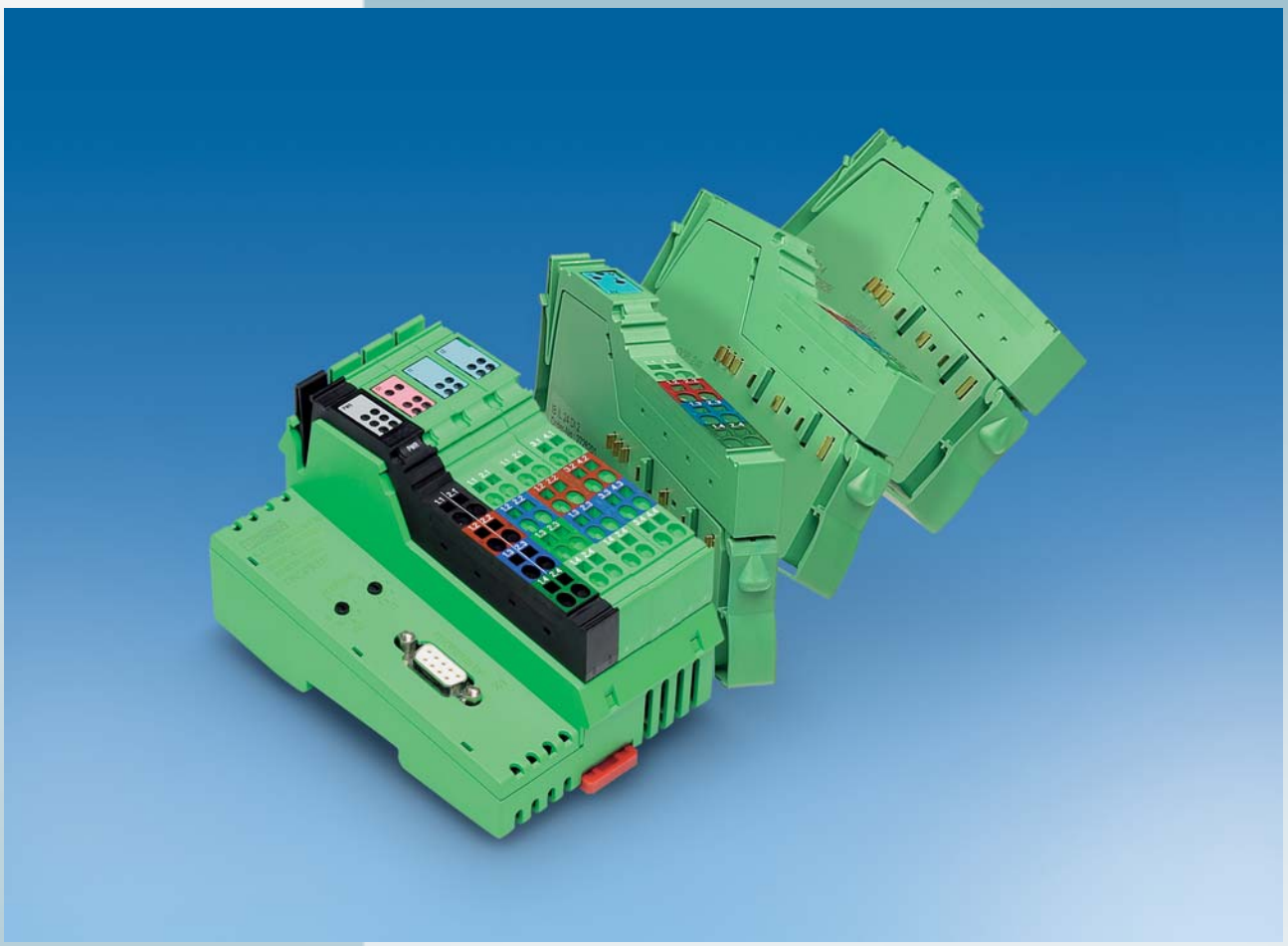
AUTOMATION



User Manual

UM QS EN IL PB BK + MELSEC

Order No.: —

Startup of Inline-PROFIBUS bus couplers on a MELSEC controller from Mitsubishi

PHOENIX CONTACT
INSPIRING INNOVATIONS

AUTOMATION

User manual

Startup of Inline-PROFIBUS bus couplers on a MELSEC controller from Mitsubishi

10/2008

Designation: UM QS EN IL PB BK + MELSEC

Revision: 00

Order No.: —

This user manual is valid for:

Designation	Order No.
IL PB BK DI8 DO4-PAC	2878926
IL PB BK DP/V1	2718688

Please observe the following notes

In order to ensure the safe use of the product described, you have to read and understand this manual. The following notes provide information on how to use this manual.

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The use of products described in this manual is oriented exclusively to

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This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

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Make sure you always use the latest documentation.
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www.download.phoenixcontact.com.

A conversion table is available on the Internet at:

www.download.phoenixcontact.com/general/7000_en_00.pdf.

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Should you have any suggestions or recommendations for improvement of the contents and layout of our manuals, please send your comments to

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Table of contents

1 Introduction

1.1 Information about this document

With the help of an example, this document helps you with the first steps when starting up an Inline-PROFIBUS systems on a MELSEC controller from Mitsubishi.

It is assumed the user has knowledge and experience in the operation of PCs and Windows operating systems.

1.2 Additional information

For comprehensive information on hardware components please refer to the documentation of the components.

Phoenix Contact

Documents describing components from Phoenix Contact can be downloaded at www.download.phoenixcontact.com.

Should you have further questions, please contact the hotline from Phoenix Contact.

Mitsubishi

Documents describing components from Mitsubishi can be downloaded at www.mitsubishi-automation.com.

- GX IEC DEVELOPER beginner's manual
- GX Configurator-DP software manual

Should you have further questions, please contact the hotline from Mitsubishi. For the contact data please visit www.mitsubishi-automation.com.

1.3 Software and hardware used for the example

Table 1-1 Software used (ordering information from Mitsubishi)

Order Designation	Order No.
GX-IEC Developer Version 7.01 Programming and documentation software according to IEC 1131.3 for MELSEC controllers	167452
GX-Configurator DP Version 7.01B Software for configuring PROFIBUS-DP network modules with MELSEC controllers	200777

Table 1-2 MELSEC software used (ordering information from Mitsubishi)

Order Designation	Order No.
MELSEC rack with 3 slots	136369
MELSEC Q61P power supply unit, input voltage 100-240V~	190235
MELSEC Q06HCPU with CF card slot memory expansion	130216
MELSEC QX80, digital input module DI16	127587
MELSEC QY80, digital output module DO16/0.5A	127588
MELSEC QJ71PB92V, PROFIBUS-DP/V1 master	165374

In the document the terms controller, CPU and PLC are used as synonyms, as they are used, for instance, in the order designation or in the software.
Each time the MELSEC Q06HCPU is meant.

Table 1-3 PROFIBUS bus couplers that can be used

Order Designation	Order No.
IL PB BK DI8 DO4-PAC	**2878926**
IL PB BK DP/V1	2718688

For the example, the IL PB BK DI8 DO4-PAC bus coupler was used.

Table 1-4 Inline terminals that can be used

Order Designation	Order No.
Any Inline terminals included in the GSD file	See AUTOMATION catalog

2 PROFIBUS-DP startup

The following is assumed:
– The hardware has been installed completely.
– The GX Configurator DP software is installed on your PC.
– The GX IEC Developer software is installed on your PC.

2.1 Communication between PC and controller (CPU)

There are two different interfaces on the controller for communication between your PC and the controller:
– Communication via the serial PS2 connection (V.24 (RS-232))
  You need a corresponding PS2 programming cable for communications.
– Communication via the USB interface
  An appropriate USB interface driver must be installed on your PC.
  Install the driver if it is not yet installed on your PC.

In the example, the connection is established via the USB interface.
- To install the USB interface driver for communication, call the ECUsbd.inf file from the "… MELSEC\Easysocket\USBDrivers" directory.
- Establish a communication connection between PC and controller.
- Start the GX Configurator DP software on your PC.

2.2 Preparing the MELSEC Q06HCPU controller for configuration of PROFIBUS-DP

2.2.1 Connecting the voltage

- Switch on the 230 V supply voltage for the controller.

When the supply voltage has been switched on and no project is loaded in the memory of the controller, this is shown with the status LEDs.
  – MODE LED is green and
  – ERROR LED is flashing red

The "Error when downloading the configuration" error message appears in the GX Configurator DP software.

The PROFIBUS-DP station cannot be configured without a project. Therefore, download a project to the controller first. This procedure is described in the following sections.

2.2.2 Downloading a new project to the controller with the GX IEC Developer

2.2.2.1 Creating a project

- Start the GX IEC Developer software tool.

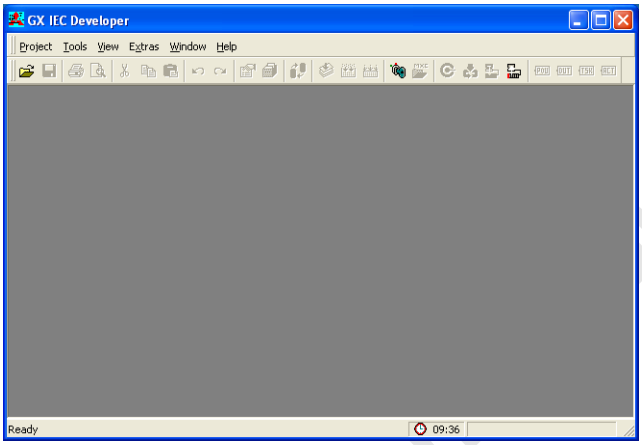


Figure 2-1 Creating a new project

- To create a new project, select the "Project, New" menu from the menu bar.
- In the "Select PLC Type" window, select the setting for the controller type (PLC type).

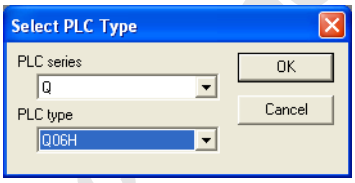


Figure 2-2 Select PLC type

- Confirm your selection with "OK".
- In the "New Project" dialog box that opens, select the path under which the project is to be stored.
- After the path enter the name of the new project.
  The software creates a subdirectory and not a file with the specified name.
- Confirm the dialog box with "Create".

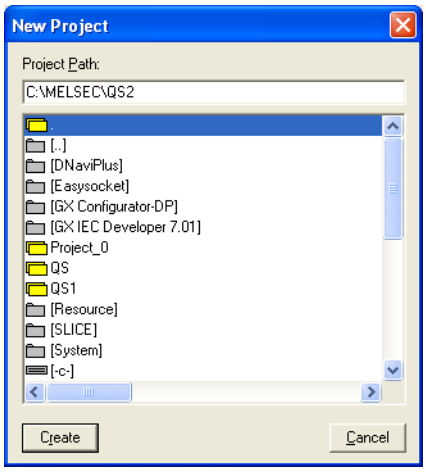


Figure 2-3 Directory structure of the new project

Now the software creates a new project.

- In the window that opens, select the startup options for the new project.
- Confirm your selection with "OK".

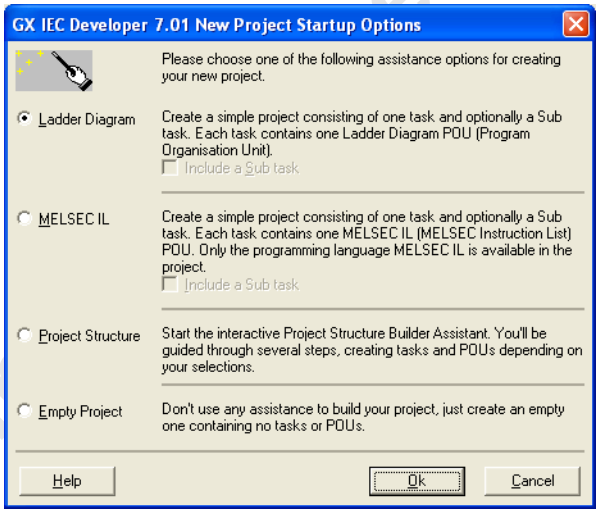


Figure 2-4 Startup options for a new project

The project will be displayed.

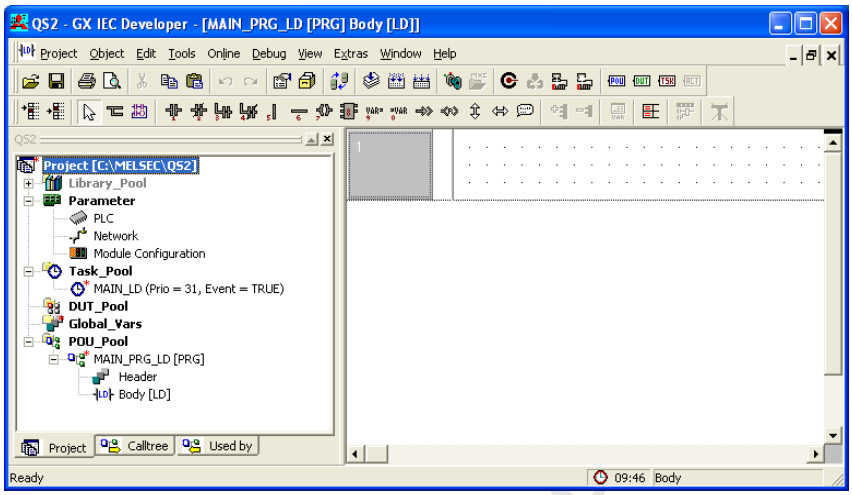


Figure 2-5 Project

2.2.2.2 Compiling a project

To compile a project, proceed as follows:

- Select the "Project, Rebuild all" menu from the menu bar.

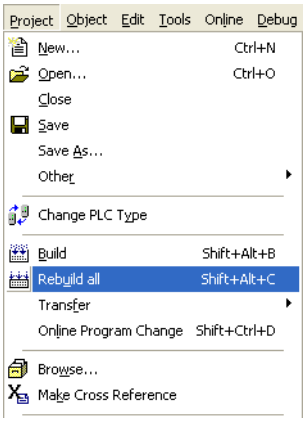


Figure 2-6 Compiling a project

- Confirm the message that appears with "Close".

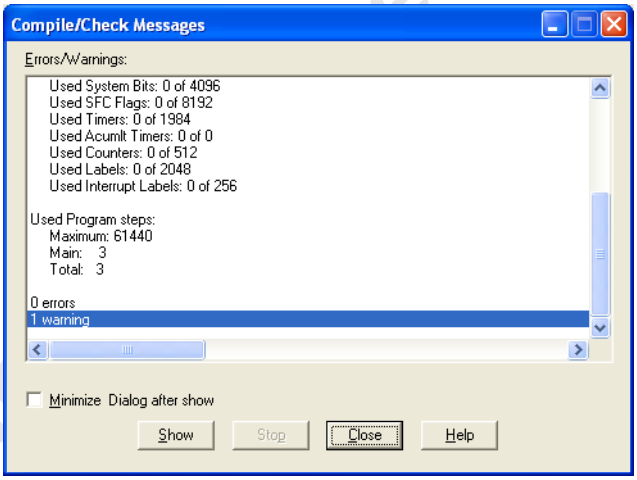


Figure 2-7 Message when compiling

2.2.2.3 Setting the communication path

To set the communication path, proceed as follows:

- Select the "Online, Transfer Setup, Ports" menu from the menu bar.

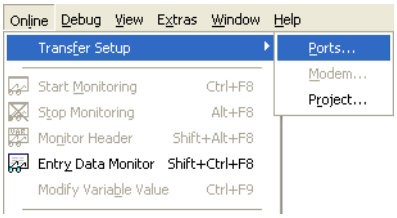


Figure 2-8 Selecting the communication path

- Select the interface to your PC (PC side I/F).
  In the example, the USB interface is used.
  In the following window, double-click on the "Serial USB" icon.

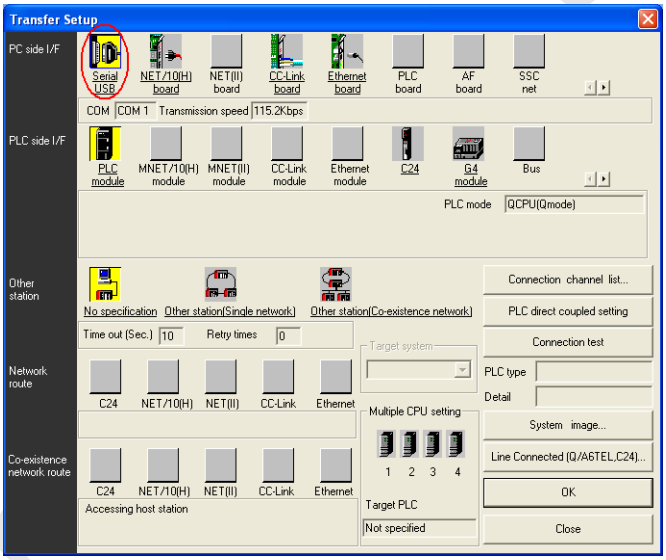


Figure 2-9 Transfer setup

- Select the "USB" interface in the next window.

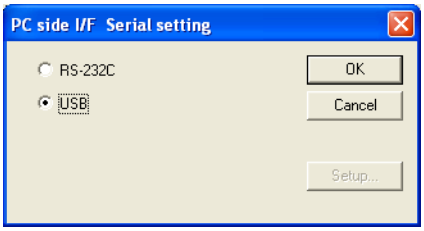


Figure 2-10 USB

- Confirm your selection for "PC side I/F, Serial setting" with "OK".
- Confirm your selection for "Transfer Setup" with "OK".

2.2.2.4 Downloading the project to the controller

To download the project to the controller, proceed as follows:

- Select the "Project, Transfer, Download to PLC" menu from the menu bar.

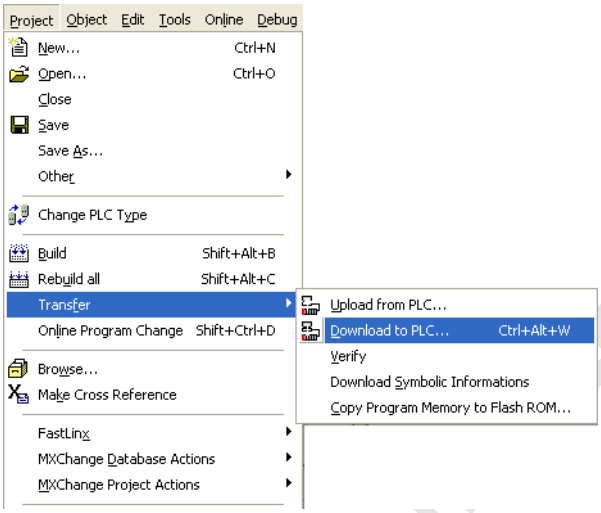


Figure 2-11 Downloading the project to the controller

No settings have to be made in the window that opens.

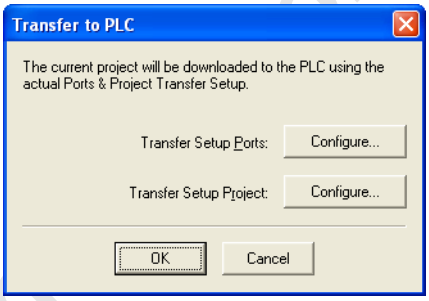


Figure 2-12 Transfer to PLC message

- Confirm the message with "OK".

The program shows the progress of the transfer.

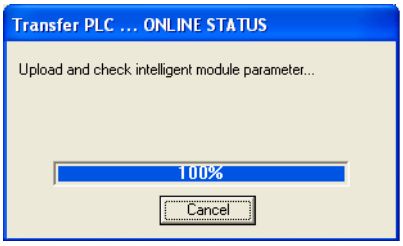


Figure 2-13 Online status of the transfer to the PLC

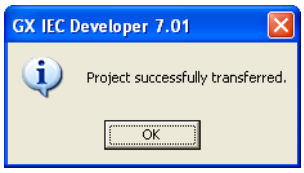


Figure 2-14 Transfer status: Project successfully transferred

Preparing the controller is now completed.

- Install the GX IEC Developer software.
- Change to the GX Configurator DP software.

2.2.2.5 Resetting the controller

To reset the controller, proceed as follows:

- Set the RESET - LCLR switch on the MELSEC Q06HCPU controller (behind the upper front cover) to RESET and then return to its mid position.
- Set the STOP - RUN switch (behind the upper front cover) to RUN.

Now the controller should display the following status:

MODE LED is green

RUN LED is green

The controller is now completely prepared.

2.2.3 Importing the GSD file in the GX Configurator DP software

Requirement: The GX Configurator DP software is open.

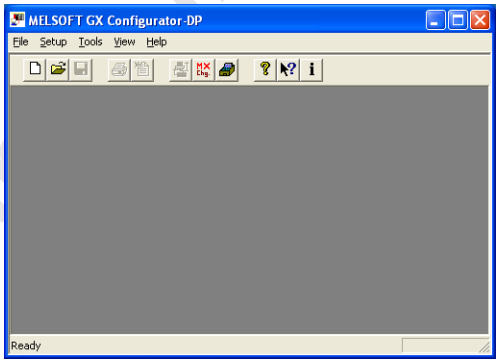


Figure 2-15 GX Configurator DP start screen

There must be a GSD file in the GX Configurator DP software for each device used. If you use an Inline station, the GSD file of the bus coupler includes all information on terminals that can be connected to this bus coupler.

Import the GSD file, if there is no GSD file for the device used. To do this, proceed as follows:

- First, close all projects. This will also be requested with a message.

Figure 2-16 Close all projects window

- Make sure that the GSD file of your bus coupler is stored on your PC. The latest GSDML files for the bus couplers from Phoenix Contact can be found on the Internet at www.download.phoenixcontact.com under the bus couplers.
- Open the "Setup, GSD Device Database" menu in the menu bar of the GX Configurator DP software.
- In the window that appears, click on "Add".

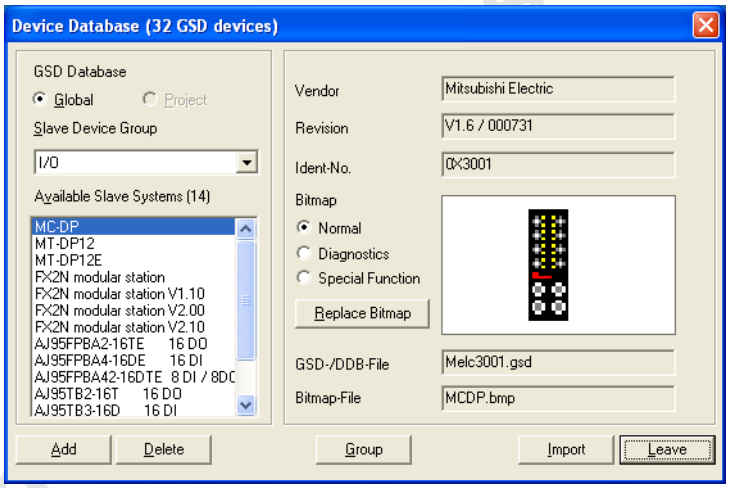


Figure 2-17 GSD database

In the window that opens, select the GSD file to be imported.

- Confirm your selection with "Open".

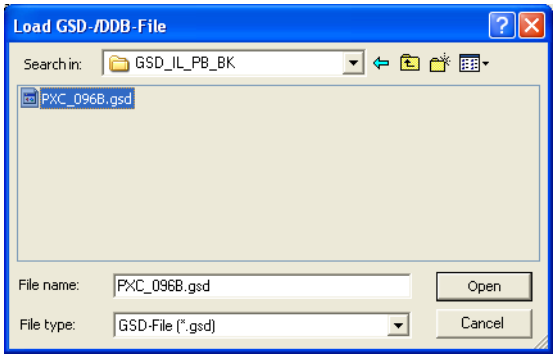


Figure 2-18 Loading the GSD file (here:IL PB BK DI8 DO4-PAC)

If there is a suitable bitmap for the GSD file, the user must store the bitmap in the directory of the GSD file so that it can be linked properly with the GSD file.

- Confirm the message that appears with "Yes".

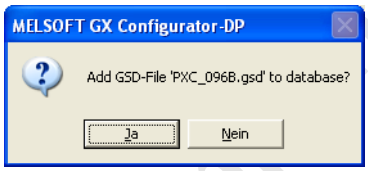


Figure 2-19 Confirming the GSD file

- Confirm the message that appears with "Yes".

Figure 2-20 Message for the GSD file

The device has been added to the GSD database.

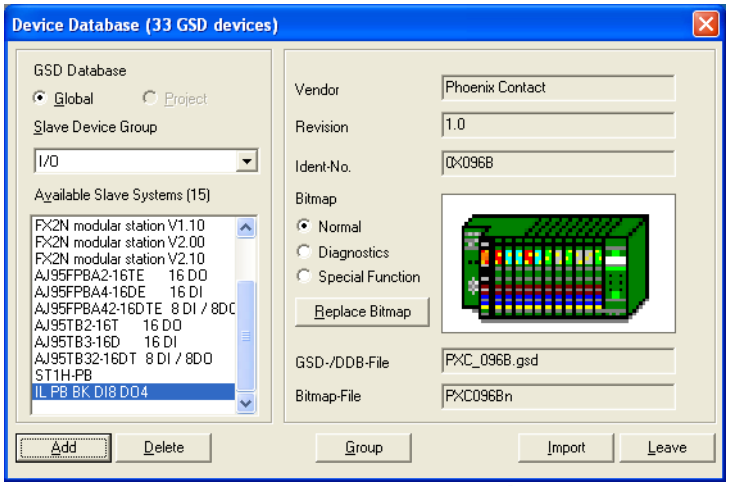


Figure 2-21 Device added to the GSD database

- Exit the dialog with "Leave".

2.3 Creating the PROFIBUS-DP configuration with the GX Configurator DP software

Requirement: The GX Configurator DP software is open.

2.3.1 Creating a new project

- To create a new project in the GX Configurator DP, select the "File, New" menu from the menu bar.
- Select the hardware settings. For the example project:

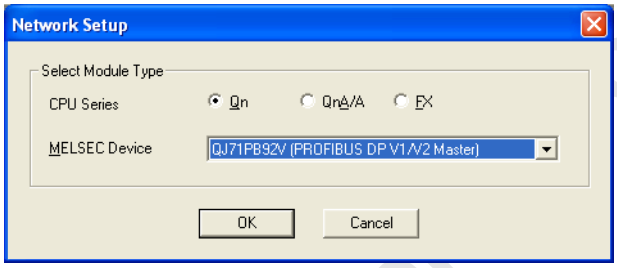


Figure 2-22 Network setup

- Confirm your selection with "OK".
- Save the project. To do so, select the "File, Save as" menu in the menu bar. The name QS_IL_PB_BK is selected here.

The project is mapped as follows:

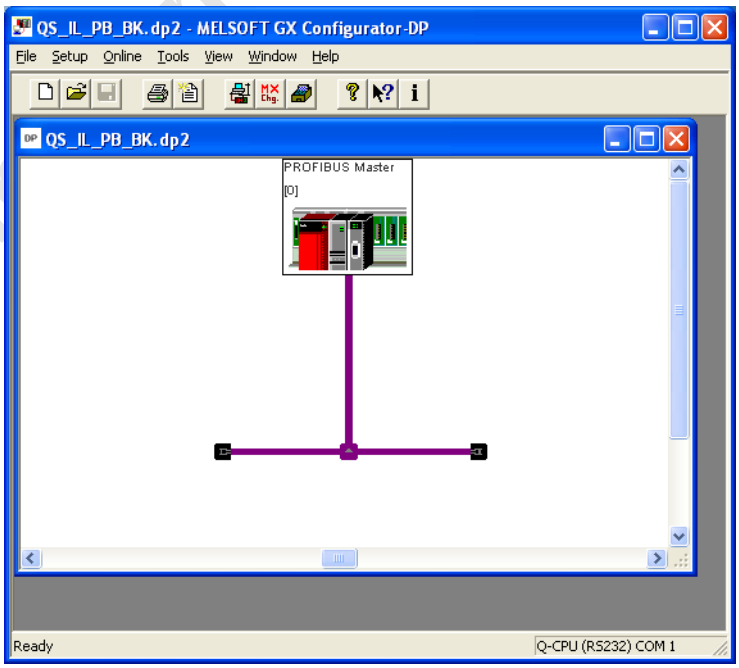


Figure 2-23 Project

2.3.2 Making transfer settings

- Select the "Online, Transfer Setup" menu from the menu bar to define the configuration.
- Select a name for the transfer.

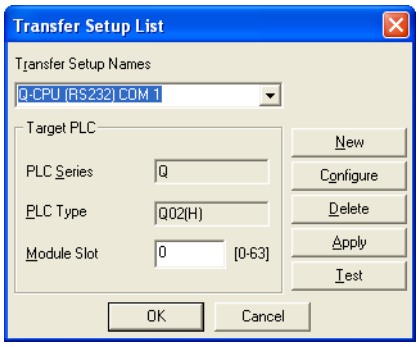


Figure 2-24 Transfer setup

- Click on the "New" button to select the controller type (PLC type) used.
- Select the controller type.

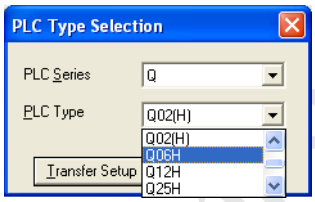


Figure 2-25 PLC type selection

- Then click on the "Transfer Setup" button.
- In the following windows define the transfer setup.
- Select the interface to your PC (PC side I/F).
  In the example, the USB interface is used.
  Therefore, double-click on the "Serial USB" icon.

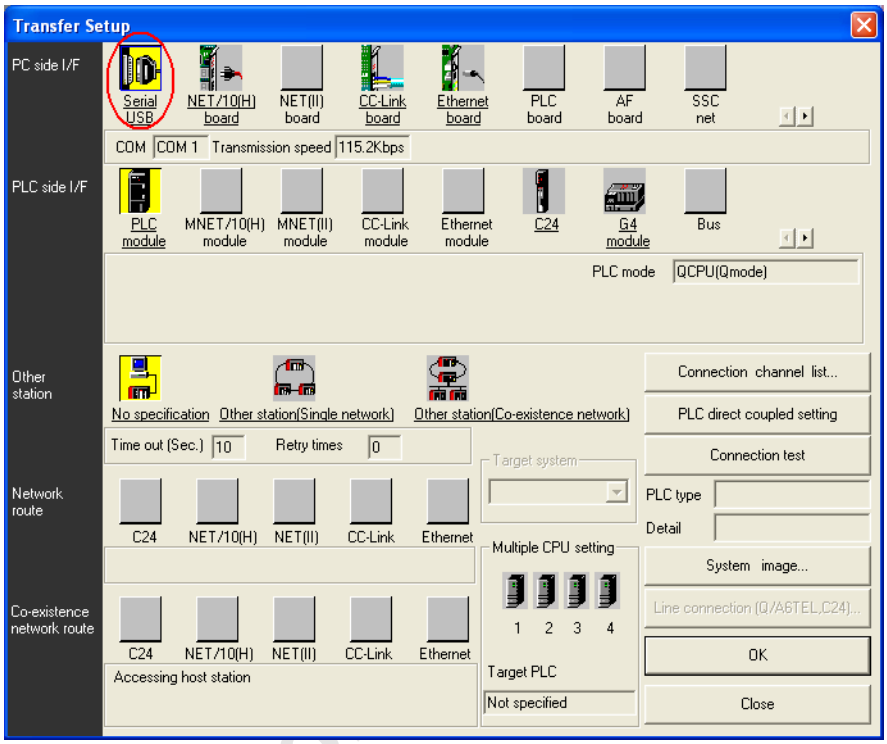


Figure 2-26 Transfer setup: Serial USB

- Select the "USB" interface in the next window.

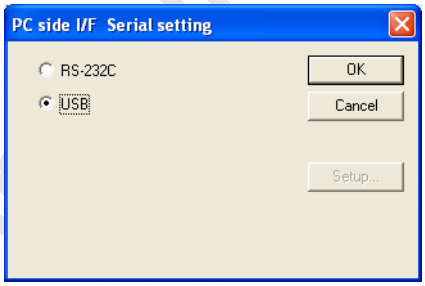


Figure 2-27 USB

- Confirm your selection with "OK".
- Confirm the "Transfer Setup" window with "OK".

The settings made are shown in the following window.

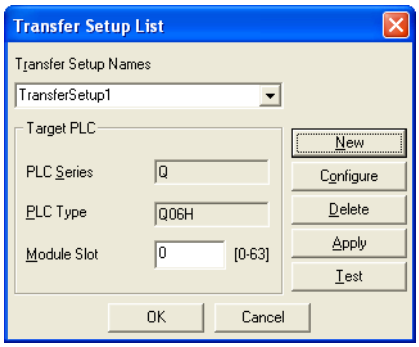


Figure 2-28 Transfer settings made

Under "Module Slot" enter the correct module slot number of the PROFIBUS master. This number can be read in by clicking on the "Test" button. To do this, proceed as follows:

- Click on the "Test" button.

An online connection to the controller is established.

- Confirm the "Connected with PLC" message with "OK".

A list of the occupied slots in the rack is created.

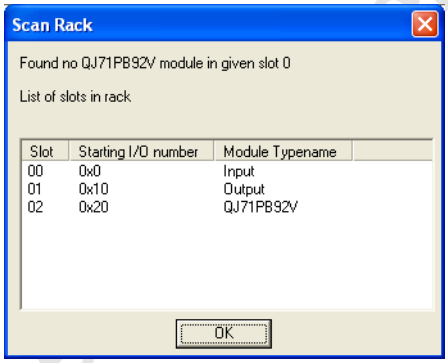


Figure 2-29 Occupied slots

The PROFIBUS-DP master (QJ71PB92V) occupies slot 02.

- Exit the dialog box with "OK".
- Enter slot 2 under "Module Slot" in the "Transfer Setup List" dialog box.

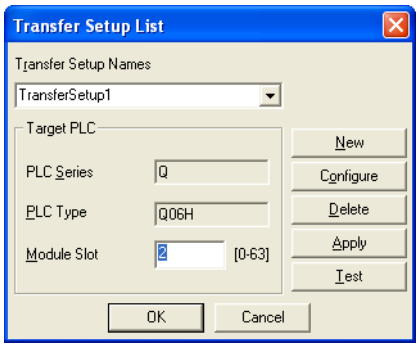


Figure 2-30 Transfer Setup List: Module Slot

- Apply the settings with "Apply".
- Close the dialog box with "OK".

2.3.3 Adding a PROFIBUS-DP slave to the PROFIBUS-DP network

Add a PROFIBUS-DP slave to the network. To do this, proceed as follows:

- Select the "Insert DP-Slave" menu item in the context menu.

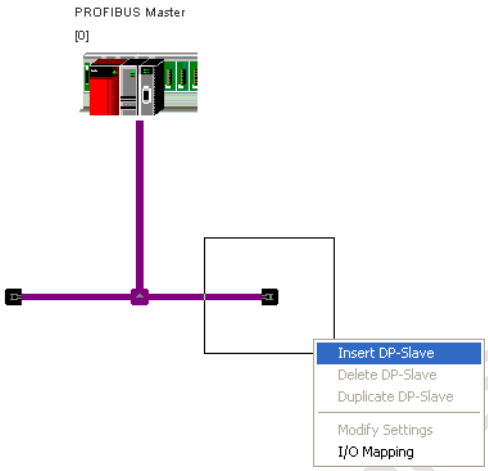


Figure 2-31 Insert DP-Slave

- Select the slave from the GSD database that appears.

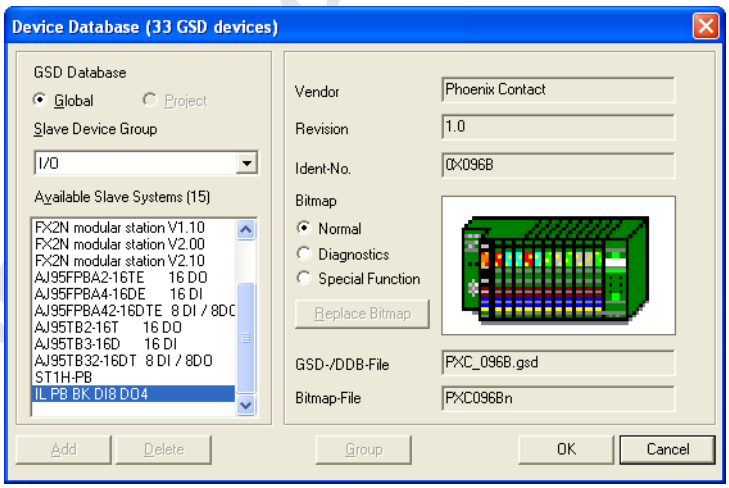


Figure 2-32 Select the slave

- Confirm your selection with "OK".
- Set the parameters of the slave in the window that opens.
  The FDL address corresponds to the PROFIBUS address set on the slave.

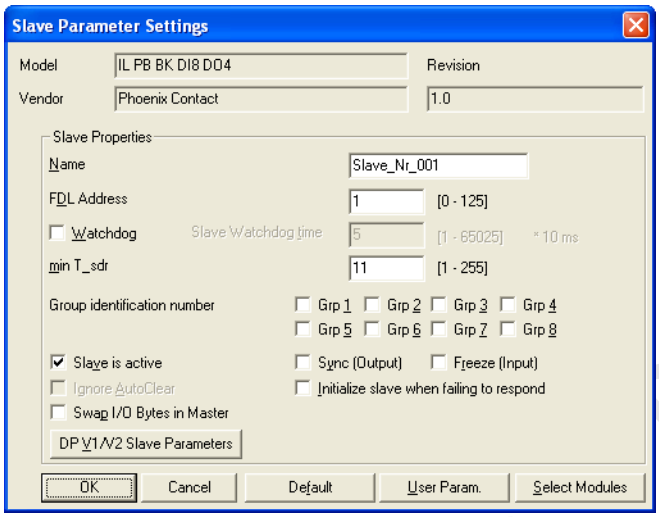


Figure 2-33 Slave parameter settings

- To set user parameters, click on the "User Param." button.
- Adjust the user parameters (see also user documentation of the device used). Use the "Default" button to reset all parameters to their default settings.

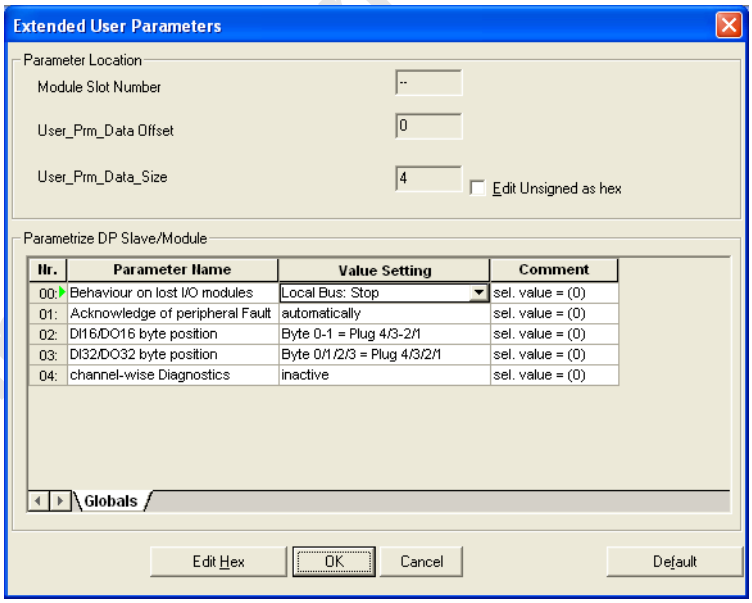


Figure 2-34 Extended user parameters

- Close the dialog box with "OK". You are then in the "Slave Parameter Settings" dialog box again.
- Click on the "Select Modules" button to configure the station.

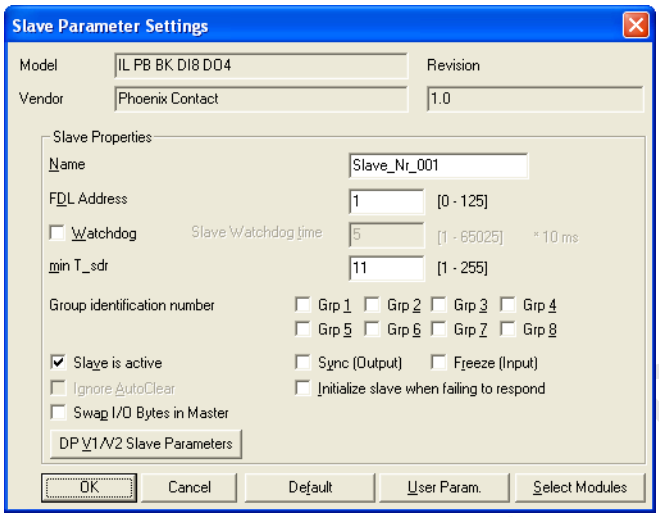


Figure 2-35 Slave Parameter Settings window

The "Slaves Modules" window opens.

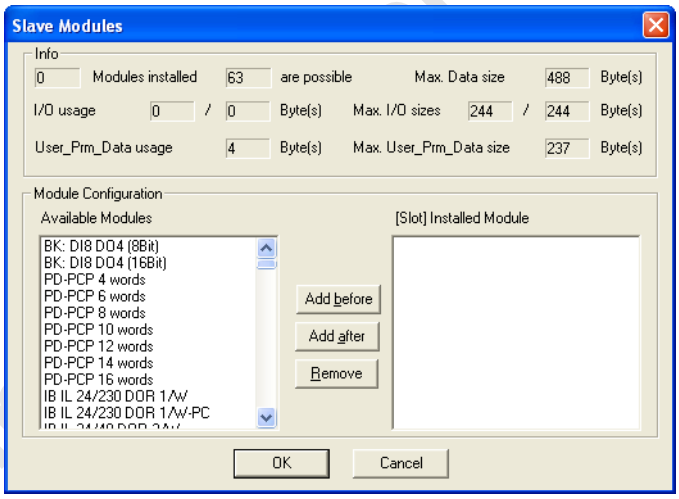


Figure 2-36 Slave Modules window

- Select under "Module Configuration, Available Modules" the devices that are used in the station.

NOTE: Malfunction when ignoring the data consistency over complete words

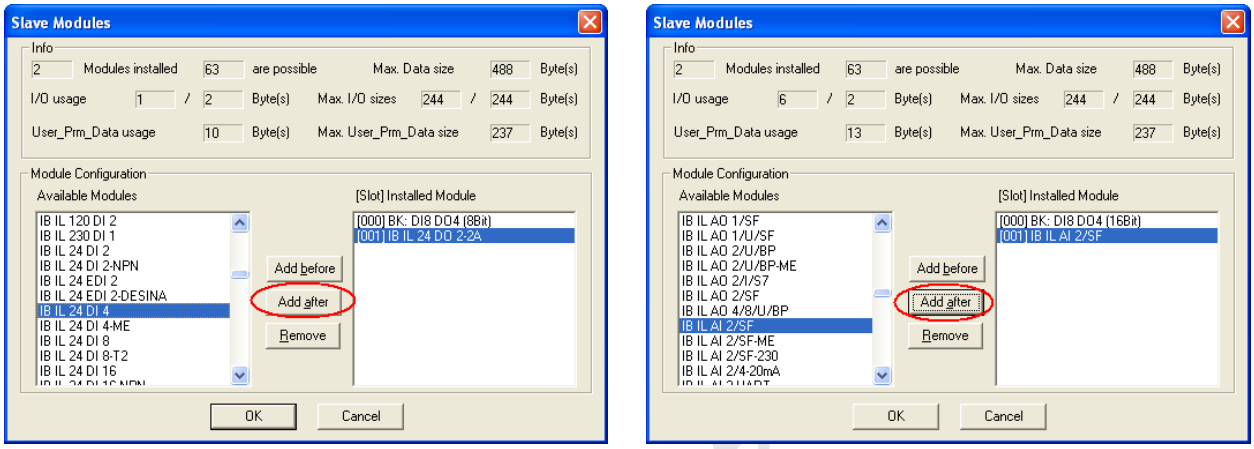
When selecting the modules, please observe Section "Addressing with a Mitsubishi controller" on page 3-1.

- Place the selected devices with the "Add before" or "Add after" buttons under "[Slot] Installed Module".
  Corrections can be made with the "Add before", "Add after" or "Remove" buttons.

For PROFIBUS bus couplers from Phoenix Contact with integrated inputs and outputs, place the description of the integrated inputs and outputs first (e.g., BK:DI8 DO (8Bit)).

Unlike with the SIMATIC manager, the description is not automatically placed at slot 0.

The devices of the station are shown under "[Slot] Installed Module".



Bus coupler added with a data width of 8 bits

Bus coupler added with a data width of 16 bits to guarantee the data consistency of the following 16-bit modules

Figure 2-37 Slave modules

The Info box shows you the resources that you have already used.

- Once you have selected all devices confirm the settings in the "Slave Modules" dialog box with "OK".
- Also confirm the "Slave Parameter Settings" dialog box with "OK".

The PROFIBUS network is displayed as follows:

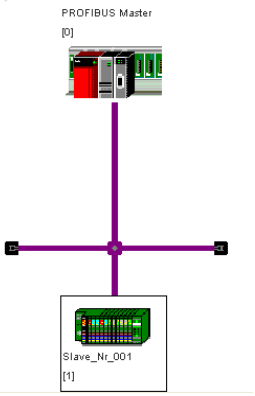


Figure 2-38 PROFIBUS network

3 Addressing with a Mitsubishi controller

3.1 Modules with a process data length of at least one word

Recommendation:

Please make sure that the addressing of modules with a process data length of at least one word always starts at an **even byte address**.

Reasons:

This section explains the reasons for this recommendation.

The addresses on a Mitsubishi controller are assigned physically.

The shortest process data length for PROFIBUS-DP is one byte. Therefore, each module on the DP slave is assigned the next free byte address.

Addressing syntax with a Mitsubishi controller:

Bit address:	D0.0 to D0.F
Byte address:	D0 and D0.8
Word address:	D0, D1, ...

The Mitsubishi controller makes no difference between analog and digital modules. It may happen, for instance, that an odd byte address is assigned to an analog module. As a data consistency of at least one word is required for analog modules, this type of addressing would cause misinterpretation of the values.

Example 1:
Faulty configuration

Use of an IB IL AI 2/SF-PAC analog terminal after the IL PB BK DI8 DO4-PAC bus coupler, that was selected with a data with of 8 bits in the configuration.

The following I/O assignment would result when the configuration does not take the data consistency of the analog module into consideration:

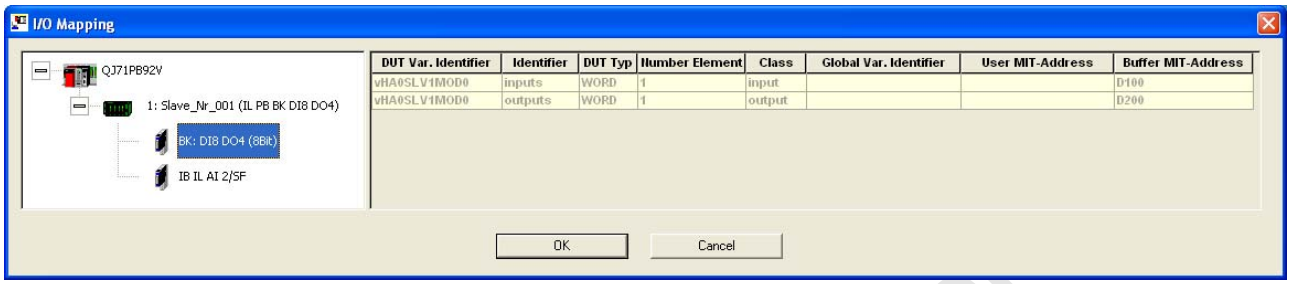


Figure 3-1 I/O assignment of inputs/outputs of the bus coupler - 8 bits

In this configuration the IL PB BK DI8 DO4-PAC bus coupler uses one byte input data. An odd byte address would thus be assigned to the analog terminal.

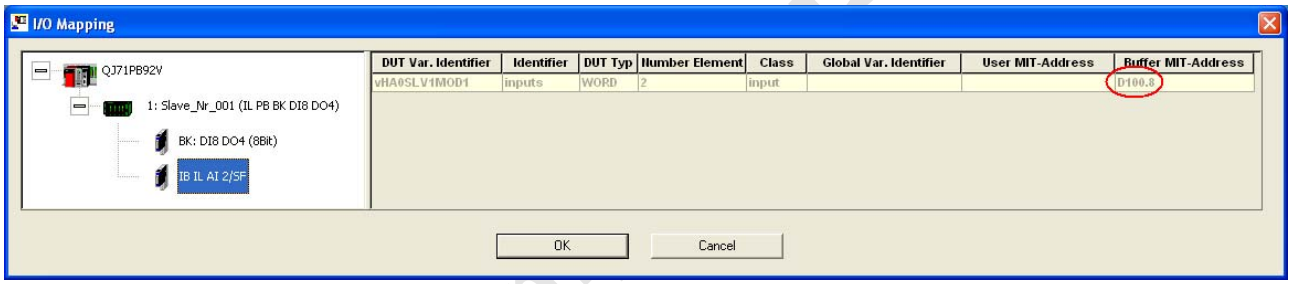


Figure 3-2 I/O assignment of analog inputs (odd byte address)

Address assignment:

BK: DI8 DO4 (8Bit)	D100
IB IL AI 2/SF-PAC	D100.8

This would cause a misinterpretation of data.

Remedy:

One possible solution would be to select another device description for the bus coupler.

There are two entries in the GSD file for the bus coupler.

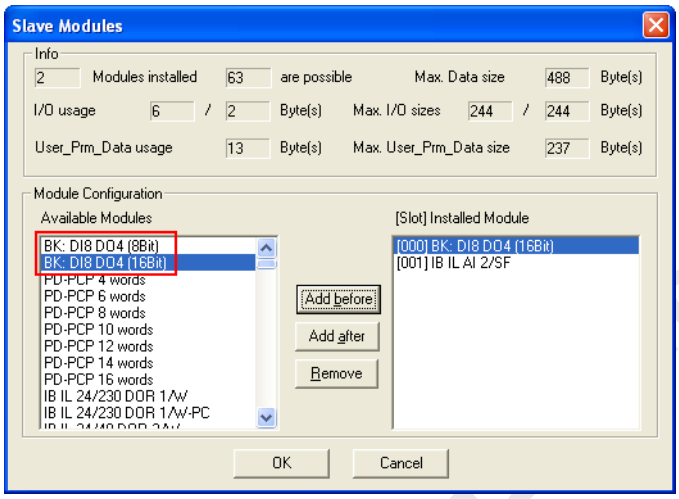


Figure 3-3 Two device descriptions for the IL PB BK DI8 DO4-PAC bus coupler

Example 2:
Correct configuration

In the module configuration select the "BK: DI8 DO4 (16Bit)" module.

It uses one word and the data of the following analog terminal is stored on an even byte address.

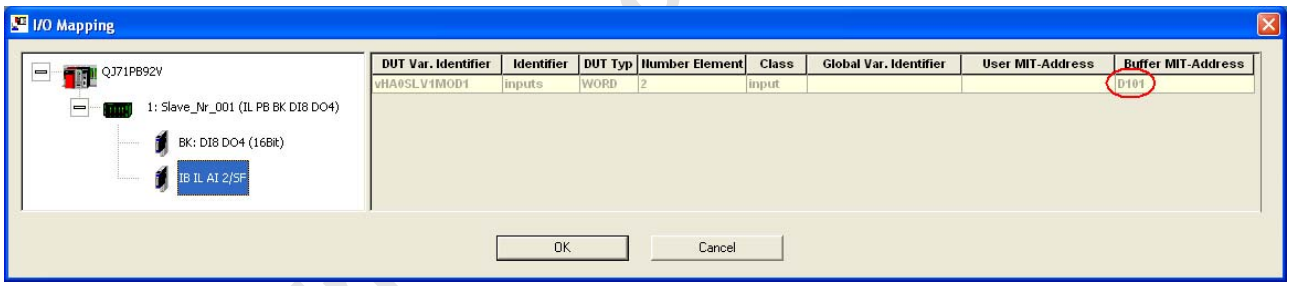


Figure 3-4 I/O assignment of analog inputs (even byte address)

Address assignment:

BK: DI8 DO4	D100
IB IL AI 2/SF-PAC	D101

Check with every configuration

The problem may occur at any position within the station as soon as there is an odd byte number in the address image prior to a terminal with at least one word data width.

Example 3: Faulty configuration despite 16-bit bus coupler

The bus coupler was added with the 16-bit description, but then a 2-bit terminal was used. Thus, an odd byte address is assigned to the analog module.

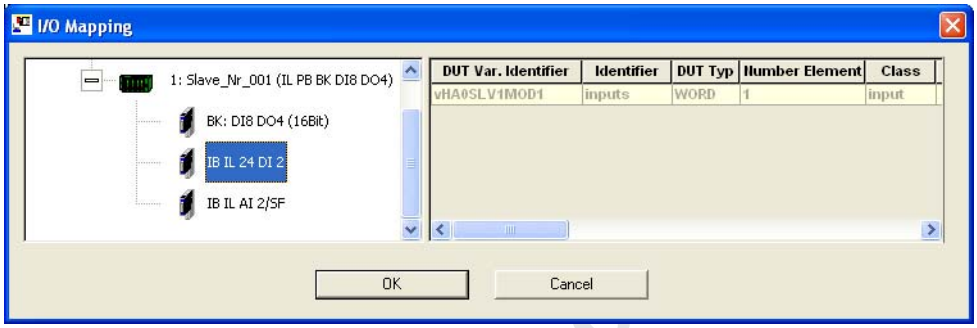


Figure 3-5 I/O assignment for 2 bits

Address assignment:

BK: DI8 DO4 (16Bit)	D100
IB IL 24 DI 2-PAC	D101
IB IL AI 2/SF-PAC	D101.8

3.2 Optimizing the memory space

One byte is assigned to each terminal with a data width of up to eight bits during the I/O assignment.

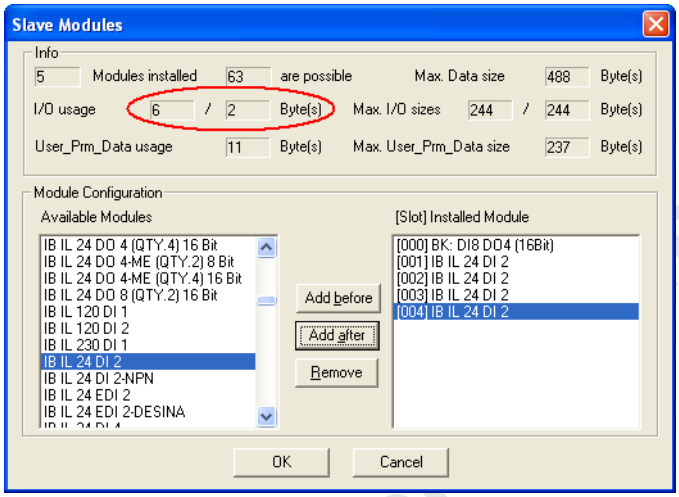


Figure 3-6 Individual descriptions for I/O modules

You can optimize the memory space if you are using several terminals of the same type with a data width of up to eight bits.

- To do this, select under "Available Modules" a compressed description.

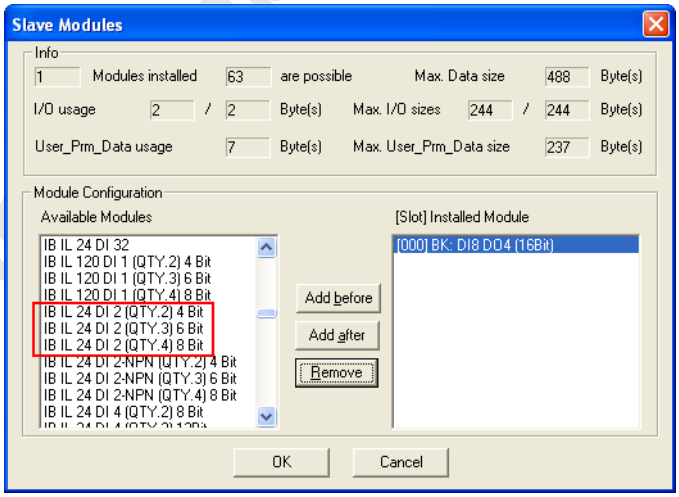


Figure 3-7 Compressed description for I/O modules

QTY (Quantity) indicates the number of modules actually used. If you are using four DI 2 terminals, select the "IB IL 24 DI 2 (QTY4) 8 Bit" description. You then have to make sure that four DI 2 terminals are used in the hardware configuration.

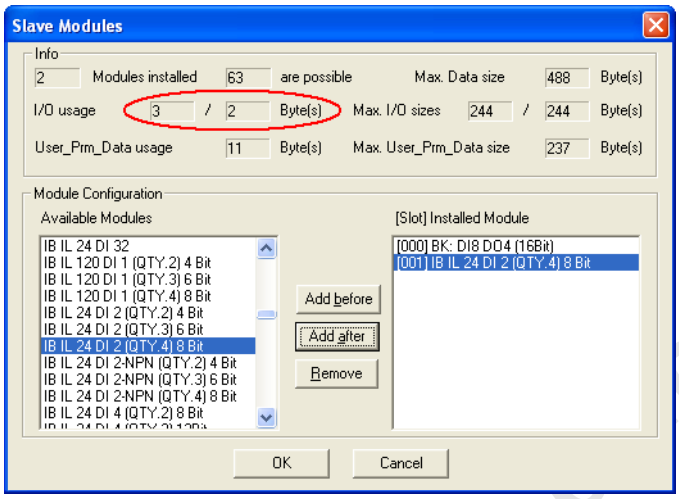


Figure 3-8 Compressed descriptions for four DI 2 terminals

In this compressed description, one byte is assigned to the four DI 2 terminals in the I/O assignment. In a non-compressed description, one byte would be assigned for each terminal which means four bytes for four terminals (see Figure 3-6).