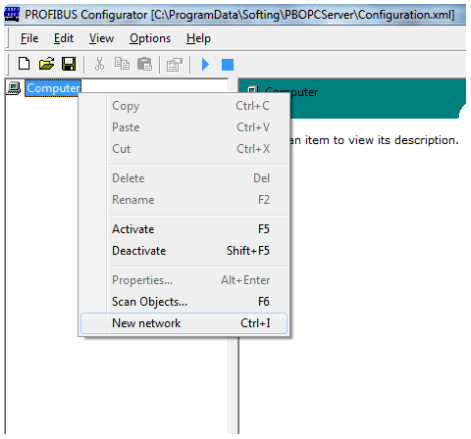
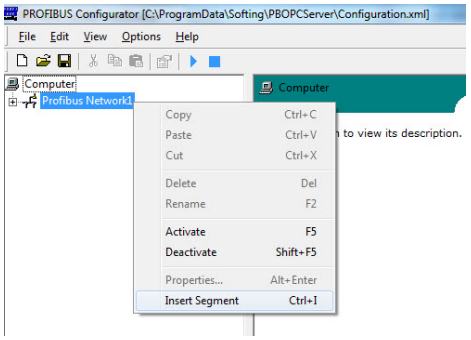
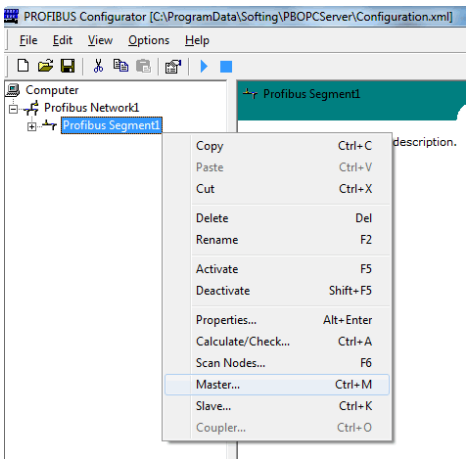
	Action	Note
1	Start the *Softing PROFIBUS Configurator*.	 en1300000711
2	Click **Options** and select **Settings...**.	
3	On the *Choose GSD* tab, Click **Import...**.	 en1300000712
4	An **Open** dialog appears. Select the GSD-file and click **Open**. **Note** For information about the location of the GSD-files, see *GSD files on page 27*.	 en1300000713
5	Now the imported GSD file appears in the list.	

Continues on next page

Setting up the bus

Use the following procedure to setup the bus using the *Softing PROFIBUS Configurator*.

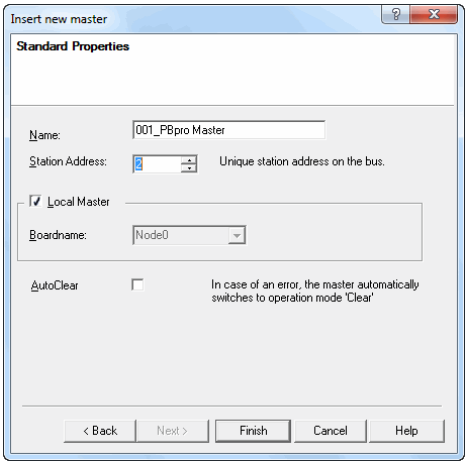
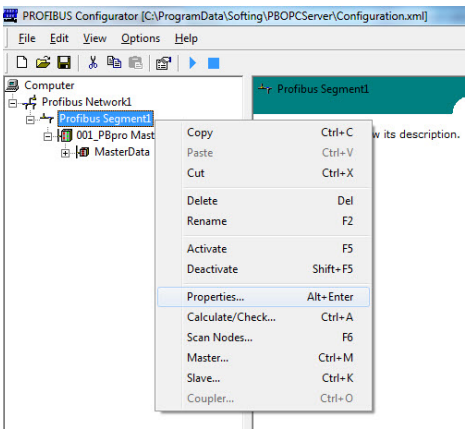
For more specific examples, see *Examples on page 39*.

	Action	Note
1	Start the *Softing PROFIBUS Configurator*.	
2	Right-click on **Computer** and select **New Network**.	 en1300000701
3	Right-click on the added network node and select **Insert Segment**.	 en1300000803
4	Right-click on the added segment and select **Master....**	 en1300000702

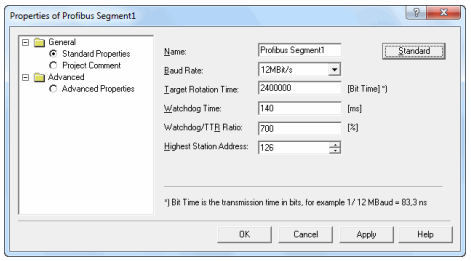
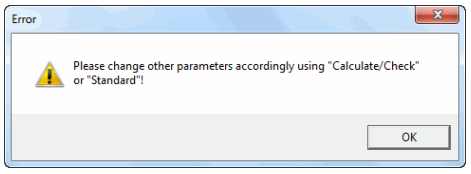
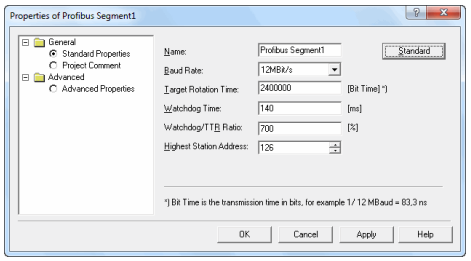
Continues on next page

3.2.1 Softing PROFIBUS configurator

Continued

	Action	Note
5	Under **Softing AG**, select **PBpro Master** and click **Next**.	 en1300000703
6	In the **Standard Properties** window, change station address to the desired value. Select the **Local Master** check box to load the bus parameters and slave parameters to the local master. Click **Finish**.	 en1300000704
7	Right-click on the segment node and select **Properties...**.	 en1300000804

Continues on next page

	Action	Note
8	Change the Baud Rate to the desired value.	 en1300000705
9	Click **OK** to change the other parameters accordingly.	 en1300000706
10	Click **Standard** and then change the other parameters to the desired values.	 en1300000705
11	Click **Apply** and then click **OK**.	

The next step of the configuration is to add and configure I/O devices and create the binary file, see *Examples on page 39*.

This page is intentionally left blank

4 Configuring the internal controller

4.1 Recommended working procedure

General

This section describes the recommended working procedure when installing and configuring the PROFIBUS controller. The working procedure helps to understand the dependencies between the different steps.

Basic steps

Use this procedure to install and configure the PROFIBUS controller.

	Action	See
1	Use an external PROFIBUS configuration tool to create a file that contains the configuration of the PROFIBUS network.	*Creating the PROFIBUS configuration file on page 36*
2	Download the PROFIBUS configuration file to the controller.	*Configuring the IRC5 controller on page 37*
3	Configure the I/O devices connected to the PROFIBUS network using RobotStudio or FlexPendant.	

Examples

See
Digital I/O configuration example (non modular station) on page 39
Modular station configuration example on page 42
Communication between two IRC5 controllers on page 47

4.2 Creating the PROFIBUS configuration file

General

To create the PROFIBUS configuration file, an external PROFIBUS configuration tool is needed. This section describes the basic steps that needs to be performed, independent of which tool is used.

Examples

The Softing PROFIBUS configurator is the tool recommended by ABB. For specific examples on how to use the tool, see *Examples on page 39*.

Basic steps

This procedure describes the general steps that needs to be performed when creating a controller network configuration file, independent of which tool is used.

	Action
1	Use the PROFIBUS configuration tool to: • Import the GSD files for all types of devices in the network. • Set the baud rate for the network. • Set the station address for the internal controller. • Add the I/O devices into the network structure. • Set the station address for all I/O devices in the network structure.
2	Save the project to create the binary PROFIBUS configuration file.

The next step is to download the binary configuration file to the controller.

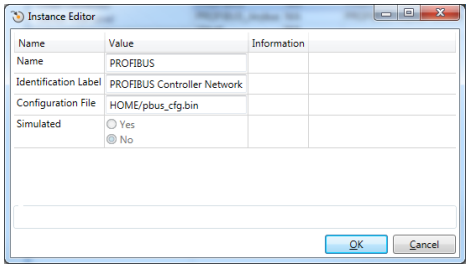
4.3 Configuring the IRC5 controller

Description

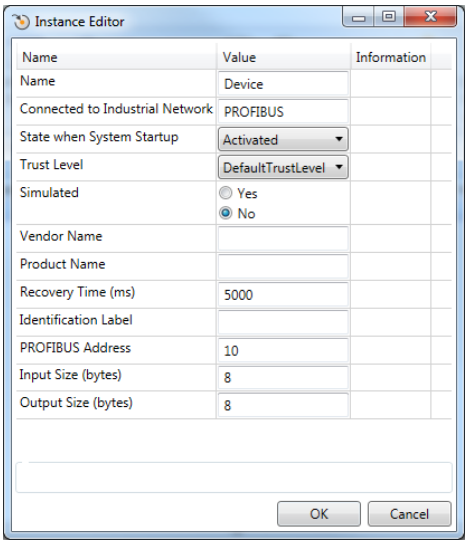
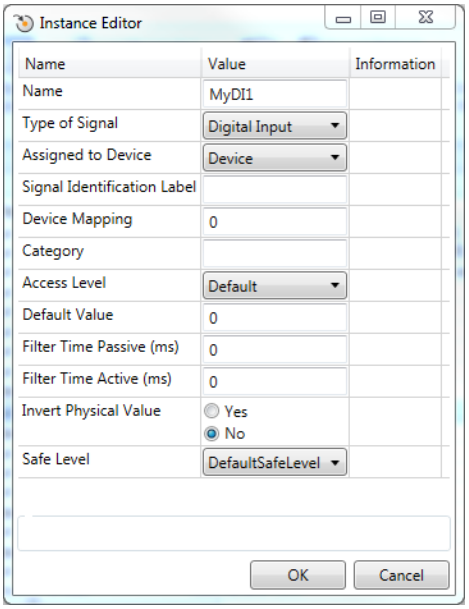
This configuration example uses the PROFIBUS configuration file, *pbus_cfg.bin*, created in section *Creating the PROFIBUS configuration file on page 36*. It shows how to use the PROFIBUS configuration file and how to add the configuration definitions to the system parameters.

Internal controller configuration

Use this procedure to configure the PROFIBUS controller in the IRC5 controller, using the **Configuration Editor** in RobotStudio.

	Action	Note
1	Start RobotStudio and connect to the IRC5 controller. Request write access.	
2	Download the binary configuration file to the controller. **Note** The recommended filename is *pbus_cfg.bin* and the recommended directory is the *HOME* directory of the currently used RobotWare system.	Use the **File Transfer** tool in RobotStudio, or an external FTP client.
3	Click **Configuration Editor** and select **I/O System**.	
4	In the **Type** list, click **Industrial Network** and then right-click in the workspace on the *PROFIBUS* item and select **Edit Industrial Network**.	For more information about the parameters, see *System parameters on page 53*.
5	Enter the parameter values for the *PROFIBUS* industrial network. • **Configuration File** shall be the path to the binary file. Click **OK**.	 xx1400002110
6	In the **Type** list, click **PROFIBUS Device**.	All devices that are used in the binary must also be defined in the controller, using the same settings.

Continues on next page

	Action	Note
7	Edit the parameter values for the device, if applicable. • **Name**, same as in the configuration file. • **Connected to Industrial Network**, shall be *PROFIBUS*. • **PROFIBUS Address**, same as in the configuration file. • Change the default values for **Input Size** and **Output Size** to the desired size Click **OK**.	 xx1400002109
8	In the **Type** list, click **Signal**.	
9	Add signals to the device • **Name**, user defined. • **Type of Signal**, select signal type from the drop-down list. • **Assigned to Device**, select from the list of previously defined devices. • **Device Mapping**, specifies which bit the signal uses in the I/O memory of the device. Click **OK**.	 xx1400002111
10	Restart the IRC5 controller to apply all settings.	

4.4 Examples

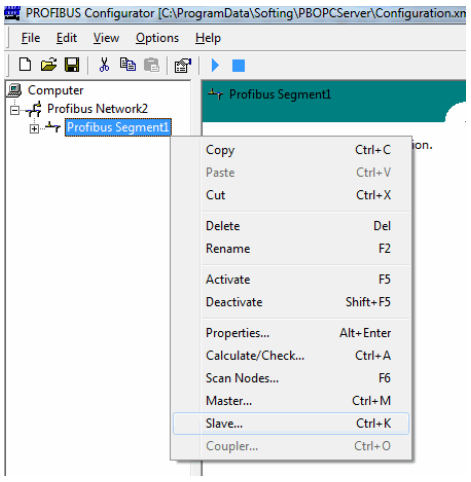
4.4.1 Digital I/O configuration example (non modular station)

Description

This is a detailed example of how to configure an ET200B 16 DI/16 DO device to the controller. The industrial network is configured using the *Softing PROFIBUS Configurator*, with the controller at address 2 and the slave device at address 10. The baudrate is 12 Mbits.

PROFIBUS configurator setup

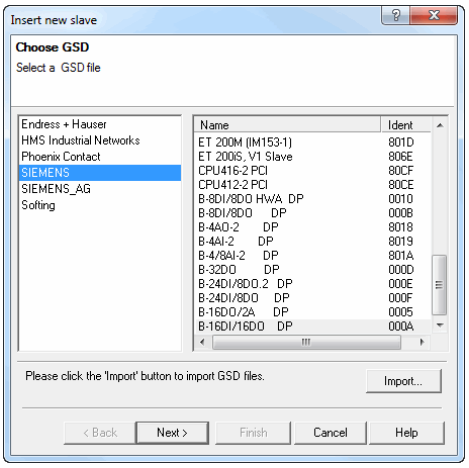
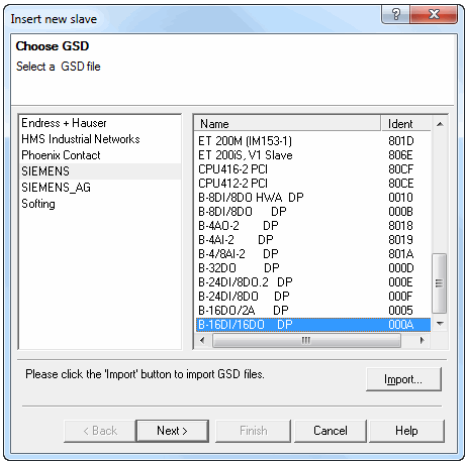
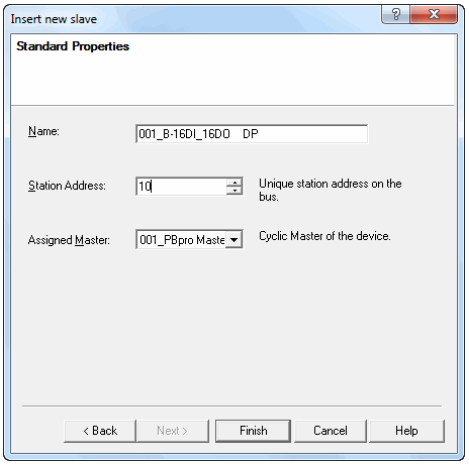
The following procedure is a step-by-step description of how to set the configuration in the *Softing PROFIBUS Configurator*.

	Action	Note
1	Start the *Softing PROFIBUS Configurator*.	
2	Import the GSD-files from the RobotWare DVD (that is, if the files have not been imported before).	See *Importing GSD files on page 30* and *GSD files on page 27*.
3	Import GSD-files for the I/O devices that shall be used.	The GSD-file is provided by the manufacturer of the device.
4	Setup the bus using the following values: • Station address 2 • Baud Rate 12 MBit/s	See *Setting up the bus on page 31*.
5	Right-click on the segment node and select **Slave...**.	 en1300000707

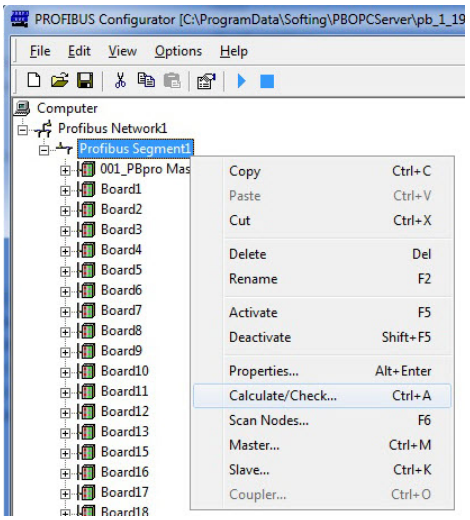
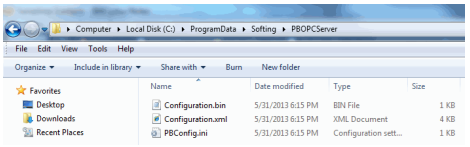
Continues on next page

4.4.1 Digital I/O configuration example (non modular station)

Continued

	Action	Note
6	Click **SIEMENS**.	 en1300000708
7	Select the **B-16DI/16DO** slave device and click **Next**.	 en1300000725
8	Change the station address to 10 in the **Standard Properties** window and click **Finish**.	 en1300000709

Continues on next page

	Action	Note
9	Right-click on the Profibus Segment and select **Calculate/Check** from the drop-down list. The **Verify segment settings** dialog box opens. Select the option to calculate or check the configuration if required. **Note** It checks or corrects the default values set for the DP-Master and improves the communication.	 xx1500000245
10	Save the configuration file. A binary file with extension *.bin* will be saved at the same location as the configuration file with extension *.xml*.	 en1300000710
11	Rename the binary file to *pbus_cfg.bin*.	This is the default file name used by the predefined network, *PROFIBUS*.
12	Download the PROFIBUS configuration file to the controller and configure the settings on the IRC5 controller.	See *Configuring the IRC5 controller on page 37*

4.4.2 Modular station configuration example

Description

The ET200S is a modular device. You can choose which type of modules to use and in which order to connect them.

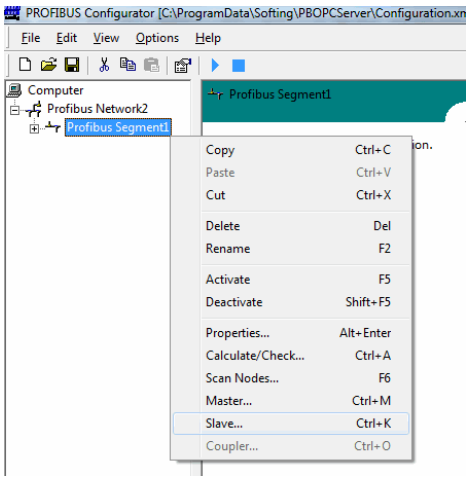
This is an example of how to configure an ET200S device to the controller. The industrial network is configured using the *Softing PROFIBUS Configurator*, with the master at address 1 and the slave device at address 10. The baudrate is 12 Mbit/s.

The ET200S device has 7 physical modules, and these are connected in following order:

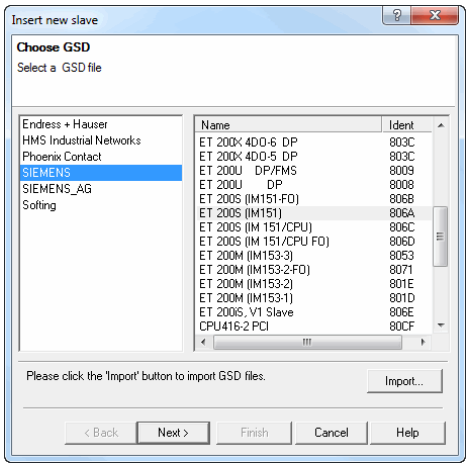
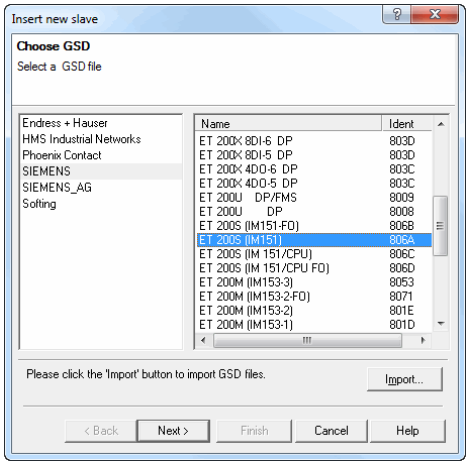
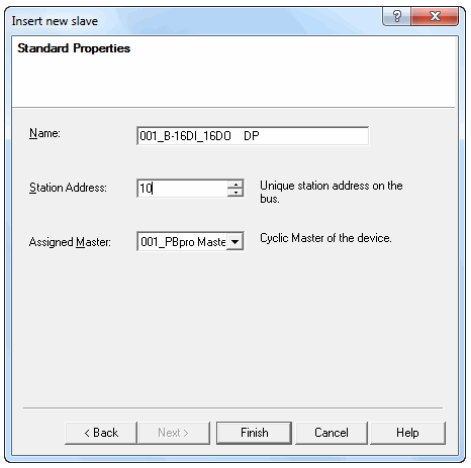
- One power module
- Two modules with 2 DO in each module
- Two modules with 2 DI in each module
- One module with 2 AO
- One module with 2 AI

PROFIBUS configurator setup

The following procedure is a step-by-step description of how to setup the configuration in *Softing PROFIBUS Configurator*.

	Action	Note
1	Start the *Softing PROFIBUS Configurator*.	
2	Import the GSD-files from the RobotWare DVD (that is, if the files have not been imported before).	See *Importing GSD files on page 30* and *GSD files on page 27*.
3	Import GSD-files for the I/O devices that shall be used.	The GSD-file is provided by the manufacturer of the device.
4	Setup the bus using the following values: • Station address 1 • Baud Rate 12 MBit/s	See *Setting up the bus on page 31*.
5	Right-click on the segment node and select **Slave....**	 en1300000707

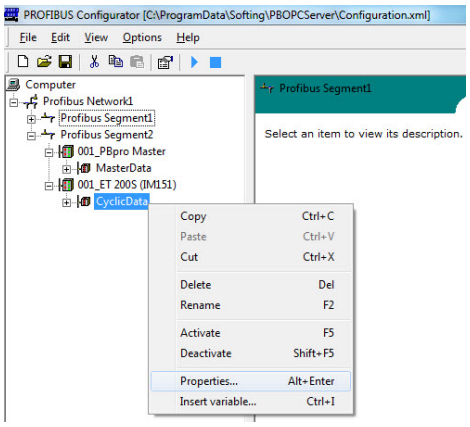
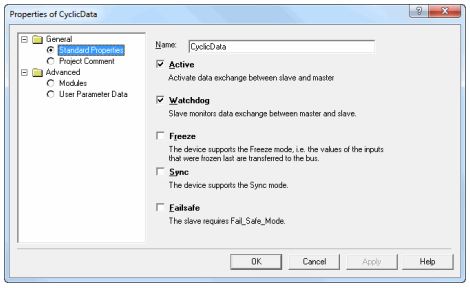
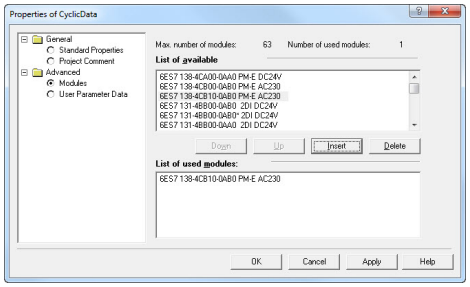
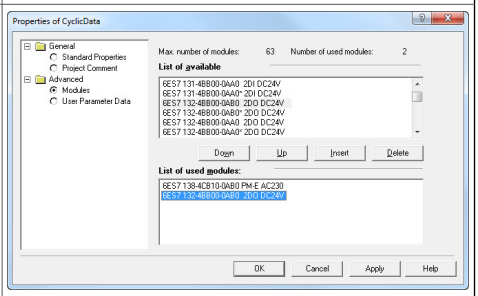
Continues on next page

	Action	Note
6	Click **SIEMENS**.	 en1300000715
7	Select the *ET 200S (IM151)* slave and click **Next**.	 en1300000726
8	Change the station address to 10 in the **Standard Properties** window and click **Finish**.	 en1300000709

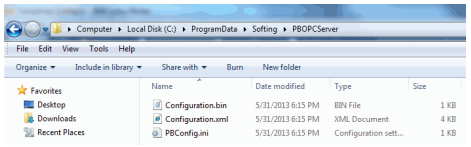
Continues on next page

4.4.2 Modular station configuration example

Continued

	Action	Note
9	Right-click on the **CyclicData** node under the new slave and select **Properties**.	 en1300000805
10	Click **Modules** in the tree view to the left. **Note** When configuring the modules, make sure different modules are added in correct order. That is, the slot numbers depend on the physical order of the modules.	 en1300000716
11	In the **Available modules** list, select the appropriate power supply module (6ES7 138-xxxxx-xxxx) and click **Insert**.	 en1300000721
12	In the **Available modules** list, select the appropriate module with 2 DO (6ES7 132-xxxxx-xxxx) and click **Insert**.	 en1300000722
13	Repeat the step to insert the second module with 2 DO.	
14	In the **Available modules** list, select the appropriate module with 2 DI (6ES7 131-xxxxx-xxxx) and click **Insert**.	
15	Repeat the step to insert the second module with 2 DI.	

Continues on next page

	Action	Note
16	In the **Available modules** list, select the appropriate module with 2 AO (6ES7 134-xxxxx-xxxx) and click **Insert**.	
17	In the **Available modules** list, select the appropriate module with 2 AI (6ES7 134-xxxxx-xxxx) and click **Insert**.	
18	Save the configuration file. A binary file with extension *.bin* will be saved at the same location as the configuration file with extension *.xml*.	 en1300000710
19	Rename the binary file to *pbus_cfg.bin*.	This is the default file name used by the predefined bus, *Profibus1*.
20	Download the PROFIBUS configuration file to the controller and configure the settings on the IRC5 controller.	See *Configuring the IRC5 controller on page 37* When creating the signals, use the unit mapping as described in *Physical signal configuration on page 45*.

Physical signal configuration

According to the *ET200S Distributed I/O System Manual* (chapter 13.1.1, Analog value representation for measuring ranges with S7) from Siemens:

- The analog values are represented in complements of two.
- The values are represented with 16 bits.
- Physical max. value: 10 V is represented by the value 27648.
- Physical min. value: -10 V is represented by the value -27648.
- The high byte is sent first, byte swap is needed.

For the configuration procedure, refer to *Technical reference manual - System parameters*.

Device mapping

Device mapping is necessary when specifying which bit in the I/O memory map of the assigned device the signal is mapped to. All physical signals (i.e. signals connected to a physical device) must be mapped.

The table shows an example of device mapping:

Signal	Unit map	Description
DO_1	0	Digital output signal.
DO_2	1	Digital output signal.
DO_3	8	Digital output signal.
DO_4	9	Digital output signal.
DI_1	0	Digital input signal.
DI_2	1	Digital input signal.
DI_3	8	Digital input signal.
DI_4	9	Digital input signal.

Continues on next page

4.4.2 Modular station configuration example
Continued

Signal	Unit map	Description
AO_1	24-31, 16-23	Analog output signal. Byte swap is needed.
AO_2	40-47, 32-39	Analog output signal. Byte swap is needed.
AI_1	24-31, 16-23	Analog input signal. Byte swap is needed.
AI_2	40-47, 32-39	Analog input signal. Byte swap is needed.

4.4.3 Communication between two IRC5 controllers

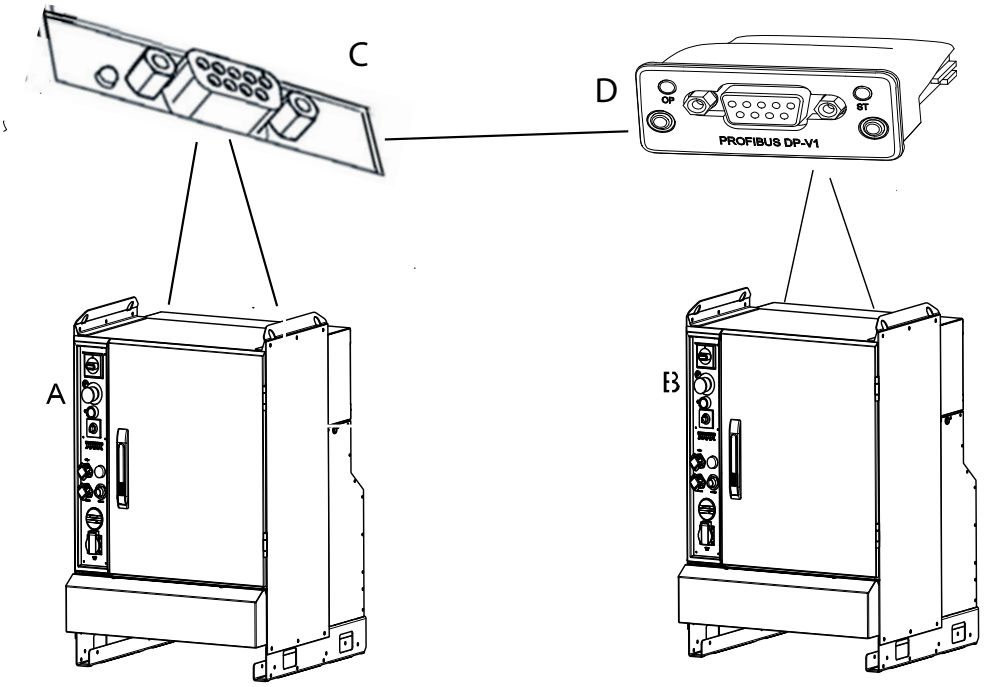
Description

The following example demonstrates how two IRC5 systems can be configured to communicate with each other, one as the controller and one as a device. The controller system uses the PROFIBUS PCI Express board (DSQC1005) and the device system uses the PROFIBUS anybus device (DSQC 667).

The industrial network is configured using the *Softing PROFIBUS Configurator*, with the controller at address 2 and with baudrate 12 Mbits. The address of the PROFIBUS anybus device is set to 10 and the input size and output size are set to 8 bytes.

Illustration

The figure illustrates communication between two IRC5 controllers.



xx1500000758

A	IRC5 PROFIBUS controller
B	IRC5 PROFIBUS device
C	PROFIBUS PCI Express board, DSQC1005, configured as a controller
D	PROFIBUS anybus device, DSQC667, configured as a device

Basic steps

	Action	Note/Info
1	Configure the controller B as a *PB_Internal_Anybus* device.	*Device system configuration on page 48*

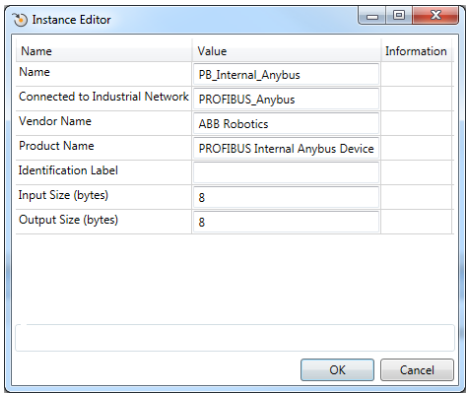
Continues on next page

4.4.3 Communication between two IRC5 controllers
Continued

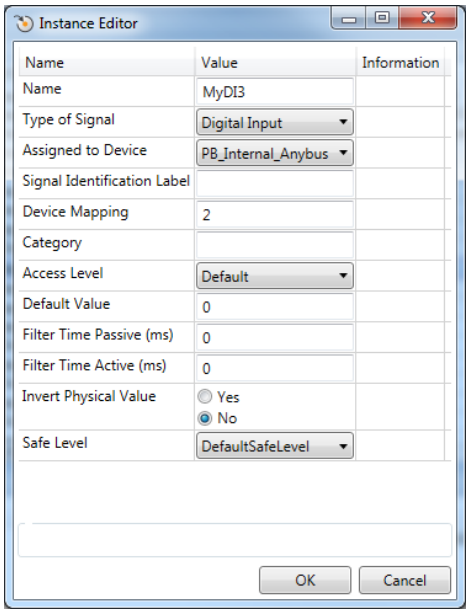
	Action	Note/Info
2	Create the binary configuration file for the controller A as controller system using *Softing PROFIBUS Configurator*.	*PROFIBUS configurator setup on page 49*.
3	Add a device (controller B) in the controller system (controller A).	*Controller system configuration on page 51*

Device system configuration

Use this procedure to configure the PROFIBUS Anybus Device in the IRC5 controller, using the **Configuration Editor** in RobotStudio.

	Action	Note
1	Start RobotStudio and connect to the IRC5 controller. Request write access.	
2	Click **Configuration Editor** and select **I/O System**.	
3	In the **Type** list, click **PROFIBUS Internal Anybus Device**, and select **PB_Internal_Anybus**.	An I/O device is required to create the signals attached to the internal device. The predefined network *PROFIBUS_Anybus* and the internal anybus device named *PB_Internal_Anybus* are created at system startup, when the robot system is installed with *PROFIBUS Anybus Device* option in controller B.
4	Edit the parameter values for the internal anybus device, if applicable. • **Input Size** and **Output Size**, change the values to the desired size. This step is optional. Click **OK**.	 xx1400002214
5	In the type list, click **Signal**.	

Continues on next page

	Action	Note
6	Add signals to the internal anybus device. • **Name**, user defined. • **Type of Signal**, select signal type from the drop-down list. • **Assigned to Device**, select the previously defined device (*PB_Internal_Anybus*). • **Device Mapping**, specifies which bit the signal uses in the I/O memory of the I/O device. Click **OK**.	 xx1400002215
7	Restart the controller B to apply all settings.	

PROFIBUS configurator setup

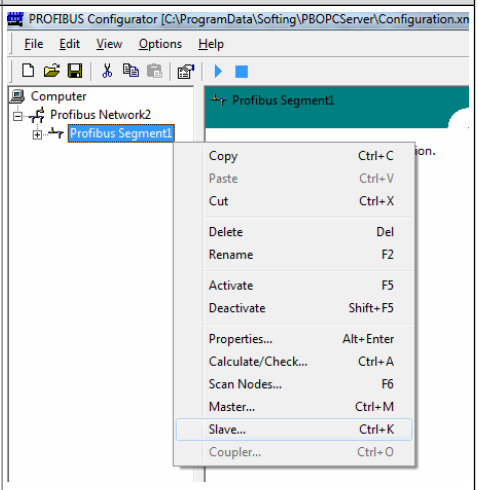
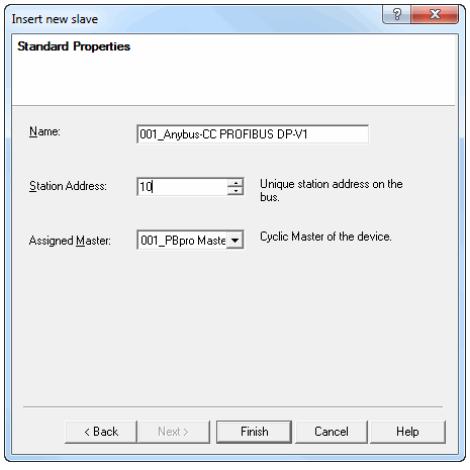
The following procedure is a step-by-step description of how to set the configuration in the *Softing PROFIBUS Configurator*.

	Action	
1	Start the *Softing PROFIBUS Configurator*.	
2	Import the GSD-files from the RobotWare DVD, if the files have not been imported before. The GSD-file for the PROFIBUS Anybus Device is called HMS_1811.gsd.	See *Importing GSD files on page 30* and *GSD files on page 27*.
3	Setup the bus using the following values: • Station address 2 • Baud Rate 12 MBit/s	See *Setting up the bus on page 31*.

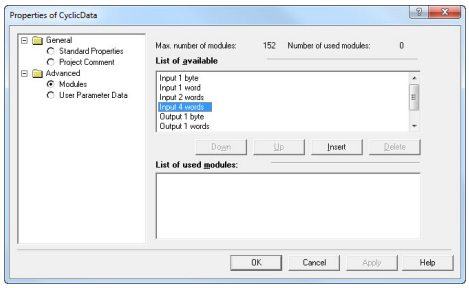
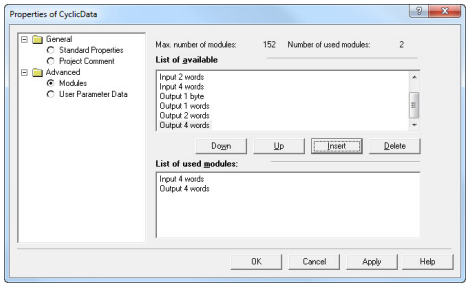
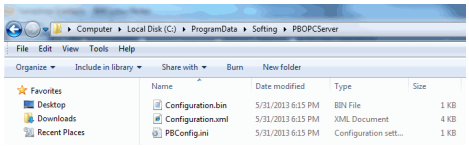
Continues on next page

4.4.3 Communication between two IRC5 controllers

Continued

	Action	
4	Right-click on the segment node and select **Slave...**.	 en1300000707
5	Click **HMS Industrial Networks** and select the **Anybus-CC PROFIBUS DP-V1** slave. Click **Next**.	 en1300000717
6	Change the station address to 10 in the **Standard Properties** window and click **Finish**.	 en1300000718

Continues on next page

	Action	
7	Right-click on the **CyclicData** node under the new slave and select **Properties**.	 en1300000719
8	Click on **Modules** in the treeview to the left.	
9	In the list of available modules, first select *Input 4 words* and click **Insert**, and then select *Output 4 words* and click **Insert**.	 en1300000720
10	Save the configuration file. A binary file with extension *.bin* will be saved at the same location as the configuration file with extension *.xml*.	 en1300000710
11	Rename the binary file to *pbus_cfg.bin*.	This is the default file name used by the predefined bus, *Profibus1*.
12	Download the PROFIBUS configuration file to the controller A and configure the settings on the controller A.	See *Configuring the IRC5 controller on page 37*

Controller system configuration

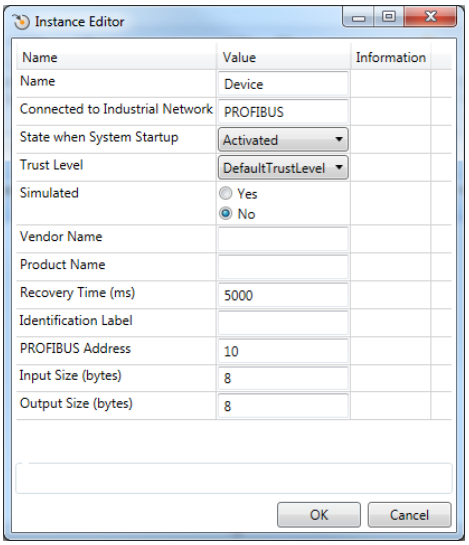
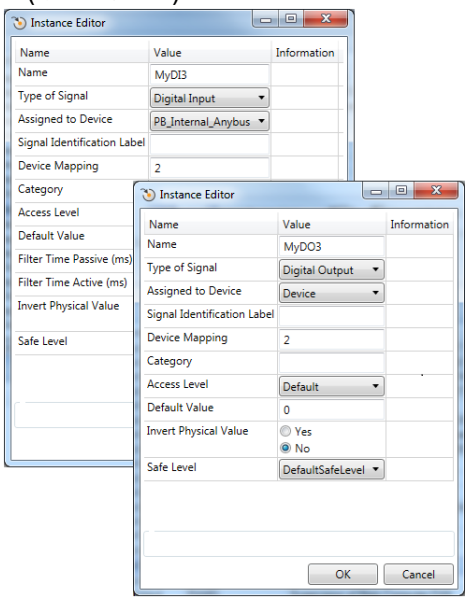
Use this procedure to configure the PROFIBUS controller in the controller A, using the **Configuration Editor** in RobotStudio.

	Action	Note
1	Start RobotStudio and connect to the controller A. Request write access.	
2	Download the *pbus_cfg.bin* configuration file to the *HOME* directory of the currently used RobotWare system.	Use the **File Transfer** tool in RobotStudio, or an external FTP client.
3	Click **Configuration Editor** and select **I/O System**.	
4	In the **Type** list, click **Industrial Network** and then right-click in the workspace on the *PROFIBUS* item and select **Edit Industrial Network**.	For more information about the parameters, see *System parameters on page 53*.

Continues on next page

4.4.3 Communication between two IRC5 controllers

Continued

	Action	Note
5	Enter the parameter values for the *PROFIBUS* network.	For more information, see *Internal controller configuration on page 37*.
6	In the **Type** list, click **PROFIBUS Device**.	
7	Add the anybus device and enter the parameter values. • **Name**, user defined. • **Connected to Industrial Network**, shall be *PROFIBUS*. • **PROFIBUS Address**, shall be 10, same as in the configuration file and in the slave controller. • **Input Size** and **Output Size**, same as defined in controller B. Click **OK**.	 xx1400002109
8	In the **Type** list, click **Signal**.	
9	Add signals to the anybus I/O device. **Note** Input signals to the *PB_Internal_Anybus* device in the controller B, are configured as outputs from the device on the controller A, and vice versa.	The digital input is configured on the controller B (as device). The digital output is the corresponding signal on the controller A (as controller):  xx1400002216
10	Restart the controller A to apply all settings.	

5 System parameters

5.1 Introduction

About the system parameters

There are both PROFIBUS specific parameters and more general parameters. This chapter describes all PROFIBUS specific system parameters. The parameters are divided into the type they belong to.

For information about other parameters, see *Technical reference manual - System parameters*.

PROFIBUS system parameters

Industrial Network

These parameters belong to the type *Industrial Network* in the topic *I/O System*.

Parameter	For more information, see
Name	*Technical reference manual - System parameters*
Configuration File	*Configuration File on page 54*
Identification Label	*Technical reference manual - System parameters*
Address	*Technical reference manual - System parameters*
Simulated	*Technical reference manual - System parameters*

PROFIBUS Device

These parameters belong to the type *PROFIBUS Device* in the topic *I/O System*.

Parameter	For more information, see
Name	*Technical reference manual - System parameters*
Connect to Industrial Network	*Technical reference manual - System parameters*
Identification Label	*Technical reference manual - System parameters*
Trust Level	*Technical reference manual - System parameters*
State when System Startup	*Technical reference manual - System parameters*
Simulated	*Technical reference manual - System parameters*
Vendor Name	*Technical reference manual - System parameters*
Product Name	*Technical reference manual - System parameters*
Recovery Time	*Technical reference manual - System parameters*
PROFIBUS Address	*PROFIBUS Address on page 55*
Input Size	*Input Size on page 56*
Output Size	*Output Size on page 57*

5.2 Type Industrial Network

5.2.1 Configuration File

Parent

Configuration File belongs to the type *Industrial Network*, in the topic *I/O System*.

Description

Configuration File specifies the path to a PROFIBUS configuration file located on the IRC5 system.

Usage

The *Configuration File* system parameter is used to locate the PROFIBUS configuration file, created by using the *Softing PROFIBUS Configurator* tool, to DSQC1005.

If the configuration file is placed in the HOME directory of the system, it will also be included in backups.

Prerequisites

The *PROFIBUS Controller* option must be installed.

Default value

The default value is HOME/pbus_cfg.bin

Allowed values

A-Z

a-z

_

.

/

5.3 Type PROFIBUS Device

5.3.1 PROFIBUS Address

Parent

PROFIBUS Address belongs to the type *PROFIBUS Device*, in the topic *I/O System*.

Description

The parameter *PROFIBUS Address* specifies the address of the device on the network.

Usage

PROFIBUS Address specifies the address that the device uses on the network, to which the controller should try to setup a connection.

Prerequisites

The *PROFIBUS Controller* option must be installed.

Default value

The default value is 125.

Allowed values

Allowed values are the integers 0-125.

5.3.2 Input Size

Parent

Input Size belongs to the type *PROFIBUS Device*, in the topic *I/O System*.

Description

The parameter *Input Size* is used to configure the input slot configuration of the PROFIBUS device.

Usage

The parameter *Input Size* is used to configure the input slot size for the PROFIBUS device. This size must match the connecting PLC's or other PROFIBUS master's defined output slot size.

Prerequisites

The option *PROFIBUS Controller* must be installed.

Default value

The default value is 1 bytes (8 signal bits).

Allowed values

Allowed values are the integers 0-64 (0-512 signal bits), specifying the data size in bytes.

5.3.3 Output Size

Parent

Output Size belongs to the type *PROFIBUS Device*, in the topic *I/O System*.

Description

The parameter *Output Size* is used to configure the output slot configuration of the PROFIBUS device.

Usage

The parameter *Output Size* is used to configure the output slot size for the PROFIBUS device. This size must match the connecting PLC's or other PROFIBUS master's defined input slot size.

Prerequisites

The option *PROFIBUS Controller* must be installed.

Default value

The default value is 1 bytes (8 signal bits).

Allowed values

Allowed values are the integers 0-64 (0-512 signal bits), specifying the data size in bytes.

This page is intentionally left blank

Index

ABB AB, Robotics
Robotics and Motion
S-721 68 VÄSTERÅS, Sweden
Telephone +46 (0) 21 344 400

ABB AS, Robotics
Robotics and Motion
Nordlysvegen 7, N-4340 BRYNE, Norway
Box 265, N-4349 BRYNE, Norway
Telephone: +47 22 87 2000

ABB Engineering (Shanghai) Ltd.
Robotics and Motion
No. 4528 Kangxin Highway
PuDong District
SHANGHAI 201319, China
Telephone: +86 21 6105 6666

ABB Inc.
Robotics and Motion
1250 Brown Road
Auburn Hills, MI 48326
USA
Telephone: +1 248 391 9000

abb.com/robotics

3HAC050966-001, Rev C, en