GX Configurator-PN 1.03

Configuration System
for PROFINET IO Networks

Software Manual

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About this Manual

The texts, illustrations, diagrams and examples in this manual are only intended as aids to help explain the functioning, operation, use and programming of the open network configuration system MELSOFT GX Configurator-PN.
Separate manuals are available for MITSUBISHI ELECTRIC's various series of MELSEC programmable logic controllers.

This manual is only intended for users with experience in handling automation and communication networks.
For using and usage of this software only the user his own is responsible.
If you have any questions regarding the installation and operation of the software described in this manual, please do not hesitate to contact your sales office or one of your MITSUBISHI ELECTRIC distribution partners.
You can also obtain information and answers to frequently asked questions from our MITSUBISHI ELECTRIC website under www.mitsubishi-automation.com.

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1 How to Use

This manual...

...is a compact guide to using GX Configurator-PN software suitable both for beginners and experienced users upgrading from other systems. The manual includes explanations of the terms and structural concepts about the software and the configuration of an open network system. The manual provides a precise step-by-step description of how to use GX Configurator-PN including sample projects. The PLC series MELSEC Q Series is referenced as MELSEC system Q in this manual.

If you are not yet familiar with MS Windows...

... please at least read the Windows Fundamentals section in the Windows User's Guide, or work through the Windows Tutorial accessible through the Help menu of the Windows Program Manager. This will teach you what you need to know about using the basic elements of Microsoft ® Windows, and the operating procedures that are identical in all Windows application programs.

If you have problems with parameter settings, ...

... please refer to the user´s manuals of the concerning open network modules.

If you get stuck...

... do not despair, help is never far away! If you run up against seemingly insoluble problems, or if you have questions about GX Configurator-PN or the connected programmable logic controller (PLC) configuration, please first refer to the manuals and documentation. Many answers and solutions can also be found directly in the GX Configurator-PN context-sensitive online help system, which can always be accessed by pressing the <F1> key. If you cannot find answers to your questions in any of these places, contact your local MITSUBISHI ELECTRIC representative or call our European headquarters in Ratingen directly. The addresses and phone numbers are provided on the back covers of our manuals.

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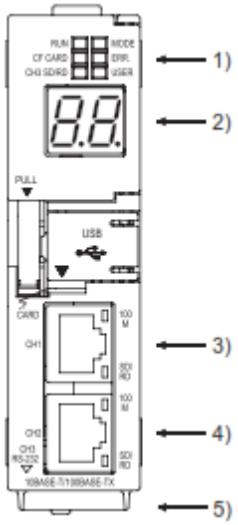
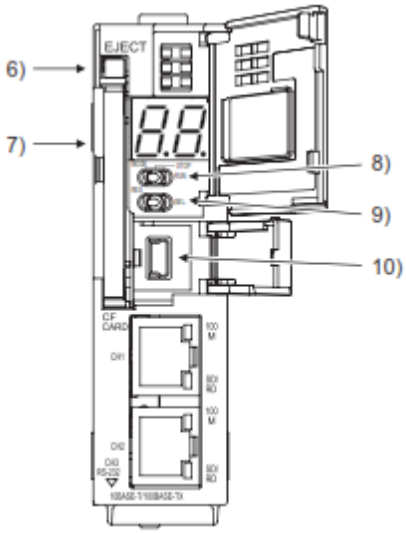
2 PROFINET Controller ME1PN1FW-Q

The ME1PN1FW-Q is a PROFINET RealTime (RT) communication master based on the hardware of the Q12DCCPU-V. The restrictions of the Q12DCCPU-V with regard to environmental, mechanical and electrical conditions apply.

The following drawings indicate the parts of the ME1PN1FW-Q.



Front face with cover closed



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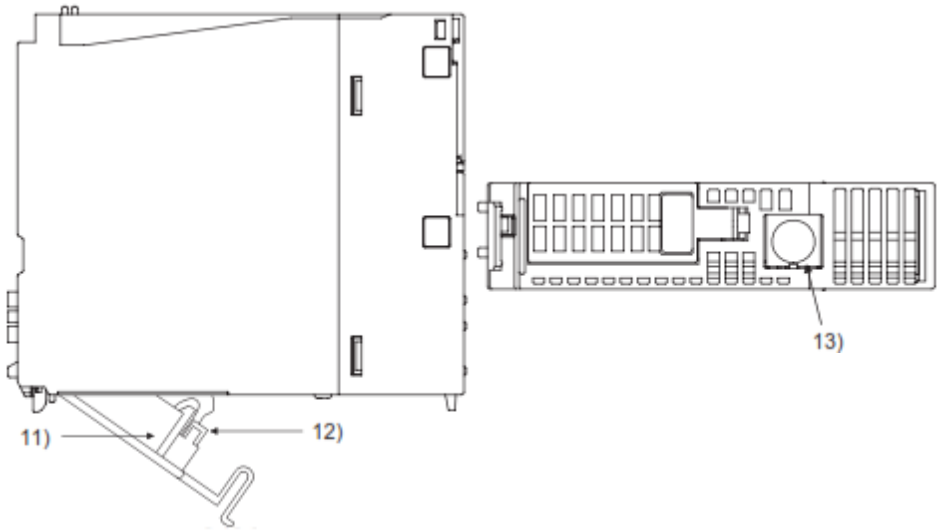

Side face **Bottom face**

Parts list

No.	Name	Description
1	Indicator LEDs	for the USER LED see 'User LED', for the other LEDs consult the Q12DCCPU-V manual
2	7-segment LEDs	see '7-Segment LED Display' for details
3	10BASE-T/100BASE-TX interface connector (RJ45)	Ethernet interface used for configuration and PROFINET I/O communication

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No.	Name	Description
	Channel 1	
4	10BASE-T/100BASE-TX interface connector (RJ45) Channel 2	Not used for the PROFINET Controller
5	Serial number plate	Hardware serial number
6	EJECT button	Press to eject CF card from slot
7	CompactFlash (CF) card installation slot	Slot for installing CF card
8	RUN/STOP/MODE switch	Sets the operation mode
9	RESET/SELECT switch	Used to reset the module
10	USB interface connector	For USB connections Not supported by the PROFINET Controller. The module can only be accessed via the first Ethernet port.
11	Battery	Buffers data in RAM
12	Battery connector pin	Pin to connect battery **Note**: when delivered the battery is not connected to ensure its capacity.
13	RS-232 interface connector	For RS-232 connections Not supported by the PROFINET Controller.

Technical Data

Maximum number of total cyclic input data (1)	9228 bytes
Maximum number of total cyclic output data (1)	9900 bytes
Maximum number of cyclic input data	1437 bytes per device (= IOCR data length)
Maximum number of cyclic output data	1437 bytes per device (= IOCR data length)
Maximum number of configured devices	128
Minimum cycle time	1 ms

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Maximum number of total cyclic input data (1)	9228 bytes
Maximum cycle time	512 ms Different IO-Devices can be configured with different cycle times
RT communication	RT Class 1
Alarm processing	Read/Write Records Limited to 5448 bytes per request
DCP (Discovery & Configure Protocol)	Supported
RPC (Remote Procedure Call)	Supported (up to 4 fragments 5448 bytes)
Baud rate	100 MBit/s Full-Duplex mode
Data transport layer	Ethernet II, IEEE 802.3
LLDP sender	supported

(1) these sizes includes potential padding that could be inserted for variable alignment.

The following limitations apply:
- The usable (minimum) cycle time depends on the number of IO-devices and the total size of input and output data. For example it is not possible due to performance reasons to have 128 IO-devices communicating with a cycle-time of 1 ms.
- RT over UDP, RT Class 2 and RT Class 3 (IRT) are not supported
- Multicast communication is not supported
- DHCP is not supported (neither for the PROFINET Controller nor for the IO-devices)
- Only one input IOCR and one output IOCR per IO-device
- Only one API (API = 0) is supported. Any profile requesting a different API is currently not supported.
- The IO-device feature “FastStartUp” cannot be used
- WriteMultiple-Record service is not supported

System Configuration

The ME1PN1FW-Q uses high speed data transfer for the data exchange with the controlling CPU. It can only be used in combination with QnU-CPUs, which support high speed data transfer. The following QnU-CPUs do not support high speed transfer and therefore cannot be used
- Q00UJ
- Q00U
- Q01U
- Q02U

Mounting the PROFINET Controller in a PLC Rack

The PROFINET Controller must be placed in a slot to the right of the controlling QnU-CPU, but not necessarily next to it. Additional QnU-, Motion- or NC-CPUs can be placed between the controlling QnU-CPU and the PROFINET Controller. Intelligent and I/O modules are supported in the slots follo-

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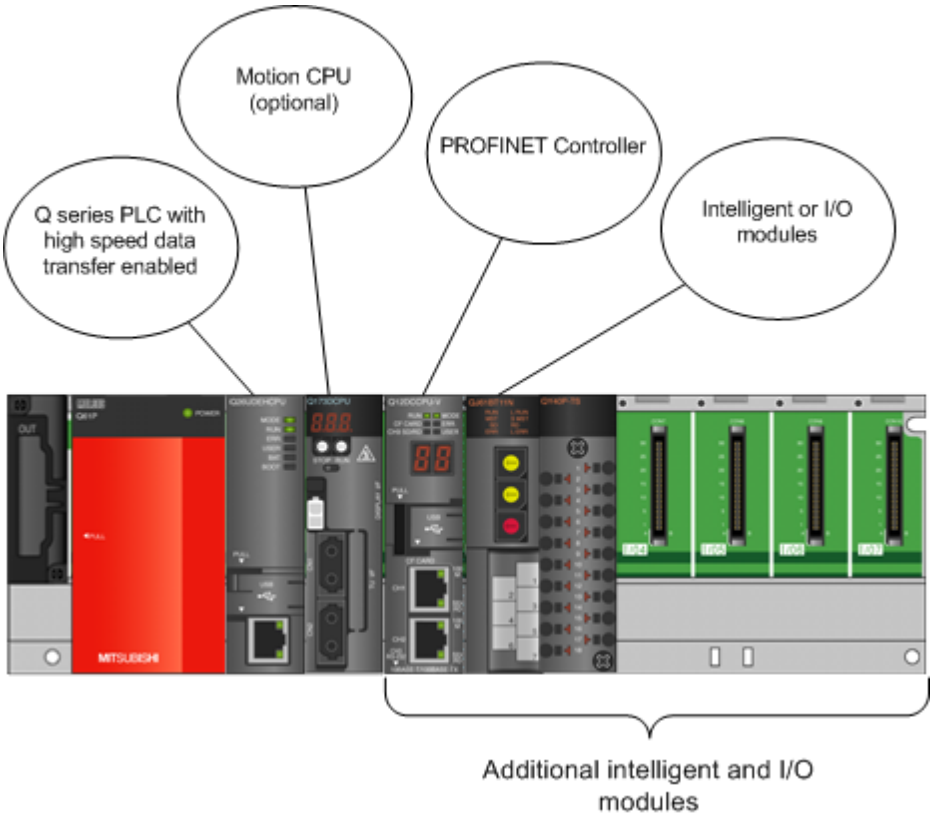
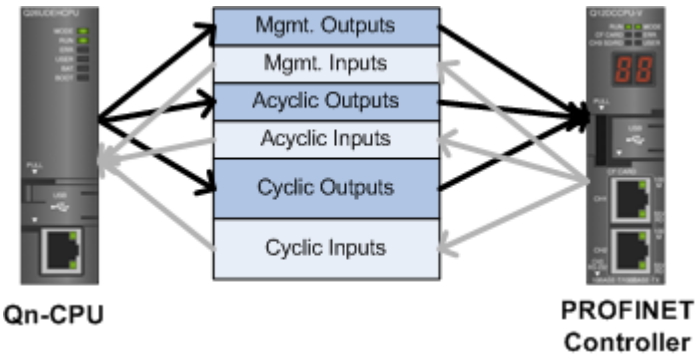
wing the PROFINET Controller.



Note: if any of the intelligent modules requires specific settings in the 'I/O Assignment' configuration, these settings must first be set in the controlling Qn-CPU using the PLC programming software (GX Developer, GX IEC Developer, GX Works 2). After this the I/O assignment settings must be copied to the PROFINET Controller by updating the PROFINET Controller using the 'Update Parameters' dialog. Otherwise the Qn-CPU will signal an error, because the I/O assignment settings on Qn-CPU and PROFINET Controller differ. When using GX Works 2 to set up the controlling QnU-CPU the parameters must not be necessarily be downloaded to the CPU module. If the PLC project path is set in the 'Update Parameters' dialog the I/O assignment information is taken from there instead of uploading them from the module.

2.1 Shared Memory PLC Interface

The communication between the PLC program and the PROFINET Controller is based on a shared memory area (inside the High Speed Area), which is accessed via buffer devices in the CPU (PLC).

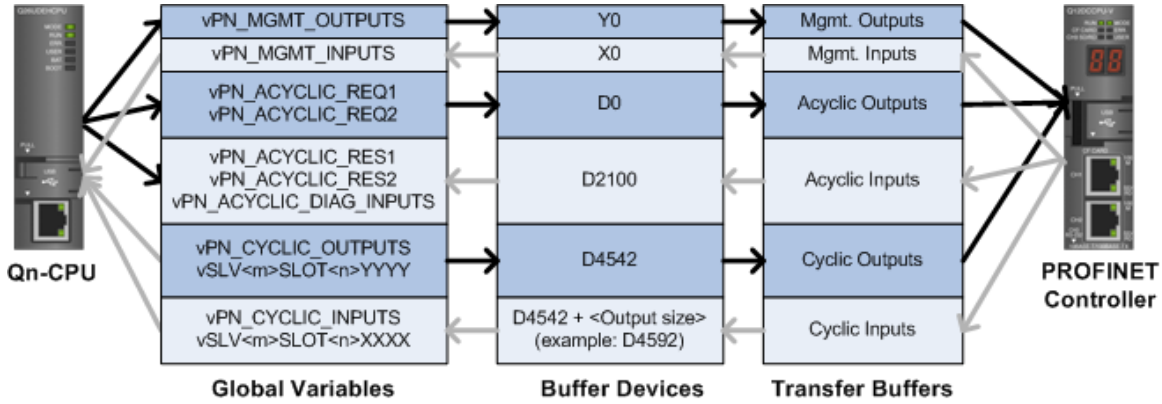


The memory area consists of the following sections

Block	Description
Management Outputs	Control and request flags from the Q-CPU to the PROFINET Controller
Management Inputs	Status and response flags from the PROFINET Controller to the Q-CPU
Acyclic Outputs	Request buffer for acyclic communication
Acyclic Inputs	Response buffer for acyclic communication
Cyclic Outputs	Outputs for I/O devices sent during cyclic data exchange
Cyclic Inputs	Inputs from I/O devices received during cyclic data exchange

Access to Shared Memory From PLC Program

GX Configurator-PN generates PLC code for the interaction of the application program with the PROFINET Controller. The PLC code contains global variables mapped to buffer devices, which are automatically exchanged between Qn-CPU and PROFINET Controller.
The following diagram shows the principal structure. For details see the section 'Global Variables'.



Addresses in High Speed Area

The settings for the high speed transfer in both the controlling Qn-CPU as well as the ME1PN1FW-Q are updated by the GX Configurator-PN software. The address range occupied in the high speed area depends on the size of the cyclic data exchanged between the controller and the I/O devices.

The two following tables list the used high speed memory area addresses for outputs and inputs. Because the size of the memory areas used for management and for acyclic communication are fixed, the total size of required high speed buffers depends only on the size of the cyclic data.

For outputs:

Profinet management	Acyclic Buffer Size	Max Cyclic Output Size (words)	High Speed Area		
			Calculated Minimal Size	Address Start	Address End

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(words)	(words)		(kWords)		
N/A	N/A	N/A	0	N/A	N/A
N/A	N/A	N/A	1	N/A	N/A
N/A	N/A	N/A	2	N/A	N/A
118	2100	854	3	10 000	13071
118	2100	1878	4	10 000	14095
118	2100	2902	5	10 000	15119
118	2100	3926	6	10 000	16143
118	2100	4950	7	10 000	17167

For inputs:

Profinet management (words)	Acyclic Buffer Size (words)	Max Input Size (words)	High Speed Area		
			Calculated Minimal Size (kWords)	Address Start	Address End
N/A	N/A	N/A	0	N/A	N/A
N/A	N/A	N/A	1	N/A	N/A
N/A	N/A	N/A	2	N/A	N/A
112	2442	518	3	10 000	13071
112	2442	1542	4	10 000	14095
112	2442	2566	5	10 000	15119
112	2442	3590	6	10 000	16143
112	2442	4614	7	10 000	17167

The refresh buffers in the high speed memory area are always aligned to the end address of the high speed area, not its start address. The end addresses is calculated by adding the total size of the high speed area to the start address of the memory area (here 0x10000). If the total size of the refresh buffers is not a multiple of kWords, the gap to the next kWord boundary is filled with the 'user area'. Because the user area always starts at address 0x10000, the start addresses of the refresh blocks are variable.
The following tables contain the formulas for calculating the start and the end address of each refresh block.

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Output Areas Offsets Calculation

Block	Start Address	End Address
Cyclic Outputs	End Addr. - Output size + 1	End Addr.
Acyclic Outputs	End Addr. - Output size - 2100 + 1	End Addr. - Output size
Mgmt. Outputs	End Addr. - Output size - 2100 - 118 + 1	End Addr. - Output size - 2100

Input Areas Offset Calculation

Block	Start Address	End Address
Cyclic Inputs	End Addr. - Input size + 1	End Addr.
Acyclic Inputs	End Addr. - Input size - 2442 + 1	End Addr. - Input size
Mgmt. Inputs	End Addr. - Input size - 2442 - 112 + 1	End Addr. - Input size - 2442

Two examples show the application of these formulas for calculating the start and end addresses for a specific combination output and input size, resulting from the corresponding PROFINET configuration.

Example 1: Output size is 900 and Input size is 500.

			Addresses in high speed area				
	Size in word	Nb points (K)	start	end	I/O	Acyclic Buffer	PROFINET Management
Outputs	900	4	10000	14095	13196-14095	11096-13195	10978-11095
Inputs	500	3	10000	13071	12572-13071	10272-12371	10160-10271

Example 2: Output size is 1900 and Input size is 1900.

			Addresses in high speed area				
	Size in word	Nb points (K)	start	end	I/O	Acyclic Buffer	PROFINET Management
Outputs	1900	5	10000	15119	13196-14095	11096-13195	10978-11095
Inputs	1900	5	10000	15119	12372-13071	10272-12371	10160-10271

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Shared Memory Structure

Data from Qn-CPU to PROFINET Controller

Size in Word	Block number (for PLC)	Global Variable Identifiers in Exported PLC Code	Description
High Speed Transmission Area (0x2710 – 0x5F0F)			
1	BLOCK 1 Size: 118	vPN_MGMT_OUTPUTS.IOC_START_STOP	Allows to start or stop the PROFINET IO-Controller.
8		vPN_MGMT_OUTPUTS.IOD_MGT_MODE	Allow to set IO-Device management in automatic or manual mode.
8		vPN_MGMT_OUTPUTS.IOD_START_STOP_DEV	Allow to connect or release connection with an IO-Device.
8		vPN_MGMT_OUTPUTS.IOD_CMD_HSK_Y	PLC to PROFINET Controller handshake flag to perform command indicated in IOD_START_STOP_DEV
8		vPN_MGMT_OUTPUTS.IOD_MGT_ALARM	Allow to enable or disable alarm management by PLC
8		vPN_MGMT_OUTPUTS.IOD_CONSIST	Allow to enable or disable the handshake mechanism for I/O data (so having consistency enabled)
8		vPN_MGMT_OUTPUTS.IOD_INPUT_HSK_Y	PLC to PROFINET Controller handshake flags for Inputs
8		vPN_MGMT_OUTPUTS.IOD_OUTPUT_HSK_Y	PLC to PROFINET Controller handshake flags for Outputs
1		vPN_MGMT_OUTPUTS.ACYC_HSK_Y_REQ1_EXECUTE and ACYC_HSK_Y_REQ2_EXECUTE	PLC to PROFINET Controller handshake bits for acyclic requests (2 bits used)
60		Reserved	Reserved for future use
750	BLOCK 2	vPN_ACYCLIC_REQ1	Buffers for acyclic re-

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750	Size: 2100	vPN_ACYCLIC_REQ2	quest data (2 buffers - max 1500 bytes each incl. header)
600		Reserved	Reserved
1	BLOCK 3 Size: 4950 max	vPN_CYCLIC_OUTPUTS.LIVE_WORD_Y	PLC to PROFINET Controller live register
Varia-ble, Up to 4949		variable names for cyclic I/O data are user-defined	output data sent to IO-Devices. The data size is variable up to 9898 bytes.

Data from PROFINET Controller to Qn-CPU

Size in Word	Block number (for PLC)	Global Variable Identifier	Description
High Speed Transmission Area (0x2710 – 0x5F0F)			
2	BLOCK 1 Size: 112	vPN_MGMT_INPUTS.IOC_STS_*	IO Controller Status
8		vPN_MGMT_INPUTS.IOD_CMD_HSK_X	PROFINET Controller to PLC handshake flag to acknowledge command in IOD_START_STOP_DEV
8		vPN_MGMT_INPUTS.IOD_INPUT_HSK_X	PROFINET Controller to PLC handshake flags for Inputs
8		vPN_MGMT_INPUTS.IOD_OUTPUT_HSK_X	PROFINET Controller to PLC handshake flags for Outputs
1		vPN_MGMT_INPUTS.ACYC_HSK_X_*	PROFINET Controller to PLC handshake bits for acyclic requests (2 bits used)
8		vPN_MGMT_INPUTS.IOD_ALARM_IND	Alarm indication
8		vPN_MGMT_INPUTS.IOD_CONN_STS	Connection status flag 0: IO-device Not connec-ted 1 Device connected
8		vPN_MGMT_INPUTS.IOD_ERR_STS	Device ERROR flag 0: device no error

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			1 Device in error
61		Reserved	
750	BLOCK 2 Size 2442	vPN_ACYCLIC_RES1	Buffers for acyclic request answer (2 buffers - max 1500 bytes each incl. header)
750		vPN_ACYCLIC_RES2	
20		vPN_ACYCLIC_DIAG_INPUTS.ADV_DIAG_*	Advanced diagnostic information about issues with PROFINET
256		Reserved for future time stamping	Not Used. Reserved
2		vPN_ACYCLIC_DIAG_INPUTS.CNF_CRC	Configuration CRC value.
64		vPN_ACYCLIC_DIAG_INPUTS.IOD_ADV_STS	Advanced device status 1 : Never Connected 0: Connected 2: Disconnected 3: Connected in error (IOPS/IOCS/APDU STATUS in error state) 4: time Out
600		Reserved	
1	BLOCK 3 Size 4678 max	vPN_CYCLIC_INPUTS.LIFE_WORD_X	PROFINET Controller to PLC live register
Up to 4677		variable names for cyclic I/O data are user-defined	Input data received from each IO-Device. Size up to 9345 bytes.

2.1.1 Management Area

IOC_START_STOP Register

This register is set or cleared by the control CPU to start or stop the PROFINET Controller.

From CPU to PROFINET IO-Controller		
Global Var. Identifier	**Values**	
	0	**1**
vPN_MGMT_OUTPUTS.IOC_START_STOP	IO-controller has to be stopped If the IO-controller is not started, nothing is done by	IO-controller has to be started If the IO-controller is started, nothing is done by PROFINET

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	PROFINET firmware. If the IO-controller is starting or started, each connection will be automatically released by the firmware, even if the connection is in manual management.	firmware. If the IO-controller is stopping (stop sequence), the firmware will continue the stop sequence up to the end and then will initiate again a start sequence. If the IO-controller is stopped, the IO-controller will be started. The controller will try to start each connection with an IO-device, which is configured with automatic management mode (1). Each connection with a device in manual management mode will not be up until the PLC explicitly sends a command to the device.

(1) See IOD_MGT_MODE registers. By default the IO-device management is in automatic mode (bits are 0). If the PLC does nothing, every connection will automatically be started, when the IO-controller is started.

IOD_MGT_MODE Registers

With these 128 bits the PLC can indicate, how each connection to an IO-device should be managed by the firmware.

- for an IO-device in automatic mode the IO-controller will initiate the connection, until the connection is established.
- for an IO-device in manual mode the IO-controller will wait for commands from the PLC to manage the connection (see IOD_START_STOP and IOD_CMD_HSK_Y registers).

From CPU to PROFINET IO-Controller			
Global Variable Identifier	**IO-Device Number**	**Values**	
		0	**1**
vPN_MGMT_OUTPUTS.IOD_MGT_MODE[0] … vPN_MGMT_OUTPUTS.IOD_MGT_MODE[15]	0 .. 15	Automatic .. Automatic	Manual .. Manual
vPN_MGMT_OUTPUTS.IOD_MGT_MODE[16] … vPN_MGMT_OUTPUTS.IOD_MGT_MODE[31]	16 .. 31	Automatic .. Automatic	Manual .. Manual
…	…	…	…
vPN_MGMT_OUTPUTS.IOD_MGT_MODE[116] … vPN_MGMT_OUTPUTS.IOD_MGT_MODE[127]	116 .. 127	Automatic .. Automatic	Manual .. Manual

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IOD_START_STOP_DEV Registers

With these 128 bits the PLC specifies, which command will be executed when the corresponding command handshake flag (see IOD_CMD_HSK_Y) is set. These registers are relevant only for devices, which are in manual management mode (see IOD_MGT_MODE).

From CPU to PROFINET IO-Controller			
Global Variable Identifier	IO-Device Number	Values	
		0	1
vPN_MGMT_OUTPUTS.IOD_START_STOP_DEV[0] … vPN_MGMT_OUTPUTS.IOD_START_STOP_DEV[15]	0 .. 15	Release connection	Establish connection
vPN_MGMT_OUTPUTS.IOD_START_STOP_DEV[16] … vPN_MGMT_OUTPUTS.IOD_START_STOP_DEV[31]	16 .. 31		
…	…		
vPN_MGMT_OUTPUTS.IOD_START_STOP_DEV[116] … vPN_MGMT_OUTPUTS.IOD_START_STOP_DEV[127]	116 .. 127		

IOD_CMD_HSK_X and IOD_CMD_HSK_Y Registers

With the 128 bits the PLC can ask the PROFINET Controller to execute command(s) previously defined in the corresponding IOD_START_STOP register(s).
When the command(s) are completed, the PROFINET Controller sets the corresponding bit(s) in the IOD_CMD_HSK_Y registers. The PLC can then verify the connection status via the IOD_CONN_STS registers.

From CPU to IO-Controller		From IO-Controller to CPU	
Global Var. Identifier	Function	Global Var. Identifier	Function
vPN_MGMT_OUTPUTS.IOD_CMD_HSK_Y[0]	Trig command for device 0	vPN_MGMT_INPUTS.IOD_CMD_HSK_X[0]	command for device 0 executed
…	Trig command for device n	…	command for device n executed
vPN_MGMT_OUTPUTS.IOD_CMD_HSK_Y[127]	Trig command for device 127	vPN_MGMT_INPUTS.IOD_CMD_HSK_X[127]	command for device 127 executed

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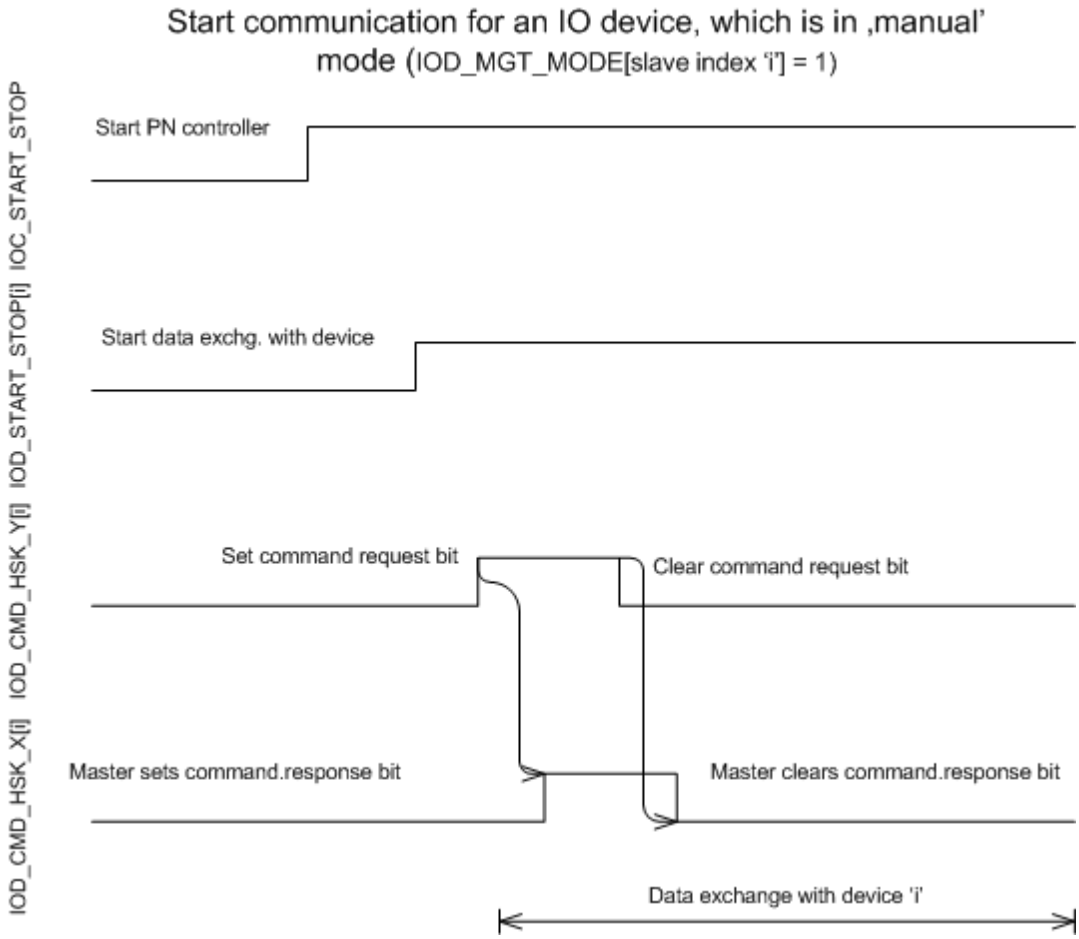
Example for Starting PROFINET Communication

If the data exchange mode for an IO device is set to 'automatic' (corresponding bit in IOD_MGT_MODE is 0), the cyclic data exchange with the device is automatically initiated, when the PROFINET Controller is started by setting IOC_START_STOP. If the device is however set to 'manual' mode, the data exchange between the PROFINET Controller and the device must be started separately by setting the bit in IOD_START_STOP_DEV, which corresponds to the device. The PROFINET Controller only evaluates a bit in IOD_START_STOP_DEV, if the equivalent bit in IOD_CMD_HSK_Y is set.



2.1.2 Cyclic Communication Area

Process Data (Cyclic Data Exchange)

From the PROFINET perspective the cyclic communication is a continuous transfer of input and output data between the IO-controller and each IO-device without further interaction by the application. In PROFINET the cyclic communication is based on the producer/consumer model. For each IO-device, the IO-controller establishes connection with a specific refresh period (duration of the cycle). The cyclic data exchange can be individually started or stopped for each PROFINET IO-device.

Inputs and outputs are exchanged between the PLC and the PROFINET Controller via the INPUT_DATA and OUTPUT DATA buffers.

- I/O variables configured in GX Configurator-PN are located inside these two buffers by respecting some alignment rules.
- As these buffers can be accessed simultaneously from the PROFINET Controller and the PLC, a

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handshake mechanism exists to ensure consistency on all variables. This mechanism is optional and can be activated and deactivated per device.

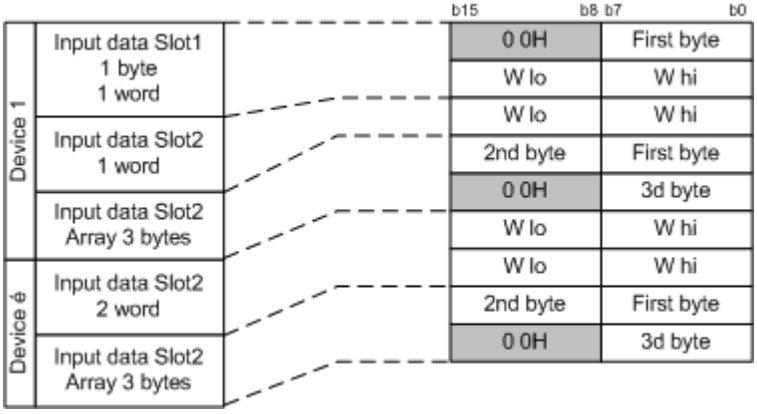
Input and Output Data Alignment

The IO-device input and output areas in the buffer memory of the PROFINET Controller are word-aligned. PROFINET variables are located in the shared memory by respecting the following rules

- The data of each PROFINET IO-device is placed at an address on a word boundary, independent of its type.
- Single or array variables must be aligned on an address modulo of the minimum of both the PLC alignment (2) and the native type size (1, 2 or 4). So specifically
  - o Each slot should always be located at the next available word boundary address
  - o BYTEs or BYTE ARRAYS of the same slot are packed in memory to follow directly the previous defined variable
  - o WORDs should always be located at the next available word boundary address
  - o DWORDs, FLOATs should be also located at a word boundary address

Additionally all WORD, DWORD and FLOAT variables are stored in little-endian format in shared memory, to ease interpretation of the variables by the PLC program.

Example:



IO-Device Consistency Management (IOD_CONSIST Registers)

The Q-series OS can ensure data consistency within a word in the data exchange via Autorefresh. The Autorefresh settings of the respective module contain a module specific X-device, which the communication module resets during access to the buffer memory. The CPU must check this device before accessing the buffer memory. If consistency handling has been disabled in the module, the device remains permanently set. The single X-device can only control access to the I/O data of all slaves together. An individual handshake for each station is not possible with this approach.

Using the following 128 bits the PLC can enable and disable at any time the consistency management per device.

From CPU to PROFINET IO-Controller			
Global Variable Identifiers	**IO-Device Number**	**Values**	
		0 (default)	**1**
vPN_MGMT_OUTPUTS.IOD_CONSIST[0] … vPN_MGMT_OUTPUTS.IOD_CONSIST[15]	0 .. 15	Disable Consistency	Enable Consistency

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From CPU to PROFINET IO-Controller			
Global Variable Identifiers	**IO-Device Number**	**Values**	
		0 (default)	**1**
vPN_MGMT_OUTPUTS.IOD_CONSIST[16] … vPN_MGMT_OUTPUTS.IOD_CONSIST[31]	16 .. 31		
…	…		
vPN_MGMT_OUTPUTS.IOD_CONSIST[116] … vPN_MGMT_OUTPUTS.IOD_CONSIST[127]	116 .. 127		

Therefore station-specific handshake flags are added to the shared memory, which block simultaneous access to the same input or output area by both the master and the PLC program. This solution is slower, but has the following advantages:

1. IO-controller checks the configuration to detect stations, which require consistency
2. it marks those stations, which require consistency for inputs and outputs.
3. handshake controls access to each station separately, not blocking simultaneous access to all stations

The disadvantage of this solution is the delay between two updates data from PLC.

Note: PLC CPU and PROFINET Controller cannot write to the same area in shared memory. Therefore the handshake mechanism requires to define two bits for device inputs and two bits for device outputs.

Output Handshake Registers (IOD_OUTPUT_HSK_Y and IOD_OUTPUT_HSK_X)

From CPU to IO-Controller	
Global Variable Identifier	**Function**
vPN_MGMT_OUTPUTS.IOD_OUTPUT_HSK_Y[0]	Take into account new outputs for device 0
…	Take into account new outputs for device n
vPN_MGMT_OUTPUTS.IOD_OUTPUT_HSK_Y[127]	Take into account new outputs for device 127

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From IO-Controller to CPU	
Global Variable Identifier	**Function**
vPN_MGMT_INPUTS.IOD_OUTPUT_HSK_X[0]	New Outputs read (will be sent to the IO-device 0 during next exchange)
…	New Outputs read (will be sent to the IO-device n during next exchange)
vPN_MGMT_INPUTS.IOD_OUTPUT_HSK_X[127]	New Outputs read (will be sent to the IO-device 127 during next exchange)

Input Handshake Registers (IOD_INPUT_HSK_Y and IOD_INPUT_HSK_X)

From CPU to IO-Controller	
Global Variable Identifier	**Function**
vPN_MGMT_OUTPUTS.IOD_INPUT_HSK_Y[0]	New Inputs of the IO-device 0 has been read.
…	New Inputs of the IO-device n has been read.
vPN_MGMT_OUTPUTS.IOD_INPUT_HSK_Y[127]	New Inputs of the IO-device 127 has been read.

From IO-Controller to CPU	
Global Variable Identifier	**Function**
vPN_MGMT_INPUTS.IOD_INPUT_HSK_X[0]	Take in account new inputs from device 0
…	Takes in account new input from device n
vPN_MGMT_INPUTS.IOD_INPUT_HSK_X[127]	Takes in account new input from device 127

Note: the ‘Input/output PLC-side flags’ are set and cleared by the PLC program, the ‘Input/output master-side flags’ are set and cleared by the master. In general write access is permitted to the input or output area of a station, if both flags are equal (0 ,0 or 1,1). Read access is permitted if both flags differ (0 ,1 or 1, 0).

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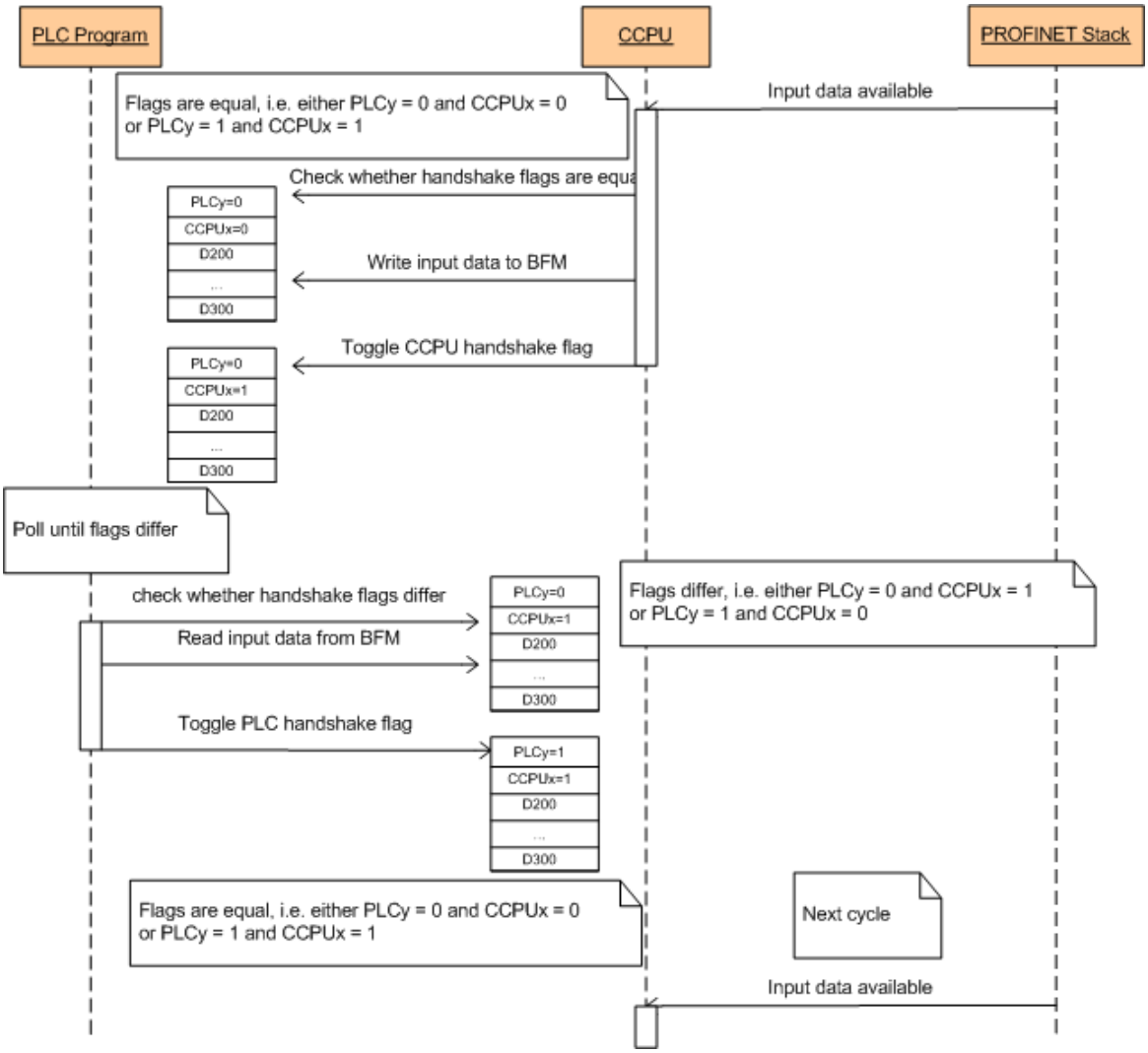
Access to Input Data

The following procedure must be followed, if the 'Input consistency flag' corresponding to the station is set.



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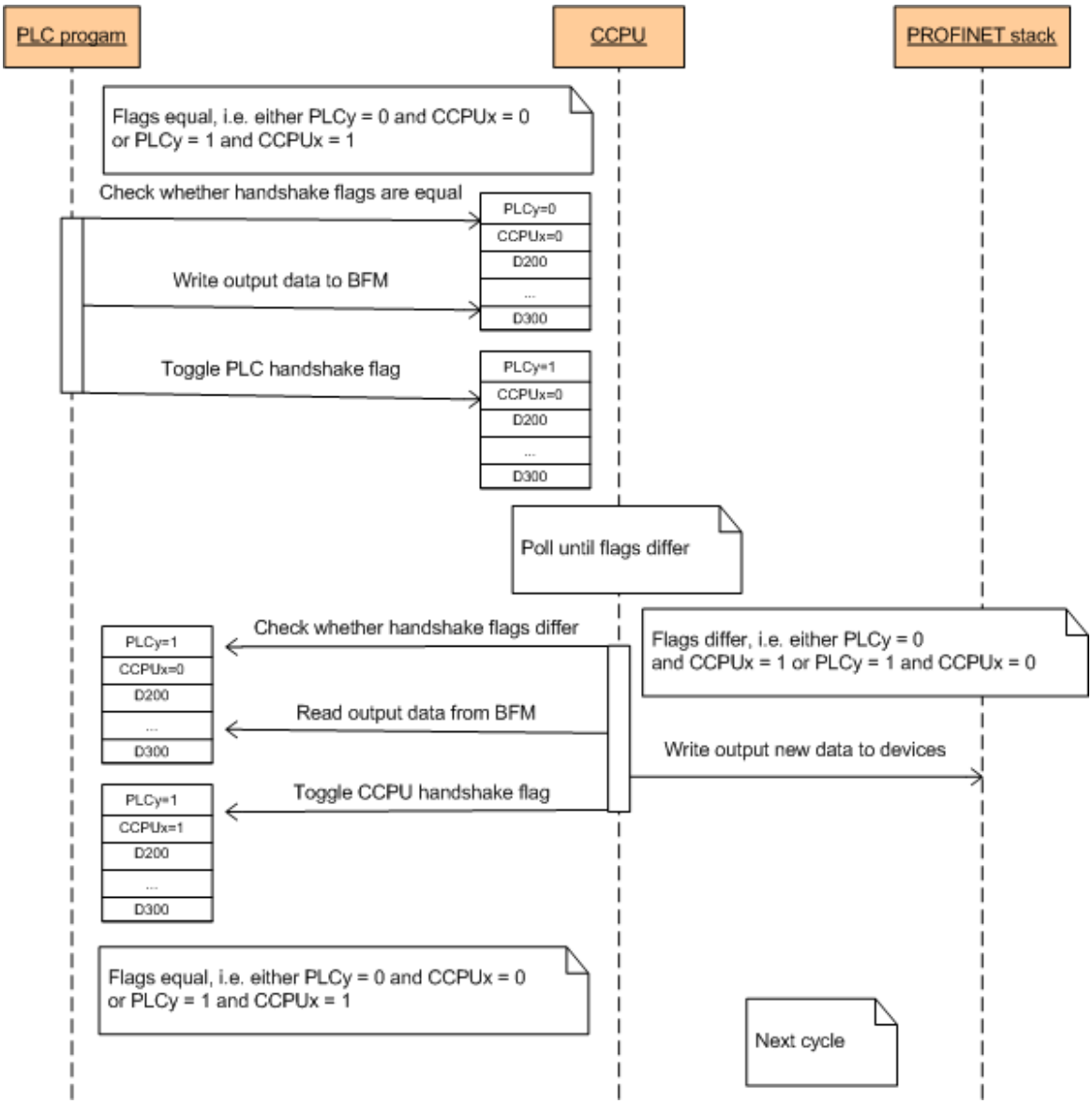
Access to Output Data

The following procedure must be followed, if the 'Output consistency flag' corresponding to the station is set.



Cycle 1:

1. The PLC CPU detects that the output buffer is free because values of the handshake flags are equal (0:0 for cycle 1)
2. The PLC CPU writes the output data to the OUTPUT_DATA buffer
3. The PLC CPU toggles its handshake flag (0 -> 1 for cycle 1)
4. The PROFINET Controller detects that the values of the handshake flags are different
5. The PROFINET Controller reads the output data from the OUTPUT_DATA buffer
6. The PROFINET Controller signals that the output buffer is free by toggling its bit to equal the one of the PLC CPU (0 -> 1 for cycle 1)
7. The cycle 1 is completed

Cycle 2:

1. The PLC CPU detects that the output buffer is free (1:1 in handshake flags)
2. The PLC CPU writes the output data to buffer memory
3. The PLC CPU toggles its handshake flag (1 -> 0 for cycle 2)
4. The PROFINET Controller detects that the values of the handshake flags are different

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5. The PROFINET Controller reads the output data from buffer memory
6. The PROFINET Controller signals that the output buffer is free by toggling its bit to equal that of the PLC CPU (1 -> 0 for cycle 2)
7. The cycle 2 is completed

2.1.3 Acyclic Communication Area

The acyclic communication is an exchange of request and response messages between the PROFINET Controller and each IO-device station. The message exchange must be initiated by the controller.

Acyclic Request/Response Buffers

The shared memory area contains two pairs of buffers (vPN_ACYCLIC_REQ1/2 and vPN_ACYCLIC_RES1/2) allowing two acyclic requests to be performed simultaneously.:
- vPN_ACYCLIC_REQ1 and vPN_ACYCLIC_REQ2 allow PLC to deposit a request.
- vPN_ACYCLIC_RES1 and vPN_ACYCLIC_RES2 allows to get the respective answers

To manage synchronization, some handshake bits are used. A request buffer can be used to send a request to any of the configured stations; there is no relation between a request buffer and a particular station.

Acyclic Handshake Bits

Each request/response buffer pair is associated with a set of handshake bits.

Global Variable Identifier	Description
vPN_MGMT_OUTPUTS.ACYC_HSK_Y_REQ1_EXECUTE	execution req. flag for buffer 1
vPN_MGMT_OUTPUTS.ACYC_HSK_Y_REQ2_EXECUTE	execution req. flag for buffer 2
vPN_MGMT_INPUTS.ACYC_HSK_X_RES1_COMPLETED	request in buffer 1 completed, response is in corresponding buffer
vPN_MGMT_INPUTS.ACYC_HSK_X_RES2_COMPLETED	request in buffer 2 completed, response is in corresponding buffer
vPN_MGMT_INPUTS.ACYC_HSK_X_RES1_ACCEPTED	request in buffer 1 accepted
vPN_MGMT_INPUTS.ACYC_HSK_X_RES2_ACCEPTED	request in buffer 2 accepted

Once the response has been read by the PLC from the response buffer, the PLC must clear the ACYC_HSK_Y_REQ<n>_EXECUTE bit corresponding to the request. The PROFINET Controller will then clear the two corresponding bits ACYC_HSK_X_RES<n>_ACCEPTED and ACYC_HSK_X_RES<n>_COMPLETED.

The following diagram shows the request/response handshake between PLC program and the PROFINET Controller for acyclic communication.

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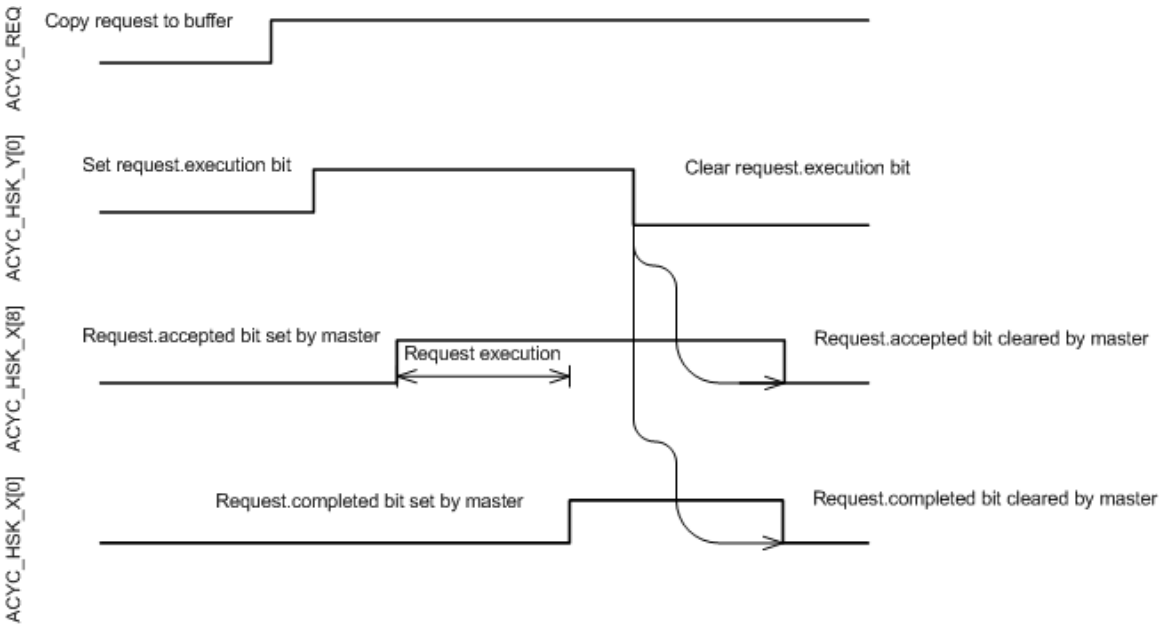

Acyclic Request Header

The request buffer consists of an header and a data buffer area. The same header is used whatever is the requested service. Consult each service detailed description to verify which fields are relevant.

Word Offset	ID	Description
0 1	RequestID	ID of the request
2	ServiceID	service identifier (see above)
3	Status	Status of the request. shall always be equal to 0x55.
4 5	DeviceID	IO-Device number defined in the GX Configurator PN, or in the case of implicit request, the IP address of the IO-device.
6 7	API	API number used to perform the Read Value: 0 to 0xFFFFFFFF
8	SlotNumber	Target slot number. Value: 0 to 0x7FFF
9	SubslotNumber	Target subslot numbe Value: 1 to 0x8FFF
10	Index	Index in the slot or sub-slot Value: 1 to 0xFFFF
11	Data length (byte)	Number of bytes stored in the request data buffer

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		Value: 0 to 1440.
12	PnDeviceID	PROFINET Device ID
13	PnVendorID	PROFINET Vendor ID
14-21	ARUUID	Never used, must be set to 0.
22-29	Reserved	Reserved

Note: Each value is in little-endian- (i.e. Intel-) format.

Acyclic Response Header

The response buffer consists of a header and a data buffer area. The same header is used independently of the requested service. Consult each service detailed description to verify, which fields are relevant.

Word Offset	ID	Description
0	RequestID	ID of the request
1		
2	ServiceID	service identifier (see above)
3	Status	Status of the Request
4	DeviceID	IO-device number defined in GX Configurator-PN or in the case of explicit request, the IP address of the IO-device.
5		
6	Data length	Number of bytes stored in the response data buffer
7	ErrorDecode	PROFINET value. Used when a negative response is returned
8	ErrorCode1	PROFINET value. Used when a negative response is returned
9	ErrorCode2	PROFINET value. Used when a negative response is returned
10-19	reserved	Reserved

Note: Each value is in little-endian- (i.e. Intel-) format.

RequestID

The RequestID field in the request buffer header can be used by PLC to identify the answer. It is the responsibility of the PLC program to manage the field RequestID. The best practice is to increment this field before each new request. The PROFINET firmware will answer to the request with the same RequestID.

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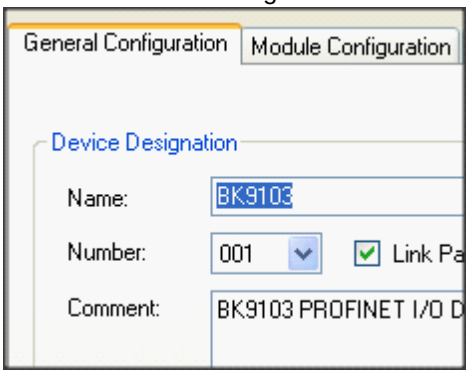
ServiceID

The field 'ServiceID' marks the type of request. Acyclic communication can be used for the following services:

Service	Identifier	Description
Network detection	0x01	determines the number of connected IO devices (see 'Network Detection Service')
IO-Device Detected	0x02	
Read Implicit	0x03	see 'Record Block Implicit Read'
Write Explicit	0x04	see 'Record Block Explicit Write'
Read Explicit	0x05	see 'Record Block Explicit Read'
Alarm Request	0x06	see 'Alarm Request'
Alarm Ack	0x07	see 'Alarm Ack'
IO-Device Information	0x08	get information for a specific IO device
Read alarm log	0x09	see 'Alarm Log'

DeviceID

This ID is defined during PROFINET configuration with the GX Configurator PN tool.



Acyclic Service Request/Response Formats

Network Detection Service

Based on DCP identify request, this service allows to detect up to 255 IO-devices present on the network (LAN). This function returns only the number of IO-Devices detected. After the call of this service, it is needed to call the service IO-Device detected (serviceID = 2) to get more information on each detected IO-Device.

Request Format

Word Offset	ID	Value
0	RequestID	PLC value
1		

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Word Offset	ID	Value
2	ServiceID	0x01
3	Status	0x55
4	DeviceID	0x0000
5		
6	API	0x0000
7		
8	SlotNumber	0x00
9	Subs-lotNumber	0x00
10	Index	0x00
11	Data length (byte)	0x0000
12	PnDeviceID	0x00
13	PnVendorID	0x00
14-21	ARUUID	0x00
22-29	Reserved	Reserved (0x00)

Response Positive Format (Status = 0)

	Word Offset	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x01
	3	Status	0x00
	4	DeviceID	0x0000
	5		
	6	Data length (byte)	0x0004
	7	ErrorDecode	0x00
	8	ErrorCode1	0x00

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	Word Offset	ID	Value
	9	ErrorCode2	0x00
	10-19	reserved	0x00
Data	20	Nr IO-Devices	Number of IO-devices detected
	21		

Response Negative Format

	Word Offset	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x01
	3	Status	!= 0x00
	4	DeviceID	0x00
	5		
	6	Data length	0x0000
	7	ErrorDecode	!= 0x00
	8	ErrorCode1	!= 0x00
	9	ErrorCode2	!= 0x00
	10-19	reserved	0x00

Possible values for Status

Value	Comment
0	Status OK
1	Profinet stack not started
2	No ethernet link
3	No IO-Device detected

Note: if more than 255 devices are detected, the function returns status OK and Nr IO Devices ==255

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IO-Device Detection

This function allows to get for each IO-Device detected by a previous call to the service Network Detection, some information like IP configuration, MAC Address, Vendor ID, Device ID, Name of the IO-Device and IO-Device type.

Request format

Word Offset	ID	Value
0	RequestID	PLC value
1		
2	ServiceID	0x02
3	Status	0x55
4	DeviceID	0x0000
5		
6	API	0x0000
7		
8	slot_number	0x00
9	Subslot_number	0x00
10	Index	0x00
11	Data length (byte)	0x00
12	PnDeviceID	0x00
13	PnVendorID	0x00
14-21	ARUUID	0x00
22-29	Reserved	Reserved (0x00)

Response Positive Format (Status = 0)

	Word Offset	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x02

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	Word Offset	ID	Value
	3	Status	0x00
	4	DeviceID	0x0000
	5		
	6	Data length (byte)	Size of the Data.
	7	ErrorDecode	0x00
	8	ErrorCode1	0x00
	9	ErrorCode2	0x00
	10-19	reserved	0x00
Data	20	VendorID	VendorID of the device
	21	DeviceID	DeviceID of the device
	22	IP address	IP address of the Device
	23		
	24	Subnetmask	Subnet mask of the Device
	25		
	26	Gateway	Gateway IP Address of the Device
	27		
	28 – 30	Mac address	Mac Address of the Device
	31	SizeName	Size name of the device (240 bytes max)
	32 - SizeName	DeviceName	Name of the device
	XX	SizeType	Size of “Type” field (max size : 25 byte)
	Xx+1 – SizeType	Type	Type of Device

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Response Negative Format

	Word Offset	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x02
	3	Status	!= 0x00
	4	DeviceID	0x0000
	5		
	6	Data length (byte)	0x00
	7	ErrorDecode	!= 0x00
	8	ErrorCode1	!= 0x00
	9	ErrorCode2	!= 0x00
	10-19	Reserved	0x00

Possible Values for Status

Value	Comment
0	Status OK
1	Profinet stack not started
4	Reception buffer too small (stack internal error)
5	No more IO-Device
6	“Network detection” service never called.

Network Detection Scenario

First, the Network detection service has to be called. This function will return the number of IO-devices (NbIOD) detected on the LAN. After, IO-Device Detection service should be called Nb IO Device times or until the returned status equal to 0. A status 5 is returned when all detected IO-devices have already been requested by the service IO-Device Detection

Note: IO-devices are returned in the same order in which they answered to the DCP identify request. Two consecutive calls to network detection can result in two different lists.

Record Block Implicit Read (non connected)

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Request format

Word Offset	ID	Value
0	RequestID	PLC value
1		
2	ServiceID	3
3	Status	0x55
4	DeviceID	Shall contain the IP address
5		
6	API	API number used to perform the read
7		
8	SlotNumber	Slot number targeted
9	SubslotNumber	Sub-slot number targeted
10	Index	Index of the record block
11	Data length (byte)	0
12	PnDeviceID	DeviceID of the IO-Device
13	PnVendorID	VendorID of the IO-Device
14-21	ARUUID	0
22-29	Reserved	Reserved (0)

Response Positive Format (Status = 0)

	Word Offset	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x03
	3	Status	0x00
	4	DeviceID	Requested device
	5		

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	Word Offset	ID	Value
	6	Data length (byte)	Buffer data size
	7	ErrorDecode	0x00
	8	ErrorCode1	0x00
	9	ErrorCode2	0x00
	10-19	reserved	0x00
Data	20	..	Data
	..		
	..		
	..		
	..		
	..		

Response Negative Format

	Word Offset	ID	Value
Header	0	Request ID	Same as the request
	1		
	2	ServiceID	3
	3	Status	!= 0
	4	Device ID	0
	5		
	6	Data length (byte)	0
	7	ErrorDecode	!= 0
	8	ErrorCode1	!= 0
	9	ErrorCode2	!= 0
	10-19	reserved	0

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Possible Values for Status

Value	Comment
0	Status OK, function
1	Profinet stack not started
2	No ethernet link
3	No IO-Device detected
4	Reception buffer too small (internal stack error)
6	Device not connected
7	Device not configured
8	Profinet error

Record Block Explicit Write (connected)

Request format

Word Offset	ID	Value
0	RequestID	PLC value
1		
2	ServiceID	4
3	Status	0x55
4	DeviceID	Requested device
5		
6	API	API number used to perform the write
7		
8	SlotNumber	Slot number targeted
9	SubslotNumber	Subslot number targeted
10	Index	Index of the record block
11	Data length (byte)	data size
12	PnDeviceID	0
13	PnVendorID	0

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Word Offset	ID	Value
14-21	ARUUID	0
22-29	Reserved	Reserved (0)
30..	data	data

Response positive format (Status = 0)

	Word Offset	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x03
	3	Status	0x00
	4	DeviceID	Requested Device
	5		
	6	Data length (byte)	0
	7	ErrorDecode	0x00
	8	ErrorCode1	0x00
	9	ErrorCode2	0x00
	10-19	reserved	0x00

Response Negative Format

	Word Off-set	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x04
	3	Status	!= 0x00
	4	DeviceID	0x00

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	Word Off-set	ID	Value
	5		
	6	Data length (byte)	0x00
	7	ErrorDecode	!= 0x00
	8	ErrorCode1	!= 0x00
	9	ErrorCode2	!= 0x00
	10-19	reserved	0x00

Possible Values for Status

Value	Comment
0	Status OK, function
1	Profinet stack not started
2	No ethernet link
3	No IO-Device detected
6	Device not connected
7	Device not configured
8	Profinet error see others status

Record Block Explicit Read (connected)

Request format

Word Offset	ID	Value
0	RequestID	PLC value
1		
2	ServiceID	0x05
3	Status	0x55
4	DeviceID	Requested device
5		
6	API	API number used to perform the read

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Word Offset	ID	Value
7		
8	SlotNumber	Slot number targeted
9	SubslotNumber	Subslot number targeted
10	Index	Index of the record block
11	Data length (byte)	0
12	PnDeviceID	0x00
13	PnVendorID	0x00
14-21	ARUUID	0x00
22-29	Reserved	Reserved (0x00)

Response positive format (Status = 0)

	Word Offset	ID	Value
Header	0	Request ID	Same as the request
	1		
	2	ServiceID	0x05
	3	Status	0x00
	4	Device ID	IP address
	5		
	6	Data length (byte)	Buffer data size
	7	ErrorDecode	0x00
	8	ErrorCode1	0x00
	9	ErrorCode2	0x00
	10-19	Reserved	0x00
Data	20		Data
	…		

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	Word Offset	ID	Value

Response Negative Format

	Word Offset	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x05
	3	Status	!= 0x00
	4	DeviceID	0x00
	5		
	6	Data length (byte)	0x00
	7	ErrorDecode	!= 0x00
	8	ErrorCode1	!= 0x00
	9	ErrorCode2	!= 0x00
	10-19	reserved	0x00

Possible values for Status

Value	Comment
0	Status OK, function
1	Profinet stack not started
2	No ethernet link
3	No IO-Device detected
4	Reception buffer too small (internal stack error)
8	Profinet error see others status

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Alarm Request

This service allows PLC to ask to PROFINET stack the alarm received from a specific IO-Device. This service has to be used in relation with the IOD_MGT_ALARM and IOD_ALARM_IND Alarm registers see 3.1.6.

Request Format

Word Offset	ID	Value
0	RequestID	PLC value
1		
2	ServiceID	0x06
3	Status	0x55
4	DeviceID	Requested Device
5		
6	API	0x00
7		
8	SlotNumber	0x00
9	SubslotNumber	0x00
10	Index	0x00
11	Data length (byte)	0x00
12	PnDeviceID	0x00
13	PnVendorID	0x00
14-21	ARUUID	0x00
22-29	Reserved	Reserved (0x00)

Response Positive Format (Status = 0)

	Word Offset	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x06
	3	Status	0x00
	4	DeviceID	Requested Device
	5		
	6	Data length (byte)	Data size
	7	ErrorDecode	0x00

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	Word Off-set	ID	Value
	8	ErrorCode1	0x00
	9	ErrorCode2	0x00
	10-19	reserved	0x00
Data	20	API	API number used to perform the alarm
	21		
	22	Priority	Alarm priority
	23	Type	Alarm type
	24	Slot number	Slot number of the alarm
	25	SubSlot number	Subslot number of the alarm
	26	Specifier	Alarm specifier
	27	Module ident number	Module ID of the Alarm
	28		
	29	SubModule ident number	submodule ID of the Alarm
	30		
	31	Data length	Data Size in byte
	Data	Data	0 to 1432 bytes

Alarm priority:

- High priority : 0x06
- Low priority: 0x05

Alarm Type:

Value (hexadecimal)	Meaning
0x0000	Reserved
0x0001	Diagnosis
0x0002	Process
0x0003	Pull
0x0004	Plug
0x0005	Status

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Value (hexadecimal)	Meaning
0x0006	Update
0x0007	Media Redundancy
0x0008	Controlled by supervisor. Logical “Pull” of a sub-module to withdraw ownership
0x0009	Released. Logical “Plug” of a submodule to re-turn ownership or trigger a reparameterization
0x000A	Plug Wrong Submodule
0x000B	Return of Submodule
0x000C	Diagnosis disappears
0x000D	Multicast communication mismatch notification
0x000E	Port data change notification
0x000F	Sync data changed notification
0x0010	Isochronous mode problem notification
0x0011	Network component problem notification
0x0012	Time data changed notification
0x0013	Dynamic Frame Packing problem notification
0x0014	MRPD problem notification
0x0015	System Redundancy
0x0016 – 0x001D	Reserved
0x001E	Upload and retrieval notification
0x001F	Pull module
0x0020 – 0x007F	Manufacturer specific
0x0080 – 0x00FF	Reserved for profiles
0x0100 – 0xFFFF	Reserved

Alarm specifier: coding of bit fields is shown below:

bits	Description	Value
0-10	Sequence number	0 to 2,047, incremented upon each indication
11	Diagnostis channel	0x00: No diagnosis available 0x01: Diagnosis available
12	Specific dia-	0x00: No diagnosis available

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bits	Description	Value
	gnosis	0x01: Diagnosis available
13	Diagnostis sub-module	0x00: No diagnosis available 0x01: Diagnosis available
14	Reserved	0x00
15	AR diagnostis	0x00: No diagnosis available 0x01: Diagnosis available

Response Negative Format

	Word Offset	ID	Value
Header	0	Request ID	Same as the request
	1		
	2	ServiceID	0x06
	3	Status	!= 0x00
	4	Device ID	0x00
	5		
	6	Data length (byte)	0x00
	7	ErrorDecode	!= 0x00
	8	ErrorCode1	!= 0x00
	9	ErrorCode2	!= 0x00
	10-19	reserved	0x00

Possible values for Status

Value	Comment
0	Status OK
1	Profinet stack not started
7	Device not configured
8	Profinet error see others status

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Value	Comment
9	No Alarm for this device

Alarm Ack

This service sends to the IO-Device the Ack alarm frame. This service has to be used in relation with the IOD_MGT_ALARM and IOD_ALARM_IND Alarm registers.

Request format

Word Offset	ID	Value
0	RequestID	PLC value
1		
2	ServiceID	0x07
3	Status	0x55
4	DeviceID	Requested device
5		
6	API	API number used to perform the ACK
7		
8	SlotNumber	Slot number targeted
9	SubslotNumber	Subslot number targeted
10	Index	has to be contain the alarm priority .
11	Data length (byte)	0x00
12	PnDeviceID	0x00
13	PnVendorID	0x00
14-21	ARUUID	0x00
22-29	Reserved	Reserved (0x00)

Response positive format (Status = 0)

	Word Off-set	ID	Value
Header	0	Request ID	Same as the request

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	Word Off-set	ID	Value
	1		
	2	ServiceID	0x07
	3	Status	0x00
	4	Device ID	Requested device
	5		
	6	Data length (byte)	0x00
	7	ErrorDecode	0x00
	8	ErrorCode1	0x00
	9	ErrorCode2	0x00
	10-19	reserved	0x00

Response negative format

	Word Off-set	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x07
	3	Status	!= 0x00
	4	DeviceID	0x00
	5		
	6	Data length (byte)	0x00
	7	ErrorDecode	!= 0x00
	8	ErrorCode1	!= 0x00
	9	ErrorCode2	!= 0x00
	10-19	reserved	0x00

Possible values for Status

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Value	Comment
0	Status OK
1	Profinet stack not started
7	Device not configured
8	Profinet error see others status
9	No alarm for this device

IO-Device Information

Request format

Word Offset	ID	Value
0	RequestID	PLC value
1		
2	ServiceID	0x08
3	Status	0x55
4	DeviceID	Requested device
5		
6	API	0x00
7		
8	SlotNumber	0x00
9	Subslot Number	0x00
10	Index	0x00
11	Data length (byte)	0x00
12	PnDeviceID	0x00
13	PnVendorID	0x00
14-21	ARUUID	0x00
22-29	Reserved	Reserved (0x00)

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Response positive format (Status = 0)

	Word Off-set	ID	Value
Header	0	Request ID	Same as the request
	1		
	2	ServiceID	0x08
	3	Status	0x00
	4	Device ID	Requested Device
	5		
	6	Data length (byte)	0x24
	7	ErrorDecode	0x00
	8	ErrorCode1	0x00
	9	ErrorCode2	0x00
	10-19	reserved	0x00
Data	20		Mac address
	21		
	22		
	23		IP address
	24		
	25		Input @ area in High Speed Area
	26		
	27		output @ area in High Speed Area
	28		
	29		Input length
	30		Output Length
	31		Refresh period
	32		Number of successul connecti-ons
	33		Number of disconnections

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	Word Offset	ID	Value
	34		State (Connected/Not Connected)
	35		Management (Manual Automatic)
	36		Current Profinet Status
	37		

Response negative format

	Word Offset	ID	Value
Header	0	Request ID	Same as the request
	1		
	2	ServiceID	8
	3	Status	!= 0
	4	Device ID	0
	5		
	6	Data length (byte)	0
	7	ErrorDecode	!= 0
	8	ErrorCode1	!= 0
	9	ErrorCode2	!= 0
	10-19	reserved	0

Possible values for Status

Value	Comment
0	Status OK, function
1	Profinet stack not started
10	Bad Device ID (Device not configured)

Alarm Log

This request allow to get an alarm description from the internal alarm log

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- Function has to be called several times to get several alarm description
- The older alarm is returned first

Request format

Word Offset	ID	Value
0	RequestID	PLC value
1		
2	ServiceID	0x09
3	Status	0x55
4	DeviceID	Requested device
5		
6	API	0
7		
8	SlotNumber	0
9	SubslotNumber	0
10	Index	0
11	Data length (byte)	0
12	PnDeviceID	0
13	PnVendorID	0
14-21	ARUUID	0
22-29	Reserved	Reserved (0)

Response positive format (Status = 0)

	Word Off-set	ID	Value
Header	0	RequestID	Same as the request
	1		
	2	ServiceID	0x09
	3	Status	0x00
	4	DeviceID	Requested Device

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	Word Offset	ID	Value
	5		
	6	Data length (byte)	0
	7	ErrorDecode	0x00
	8	ErrorCode1	0x00
	9	ErrorCode2	0x00
	10-19	reserved	0x00
Data	20	Date	Date of the PROFINET Controller when the frame has been received
	21		
	22	Time	Time of the PROFINET Controller when the frame has been received
	23		
	24	Alarm Type	
	25	API	API number used to perform the alarm
	26		
	27	Alarm Priority	
	28	ModuleID	ID of the module. Manufacturer dependant.
	29		
	30	SubModuleID	ID of the module. Manufacturer dependant.
	31		
	32	Slot	Slot number of the alarm
	33	SubSlot	Subslot number of the alarm
	34	Alarm specifier	

Response negative format

	Word Offset	ID	Value
Header	0	RequestID	Same as the request
	1		

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	Word Offset	ID	Value
	2	ServiceID	0x09
	3	Status	!= 0x00
	4	DeviceID	0x00
	5		
	6	Data length (byte)	0x00
	7	ErrorDecode	!= 0x00
	8	ErrorCode1	!= 0x00
	9	ErrorCode2	!= 0x00
	10-19	reserved	0x00

Possible values for Status

Value	Comment
0	Status OK, function
1	PROFINET stack not started
2	No ethernet link
7	Device not configured
8	PROFINET error see others status
9	No alarm in log

Alarm Management

A IO-device is able to send alarms to the IO-controller. When a alarm is received, the IO-controller is expected to get the alarm description, then to acknowledge the alarm.
An IO-device can send up to 2 alarms simultaneously:
- one alarm of High Priority
- one alarm of low priority.

The IO-device won't be able to initiate a new alarm of the respective priority as long as the IO-controller has not "acknowledge" the previous one

By default, the PROFINET stack can handle alarm automatically without reporting any indication to the PLC program. However, PLC can decide to manage or not by itself alarms for each device. This can be done using the IOD_MGT_ALARM registers. With these eight 16bit registers the PLC can indicate, how the firmware should for each IO-device manage alarms.

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From CPU to PROFINET IO-Controller			
Global Variable Identifier	**IO-Device Number**	**Values**	
		0	**1**
vPN_MGMT_OUTPUTS.IOD_MGT_ALARM[0] … vPN_MGMT_OUTPUTS.IOD_MGT_ALARM[15]	0 .. 15	Automatic .. Automatic	Manual .. Manual
vPN_MGMT_OUTPUTS.IOD_MGT_ALARM[16] … vPN_MGMT_OUTPUTS.IOD_MGT_ALARM[31]	16 .. 31	Automatic .. Automatic	Manual .. Manual
…	…	….	….
vPN_MGMT_OUTPUTS.IOD_MGT_ALARM[116] … vPN_MGMT_OUTPUTS.IOD_MGT_ALARM[127]	116 .. 127	Automatic .. Automatic	Manual .. Manual

For an IO-device in automatic mode the IO-controller automatically acknowledges each alarm received from an IO-device (IOD_ALARM_IND bits are not used). For an IO-device in manual mode an alarm indication is signalled to the PLC program via the IOD_ALARM_IND registers.

From IO-Controller to CPU	
Register	**Function**
vPN_MGMT_INPUTS.IOD_ALARM_IND[0]	Alarm has been received from the device 0
…	Alarm has been received from the device n
vPN_MGMT_INPUTS.IOD_ALARM_IND[127]	Alarm has been received from the device 127

Note: the stack can store internally both high and low priority alarms. When the CPU requests alarms, the high priority alarm will be returned first. The IOD_ALARM_IND bit for the corresponding device will be reset only after the management of both alarms.

The following diagram demonstrates an alarm cycle (when alarm management is activated by the PLC program).

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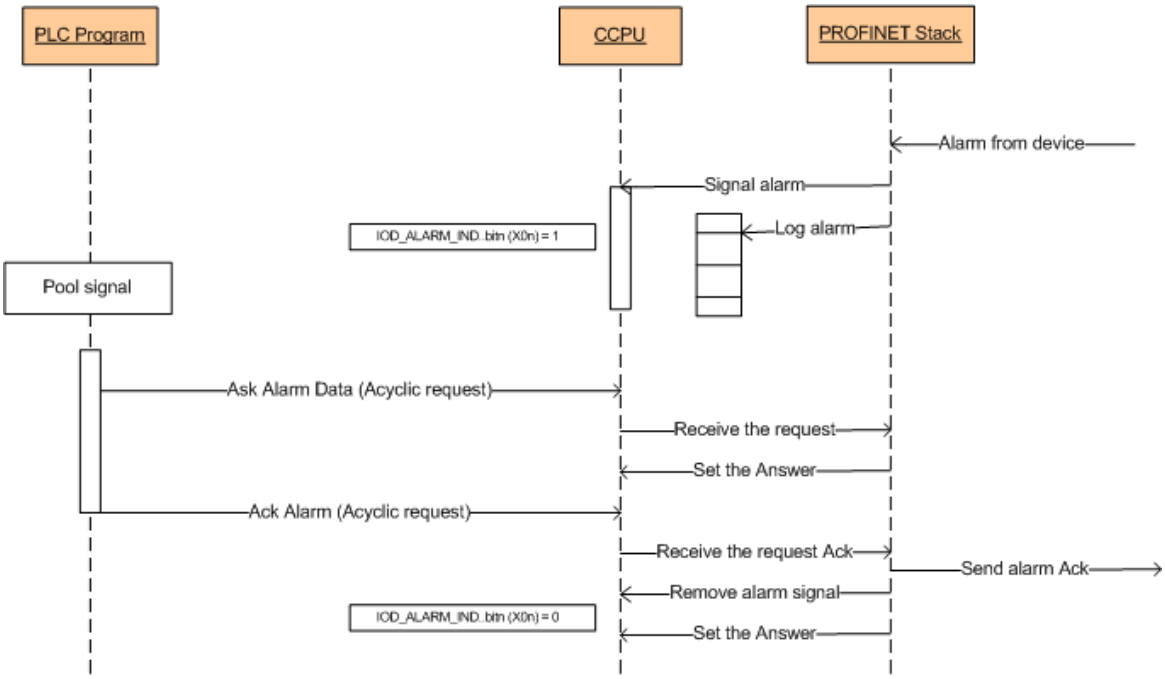

Note: a ring buffer exists for each device. This ring buffer stores up to seven alarms for each IO-device. Each incoming alarm is logged in this ring log buffer, from which the PLC can read using acyclic requests.

2.1.4 Network Diagnostics

PROFINET IO Controller Status

The bits in these two words provide information on the IO-controller stack state.

From PROFINET IO-Controller to CPU		
Global Variable Identifier	**Values**	
	0	**1**
vPN_MGMT_INPUTS.IOC_STS_CONFIG_OK	No configuration.	Configuration OK.
vPN_MGMT_INPUTS.IOC_STS_CONFIG_DOWNLOADING		A new configuration is downloading
vPN_MGMT_INPUTS.IOC_STS_KEYFILE_ERROR		Missing or wrong keyfile
vPN_MGMT_INPUTS.IOC_STS_STARTED	Not Started	Started
vPN_MGMT_INPUTS.IOC_STS_ERROR_DIAG_SET	No error	Error occured (see Diagnostic area)
vPN_MGMT_INPUTS.IOC_STS_PLC_WD_ERR	Watchdog ok or watchdog mechanism disabled	Watchdog mechanism detects that PLC is not run-

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From PROFINET IO-Controller to CPU		
Global Variable Identifier	Values	
	0	1
		ning.

Possible combinations of the flags IOC_STS_CONFIG_OK, IOC_STS_CONFIG_DOWNLOADING, IOC_STS_KEYFILE_ERROR and IOC_STS_STARTED with their respective meaning are

Flags Set	Comment
no flag set	There is no configuration inside the PROFINET Controller. To use PROFINET download a configuration
IOC_STS_KEYFILE_ERROR	BAD pnengine.dat.
IOC_STS_CONFIG_DOWNLOADIN G	A new configuration download is pending.
IOC_STS_CONFIG_OK	Configuration is valid. Waiting start from PLC
IOC_STS_CONFIG_OK and IOC_STS_STARTED	Configuration is valid. PROFINET is started.

- * During a configuration download sequence .IOC_STS_CONFIG_OK is off (= "No Configuration").
- At the end of the configuration download sequence, the new configuration will be immediately started, if the IOC_START_STOP.bit0 equals 1.

If IOC_STS[1].bit2 is set, the MAC address protection mechanism detected an issue and PROFINET cannot be started.

IOD_CONN_STS Registers

The following 128 bits contain the connection state of each IO-device.

PROFINET IO-Controller to CPU			
Global Variable Identifier	IO-Device Number	Values	
		0	1
vPN_MGMT_INPUTS.IOD_CONN_STS[0] … vPN_MGMT_INPUTS.IOD_CONN_STS[15]	0 .. 15	Not Connec-ted	Connected
vPN_MGMT_INPUTS.IOD_CONN_STS[16] … vPN_MGMT_INPUTS.IOD_CONN_STS[31]	16 .. 31		
…	…		

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PROFINET IO-Controller to CPU			
Global Variable Identifier	**IO-Device Number**	**Values**	
		0	**1**
vPN_MGMT_INPUTS.IOD_CONN_STS[116] … vPN_MGMT_INPUTS.IOD_CONN_STS[127]	116 .. 127		

IOD_ERR_STS Registers

The following 128 bits indicate for each IO-device, whether an error has occurred.

PROFINET IO-Controller to CPU			
Global Variable Identifier	**IO-Device number**	**Values**	
		0	**1**
vPN_MGMT_INPUTS.IOD_ERR_STS[0] … vPN_MGMT_INPUTS.IOD_ERR_STS[15]	0 .. 15	No Error	Error
vPN_MGMT_INPUTS.IOD_ERR_STS[16] … vPN_MGMT_INPUTS.IOD_ERR_STS[31]	16 .. 31		
…	…		
vPN_MGMT_INPUTS.IOD_ERR_STS[116] … vPN_MGMT_INPUTS.IOD_ERR_STS[127]	116 .. 127		

For each IO-device the following combinations are possible:

IOD_CONN_STS	IOD_ERR_STS	Meaning
0	0	IO-device not connected because no connection requested.
1	0	IO-device connected, connection without error.
0	1	IO-device not connected. In automatic mode connection not possible. In manual, last connection request failed.
1	1	IO-device connected but connection in error

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Device Advanced Status (IOD_ADV_STS Registers)

For each IO-device a byte in the variable 'vPN_ACYCLIC_DIAG_INPUTS.IOD_ADV_STS' contains the detailed status error code, when the corresponding bit in IOD_ERR_STS is set. Each element in the word array 'IOD_ADV_STS' contains the status codes of two devices, the status of the device with an odd index is placed in the low byte, the status of the device with an even index is placed in the high byte.

IOD_CONN_STS, IOD_ERR_STS	Byte Value in IOD_ADV_STS	Comment
N/A	0	IO-device Status is not set. (no error)
1,1	1	The IO-device produces in stop mode
1,1	2	One of IOPS in input frame is in bad.
1,1	3	One of IOCS in input frame is in bad.
1,1	4	IO-device Configuration does not match.
1,1	5..99	Reserved
0,1	100	No answer from the IO-device at the DCP identify request. The configured name is not present on the network.
0,1	101	Duplicate name for the IO-device. The DCP identify request received several answers from different IO-devices.
0,1	102	Duplicate IP address detected during DCP identify request.
0,1	103	Out of AR resource. The device is already connected and do not accept more connection.
0,1	103-252	Reserved, to be completed during development.
0,1	253	Connection failed.
0,0	254	Never connected. This IO-device ID is present in the configuration, but the PROFINET stack never sent a connect request.
0,0	255	Not used. This IO-device ID is not present in the configuration.

Diagnostic Area (ADV_DIAG_* Registers)

In the ADV_DIAG_* registers the PROFINET stack can report some advanced information on the PROFINET Controller state (used for technical support only).

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From IO-Controller to CPU		
Global Variable Identifier	**Contents**	
vPN_ACYCLIC_DIAG_INPUTS.ADV_DIAG_ERR_CODE	PROFINET stack error code	0: Stack running well
		1: MAC address check fails
		2: MAC file encrypted not found
		3: Assert
		4: Error system
vPN_ACYCLIC_DIAG_INPUTS.ADV_DIAG_ERR_CODE2	PROFINET stack error code (high word)	0 (currently not used)
vPN_ACYCLIC_DIAG_INPUTS.ADV_DIAG_ADD_INFO	Additional information depending on the main error code. See below	

Error code value	Additional information (word 2 to 19)															
0	All 0															
1	0	1	2	3	4	5	6	7	..	..	..	..	..	..	17	18
	MAC address PROFINET Controller			MAC address stack												
2	All 0															
3	0	1	2	3	4	5	6	7	..	..	..	..	..	..	17	18
	Line in the file	File name where the assert appears.														
4	0	1	2	3	…	18										
	ErrCde	ErrDec	Errcod1	Errcod2												

2.1.5 PLC Program Watchdog

LIVE_WORD_X and LIVE_WORD_Y Registers

The live word register variables 'vPN_CYCLIC_INPUTS.LIVE_WORD_X' and 'vPN_CYCLIC_OUTPUTS.LIVE_WORD_Y' allows the PLC to activate a watchdog mechanism bet-

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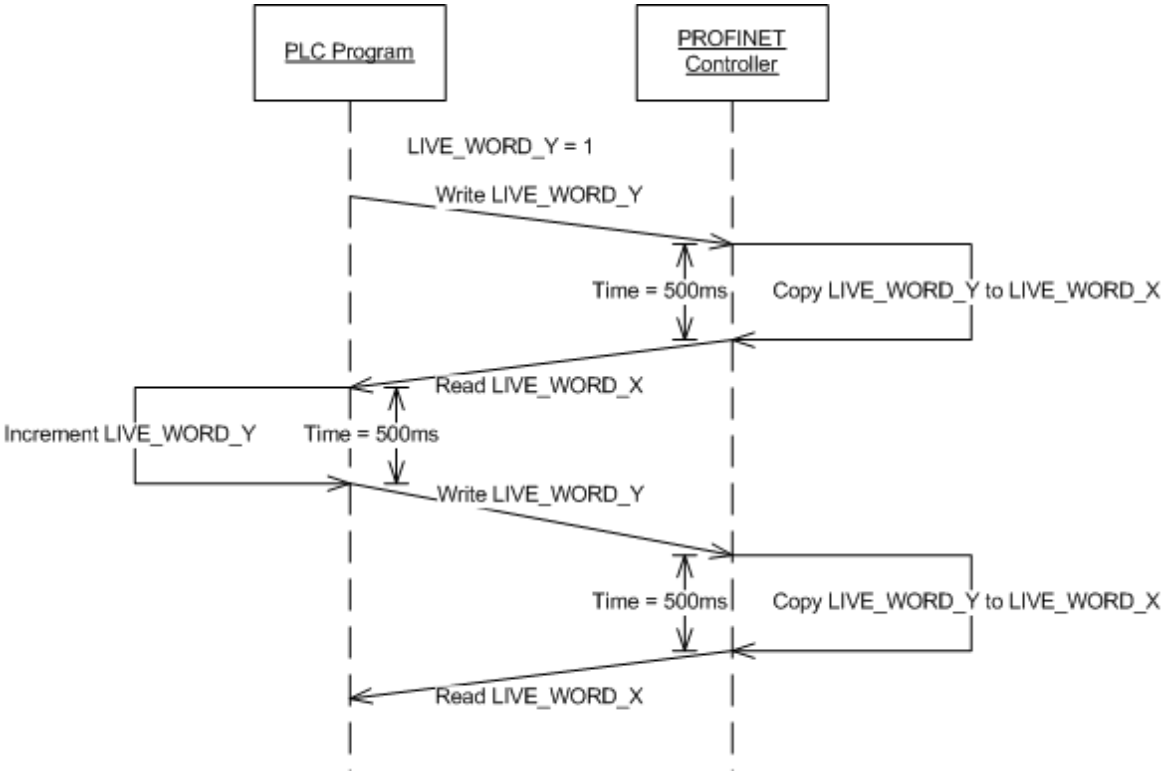
ween the PLC program and the PROFINET Controller. By default this mechanism is not activated (LIVE_WORD_X =0)
The following scenario applies:



By default the LIVE_WORD_Y register is set to 0, meaning that no check is activated.
To activate the mechanism, PLC sets LIVE_WORD_Y to 1 or to any value different from 0

The IO-controller reads the LIVE_WORD_Y value in an interval of 500 ms. If the value is identical three consecutive times (1.5s) and differs from 0, the IO-controller will consider the PLC as no longer running. In this case IO-controller sets the IOC_STS.bit17 for indication.
If activated this watchdog mechanism is the only way for the IO-controller to detect that a PLC program is currently running. In this case any attempt to download a new configuration will display a warning message to alert the end user.
Once the mechanism is activated the PLC has to write a new value each 500 ms. The mechanism can be stopped at any time by writing 0 again to the LIVE_WORD_Y register.
Each 500ms the IO-controller also copies the LIVE_WORD_Y read value in the LIVE_WORD_X register If the PLC does not read the same value after a maximum of 1 second, the PLC can consider that the IO-controller is no longer running and start any appropriate action.

2.1.6 PLC and PROFINET Controller States (RUN/STOP)

PLC STATE	PROFINET Controller STATE	Comment
RUN	RUN	PROFINET stack is in RUN. IOPS and IOCS have status GOOD Input data are updated in the High Speed Area

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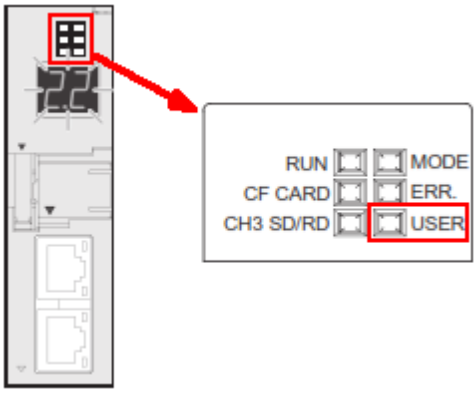
RUN	STOP	PROFINET stack is in STOP. Output data = old values and IOPS and IOCS set to BAD Input data are updated in the high speed area
STOP	RUN	PROFINET stack is in RUN. Output data = old values an IOPS and IOCS set to GOOD Input data are updated in the high speed area
STOP	STOP	PROFINET stack is in STOP. Output data = old values an IOPS and IOCS set to BAD Input data are updated in the high speed area

2.2 LED Display

2.2.1 User LED

The 'USER' LED is the bottom-right one in the six LEDs group on the front of the ME1PN1FW-Q.



This LED signals PROFINET Controller specific states in combination with the 7-segment LED display. For the meaning of the other LEDs please consult the user manual of the Q12DCCPU-V.

State	Meaning
RED	Error, see 7 segments LED
RED slow blink	Some IO-devices are not connected.
RED rapid Blink	Network storm
Green	All OK. All IO-devices connected whatever their mode (manual or automatic)
Green slow blink	All OK. All IO-devices in automatic mode are connected. All IO devices in manual mode are not connected.
Green rapid Blink	All OK. All IO-devices in automatic mode are connected. Some IO devices in manual mode are connected, some are not connected
Orange	All IO-devices connected whatever their mode (manual or automatic). However, some configuration mismatches exist.

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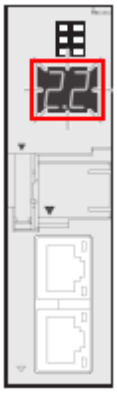
State	Meaning
Orange slow blink	All IO-devices in automatic mode are connected. All IO devices in manual mode are not connected. However, some configuration mismatches exist.
Orange rapid Blink	All IO-devices in automatic mode are connected. Some IO devices in manual mode are connected, some are not connected. However, some configuration mismatches exist.

2.2.2 7-Segment LED Display

The 7-segment display is located on the front of the ME1PN1FW-Q.



It indicates PROFINET Controller specific states in combination with the status of the User LED.

User LED	7 segment value	Meaning
Red fix	1	No Ethernet link
	2	No configuration
	3	No IO-device connected
	4	The engine.dat file is corrupted.
	5	Stack failed to start
	6	Declare Device failed (config corrupt)
	7	Error system see 3.1.7.4.
Green fix	Off	All IO-devices connected
N/A	BL	A DCP blink command is receiving.
OFF	8	Wait Start from register.
Red fix	9	The stack can't start. The initialization sequence failed
	10	Memory allocation error during initialization sequence

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User LED	7 segment value	Meaning
	11	CNFMAST.001 is missing in folder \RAM\Profinet\Default
	12	CNFDEVIC.001 is missing in folder \RAM\Profinet\Default
	13	CNFNAME.001 is missing in folder \RAM\Profinet\Default
	14	copycross10.bin is missing in folder \RAM\Profinet\Default
	15	CNFMAST.001 is missing in folder \RAM\Profinet
	16	CNFDEVIC.001 is missing in folder \RAM\Profinet
	17	CNFNAME.001 is missing in folder \RAM\Profinet
	18	copycross10.bin is missing in folder \RAM\Profinet
	19	Configuration files Access error. File is open but not readable
	20	Configuration files check error. Values read in the file are not acceptable. Configuration of high speed area is wrong
	21	Init controller failed. Cannot start the PROFINET firmware
	22	GX Configurator Remote access initialization failed

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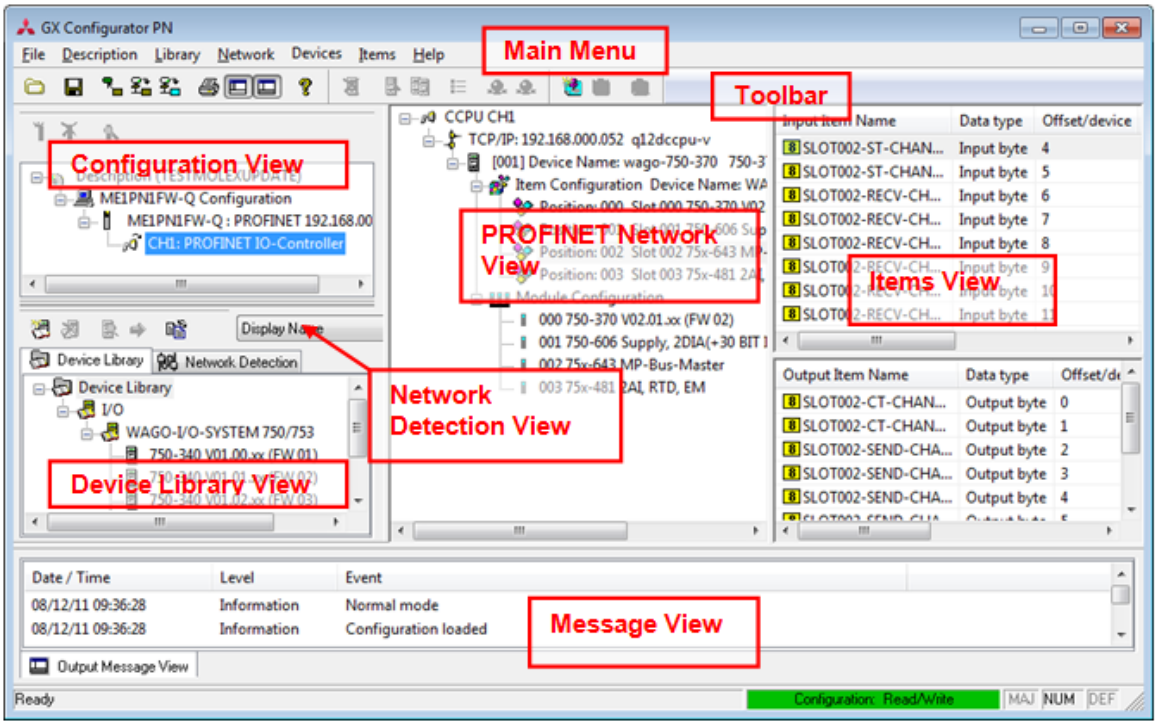
3 Getting to know GX Configurator-PN

GX Configurator-PN Concept

GX Configurator-PN (GXPN) is the configuration tool for PROFINET I/O interfaces in MITSUBISHI PLCs. It provides functions for defining a PROFINET I/O network, validating the configuration and downloading it to the respective PLC module via a MITSUBISHI automation network.
GX Configurator-PN is capable of downloading configuration data to the PROFINET I/O module via a variety of different communication types. The module can be located in a PLC rack directly connected to the PC or in a PLC rack, which is connected to other PLCs in a separate network.
GX Configurator-PN takes information on PROFINET I/O slaves from GSD files, which are specific to the respective slave and usually provided by the slave hardware vendor. It generates multi-CPU parameters for use in GX Developer (GD) and GX IEC Developer (GID).

User Interface

The graphical user interface of GX Configurator-PN assists the user by making the most important functions easily accessible.



The main items of the user interface are

- Main Menu
- Toolbar
- Configuration View
- PROFINET Network View
- Device Library View
- Network Detection View
- Items View
- Message View

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4 Installation

Before You Begin

Copyright

Important Notice:
This software is protected by copyright. By opening the distribution disks package you automatically accept terms and conditions of the license agreement.
You are only permitted to make one single copy of the original distribution disks for your own backup and archiving purposes.

Software Purpose

This software is a configuration utility software package which will be used to configure the following PROFINET I/O network interface modules of MELSEC System Qn series PLCs:

- PROFINET I/O master module ME1PN1FW-Q

4.1 System Requirements

To install the GX Configurator-PN software package your computer has to meet the following requirements

Minimum Hardware Requirements

- Pentium II 350 Mhz processor (for Vista: 1 GHz processor)
- 256 MB RAM for Microsoft ® Windows XP
- 1 GB RAM for Microsoft ® Windows Vista
- VGA compatible graphics adapter
- 17"/43 cm diag. VGA monitor
- At least 200 MB free hard disk space
- CD-ROM drive
- interface for communication with the PLC system

Software Requirements

GX Configurator-PN is a 32-bit software that runs on the following operating systems

- Microsoft ® Windows XP Home or Professional Edition
- Microsoft ® Windows Vista Home (or higher)
- Microsoft ® Windows 7 Home (or higher), both 32- and 64-bit versions
- Microsoft ® Windows 8, both 32- and 64-bit versions

Related MELSOFT Software

GX Configurator-PN is typically used together with one of the PLC programming packages for MITSUBISHI PLCs

- 'GX Developer' (GD)
- 'GX IEC Developer' (GID)
- 'GX Works 2' (GXW2) (version 1.501X or higher)

Certain functions of GX Configurator-PN are restricted or not available for specific PLC programming packages.

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4.2 Software Installation

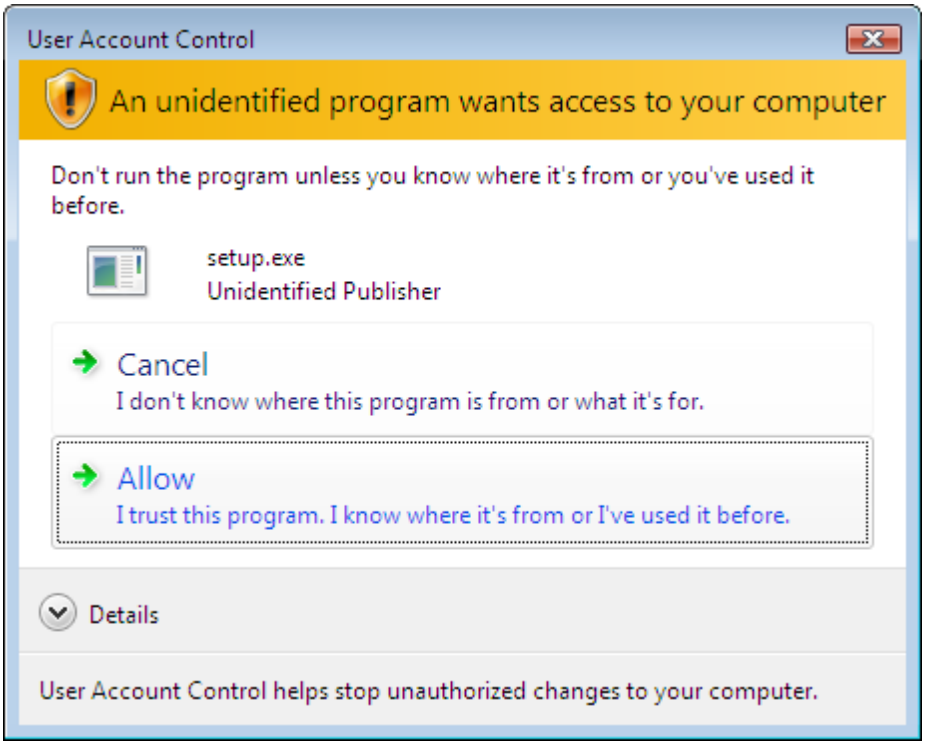
GX Configurator-PN Setup

To install the GX Configurator-PN software you need to have Microsoft ® Windows properly installed. You may require administrator privileges when installing the software.
If an older version of GX Configurator-PN is already installed, uninstall it first. After the de-installation please start the installation of the new version. If you want to keep the older version of GX Configurator-PN, please select a different directory for the new version. A de-installation of the older version, after the newer version has been installed, will also damage the newer version. Therefore please reinstall the new version after uninstalling both the older and the newer GX Configurator-PN versions, if you encounter problems. Please stop all other running software before the installation and do not run other installation programs during the installation of GX Configurator-PN.

Installing GX Configurator-PN

To start the installation, proceed as follows:

1. Insert the installation CD-ROM into your CD-ROM drive.
2. If you have 'Autorun' enabled for the drive, the setup should start automatically.
3. If the setup is not started automatically, please locate the 'setup.exe' file and execute it.
4. If you see the following message on a Windows ® Vista operating system, please select 'Allow'



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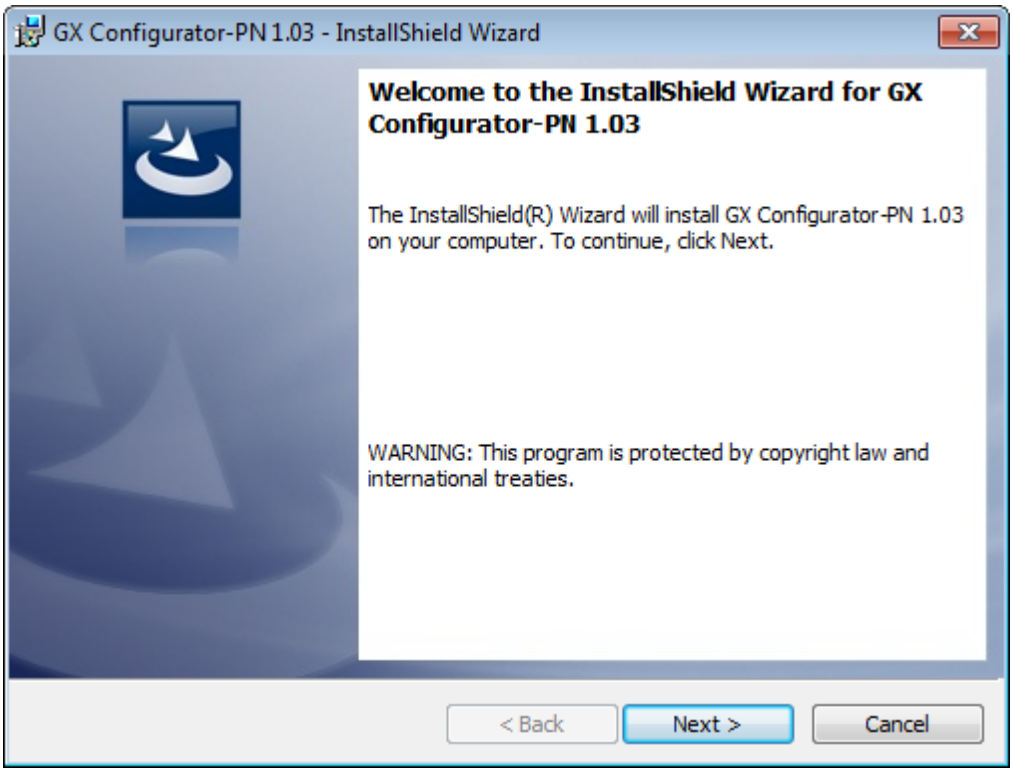
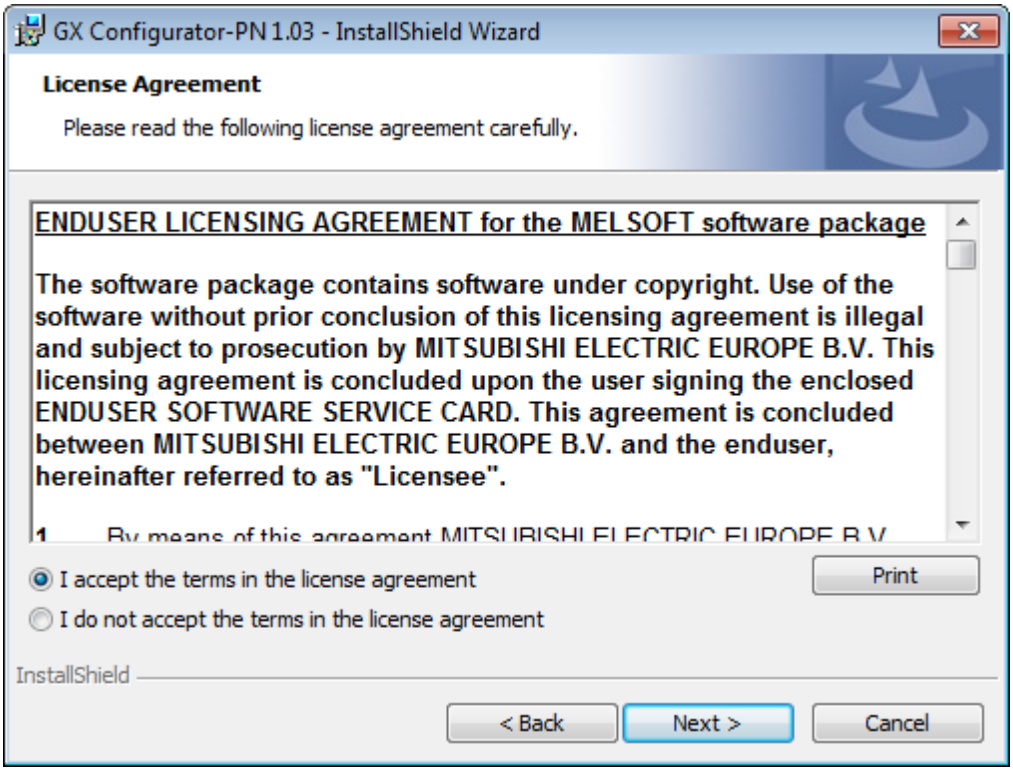
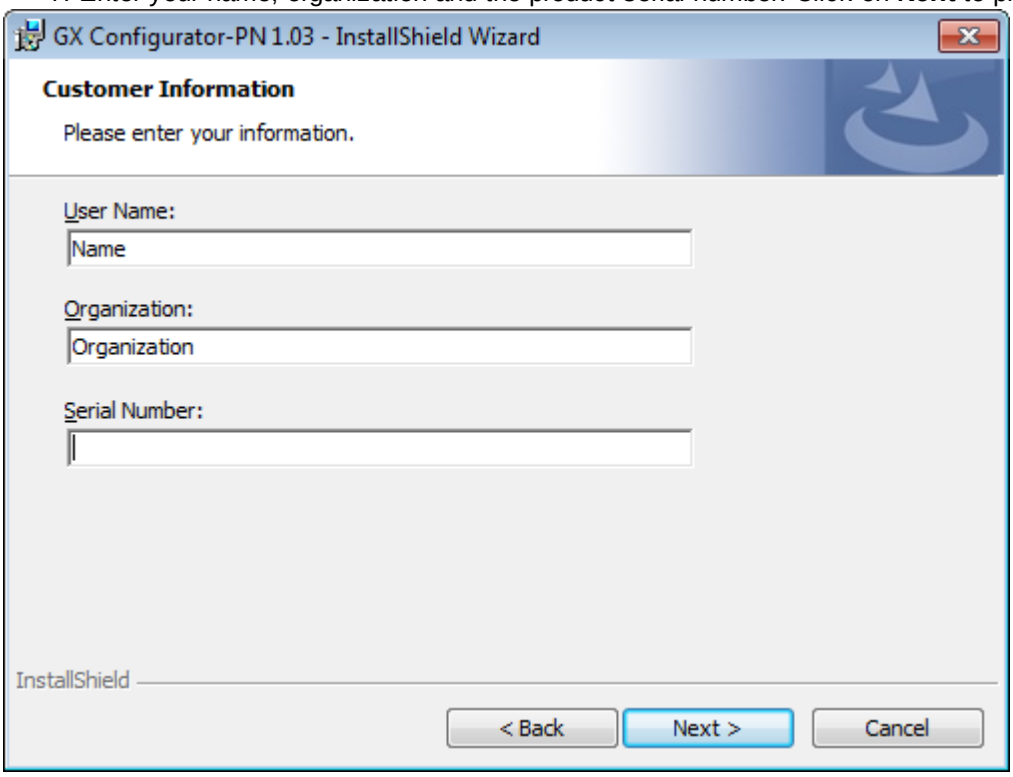
5. Follow the given instructions that guide you through the installation procedure. Continue with **Next**.



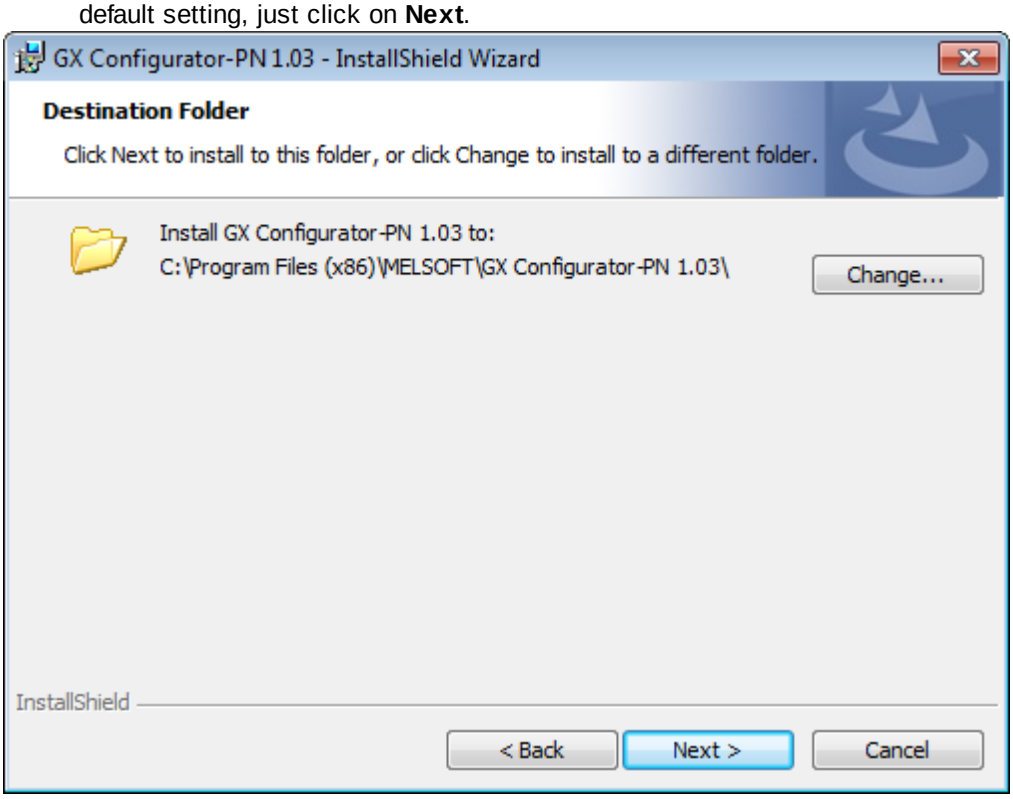
6. The licensing agreement is displayed. Please read these terms carefully. If you accept the license agreement, you can proceed with the installation by clicking **Next**. Otherwise the installation is aborted.



7. Enter your name, organization and the product serial number. Click on **Next** to proceed.



8. Enter the destination folder where you want the GX Configurator-DP software to be installed (default **C:\Program Files\MELSOFT\GX Configurator-PN 1.03**). If you want to install to a different directory, click on **Change** and select the installation directory. If you agree with the default setting, just click on **Next**.



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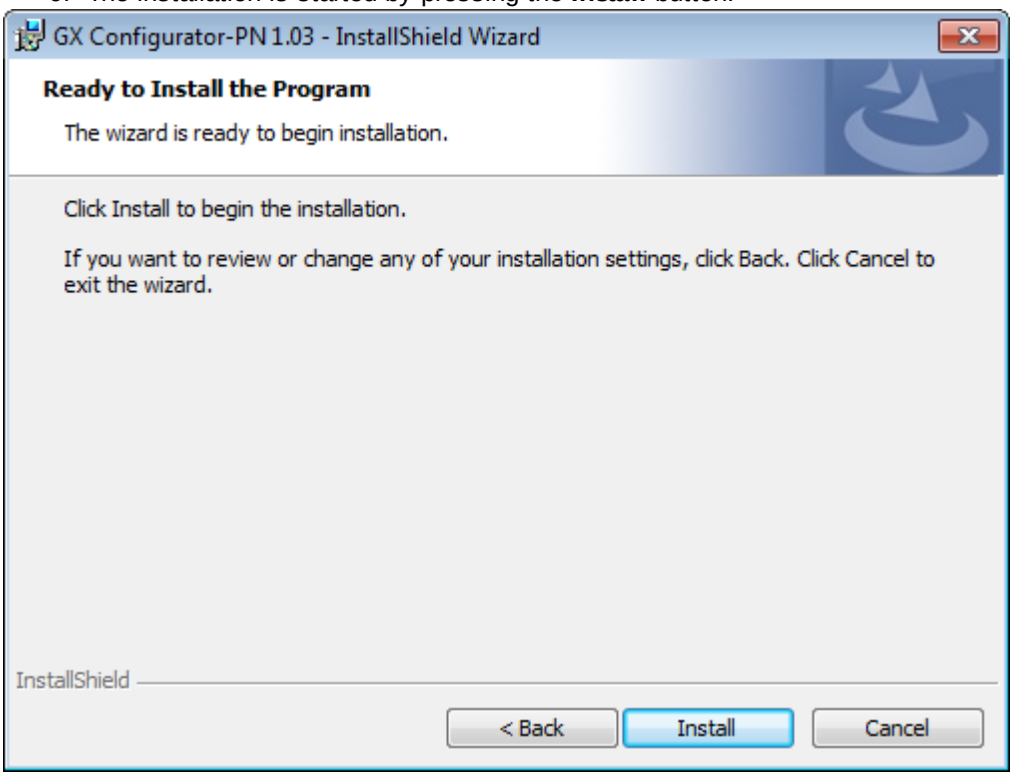
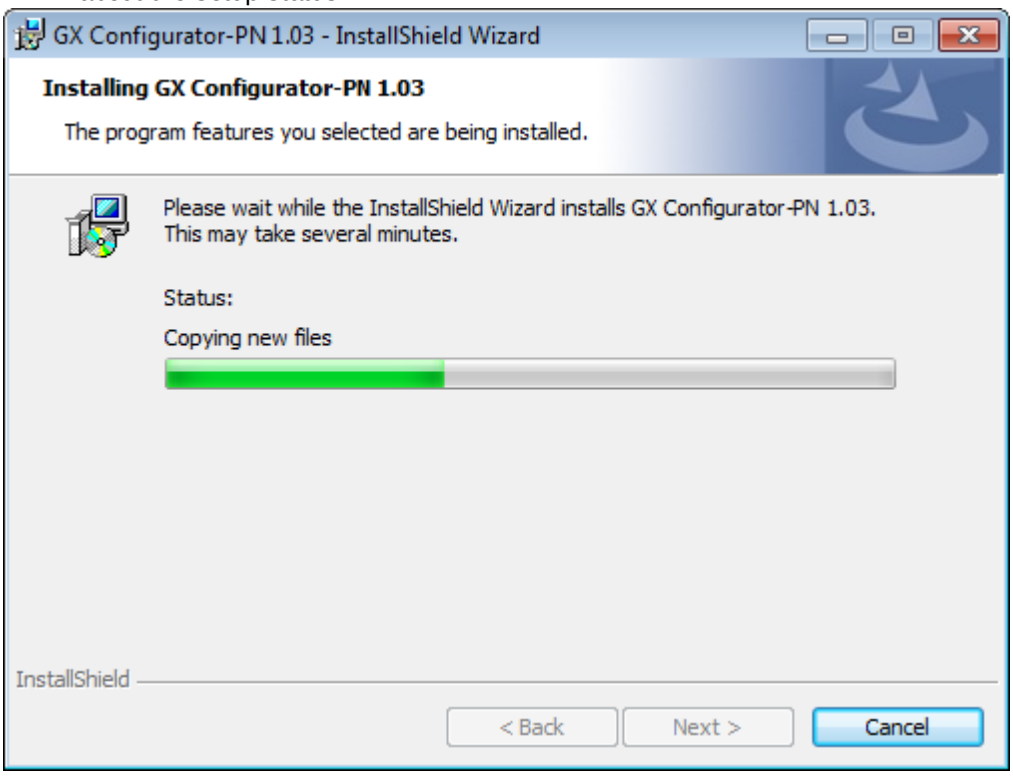
9. The installation is started by pressing the **Install** button.



10. After pressing the 'Install' button the installation is started. Progress bars will inform you about the setup status.



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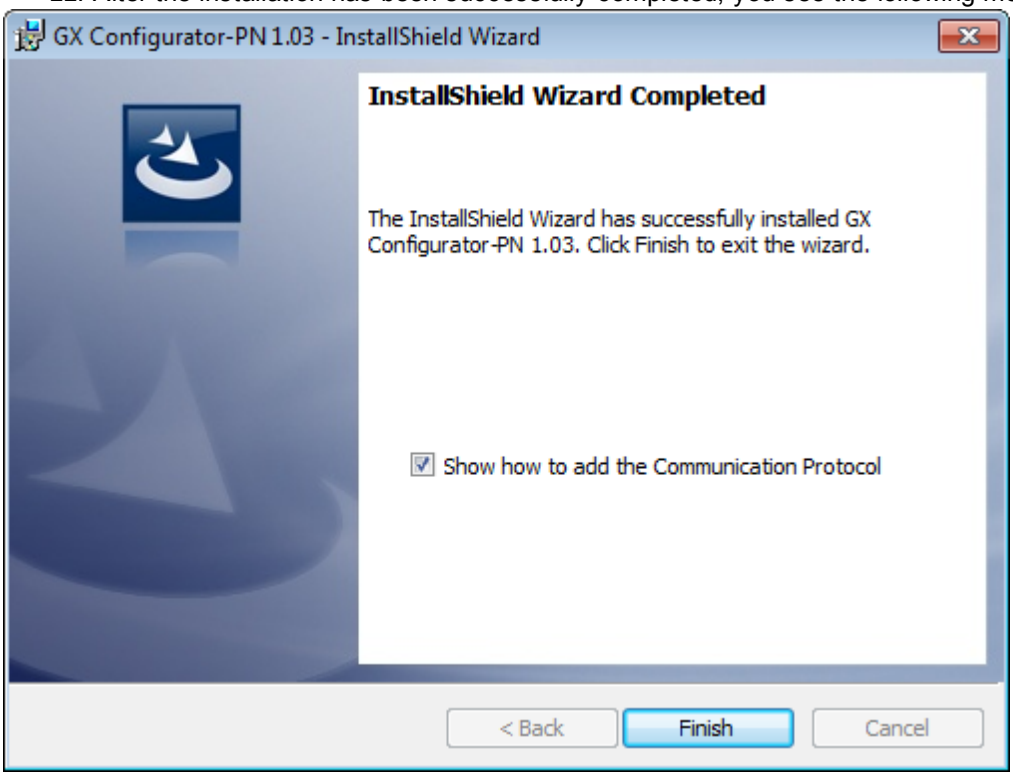
11. After the installation has been successfully completed, you see the following message



For the communication with the PROFINET Controller the 'Discovery and Configuration Protocol' (DCP) communication driver must be attached to the local Ethernet interface, which is connected to the controller. The exact steps depend on the operating system used. Please see section 'Installing the DCP Protocol Driver' for details.

Button Functions

With the **Next** button you will leave the current menu and enter the next menu.
With the **Back** button you go to the previous window.
Cancel button ends the installation procedure.

4.3 Installing the DCP Protocol Driver

The DCP protocol must be manually added to the Ethernet interface, which is used for communication with the PROFINET Controller. The procedure is specific for each of the following supported operating systems

- Windows XP
- Windows Vista
- Windows 7
- Windows 8

Note: you may need administrator rights for the following steps!

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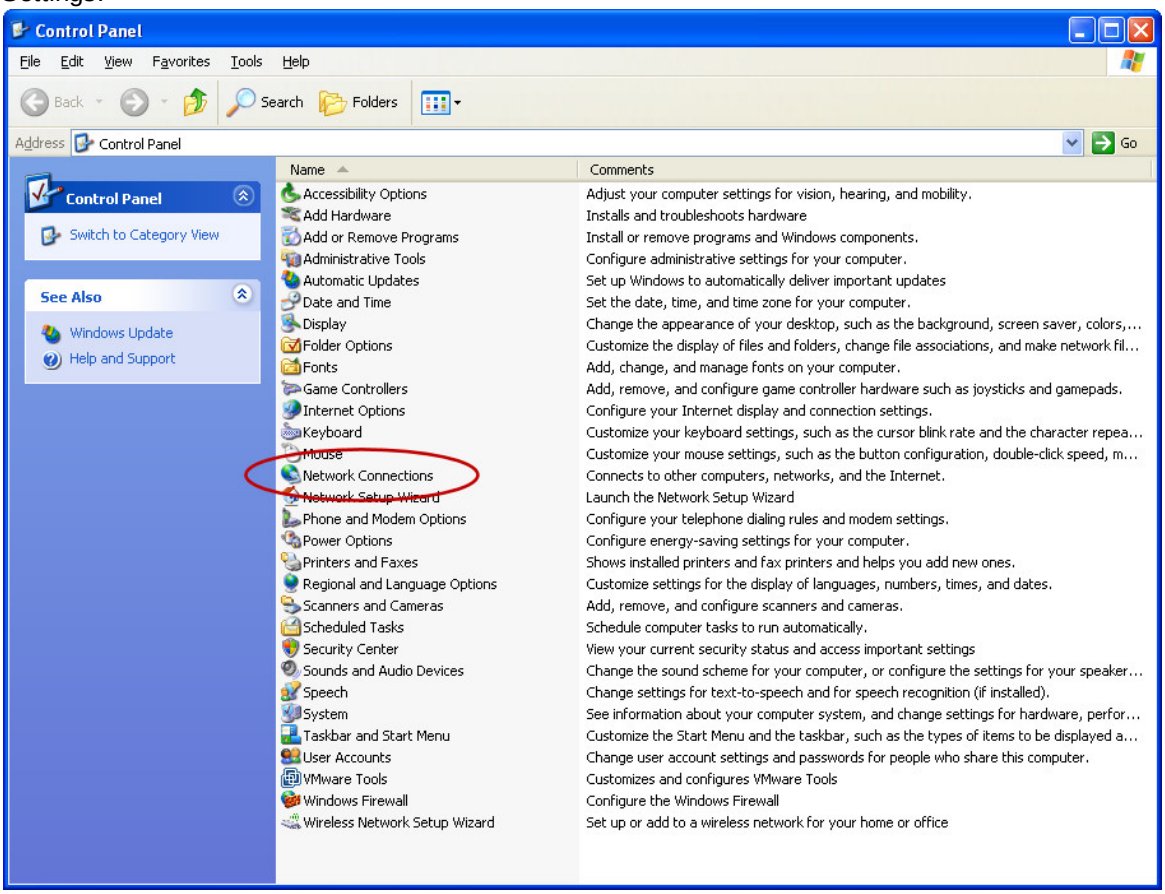
4.3.1 Windows XP

1. Open the Control Panel and double click "Network Connections" to open the Network Connection Settings.



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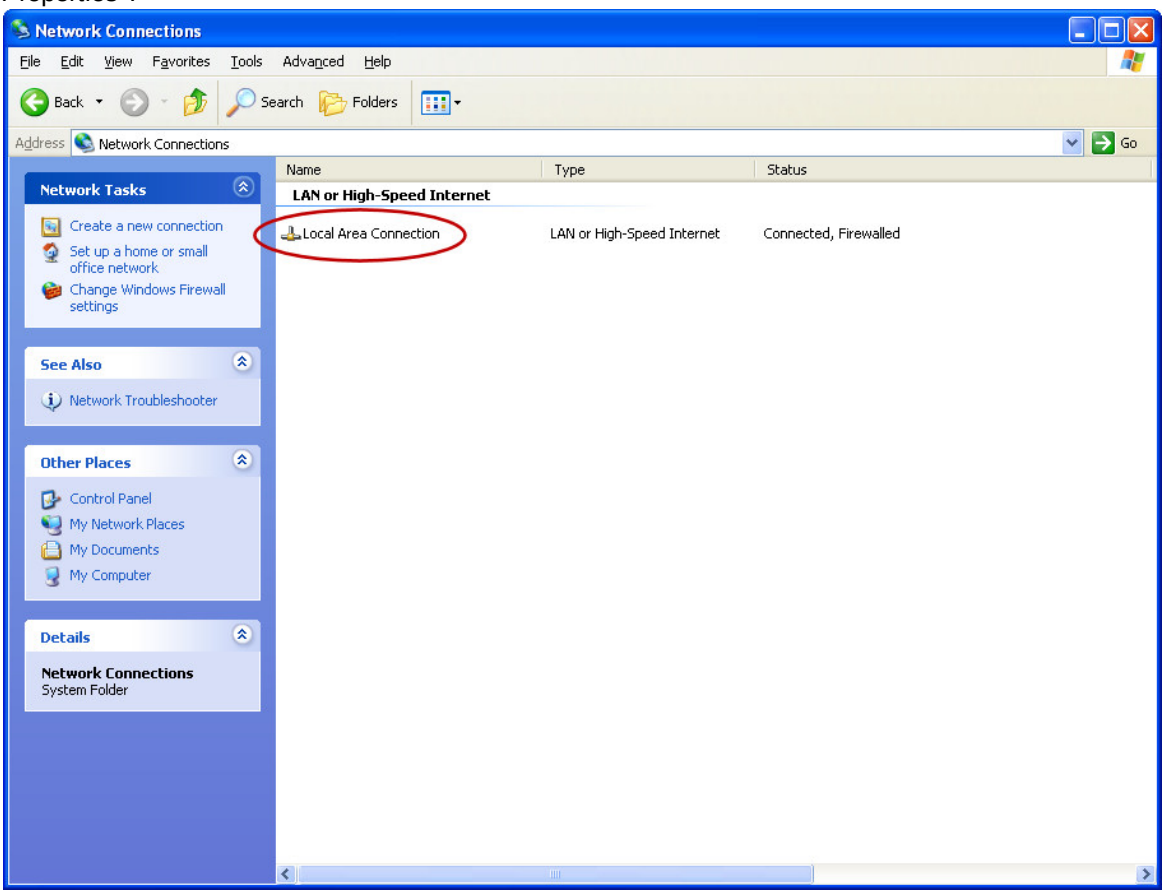
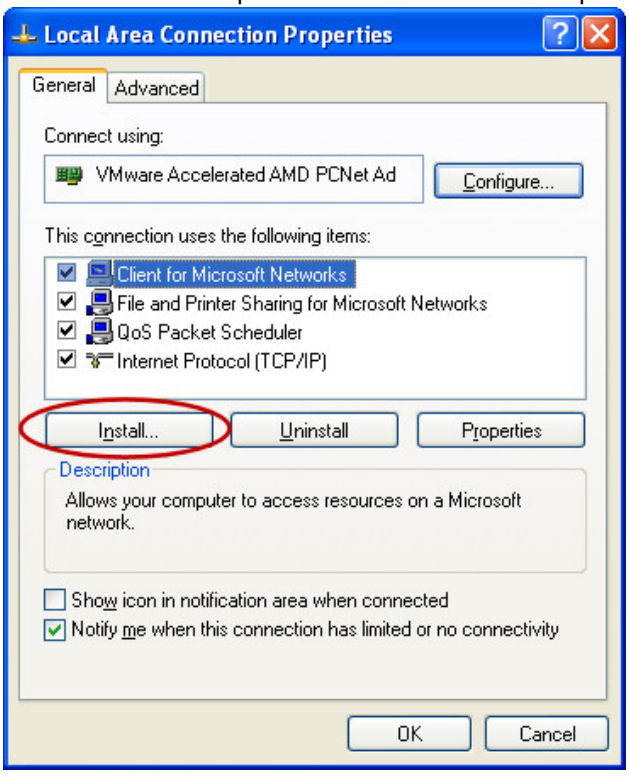
2. Right click "Local Area Connection" and select "Properties" to open the "Local Area Connection Properties".



3. Click "Install" to open the "Select Network Component Type" dialog.



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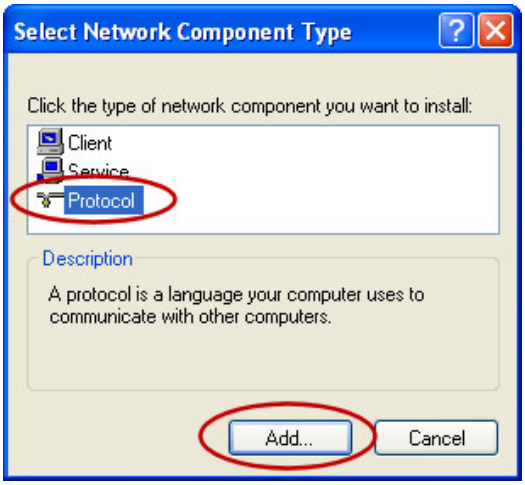
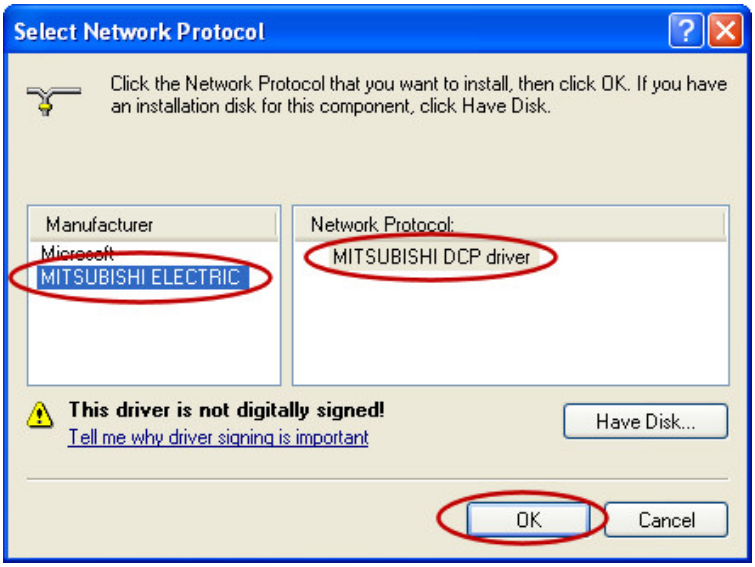
4. Select "Protocol" from the List and click "Add..." to open the "Select Network Protocol" dialog.



5. Select "MITSUBISHI ELECTRIC" from the "Manufacturer" List and after that "MITSUBISHI DCP driver" from the "Network Protocol" List. Then click "OK" to confirm the selection.



The "MITSUBISHI DCP driver" is now added to the Protocol List in the dialog "Local Area Connection Properties".

Note: After adding the driver the operating system must be restarted to enable online operation for GX Configurator-PN.

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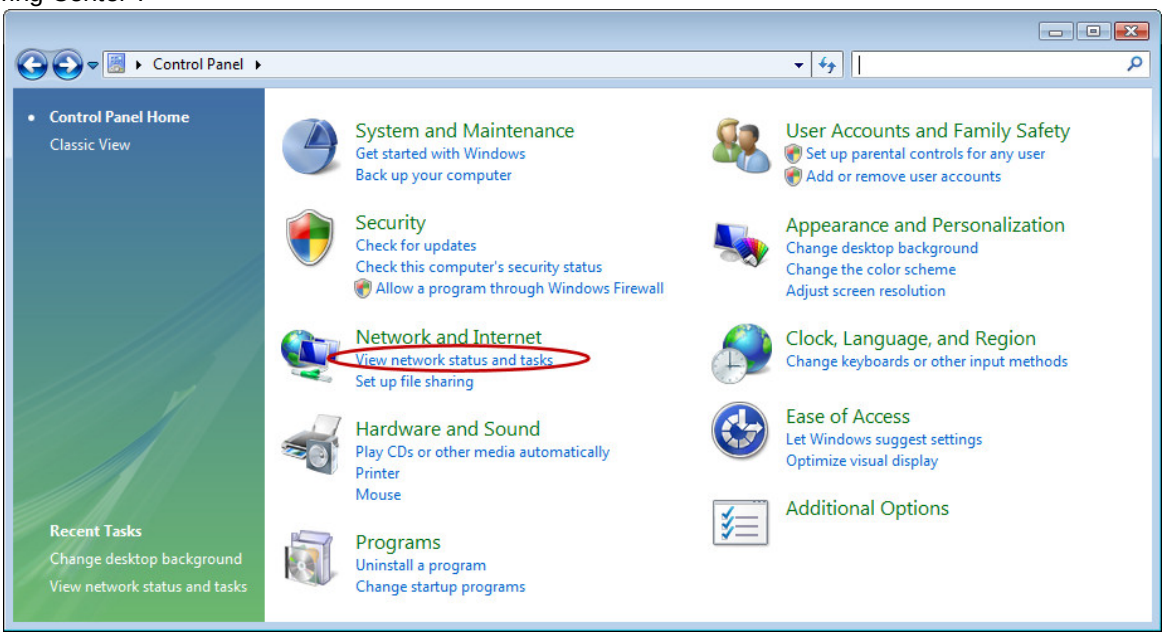
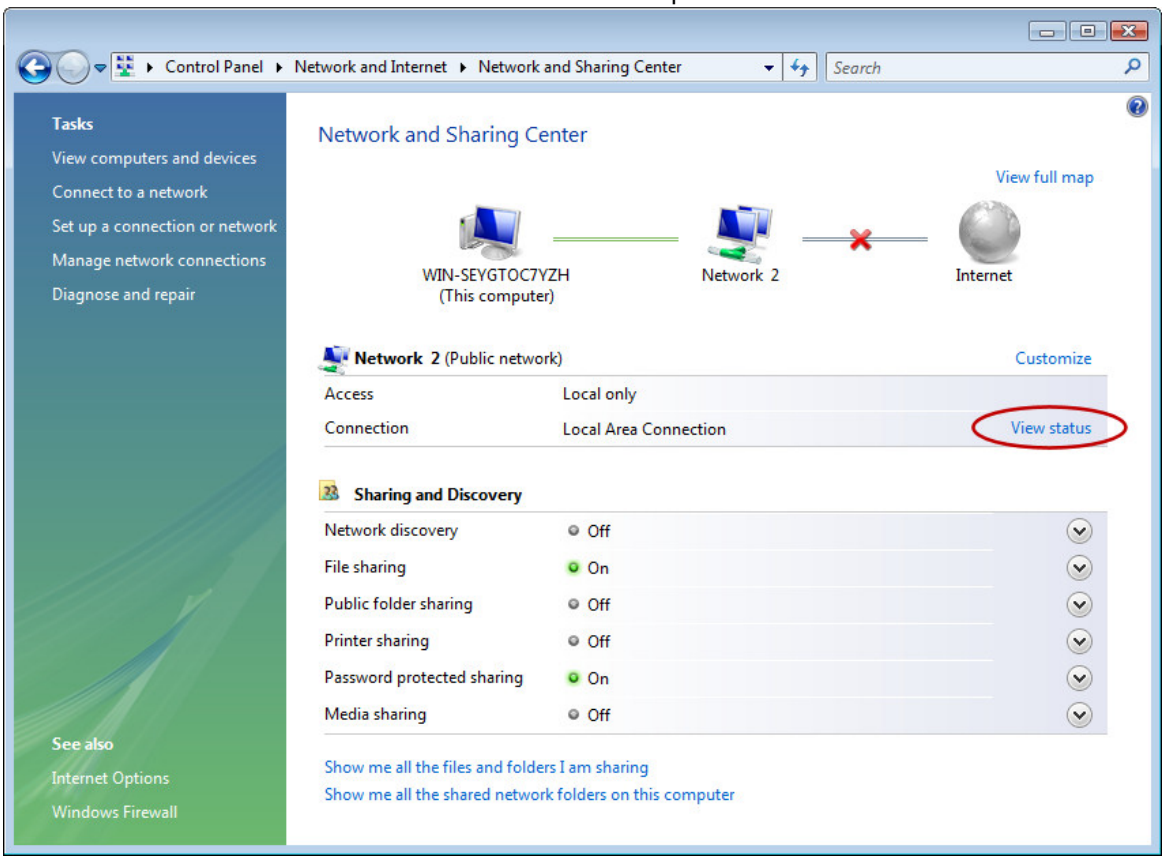
4.3.2 Windows Vista

1. Open the Control Panel and click "View network status and tasks" to open the "Network and Sharing Center".



2. Click "View Status" of the "Local Area Connection" to open the "Local Area Connection Status".



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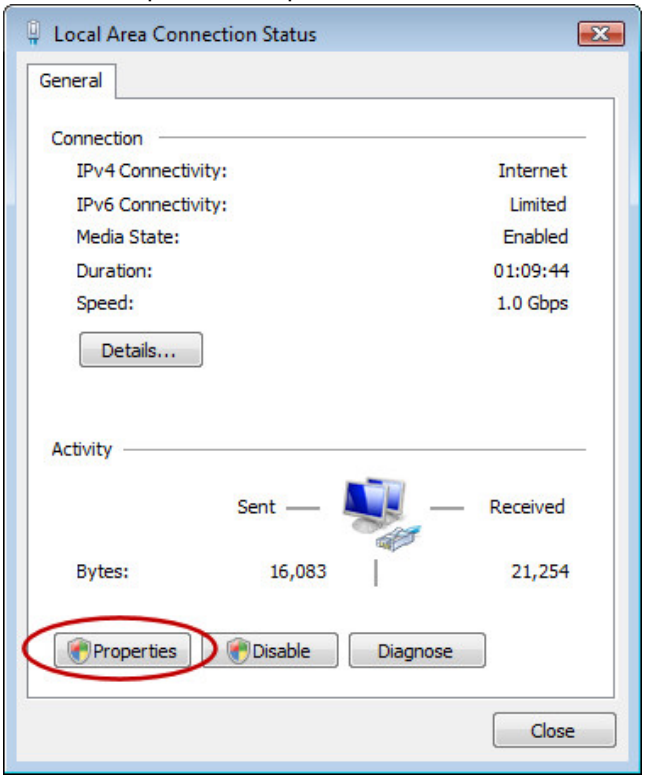
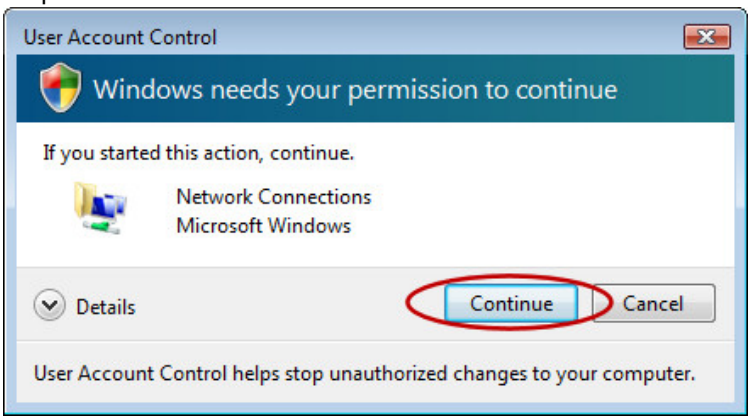
3. Click "Properties" to open the "Local Area Connection Properties".



4. Answer the "User Account Control" with "Continue" to step further to the "Local Area Connection Properties".



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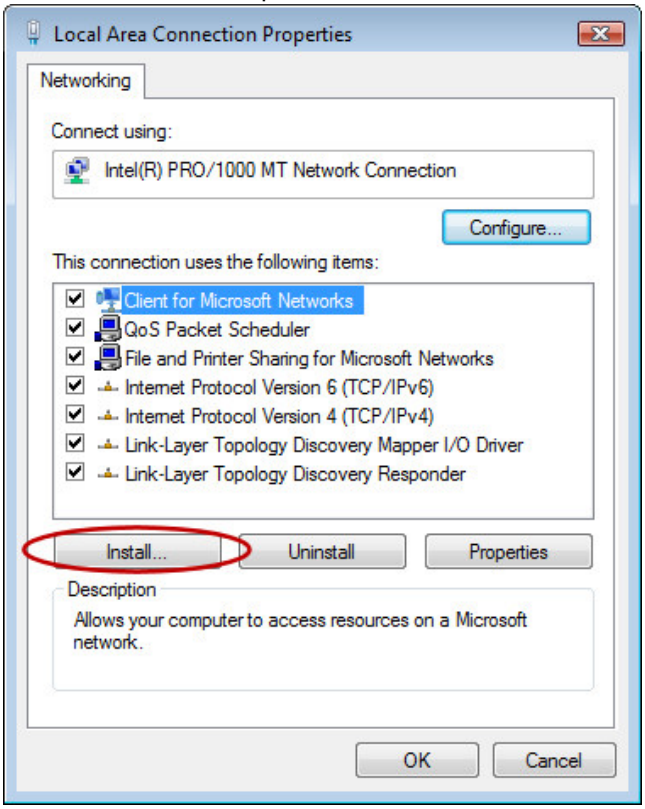
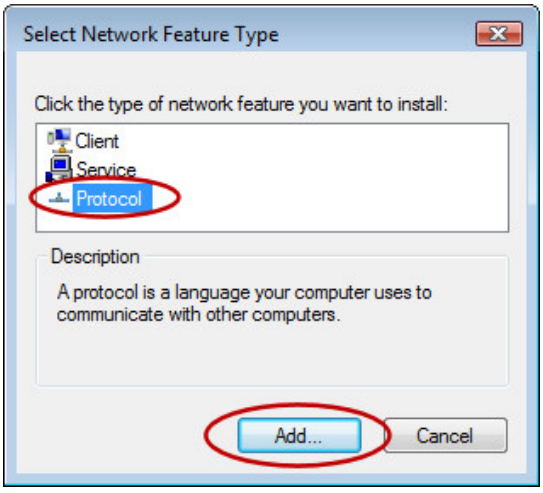
5. Click "Install..." to open the "Select Network Feature Type" dialog.



6. Select "Protocol" from the List and click "Add..." to open the "Select Network Protocol" dialog.



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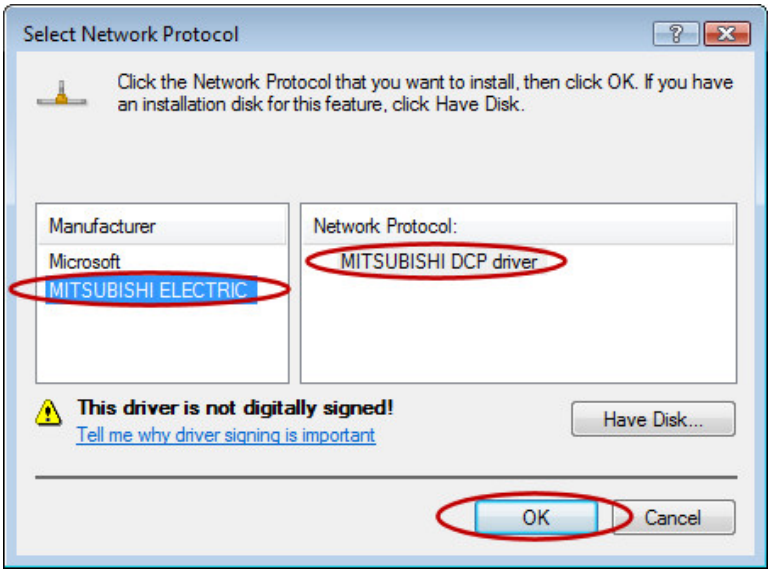
7. Select "MITSUBISHI ELECTRIC" from the "Manufacturer" List and after that "MITSUBISHI DCP driver" from the "Network Protocol" List. Then click "OK" to confirm the selection.

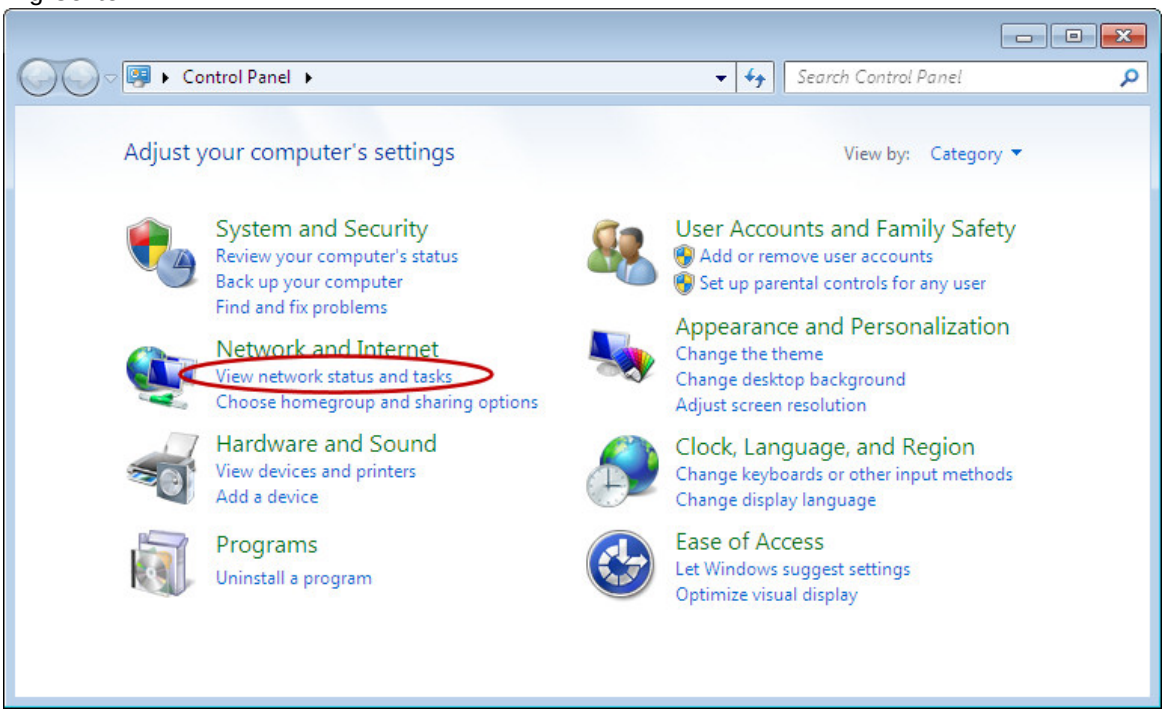


The "MITSUBISHI DCP driver" is now added to the Protocol List in the dialog "Local Area Connection Properties".

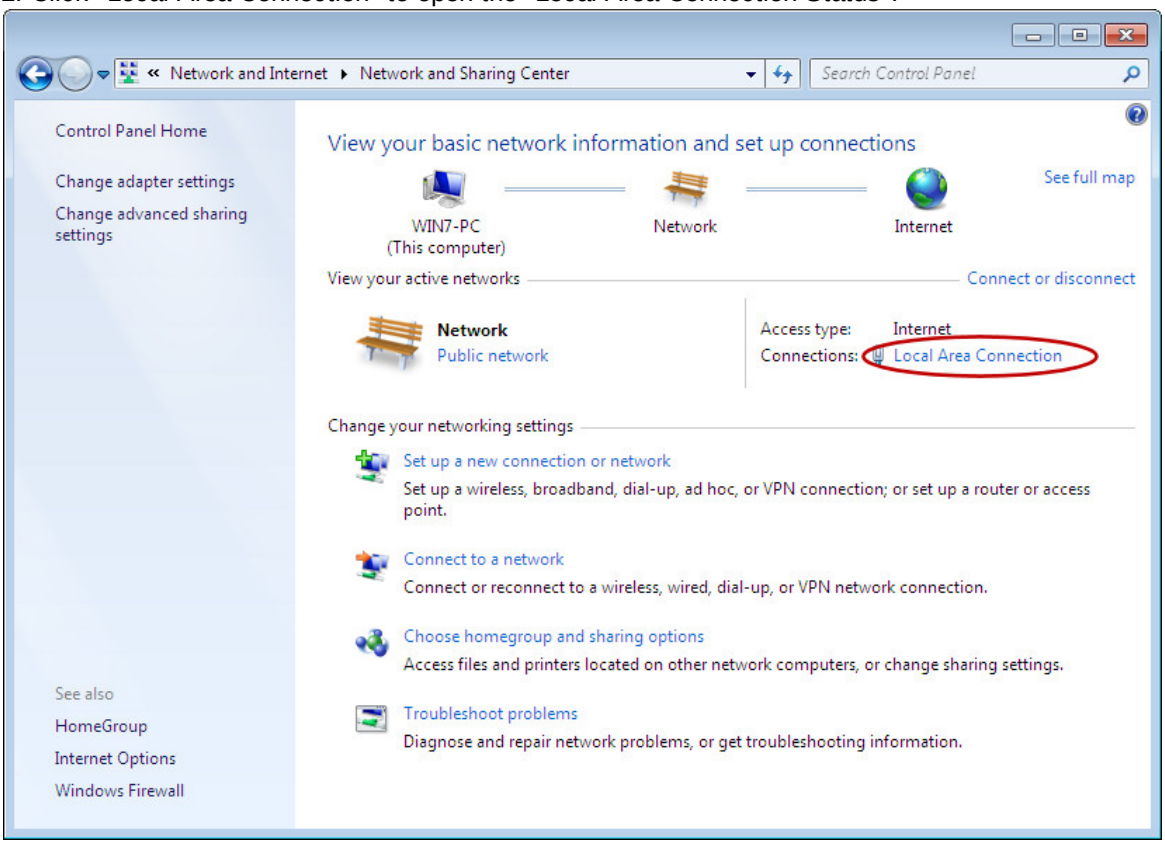
Note: After adding the driver the operating system must be restarted to enable online operation for GX Configurator-PN.

4.3.3 Windows 7

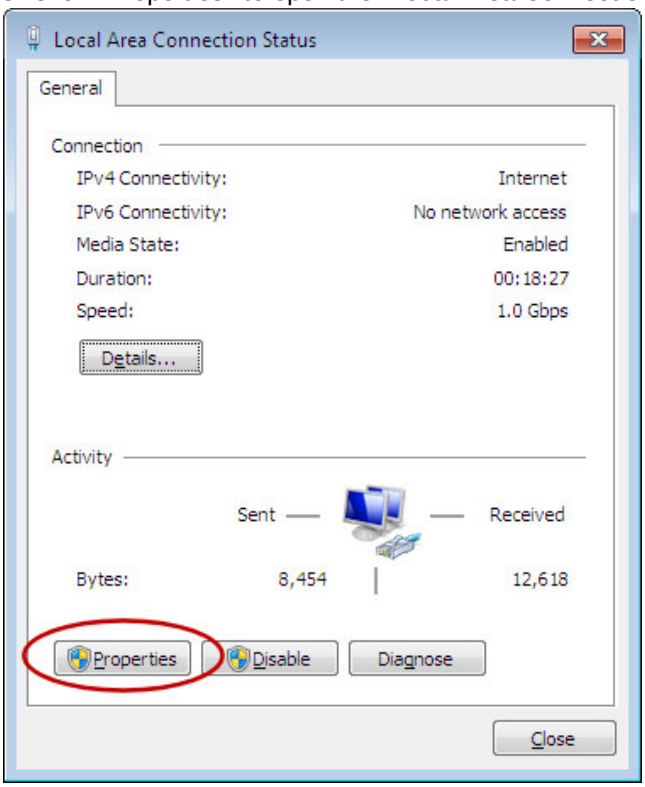
1. Open the Control Panel and click "View network status and tasks" to open the "Network and Sharing Center".



2. Click "Local Area Connection" to open the "Local Area Connection Status".



3. Click "Properties" to open the "Local Area Connection Properties".



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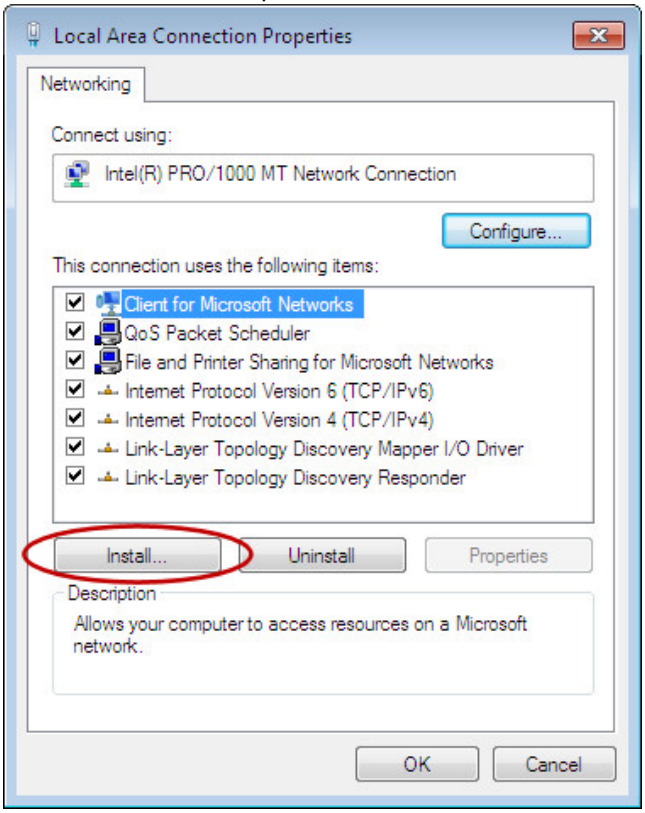
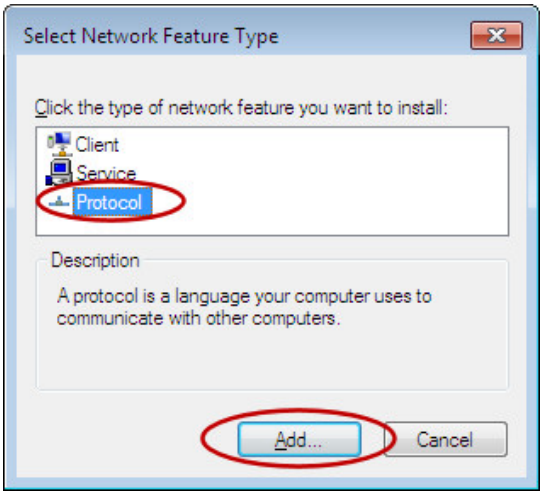
4. Click "Install..." to open the "Select Network Feature Type" dialog.



5. Select "Protocol" from the List and click "Add..." to open the "Select Network Protocol" dialog.



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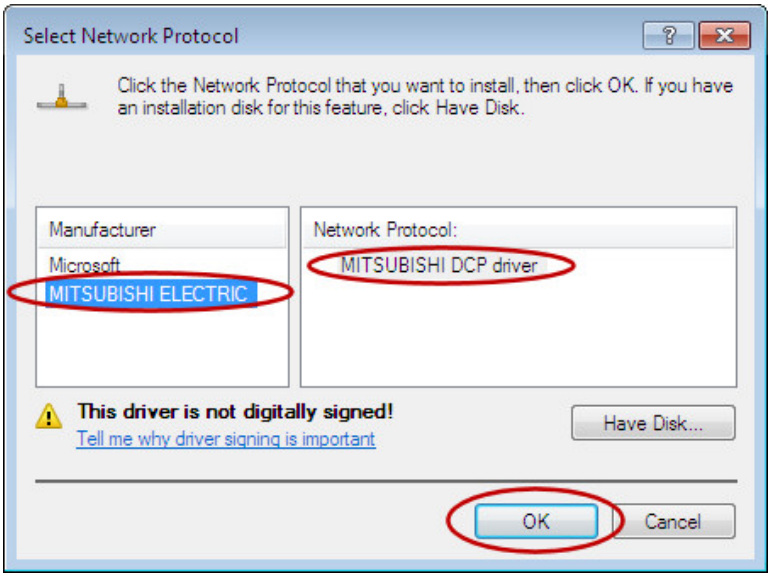
6. Select "MITSUBISHI ELECTRIC" from the "Manufacturer" List and after that "MITSUBISHI DCP driver" from the "Network Protocol" List. Then click "OK" to confirm the selection.

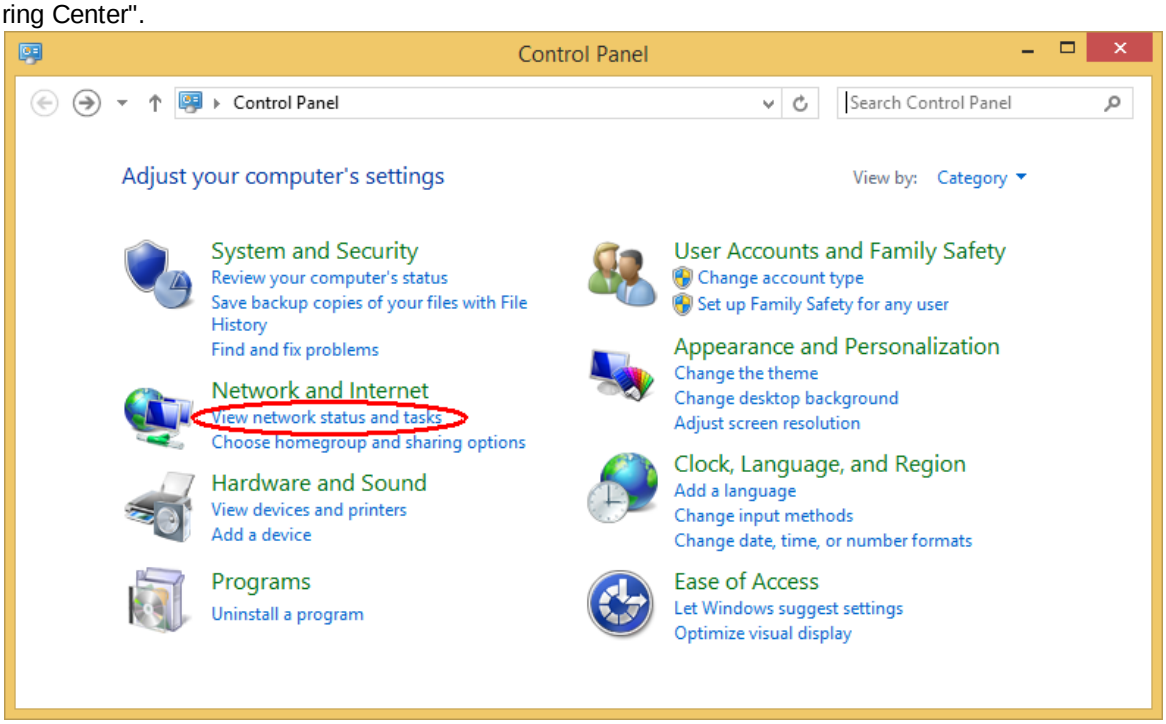


The "MITSUBISHI DCP driver" is now added to the protocol list in the dialog "Local Area Connection Properties".

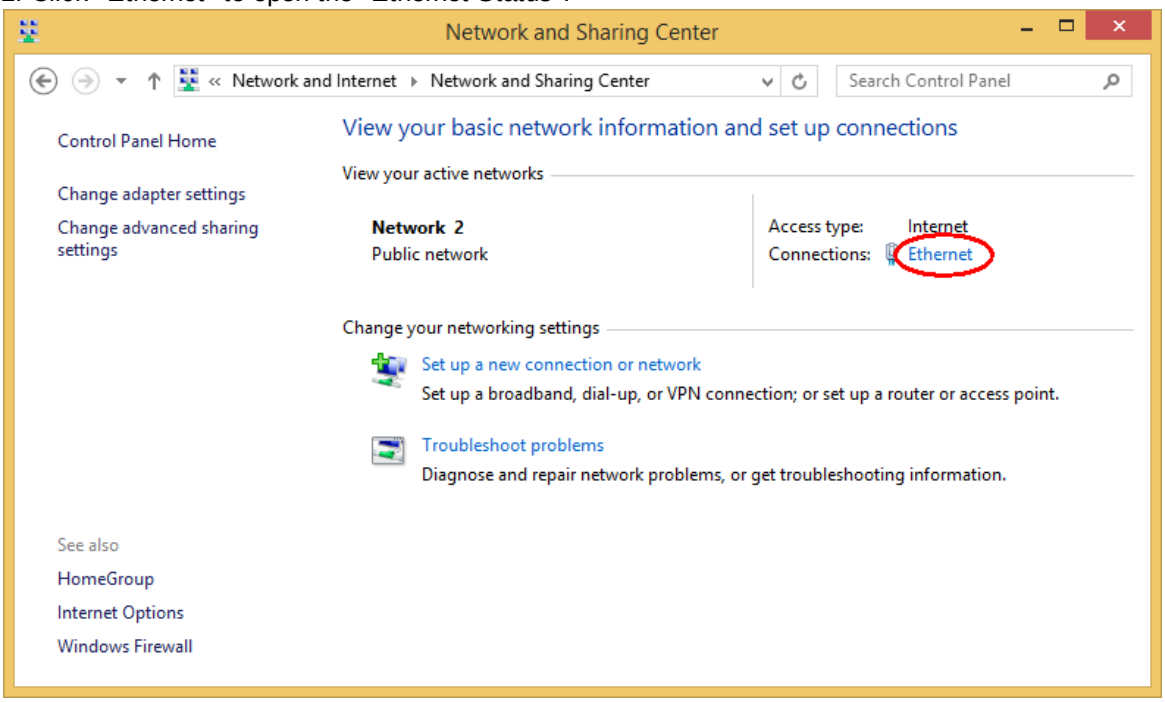
Note: After adding the driver the operating system must be restarted to enable online operation for GX Configurator-PN.

4.3.4 Windows 8

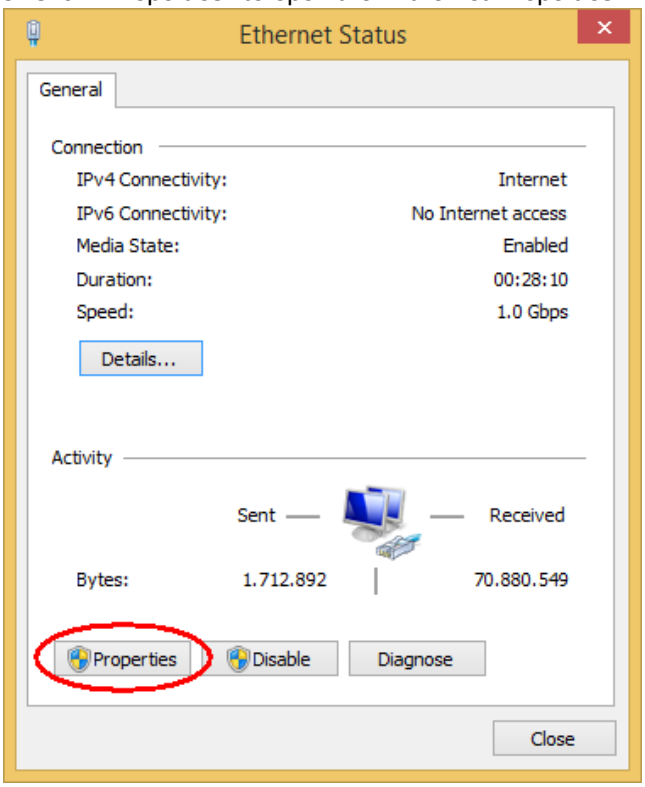
1. Open the Control Panel and click "View network status and tasks" to open the "Network and Sharing Center".



2. Click "Ethernet" to open the "Ethernet Status".



3. Click "Properties" to open the "Ethernet Properties".



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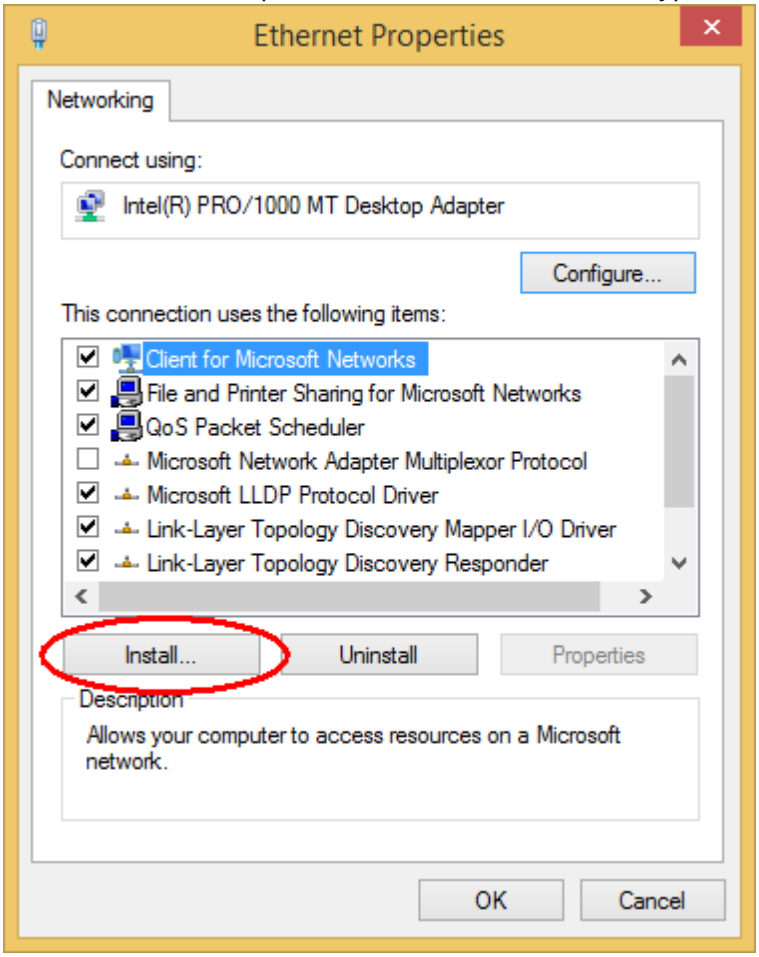
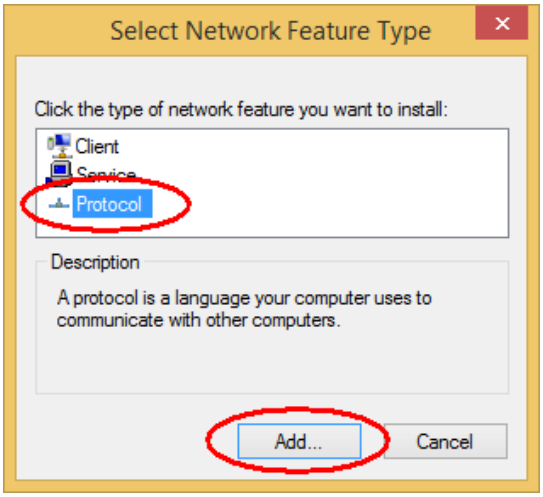
4. Click "Install..." to open the "Select Network Feature Type" dialog.



5. Select "Protocol" from the List and click "Add..." to open the "Select Network Protocol" dialog.



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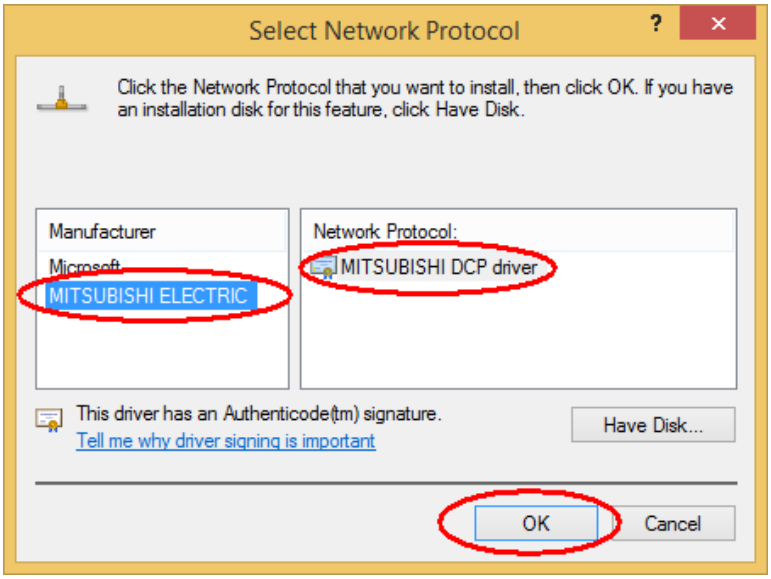
6. Select "MITSUBISHI ELECTRIC" from the "Manufacturer" List and after that "MITSUBISHI DCP driver" from the "Network Protocol" List. Then click "OK" to confirm the selection.



The "MITSUBISHI DCP driver" is now added to the protocol list in the dialog "Local Area Connection Properties".

Note: After adding the driver the operating system must be restarted to enable online operation for GX Configurator-PN.

4.4 PROFINET Controller Installation

The PROFINET Controller must be in its factory default settings, before the PROFINET I/O firmware can be installed and started. If the module has been used before or any problems are encountered during the PROFINET I/O firmware installation, the module must first be set to its factory defaults. For the detailed procedure see the section 'Troubleshooting - Factory Default Settings'.

To install the PROFINET I/O firmware the CF card received from MITSUBISHI must be inserted in the CF card slot on the module.

1. reset the module to initiate copying the contents of the CF card to the ME1PN1FW-Q memory

2. wait, until the 7-segment LED shows '**AA**', indicating that the script on the CF card has been completed without an error

3. now remove the CF card and reset the controller

4. start GX Configurator-PN, create a configuration with the correct MAC address of the PROFINET Controller and enter the IP address you want for the PROFINET Controller.

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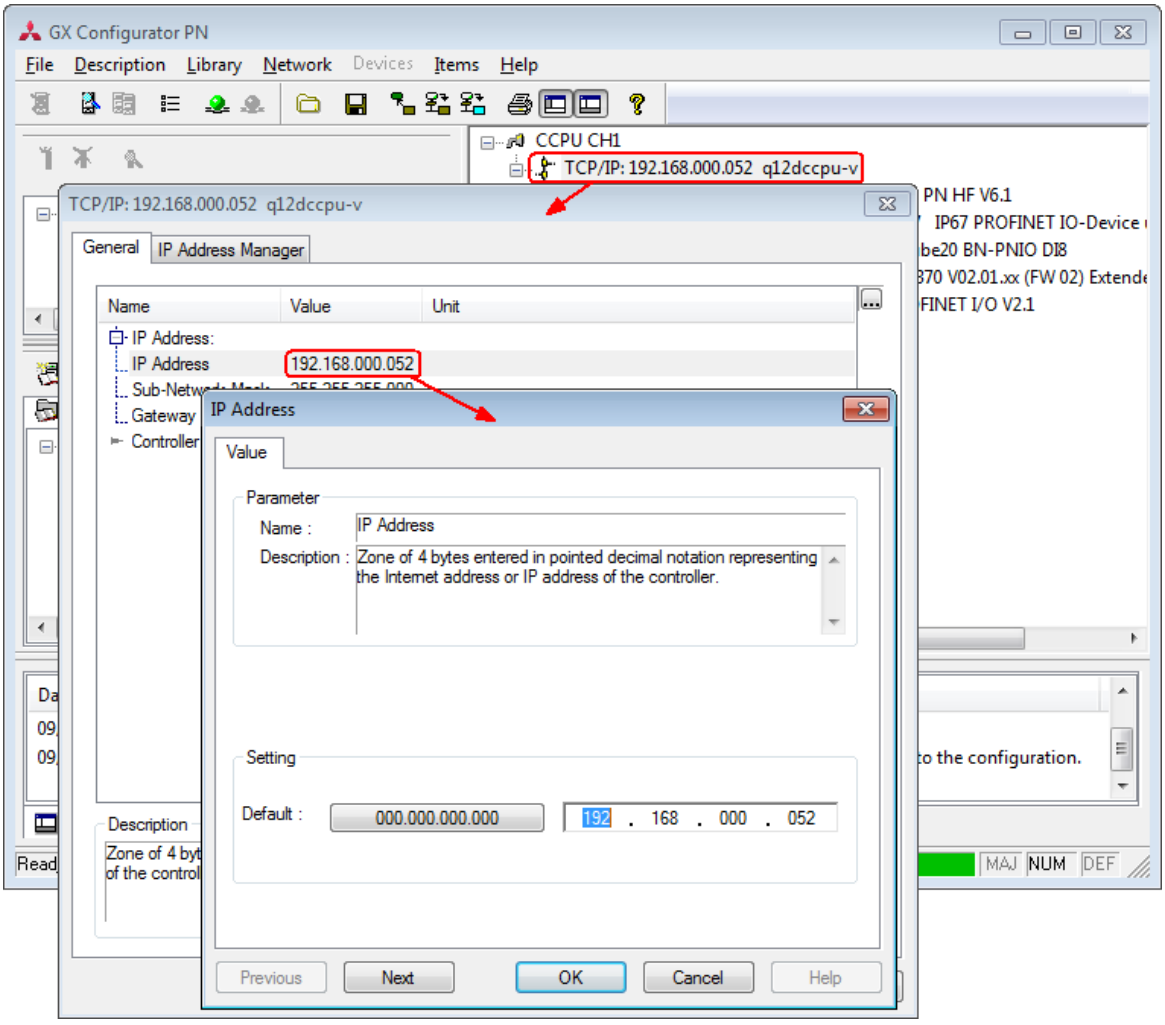
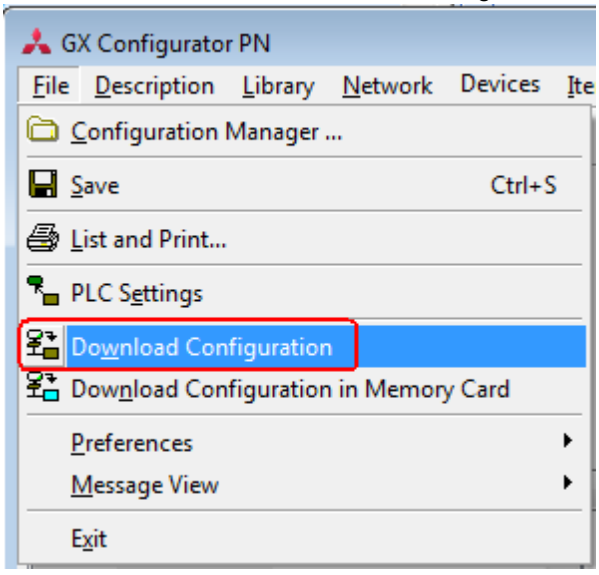


5. download the configuration (this includes setting the IP address from the default setting of the PROFINET Controller to the address assigned in the GX Configurator-PN project)



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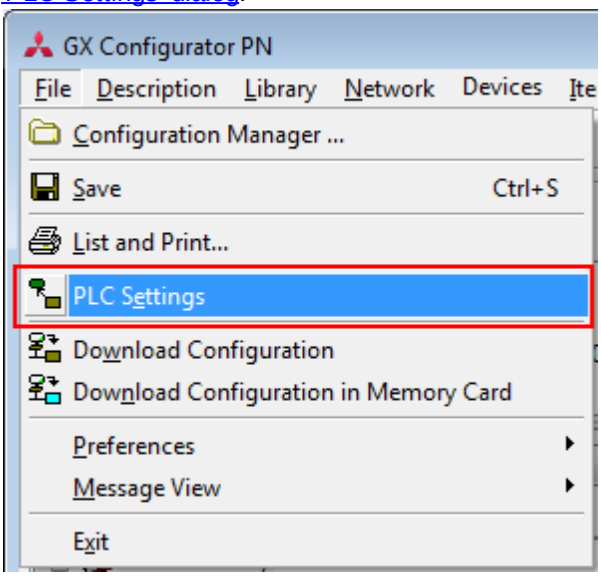
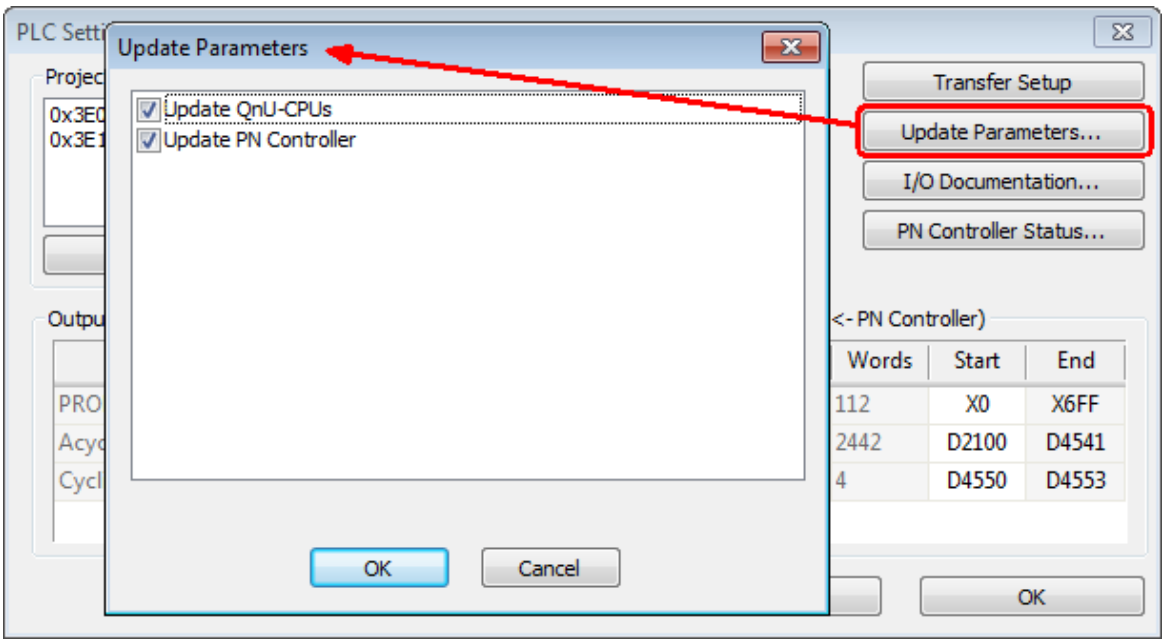
6. update the refresh settings on both the controlling Qn-CPU and the PROFINET Controller in the 'PLC Settings' dialog.





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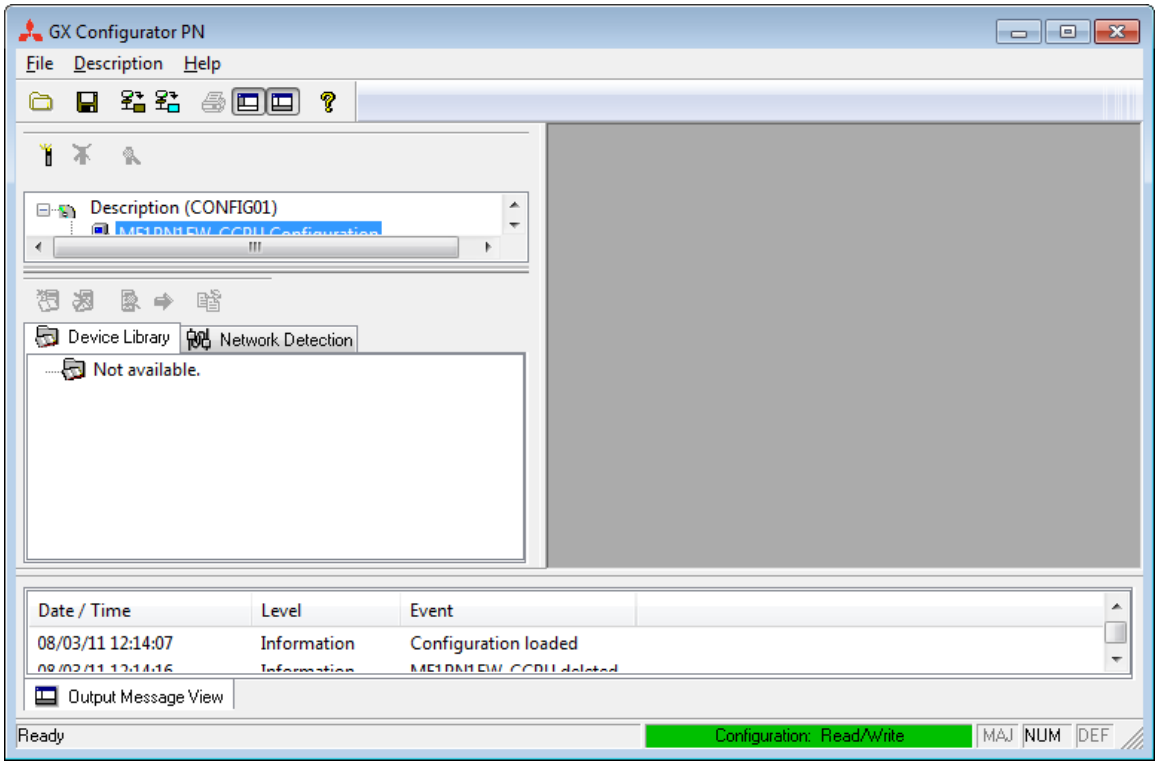
5 Getting Started

Below are the main steps, which are required to configure a PROFINET I/O master module.

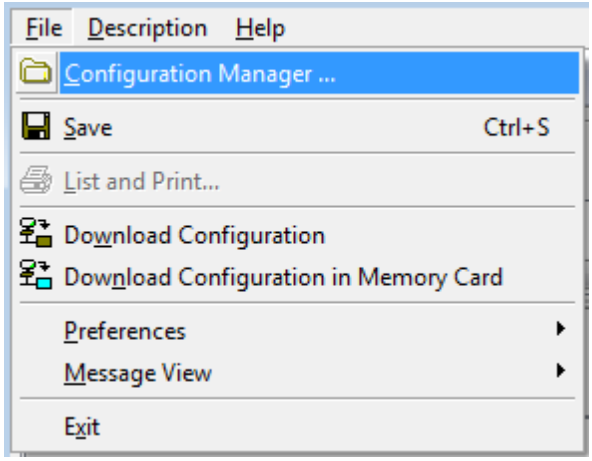
Start GX Configurator-PN

1. Start GX Configurator-PN via the shortcut in the Programs menu. The default location of the shortcut is **Programs \ MELSOFT Application \ GX Configurator-PN 1.03 \ GX Configurator-PN 1.03**.



Start a New Project

1. In the main menu **File** select **Configuration Manager**.



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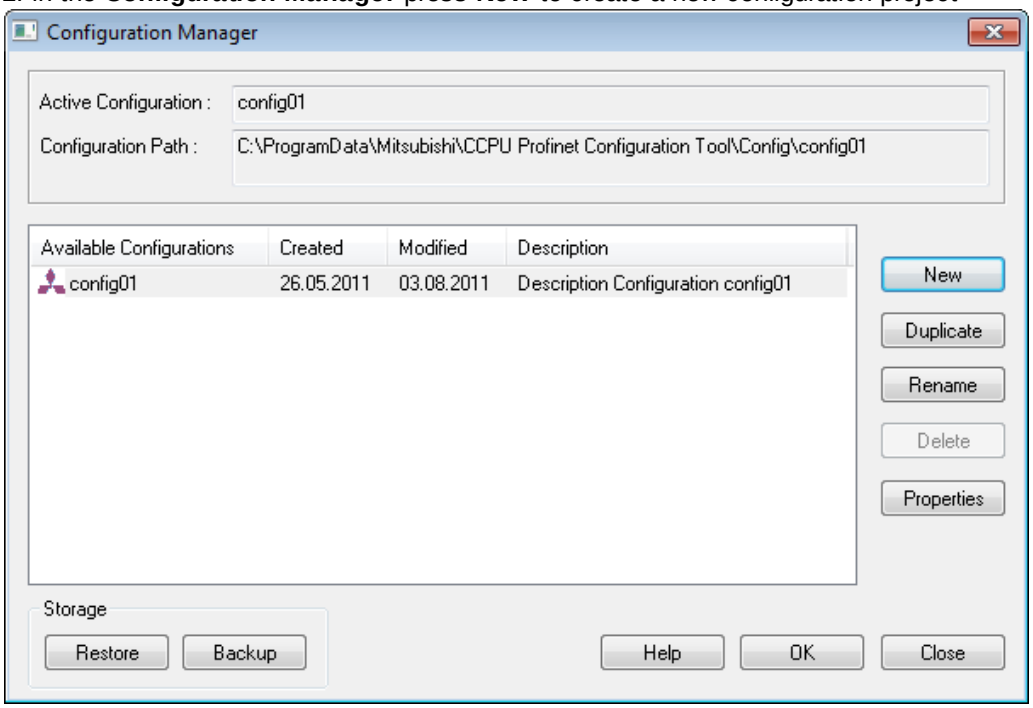
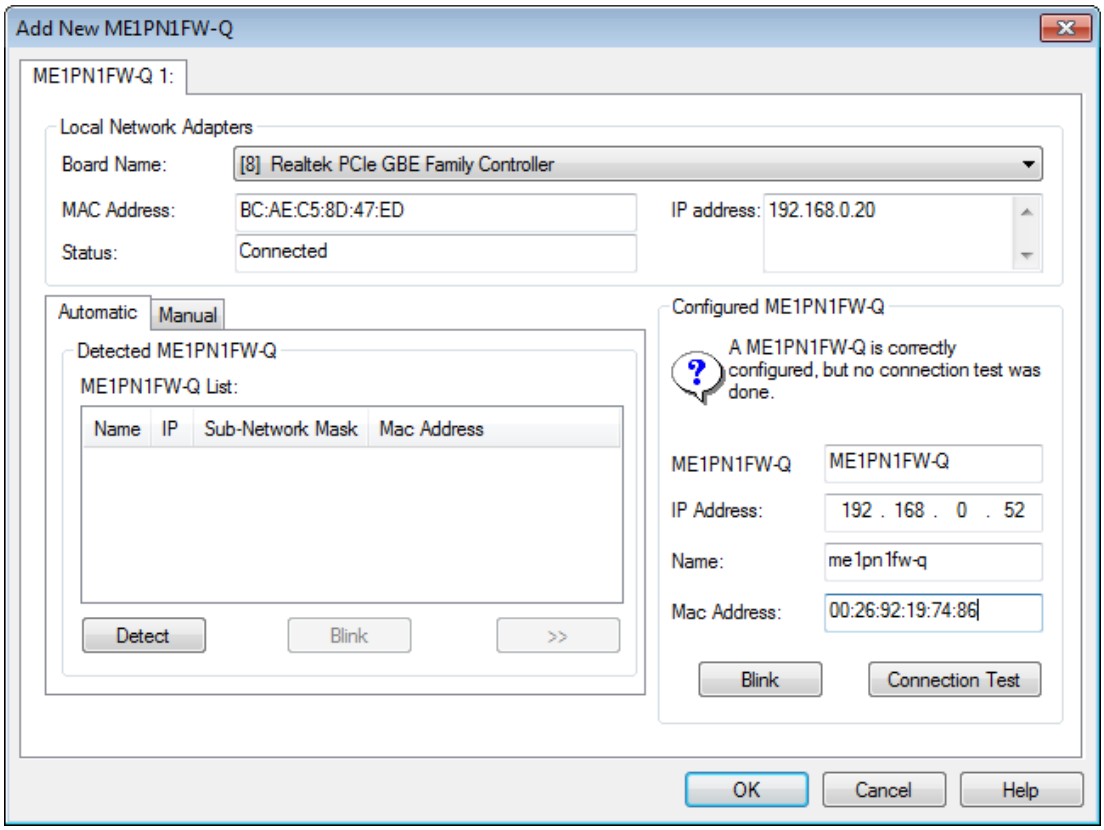
2. in the **Configuration Manager** press **New** to create a new configuration project



After closing the 'Configuration Manager' dialog the 'Add New ME1PN1FW-Q' dialog is displayed. The user must select the local network interface, the ME1PN1FW-Q is connected to. The user can then choose to obtain the network address of the module either automatically or manually. For details see the description of the 'Add New ME1PN1FW-Q' dialog.



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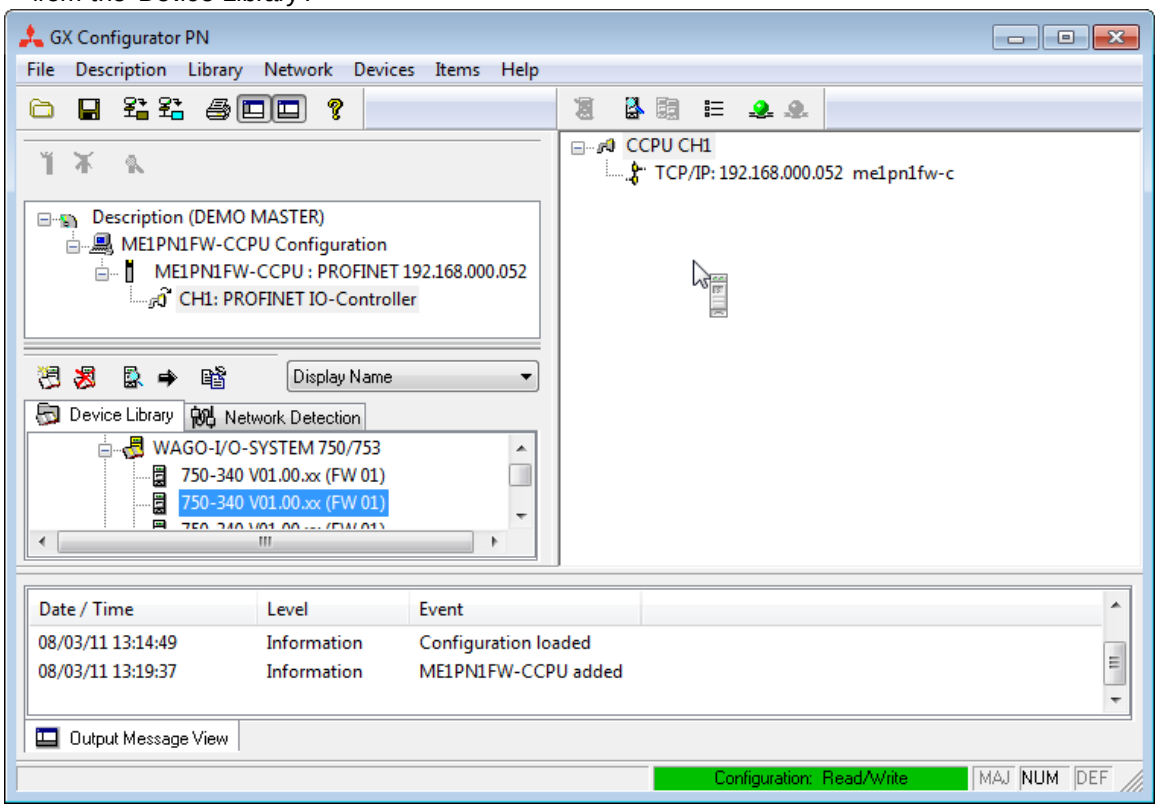
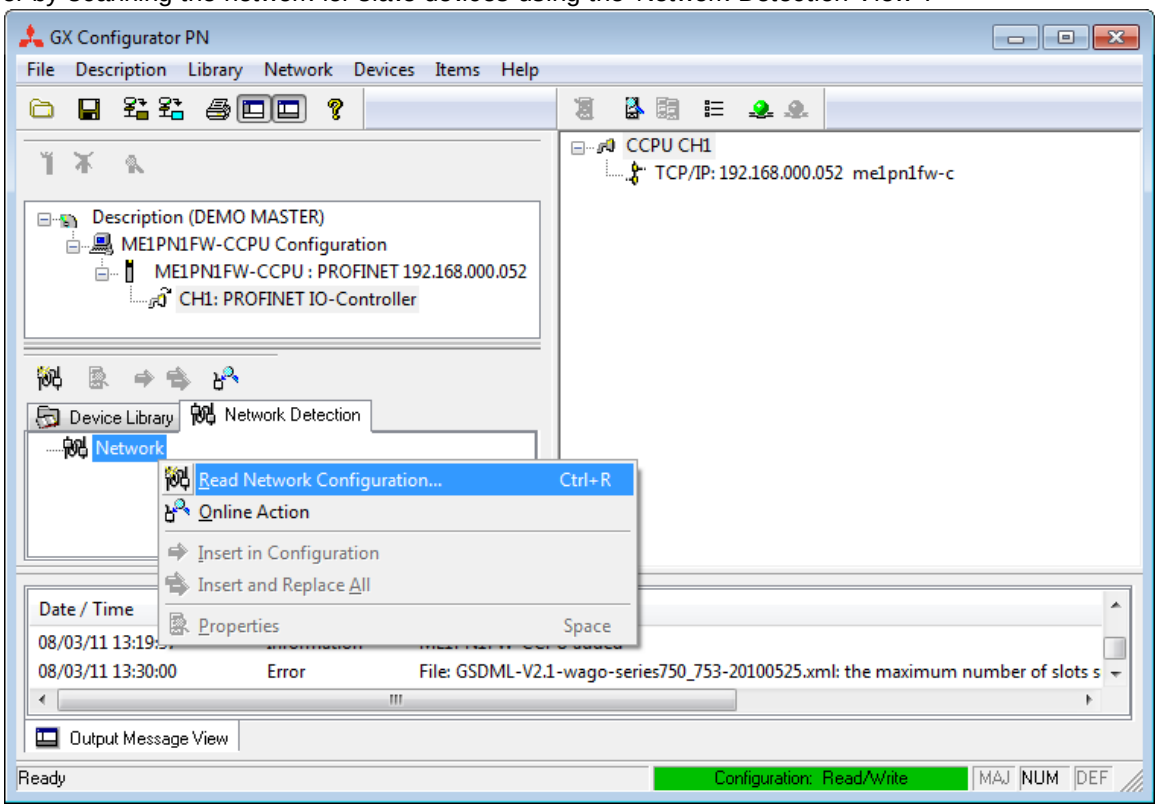
3. the inserted module is now displayed in the network view and slaves can be added by drag&drop from the 'Device Library'.



or by scanning the network for slave devices using the 'Network Detection View' .



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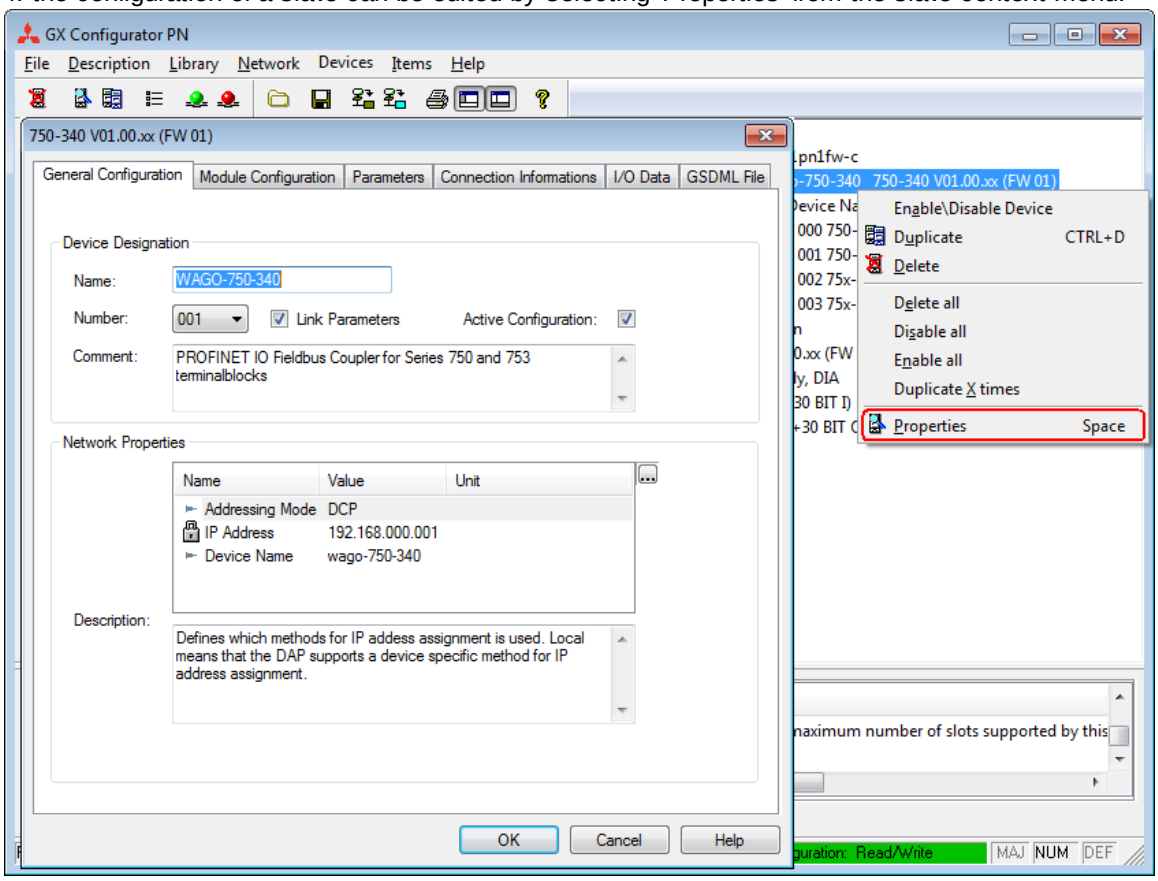
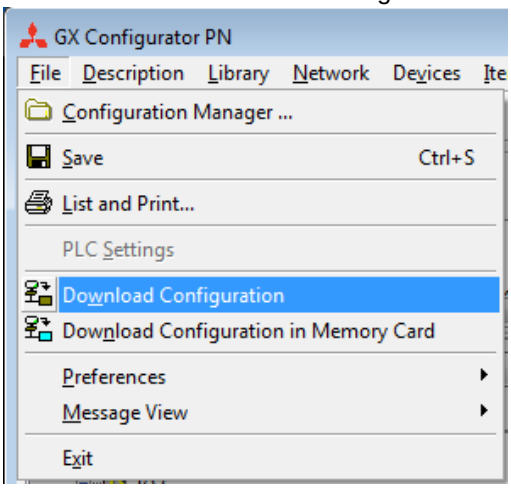
4. the configuration of a slave can be edited by selecting 'Properties' from the slave context menu.



5. after completing the network settings the configuration can be downloaded to the ME1PN1FW-Q with the item 'Download Configuration' from the 'File' menu.



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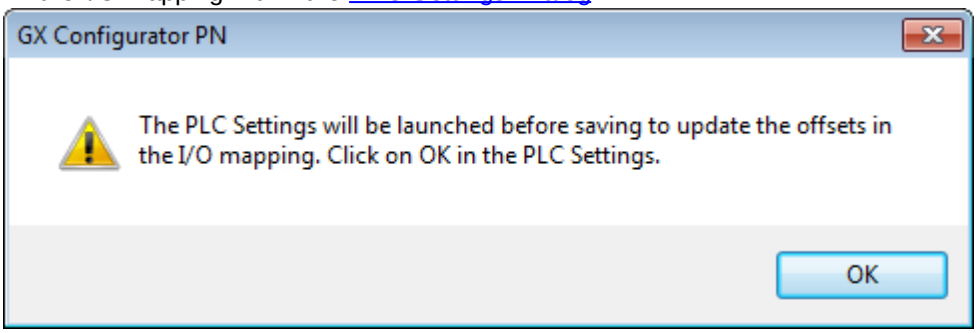
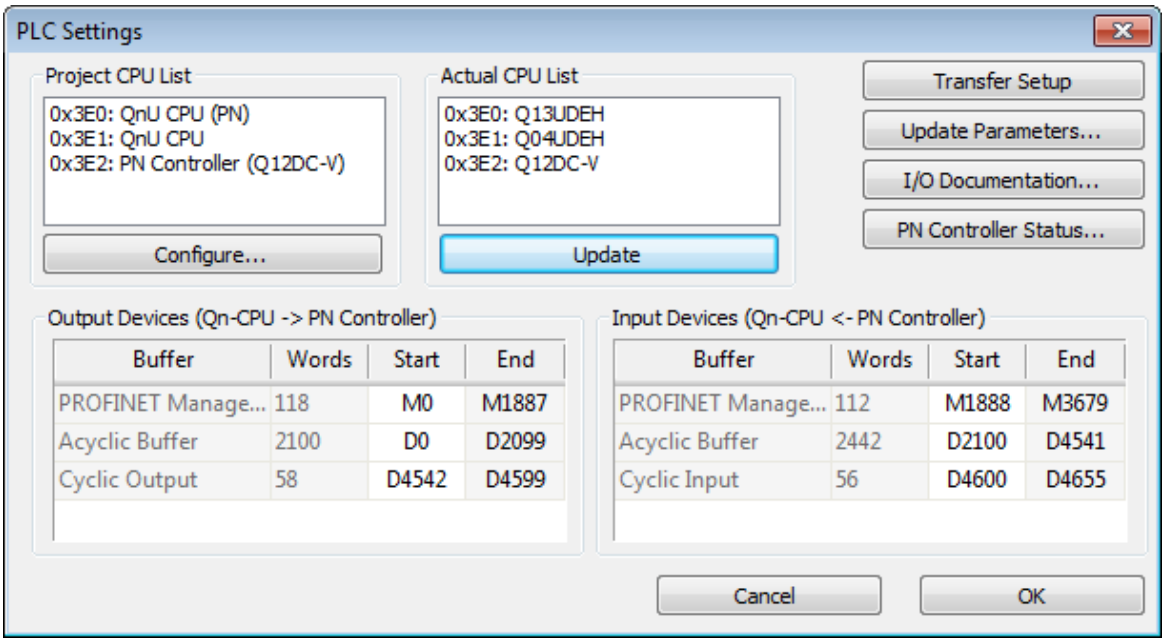
6. whenever the I/O configuration has been changed the user is prompted to update the offsets in the I/O mapping within the 'PLC Settings' Dialog.





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6 Main Menu

Starting GX Configurator-PN

Select GX Configurator-PN from the Windows Start menu. The default shortcut is

Start -> Programs -> MELSOFT Applications -> GX Configurator-PN 1.03 -> GX Configurator-PN 1.03

Main menu

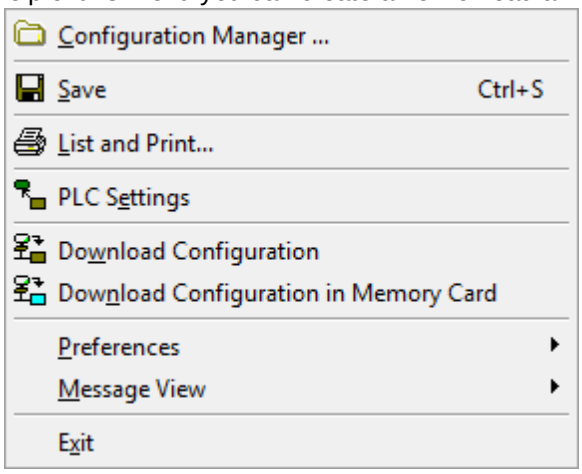
The main menu offers the following pull-down menus.

Main Menu Items	Description
File	opening, saving and downloading configurations
Description	add/remove a PROFINET Controller
Library	managing the library with the device types
Network	functions related to scanning an existing network
Devices	adding/removing devices from/to the network
Items	configuring data items in device modules
Help	help and application information

The items in the open pull-down menus can be reached via mouse or keyboard. The underlined character will start the function. In addition there are some menu items which may be started using predefined shortcuts.

6.1 File Menu

After having started the GX Configurator-PN software, this is the first menu to work with. With the help of this menu you can create a new or load an existing project.



The menu offers the following commands:

Command	Description
Configuration Manager	Opens the project manager for selecting and managing configurati-

Command	Description
	on projects
Save	Save the current configuration
List and Print	Opens the ‘Preview and Print Listings’ dialog
PLC Settings	Opens the 'PLC Settings' dialog
Download Configuration	Download the configuration to the PROFINET controller
Download Configuration in Memory Card	Download the configuration to the memory card in the PROFINET controller
Preferences	Selects the user interface layout, active ‘Advanced Mode’
Message View	Functions related to the ‘Message View’
Exit	End application

Command 'Save'

This item saves the modifications of the current configuration.

'List and Print'

Opens the 'Preview or Print Listings' Dialog.

Command 'PLC Settings'

The 'PLC Settings' dialog provides the user interface for configuring the data exchange between the PROFINET Controller and the controlling Qn-CPU. This includes

- assigning buffer devices
- updating refresh settings in Qn-CPU, PROFINET Controller and/or the PLC programming project
- checking existing refresh settings

For details see 'PLC Settings' dialog.

Command 'Download Configuration'

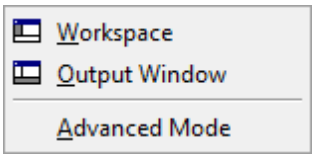
The current configuration is downloaded to the RAM of the PROFINET Controller.

Note: please make sure that the refresh settings for the interaction with the PLC program are consistent with the configuration of the PROFINET Controller by updating the refresh settings in the 'PLC Settings' dialog after a download of the PROFINET Controller configuration.

Command 'Download Configuration in Memory Card'

The current configuration is downloaded to the CF-card inserted in the PROFINET Controller.

Command 'Preferences'



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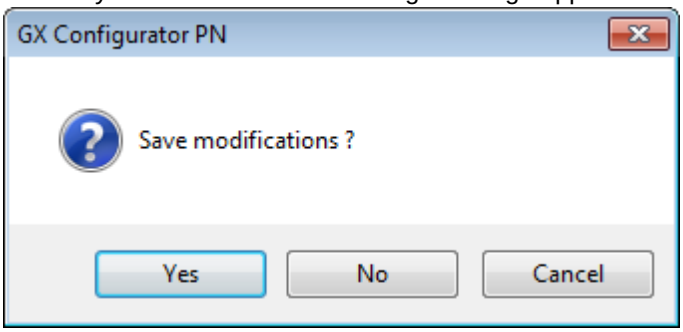
Command	Description
Workspace	Toggles the display of the 'Configuration View', the 'Device Library View' and the 'Network Detection View'
Output Window	Toggles the display of the 'Message View' window
Advanced Mode	Toggles 'Advanced Mode'

Command 'Message View'

This item opens the 'Message View' menu.

Command 'Exit'

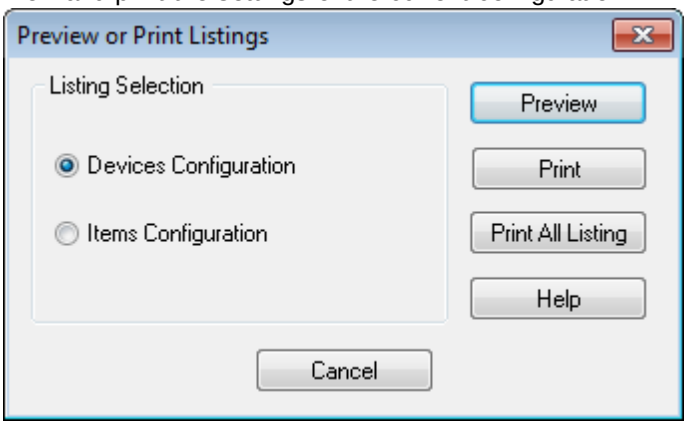
You can use this menu command to quit the software. If the configuration has been modified and has not yet been saved the following message appears



If you want to save the last changes before leaving and ending GX Configurator-PN choose **Yes**. If you choose **No**, all modifications to the respective project are lost.

6.1.1 'Preview or Print Listings' Dialog

View and print the settings of the current configuration.



Name	Description	Choices / Range	Default
Devices Configuration	If selected, the I/O devices and their configuration are included in the printout	-	-
Items Configuration	If selected, the data items are included in the printout	-	-

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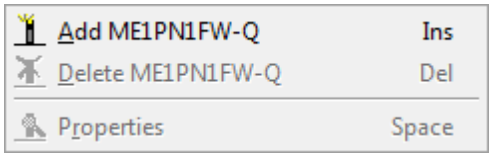
Preview	Shows the contents of the selected configuration in the default text editor	-	-
Print	Prints the selected part of the configuration on the default printer	-	-
Print All Listing	Prints devices and items on the default printer	-	-
Help	Open online help	-	-
Cancel	Close the dialog	-	-

6.2 Description Menu



The menu contains the following commands:

Command	Description
Add ME1PN1FW-Q	Add PROFINET Controller to configuration
Delete ME1PN1FW-Q	Remove PROFINET Controller from configuration
Properties	Open 'Properties' dialog for PROFINET Controller

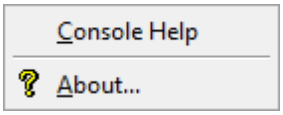
Command 'Add ME1PN1FW-Q'

Add a ME1PN1FW-Q to the configuration

Command 'Delete ME1PN1FW-Q'

Remove the ME1PN1FW-Q from the configuration

6.3 Help Menu



The menu contains the following commands:

Command	Description
Console Help	Opens the online help
About	Displays version information

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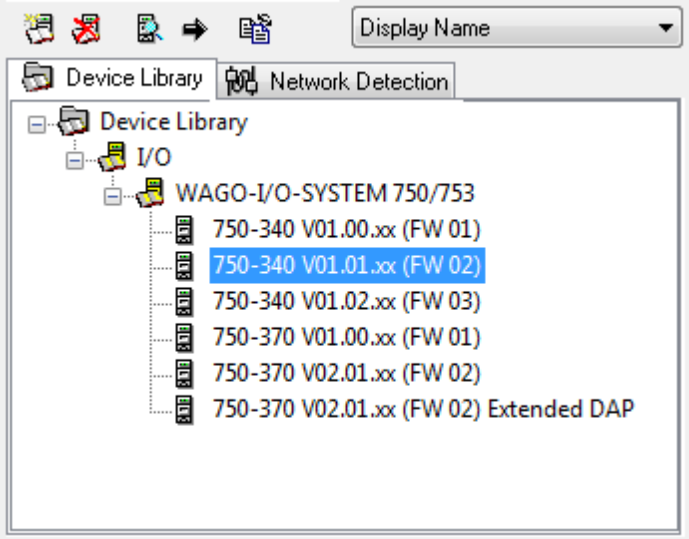
7 User Interface

7.1 Device Library

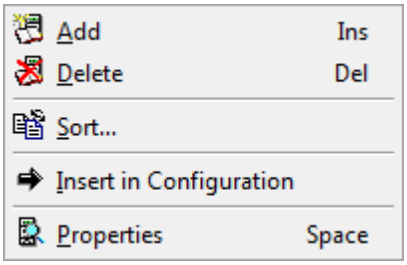
The device library is the local collection of descriptions for types of PROFINET I/O devices.



The parameters used for configuring an IO-Device are contained in a GSDML file (Generic Station Description Markup Language), commonly called a GSD. A GSD may contain one or more IO-Device descriptions.
The device library is used to store GSD files and to provide a graphic view. Using this graphic view, it is possible to manually insert IO-Devices into the current configuration. The device library is also accessed during automatic detection of IO-devices present on the network.

Context Menu

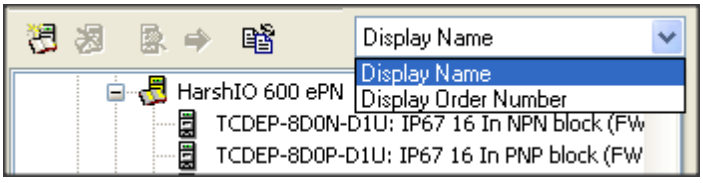
For the nodes in the device library tree context menus exists. The entries depend on the type of the selected node.



This menu is also accessible via the main menu. For a detailed description see 'Libray Menu'.

Library Display Options

The selector above the device library tree allows you to choose the display mode.



The available options are

Display Name	Display the product name
Display Order Number	Display the order number

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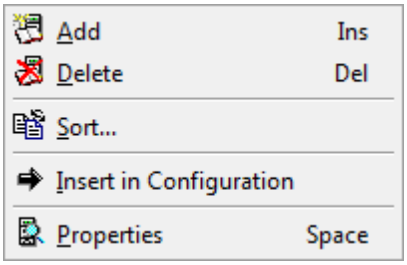
Adding IO-Device Types to the Library

The 'GSDML Management' wizard lets you add one or more IO-Devices to the library. This wizard may be accessed via the button or via the menu item ‘Add…’ from the context menu of the device library or the ‘Library’ submenu in the main menu. For details see 'Add GSDML Files'.

7.1.1 Library Menu

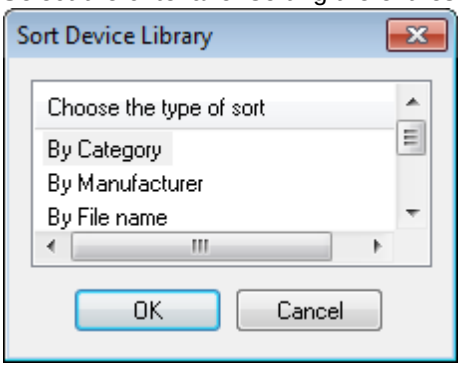


The menu contains the following commands:

Command	Description
Add	Add device type with GSDML file to library
Delete	Remove device type from library Device types must not be deleted while being used in the configuration. **Note**: deleting a GSD from the library does not physically delete the GSD file on the hard disk. It is instead moved to the subdirectory 'removed_gsdml'
Sort	Sort the entries in the library
Insert in Configuration	Add selected device type to library
Properties	Show properties of the selected device type

Sort Device Library

Select the criteria for sorting the entries in the device library



Name	Description	Choices / Range	Default
Choose the type of sort	Select the criteria for sorting the ent-	Category /	Category

Name	Description	Choices / Range	Default
	ries in the device library Available sort keys are: **By Category**: Displays IO-Devices according to their main type then their secondary type. This sort is based on the "Main Family" and "Product Family" fields in the GSD for the IO-Device. **By Manufacturer**: Displays the IO-Device by manufacturer. This sort is based on the "VendorName" field in the GSD for the IO-Device. **By File name**: Displays the IO-Devices according to the GSD filename. **By IO-Device name**: Displays the IO-Devices by name. This sort is based on the "Name" field in the GSD for the IO-Device.	Manufacturer / File name / IO-Device name	
OK	Close dialog and save changes		
Cancel	Close dialog and discard changes		

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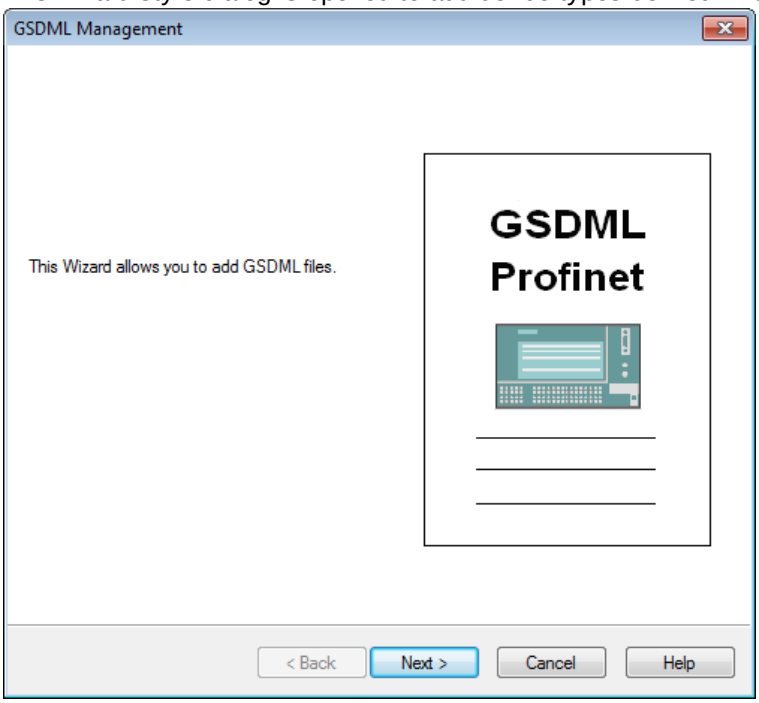
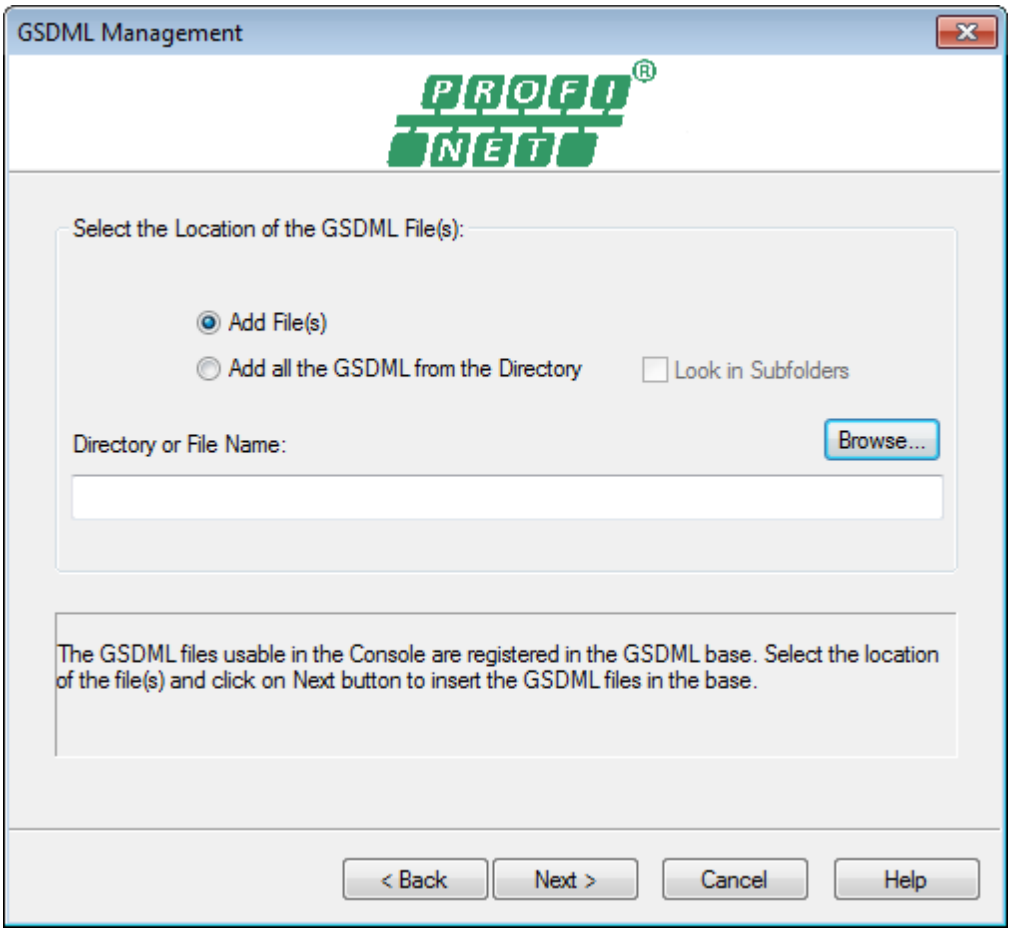
7.1.2 'GSDML Management' Dialog

This wizard-style dialog is opened to add device types defined in GSDML files to the device library.





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Name	Description	Choices / Range	Default
Add File(s)	Add one or more GSDML files Use the [Browse] button to select the files. If the file already exists, the 'File Already Exists' warning is displayed.	Selected / not selected	Selected
Add all the GSDML from the Directory	Add the GSDML files in a specified directory and (optionally) its subdirectories Use the [Browse] button to select the files. If a file already exists, the 'File Already Exists' warning is displayed.	Selected / not selected	Not selected
Look in Subfolders	If selected, also the subfolders of the selected directory are searched for GSDML files.	Selected / not selected	Not selected
Directory or File Name	Path of the selected file(s) or directory	-	-
Browse	Open a file dialog for selecting the GSDML file(s) or the directory to search	-	-
Back	Go back to the start page	-	-
Next	Proceed and add the selected file or scan the selected directory	-	Default button
Cancel	Close wizard and discard changes	-	-
Help	Open online help	-	-

'File Already Exists' Warning

If a file is to be added, which already exists in the library, a warning is displayed. The existing type is not overwritten. If it should be replaced, the existing entry must be deleted first.

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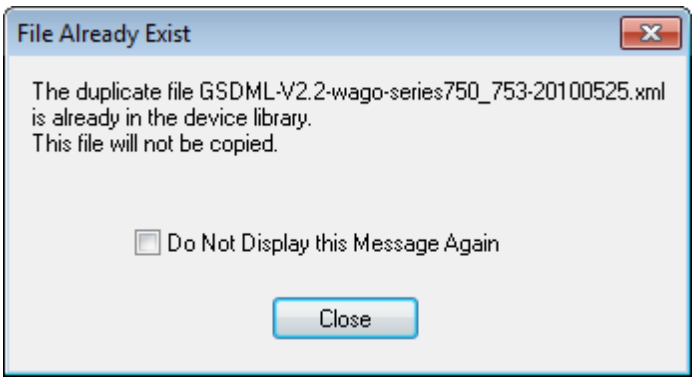
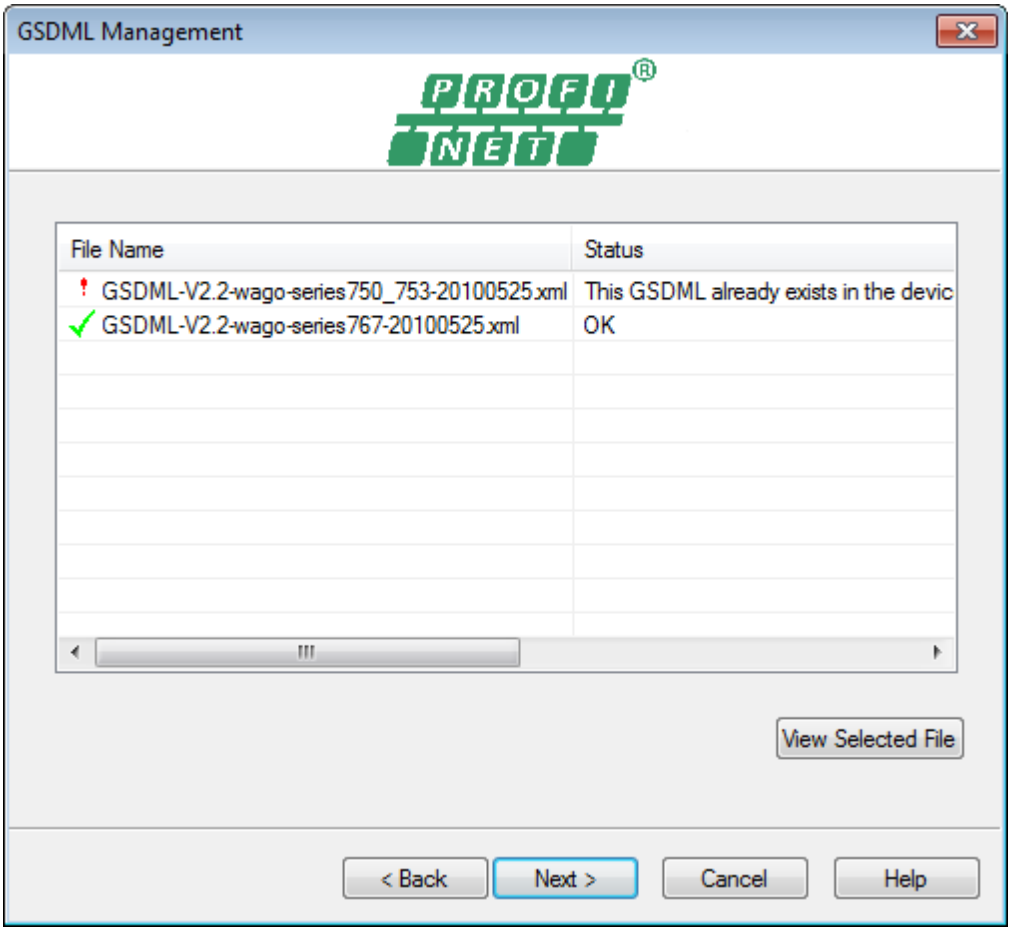


'Add GSD File Completed' Page

After adding one or several GSD files to the library, the next page shows for each selected GSD file, whether it has been added to the library or not.



Name	Description	Choices / Range	Default
Column 'File Name'	Name of GSDML file	-	-
Column 'Status'	Status (added or failure)	-	-

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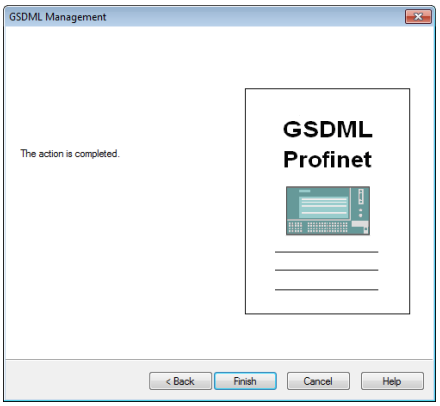
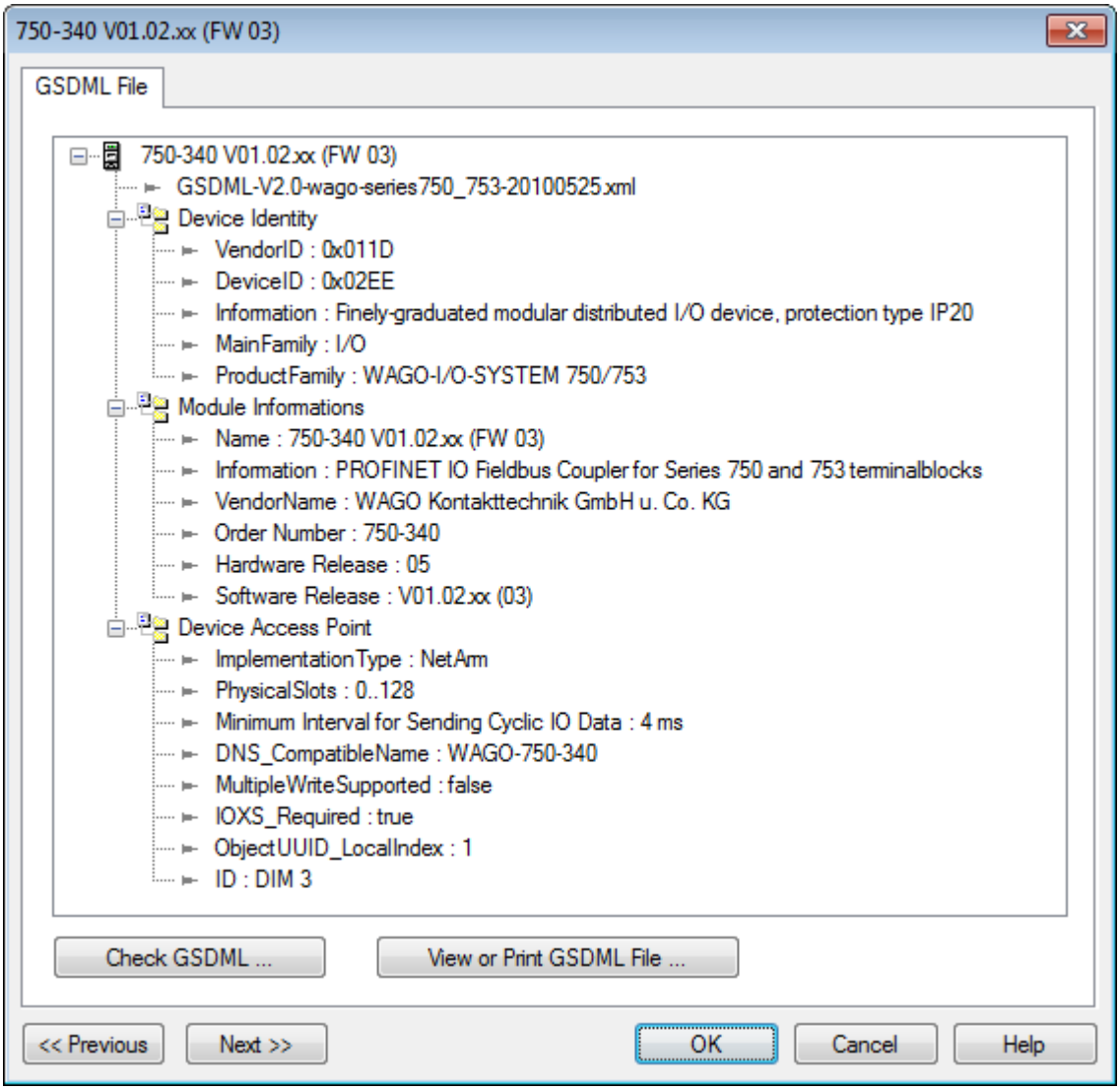
Name	Description	Choices / Range	Default
Columns 'Family Name', 'Schema Version', 'Manufacturer', 'File Date' and 'File Time'	Additional information taken from the GSDML file	-	-
View Selected File	Open the selected GSDML file in the default text editor	-	-
Back	Go back to the previous page	-	-
Next	Proceed to the next page to end the wizard 	-	Default button
Cancel	Close wizard and discard changes	-	-
Help	Open online help	-	-

7.1.3 'Device Type Properties' Dialog

A double-click on a device type entry in the 'Device Library' tree opens a dialog with information from the respective GSDML file.



Name	Description	Choices / Range	Default
Tree	Structured display of the GSDML file contents	-	-
Check GSDML	Checks, whether GSDML file contents comply to the specification (i.e. schema definition)	-	-
View or Print GSDML File	Displays the GSDML file contents in the default text editor, from they can be saved or printed	-	-
Previous	Show properties of previous device	Disabled, if the device is the first in the list	-

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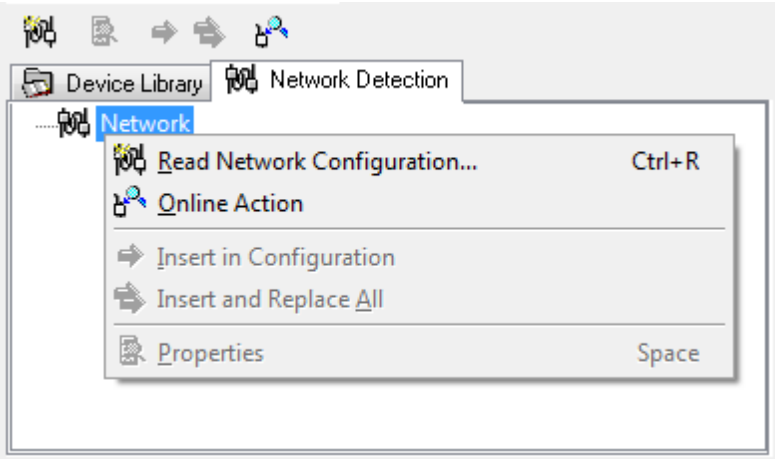
Name	Description	Choices / Range	Default
Next	Show properties of next device	Disabled, if the device is the last in the list	-
OK	Close dialog and save changes	-	-
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

7.2 Network Detection

Instead of manually adding device types to the network configuration the user can scan the network of the PROFINET Controller for connected devices and one or several of these devices to the current network configuration.



The context menu of the 'Network' node corresponds to the 'Network Menu' in the main menu.

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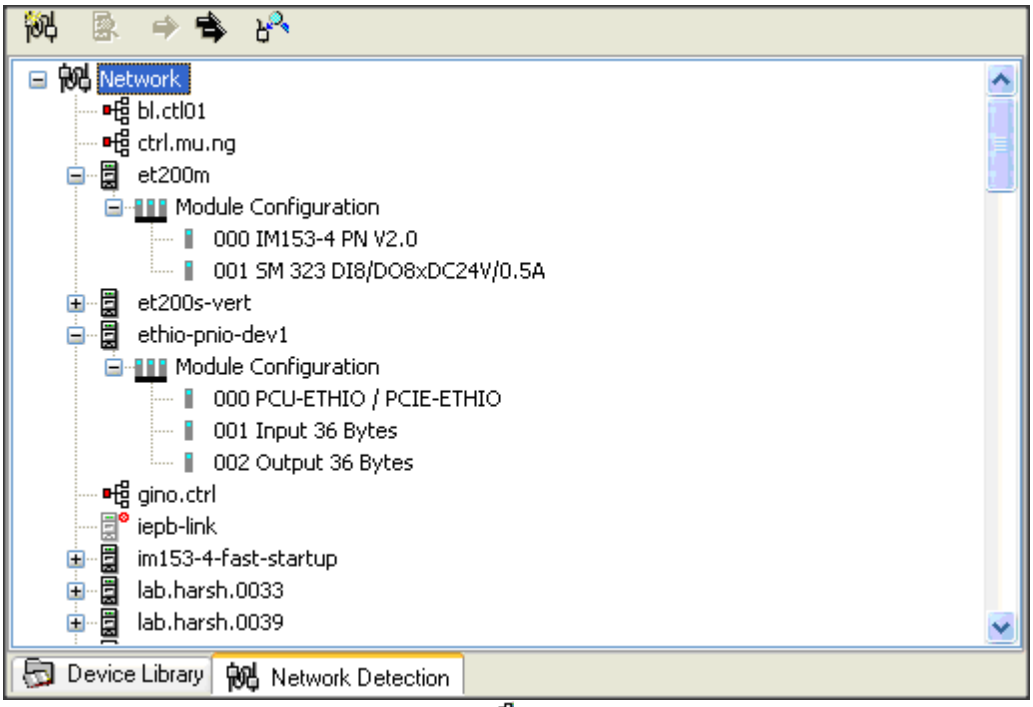
Network Tree



Network components with icons like this: are IO-Controllers They cannot be used in the current configuration.

Network detection will carry out an implicit read request to the IO-Device to find out the configuration of the IO-Device's slots and sub-slots. Certain IO-Devices do not support this request and must therefore be configured manually.

The message window contains all the IO-Devices, whose name or current IP address are not compatible with network detection from GX Configurator-PN.
IO-Devices with an IP address, which is not of the same class as that of the IO-Controller, are represented like this: They cannot be inserted into the current configuration.

For PROFINET network detection to be as effective as possible, the following rules must be obeyed:

- Each IO-Device must have a unique name
  PROFINET uses DCP protocol to address the IO-Devices. This protocol allows a name to be given to each IO-Device. As for the IP address, the name must be unique over the network. To name an IO-Device, it is recommended to use the 'Online Action Tool'.

- Each IO-Device must have one IP address in the same network range as the IO-Controller.
  When an IO-Device is detected, an implicit read request is carried out to find out the slot/sub-slot configuration of the IO-Device. This request uses RPC protocol based on TCP/IP. If the IO-Device is not in the same network range as the IO-Controller, then this request will fail. To configure an IP address for an IO-Device, it is recommended to use the 'Online Action Tool'.

- Each IO-Device must have its GSD present in the device library.
  The configuration of an IO-Device is based on its GSD. Without a GSD file an IO-Device cannot be configured.

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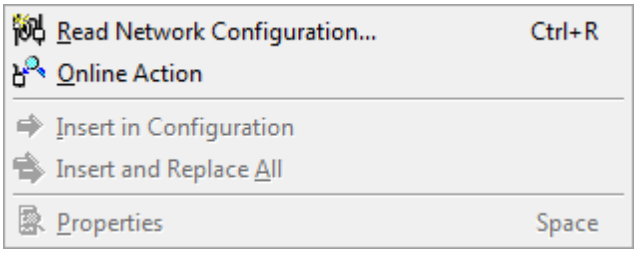
7.2.1 'Network' Menu

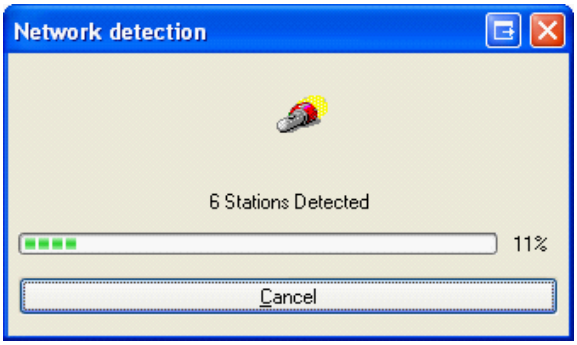


The menu contains the following commands:

Command	Description
Read Network Configuration	Scans the network for connected devices
Online Action	Starts the 'Online Action' tool for finding and identifying devices and for setting device name and/or IP address
Insert in Configuration	Adds the selected device to the current network configuration
Insert and Replace All	Removes the devices currently configured and adds all devices found
Properties	Opens the view with the properties of the selected device

Command 'Read Network Configuration'

This command scans the network for connected devices.



Alternatively the button can be pressed. The devices found are listed in the [Network Detection] area.

Command 'Online Action'

Starts the 'Online Action' tool for finding and identifying devices and for setting device name and/or IP address.

Command 'Insert in Configuration'

Adds the selected device to the current network configuration.

Command 'Insert and Replace All'

Removes the devices currently configured and adds all devices found.

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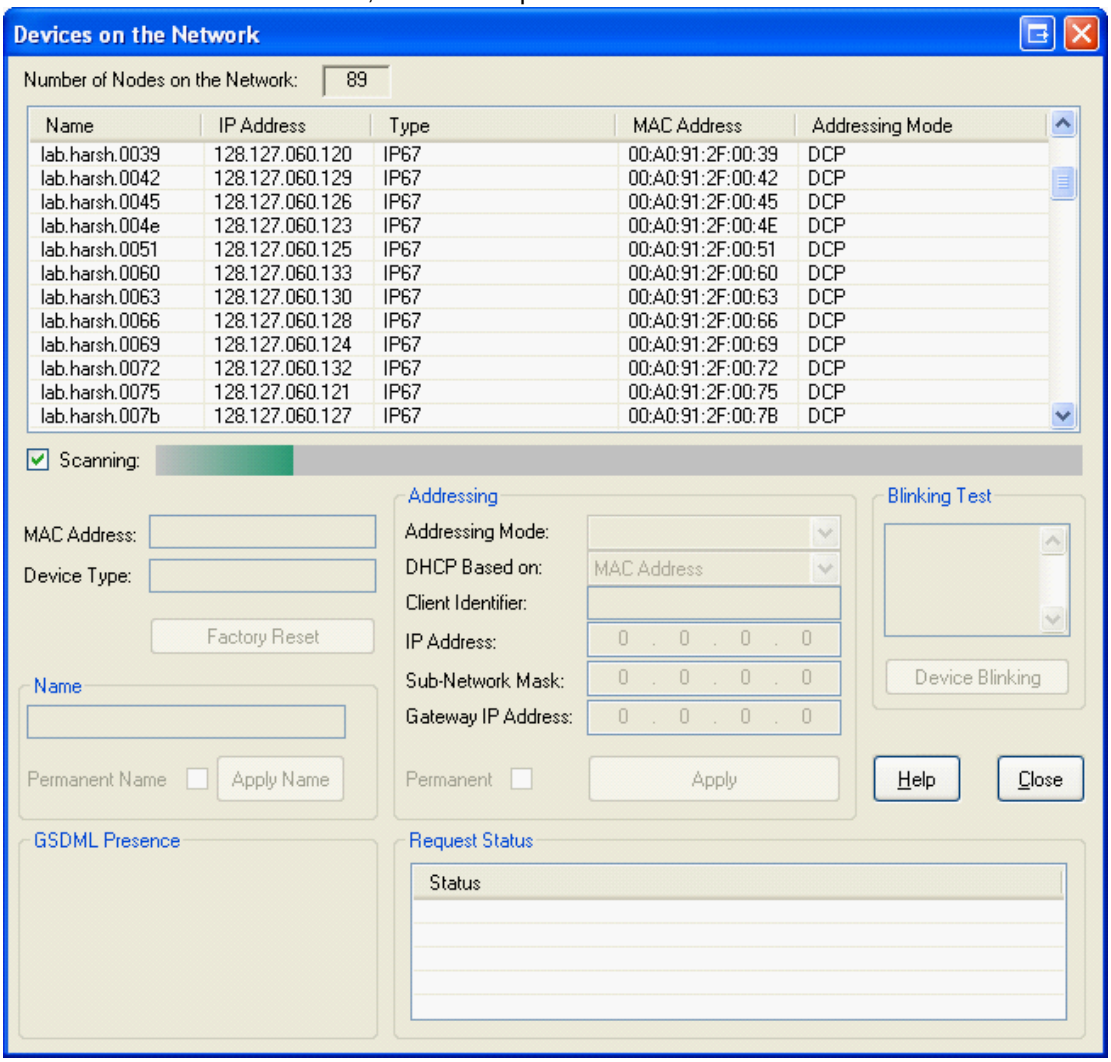
Command 'Properties'

Opens the view with the properties of the selected device.

7.2.2 Online Action Tool

The 'Online Action' tool is started via either the menu item 'Online Action' or by pressing the button. When the tool is started, it issues requests to detect PROFINET stations on the network.



Name	Description	Choices / Range	Default
Number of Nodes on the Network	Number of network nodes found	-	-
Network Nodes Table	Shows the PROFINET stations present as well as their name, IP address, type, MAC address and addressing mode	-	-

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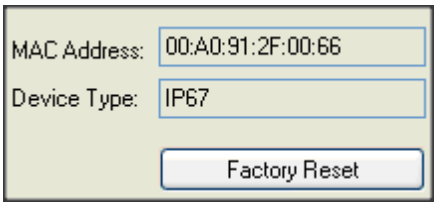
Name	Description	Choi-ces / Range	Default
Scanning	If checked, the network nodes list is refreshed every 3 seconds. Otherwise the list is not re-freshed again.	-	-
MAC Address	Ethernet address of the selected device	-	-
Device Type	Type of the selected device	-	-
Factory Reset	Sends a DCP request to the IO-Device telling it to restart with its factory default settings. The result of this command will be displayed in the Request status field 	-	-
Name	Name of the selected device	-	-
Permanent Name	Checked: the IO-Device is to store its new name in non-volatile memory. After the next power cycle the device must use its new name. Unchecked: the IO-Device is to store its new name in volatile memory. After the next power cycle the device goes back to its old name.	-	-
Apply Name	Sends a DCP request to the IO-Device telling it to use its new name. The result of this command will be displayed in the Request status field. For further information see 'Naming an IO-Device'.	-	-
Addressing Mode	There are three available addressing modes: **DCP**: the IO-Controller may change the TCP/IP configuration of the device. The IO-Controller will change the TCP/IP configuration of the IO-Device if it differs from the TCP/IP configuration of the IO-Device contained in the IO-Controller configuration. **DHCP**: In this mode, the IO-Device obtains its TCP/IP configuration from a DHCP server. The criterion for obtaining the TCP/IP configuration from the DHCP server is configurable in the 'DHCP Based on' list.	-	-

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Name	Description	Choices / Range	Default
	Note: if an IO-Device is configured in DHCP mode and a connection is established, the IO-Controller compares the TCP/IP configuration of the IO-Device with that contained in the configuration of the IO-Controller. If they differ, the connection cannot be established.		
DHCP Based on	**MAC address**: the identifier used for obtaining the IP configuration from the DHCP server will be the MAC address of the IO-Device. **Station name**: the identifier used for obtaining the IP configuration from the DHCP server will be the name of the IO-Device. **Client identifier**: the identifier used for obtaining the IP address from the DHCP server will be the character string entered by the user in the [Client Identifier] field. **Local**: This parameter cannot be selected. It is there for information only if the IO-Device is already set to local mode.	-	-
Client Identifier	The identifier used for obtaining the IP address from the DHCP server	-	-
IP Address	IP address to be set in the device	-	-
Sub-Network Mask	Sub-network mask to be set in the device	-	-
Gateway IP Address	Gateway IP address to be set in the device	-	-
Permanent	Checked: the IO-Device is to store its new IP configuration in non-volatile memory. When it is next turned on, it must use its new IP configuration. Unchecked: the IO-Device is to store its new IP configuration in volatile memory. When it is next turned on, it must use its new IP configuration.	-	-
Apply	Sends a DCP request to the IO-Device for it to use its new TCP/IP configuration. The result of this command will be displayed in the Request status field. For further information see 'Configure the IP Address of an IO-Device'	-	-
Blinking Test	If the GSDML file of the selected device exists in the device library and contains the	-	-

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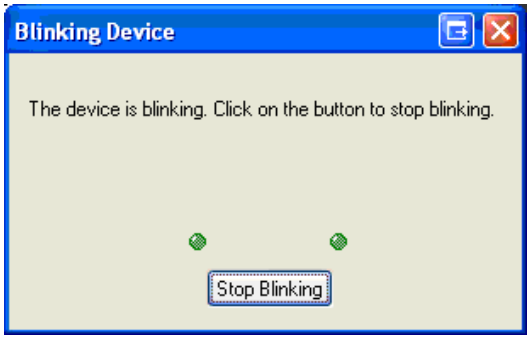
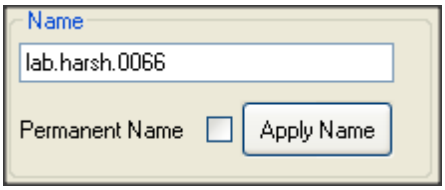
Name	Description	Choi-ces / Range	Default
	'DCP_FlashOnceSignalUnit' tag, the text from the GSDML file indicates the device behaviour when it receives a DCP flash command.		
Device Blinking	The 'Blinking Device' dialog is displayed and DCP blink commands are sent to the device. 	-	-
Help	Open online help	-	-
Close	Close dialog	-	Default button
Request Status	Lists the results of the commands issued in this dialog	-	-

Naming an IO-Device

When an IO-Device is selected from the list, the name of the selected IO-Device is shown in the Name field and the Write to device button is enabled.



This command sends a DCP request to the IO-Device telling it to use its new name.
The Permanent name checkbox is used as follows:

- Checked: the IO-Device is to store its new name in non-volatile memory. When it is next turned on, it must use its new name.
- Unchecked: the IO-Device is to store its new name in volatile memory. When it is next turned on, it goes back to its old name.

The result of this command will be displayed in the Request status field.

Naming rules for an IO-Device

The name of an IO-Device is made up of 1 to 240 characters and must comply with the following rules:

- 1 or more labels separated by [.]

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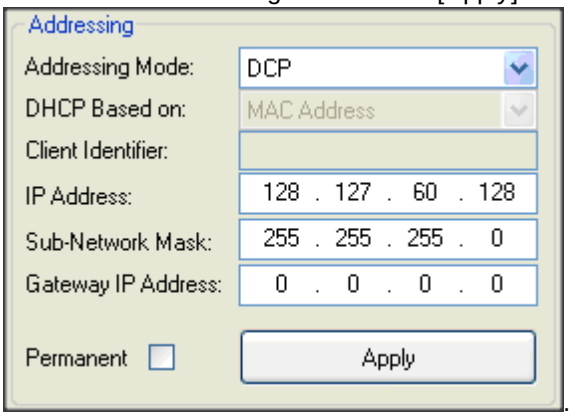
- the size of a label varies from 1 to 63 characters
- total size (sum of all label and [.] character) varies from 1 to 240 characters
- the allowed characters are [a-z0-9], upper-case letters are prohibited
- labels may not start with [-]
- labels may not terminate with [-]
- labels may not start with [port-xyz] or [port-xyz-abcde] where a,b,c,d,e,x,y,z = 0..9

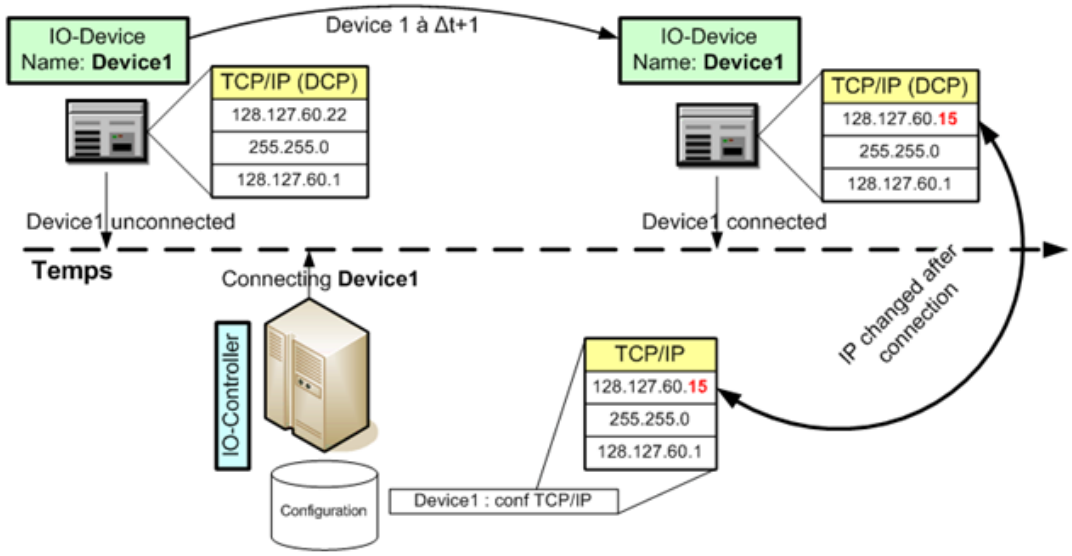
Configure the IP Address of an IO-Device

When an IO-Device is selected from the list, the TCP/IP configuration of the selected IO-Device is shown in the addressing field and the [Apply] button is enabled.



There are three available addressing modes:

- **DCP**: In this mode, although the IO-Device has a TCP/IP configuration, when an IO-Controller connects to this IO-Device, the IO-Controller may change the TCP/IP configuration of this IO-Device. The IO-Controller will change the TCP/IP configuration of the IO-Device if it differs from the TCP/IP configuration of the IO-Device contained in the IO-Controller configuration.



- **DHCP**: In this mode, the IO-Device obtains its TCP/IP configuration from a DHCP server. The criterion for obtaining the TCP/IP configuration from the DHCP server is configurable. The DHCP based on gives the following options:

  MAC address: the identifier used for obtaining the IP configuration from the DHCP server will be

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the MAC address of the IO-Device.
Station name: the identifier used for obtaining the IP configuration from the DHCP server will be the name of the IO-Device.
Client identifier: the identifier used for obtaining the IP address from the DHCP server will be the string entered in the client identifier field.

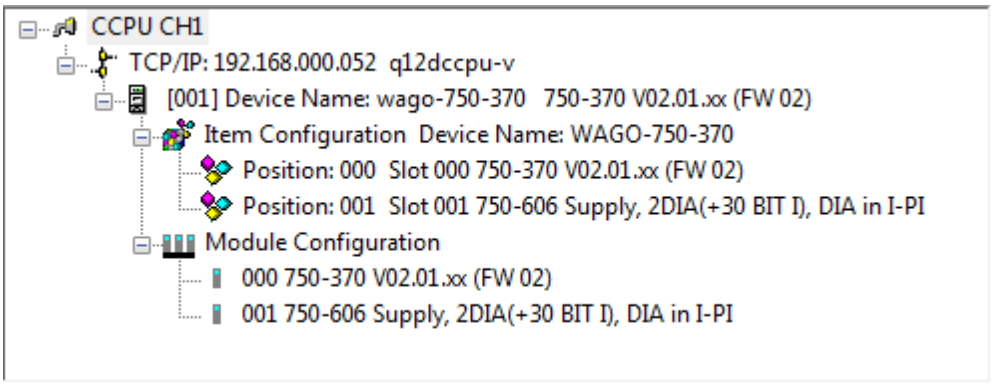
If an IO-Device is configured in DHCP mode: when a connection is established, the IO-Controller compares the TCP/IP configuration of the IO-Device with that contained in the configuration of the IO-Controller. If they differ, the connection cannot be established.

- **Local**: This parameter cannot be selected. It is there for information only if the IO-Device is already set to local mode.

7.3 PROFINET Network View

The PROFINET network view is the central view of the application. It lists

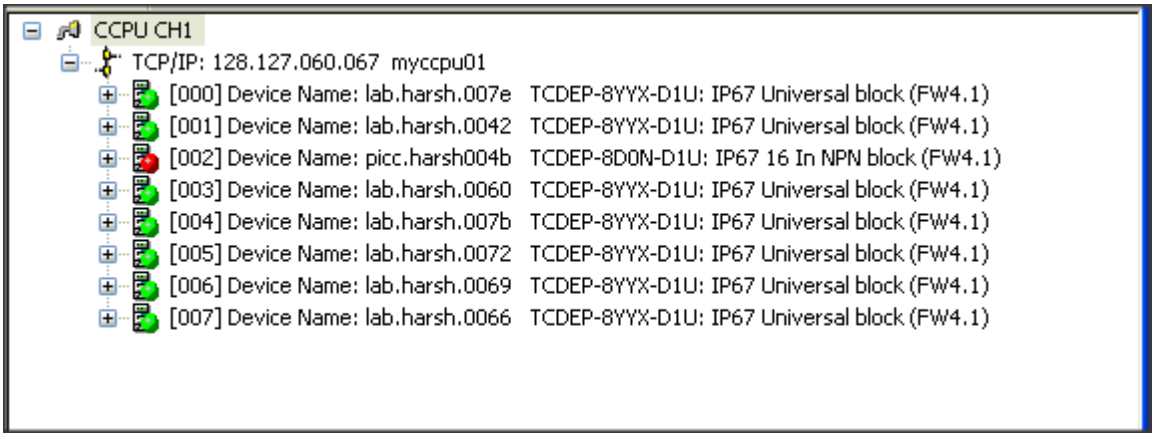
- PROFINET controller
- assigned I/O devices
- modules of the I/O devices



Operations for the network view are contained in the 'Devices' Menu.

Diagnostic Mode

The diagnostic mode is activated with the menu item 'Start Console Diagnostic' or by pressing the button.



After configuring the IO-Controller, adding and configuring the devices of your network and downloading your configuration to the board, the statuses of all devices can be tested with the internal dia-

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gnostic tool. This tool gives a first level diagnosis of the status of the current configuration. When the diagnostic mode is enabled, the configuration cannot be changed. It is in read-only mode.
Once enabled, the diagnostic view shows the current status of the connection for each IO-Device.

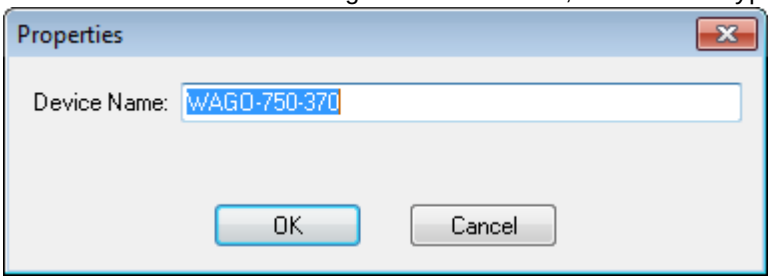
Indicates that the IO-Device is connected

Indicates that the IO-Device is disconnected but that a connection phase is under way

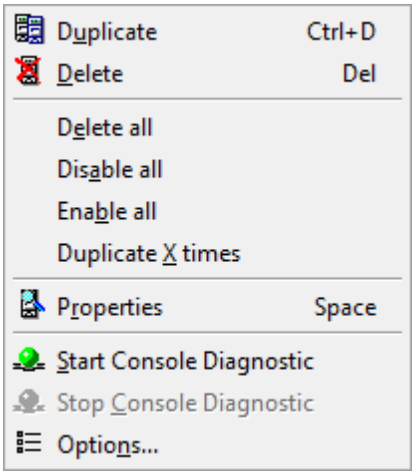
Indicates that the IO-Device is not connected. Connection is controlled by the user

'Device Name Properties' Dialog

The device name can be changed from its default, which is the type name taken from the GSD file.



7.3.1 'Devices' Menu



The menu contains the following commands:

Command	Description
Duplicate	Add a copy of the selected device
Delete	Remove the selected device
Delete all	Remove all devices
Disable all	Disable all devices
Enable all	Enable all devices
Duplicate X times	Add multiple copies of the selected device
Properties	If the PROFINET Controller is selected: opens the 'PROFINET Controller Properties' dialog If an IO device is selected:

Command	Description
	opens the 'PROFINET I/O Device Properties' dialog
Start Console Diagnostic	Start diagnostic mode
Stop Console Diagnostic	Stop diagnostic mode
Options	Opens the 'Display Option' dialog

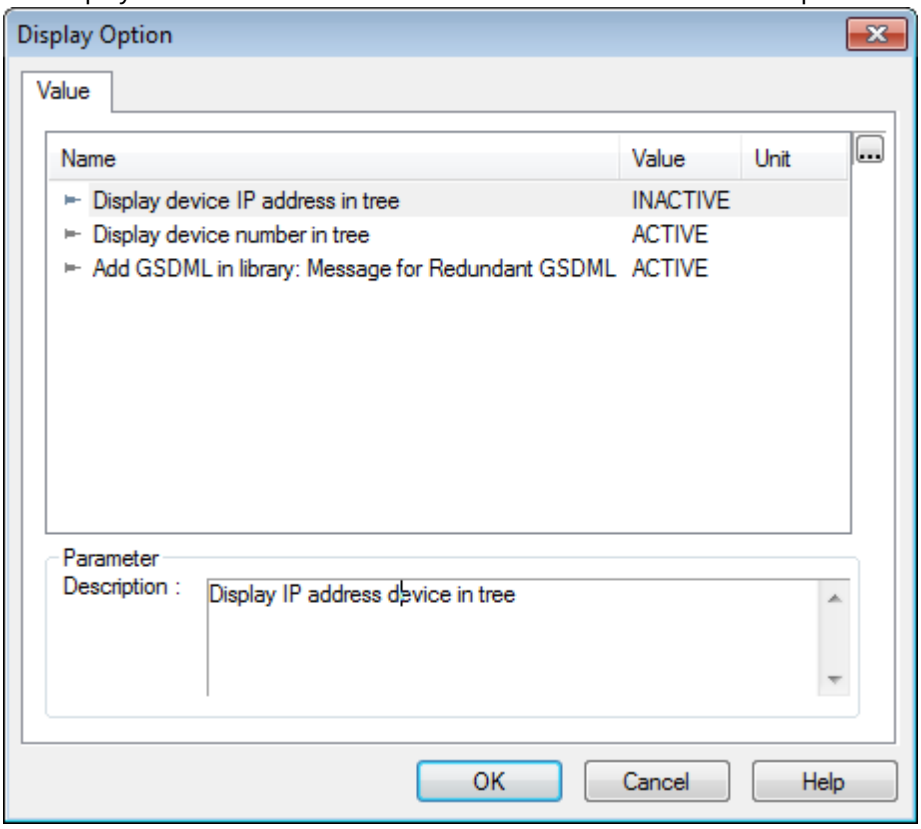
Properties

The effect of this menu item depends on the node, which is selected in the network tree.

Node Type	Properties Dialog
Channel	'Channel Properties' Dialog
PROFINET Controller	'ME1PN1FW-Q Properties' Dialog
IO-Device	'IO-Device Configuration' Dialog
Item Configuration - Device	PROFINET Network View - 'Device Name Properties' Dialog
Item Configuration - Slot	'Items Declaration' Dialog
Module Configuration	'IO-Device Configuration' Dialog - Tab 'Module Configuration'
Module Name	'Module Configuration' Dialog

7.3.2 'Display Option' Dialog

The display of the PROFINET network tree can be modified with the options in this dialog.



Name	Description	Choices / Range	Default
Display device IP address in the tree	If enabled, displays the IP address of the device in the current configuration tree.	Active / Inactive	Inactive
Display device number in the tree	If enabled, displays the number of the device in the current configuration tree.	Active / Inactive	Active
Add GSDML in library: Message for redundant GSDML	If enabled, displays a message if a GSDML file for the same device with the same file version is already in the GSDML database. This GSDML file will not be inserted into the device library.	Active / Inactive	Active
Parameter Description	Shows a descriptive text to the selected parameter	Read-only	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

7.3.3 'Channel Properties' Dialog

This dialog provides access to timing parameters for the PROFINET I/O communication. The displayed values depend on whether 'Advanced Mode' has been selected or not.

In 'Standard Mode':

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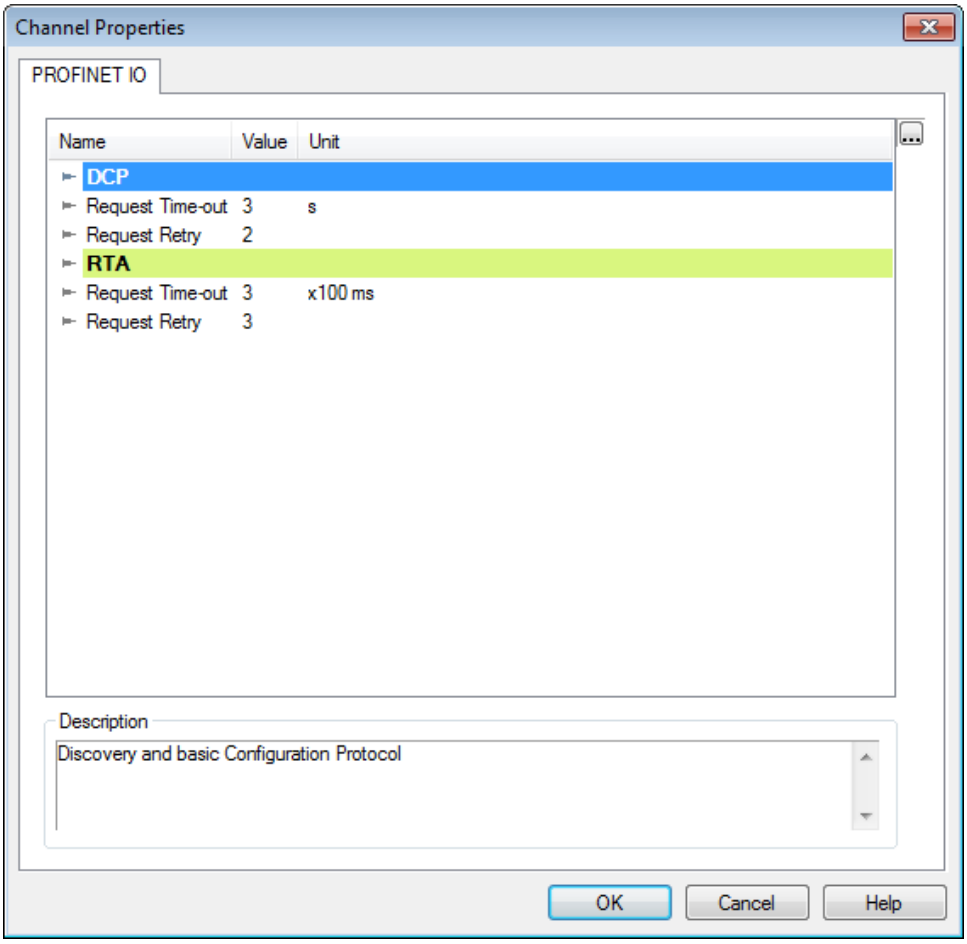

DCP section	
Request time-out	Sets the maximum time from the IO-Controller sending a DCP request from the reply. It also sets the listening time of the IO-Controller to the DCP identification request
Number of request retries	Sets the maximum number of times a DCP request is repeated following a timeout.
RTA (Real Time with Acknowledgment) section	
Request time-out	Sets the maximum period separating the time from the IO-Controller sending a RTA request and the reply.
Number of request retries	Sets the maximum number of times an RTA request is repeated following a timeout.

In 'Advanced Mode':

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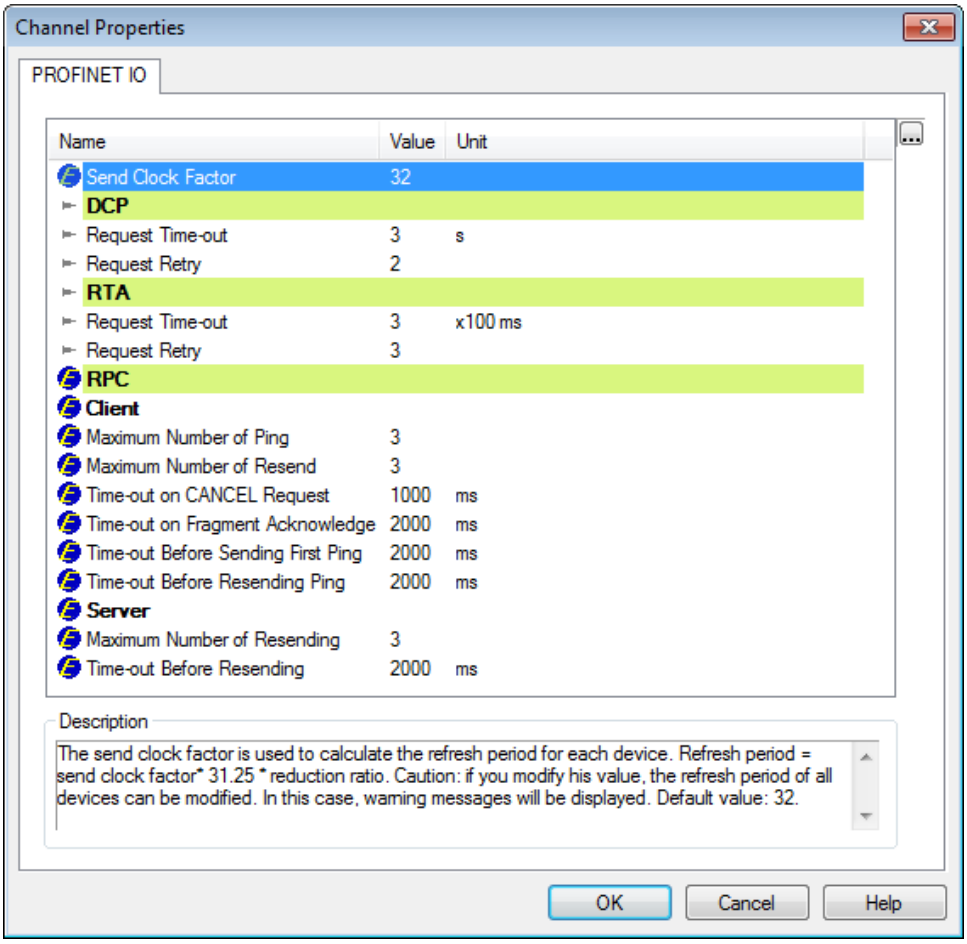

RPC section - Client	
Maximum number of pings	Sets the maximum number of pings while awaiting a response.
Maximum number of re-sends	Sets the maximum number of times an RPC frame is repeated (question or response).
Timeout on CANCEL request	Sets the maximum time from the IO-Controller sending an RPC cancel request to the reply.
Timeout on Fragment Acknowled-ge	Sets the maximum time separating the IO-Controller sending an RPC ACK request from the reply.
Timeout on sending first ping	Sets the maximum time separating the IO-Controller sending the first RPC PING request from the reply.
Timeout on resending first ping	Sets the maximum time separating the IO-Controller sending an RPC PING request from the response to the first PING.
RPC section - Server	
Maximum number of re-sends	Maximum times a telegram is retransmitted before signalling an error.
Timeout before resending	Interval to wait before retransmitting a telegram.

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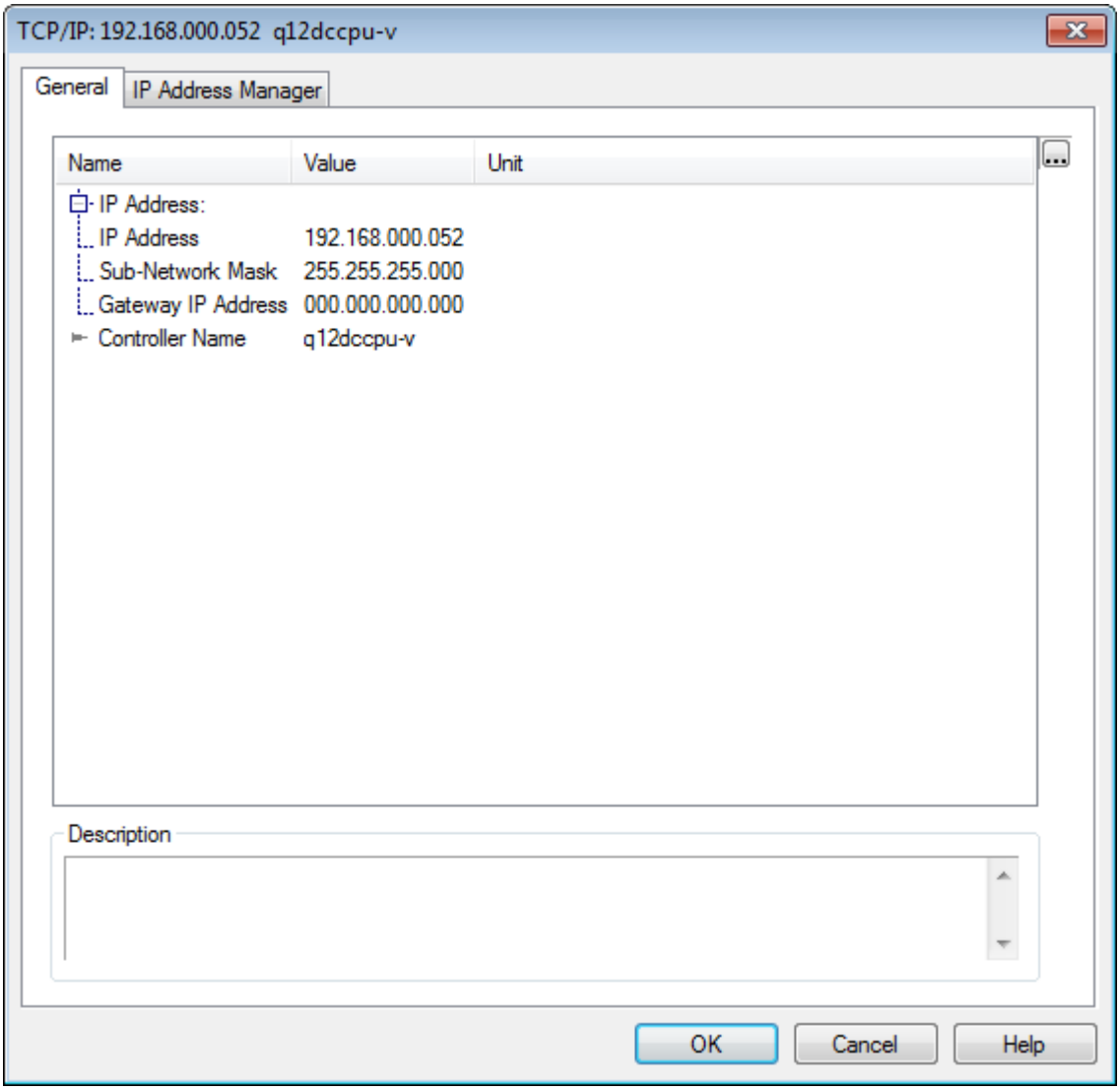
7.3.4 IP Address Manager

This dialog provides access to the network address settings of the PROFINET Controller and to the 'IP Address Manager'.

PROFINET Controller Network Address Settings



Name	Description	Choices / Range	Default
Table	**IP Address:** area of 4 bytes entered in decimal notation with decimal point representing the Internet address or IP address of the PROFINET Controller channel 1 (CH1) **Sub-Network Mask:** defines the addresses to be routed by the gateway and the network of valid IP addresses. **Gateway IP Address:** IP address of a machine which can perform routing to another network.	-	-

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Name	Description	Choices / Range	Default
	PROFINET is not an IP-based protocol. It will not be possible to route I/O exchanges through a gateway. **Controller Name:** PROFINET name of the IO-Controller.		
Description	Provides help on the selected field.	read-only	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

Note: after changing the controller IP address the configuration must be downloaded. Otherwise the controller will regain the old IP address after the next reset.

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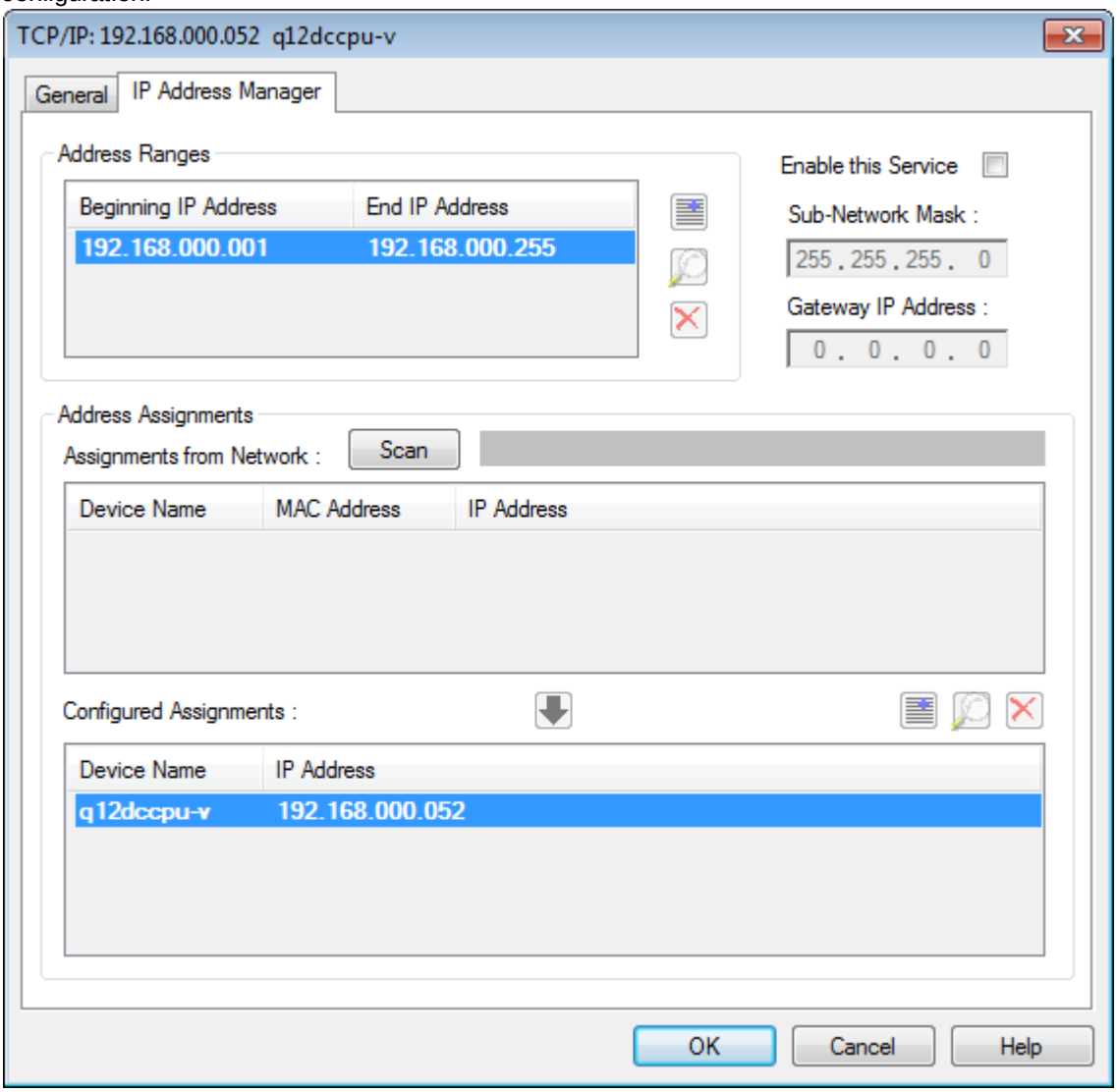
IP Address Manager

The 'IP Address Manager' service manages the IP address allocation for IO-Devices present in the configuration.



Name	Description	Choices / Range	Default
Address Ranges	define one or more IP address ranges IP addresses from these ranges will be distributed by the console when an IO-Device is added. The address ranges are managed using the following buttons: Creates an address range Edits the selected address range Deletes the selected address range	-	-

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Address Assignments	To reserve IP addresses for predefined IO-Device names This is useful for IO-Devices with addresses which must remain fixed. When the respective IO-Device is inserted into the current configuration, the corresponding IP address will automatically be assigned to it.	-	-
Scan	Get a list of I/O devices on the network The button is used to copy device name and IP address to the 'Configured Assignments' list. Alternatively the button allows to make an assignment by specifying the IP address and the name of the IO-Device.	-	-
Enable this Service	Enable the 'IP Address Manager' service	selected / not selected	not selected
Sub-Network Mask	Sub-netwok mask from the configuration of the PROFINET Controller The subnetwork mask along with the gateway address cannot be configured using this service.	read-only	
Gateway IP Address	Gateway address from the configuration of the PROFINET Controller	read-only	
Configured Assignments	List of configured pairs of device name and IP address, which are assigned by the address manager, when the device is connected. : Edits the selected entry : Deletes the selected entry	-	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

When a connection is established, the PROFINET Controller can send the TCP/IP configuration to an IO-Device. This helps to avoid problems with IP address conflicts. The IP addresses distributed by the console will only be effective, when the PROFINET Controller establishes the connection with the IO-Device.

Note: if no address ranges have been specified, the IP addresses of the network devices start with the first IP address within the specified subnet mask, independent of the controller IP address.

Changing the Controller IP Address

If a different IP address has been entered and the dialog has been closed by pressing 'OK', the user

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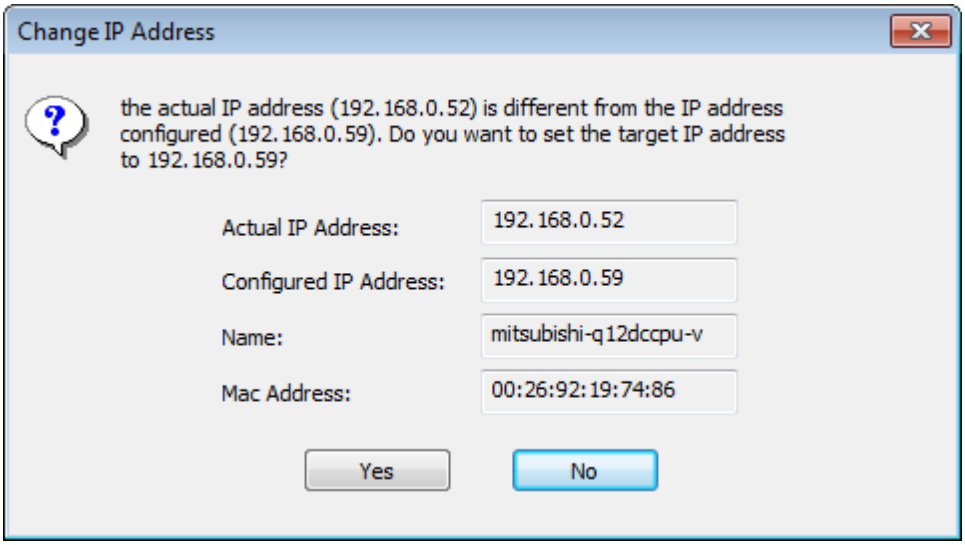
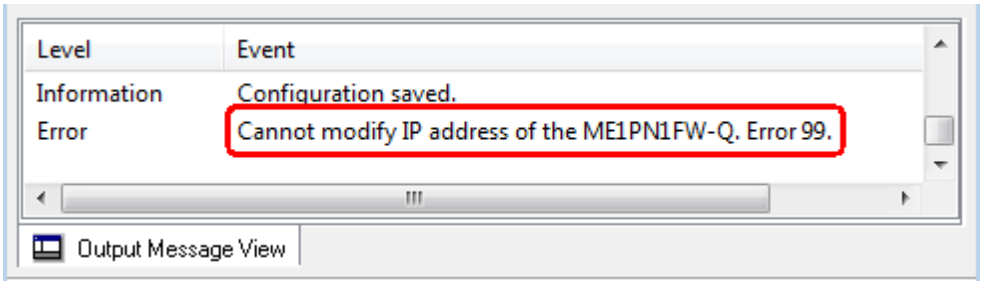
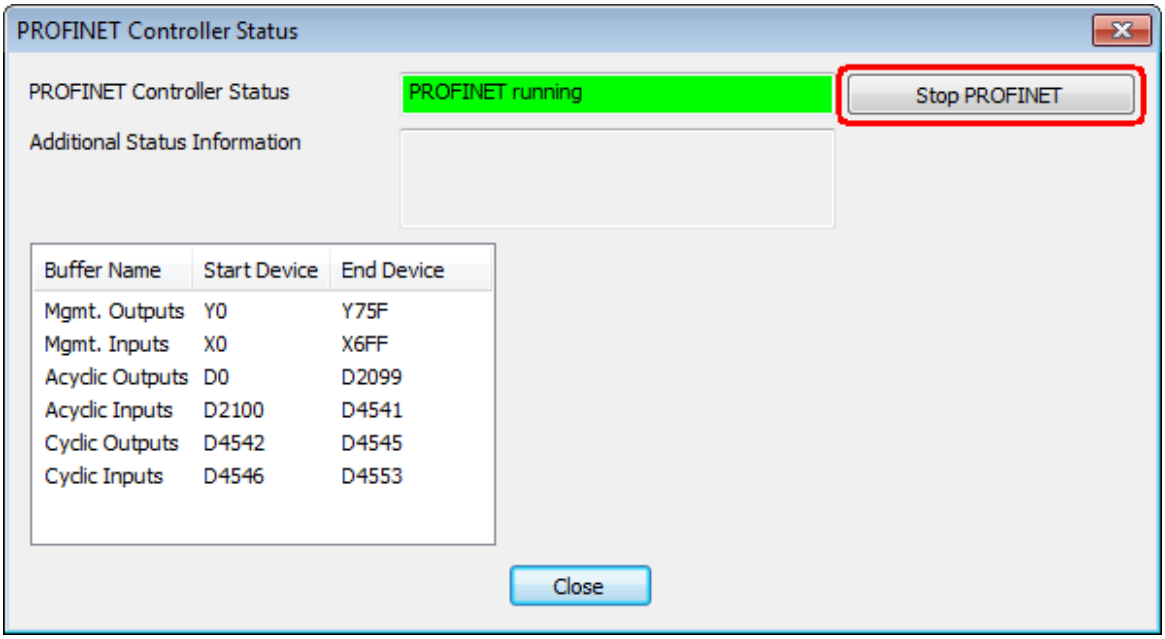
is asked, whether the IP address should also be changed online on the PN controller.



The IP address can only be changed on the controller, if the PROFINET cyclic data exchange is stopped. If the data exchange has been started, the attempt to change the IP address online causes an error entry in the log.



The data exchange can be stopped via the 'PROFINET Controller Status' dialog.



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7.4 Items View

Lists the I/O points of the module selected in the network configuration view. The user can select an item and change its name in the 'Items Properties' Dialog

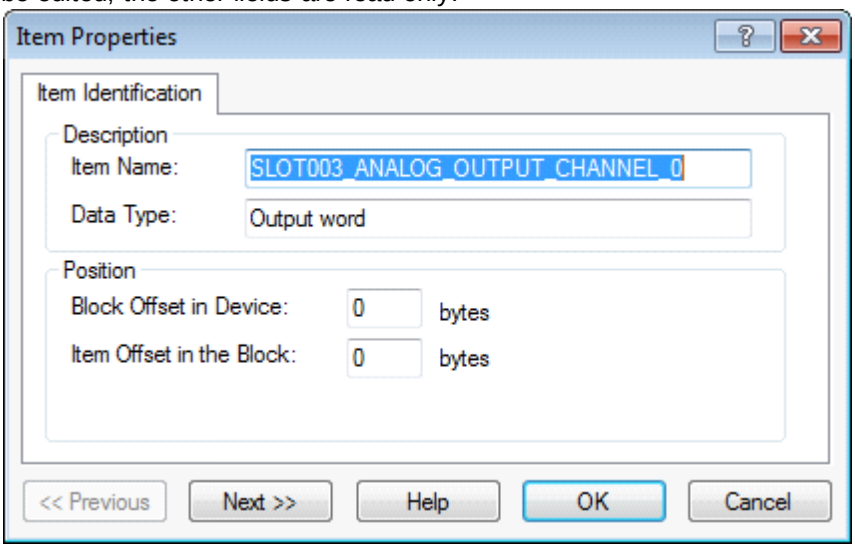
Input Item Name	Data type	Offset/device	Offset/module	Bit in the byte	Word Offset in Inputs
8 SLOT004_STATUS_CHANNEL_0	Input byte	4	0		6
16 SLOT004_CNT_VAL_CHANNEL_0	Input word	5	1		7
8 SLOT004_STATUS_CHANNEL_1	Input byte	7	3		8
16 SLOT004_CNT_VAL_CHANNEL_1	Input word	8	4		9

Output Item Name	Data type	Offset/device	Offset/module	Bit in the byte	Word Offset in Outputs
8 SLOT004_CONTROL_CHANNEL_0	Output byte	3	0		5
16 SLOT004_CNT_SET_CHANNEL_0	Output word	4	1		6
8 SLOT004_CONTROL_CHANNEL_1	Output byte	6	3		7
16 SLOT004_CNT_SET_CHANNEL_1	Output word	7	4		8

The context menu in the view corresponds to the 'Items Menu' in the main menu.

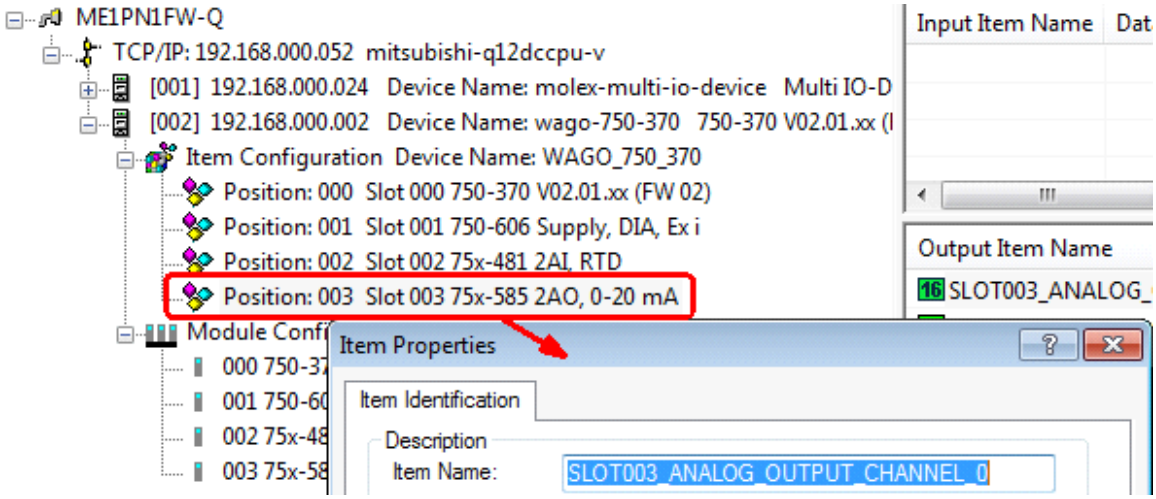
'Item Properties' Dialog

This dialog is opened by double-clicking an item in the 'Items View' table. Only the 'Item Name' can be edited, the other fields are read-only.



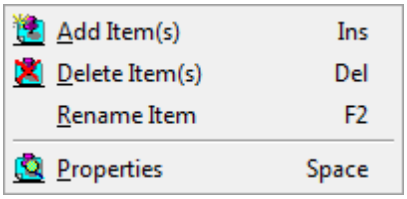
'Items Declaration' Dialog

This dialog is opened by double-clicking a position in the 'PROFINET Network' view.



The user can change the I/O structure of the module. This affects the global variable, which represents the module in the generated PLC code.

7.4.1 'Items' Menu



The menu contains the following commands:

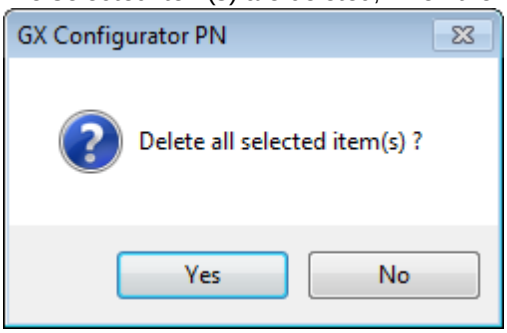
Command	Description
Add Item(s)	Add item(s)
Delete Item(s)	Delete selected item(s)
Rename Item	Rename the selected item
Properties	Properties of the selected item

Command 'Add Item(s)'

Opens the 'Items Declaration' dialog to define new items or edit existing ones.

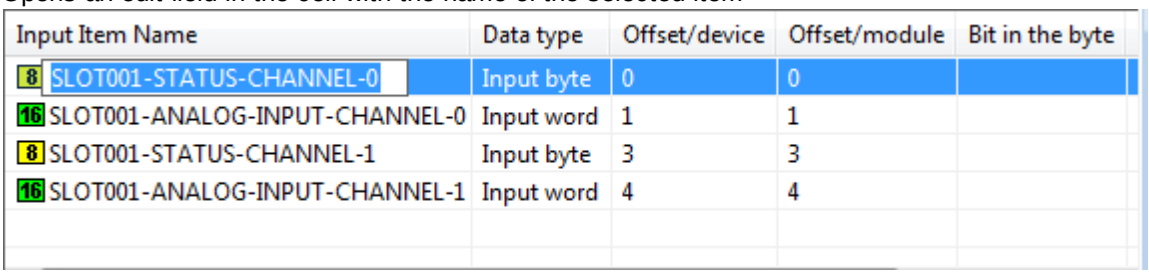
Command 'Delete Item(s)'

The selected item(s) are deleted, when the following query is confirmed.



Command 'Rename Item'

Opens an edit field in the cell with the name of the selected item



Command 'Properties'

This command opens the 'Item Properties' dialog.

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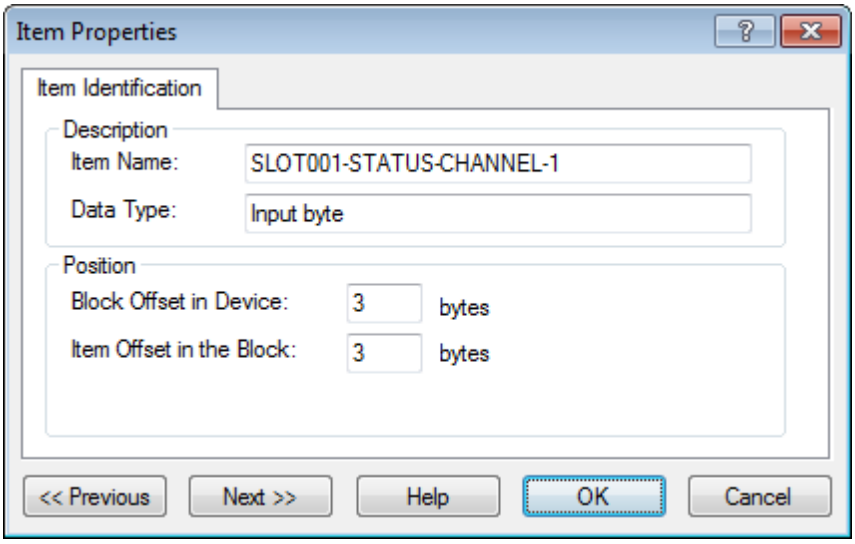
7.4.2 'Items Properties' Dialog



Name	Description	Choices / Range	Default
Item Name	Item name	1 - 50 characters	-
Data Type	Item data type	read-only	-
Block Offset in Device	Offset of the item within the input or output area of the device in bytes	read-only	-
Item Offset in the Block	Offset of the item within its block in bytes	read-only	-
Previous	Show settings of previous item in table	Enabled, the selected item is not the first one	-
Next	Show settings of next item in table	Enabled, the selected item is not the last one	-
Help	Open online help	-	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-

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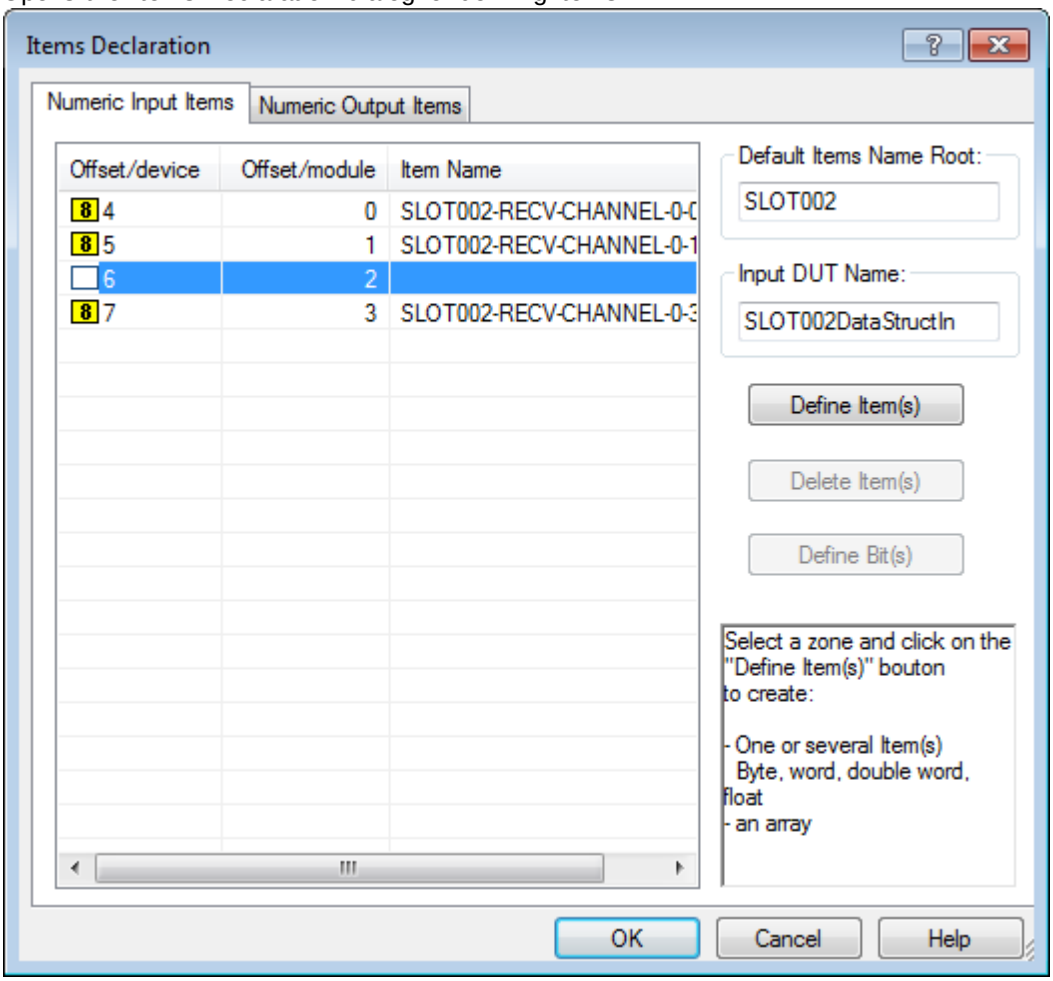
7.4.3 'Items Declaration' Dialog

Opens the 'Items Declaration' dialog for defining items.



Name	Description	Choices / Range	Default
Numeric Input Items	Table with items in input area	read-only	-
Numeric Output Items	Table with items in output area	read-only	-
Default Items Name Root	Prefix for item names		SLOT<nnn> with <nnn> being the slot in the slave
Input DUT Name	Name of the struct, which contains the items		-
Define Item(s)	opens the 'Define Item(s)' dialog	Enabled, if an unallocated area is selected; disabled, if an existing item is selected	-
Delete Item(s)	delete selected item(s)	Enabled, if an exis-	-

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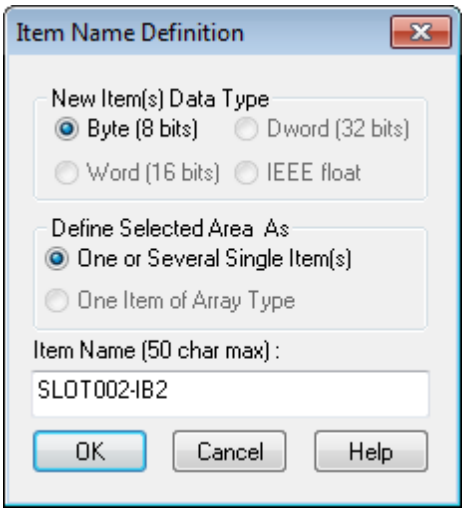
Name	Description	Choices / Range	Default
		ting item is selected	
Define Bit(s)	opens the 'Define Bit(s)' dialog	Enabled, if an existing item is selected	-
OK	Close dialog and save changes	-	Default
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

Warning: when changing the data type of an item the memory position may change. Elements of WORD, DWORD and REAL types are always placed on a word boundary. This may require insertion of padding bytes and thus change the sizes of the transfer buffers for the cyclic data. Therefore the refresh settings must always be updated in both the PLC CPU and the PROFINET Controller.

Define Item(s)

Define one or more items.



Name	Description	Choices / Range	Default
Data Type	Data type of the item	Byte, Word, Dword, IEEE float	Byte
Define Selected Area	Select, whether either several single items or an item of array type is created	Single Items / Array	Single Items
Item Name	Name of the new item	1 - 50 characters	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-

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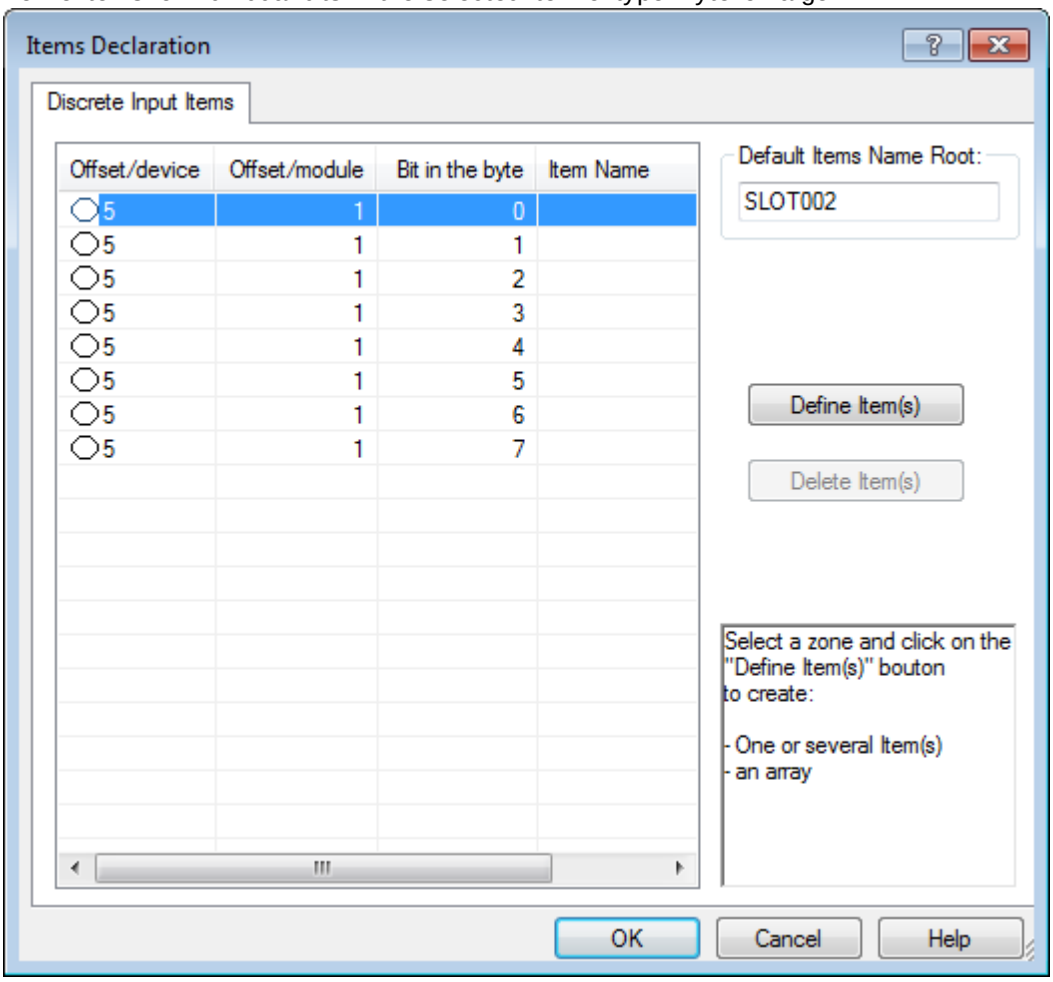
Name	Description	Choices / Range	Default
Help	Open online help	-	-

Define Bit(s)

Define items for individual bits in the selected item of type 'Byte' or larger.



Name	Description	Choices / Range	Default
Discrete Input Items or Discrete Output Items	Table with items in input area	read-only	-
Default Items Name Root	Prefix for item names	-	SLOT<nnn> with <nnn> being the slot within the slave
Define Item(s)	opens the 'Item Name Definition'	Enabled, if a very	-

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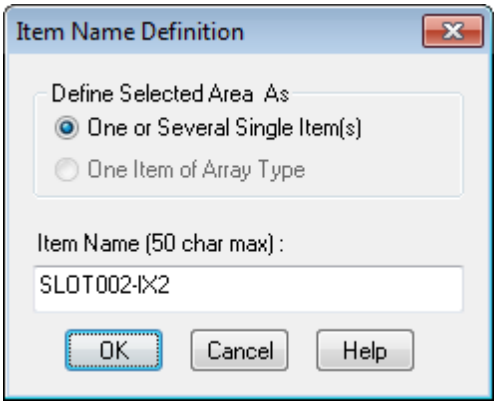
Name	Description	Choices / Range	Default
	dialog (see 'Bit Item Definition')	unallocated area is selected; disabled, if an existing item is selected	
Delete Item(s)	delete selected item(s)	Enabled, if an existing item is selected	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

Bit Item Definition

Specify the name(s) for one or multiple bit items



Name	Description	Choices / Range	Default
Define Selected Area	Select, whether either several single items or an item of array type is created	Single Items / Array	Single Items
Item Name	Name of the new item	1 - 50 characters	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

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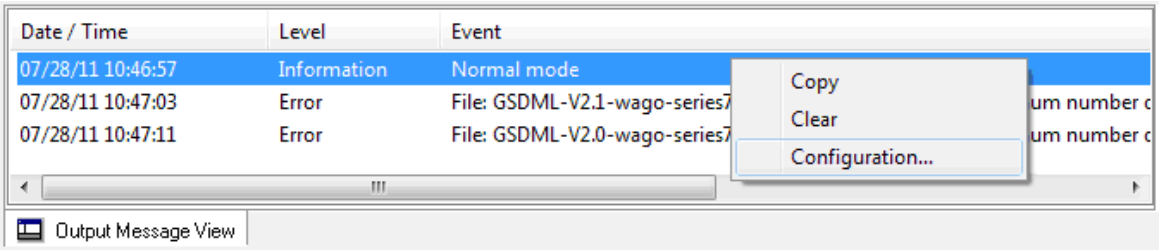
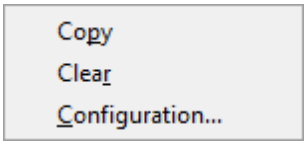
7.5 Message View

The message view shows the entries of the events log.



The message view contains a context menu.

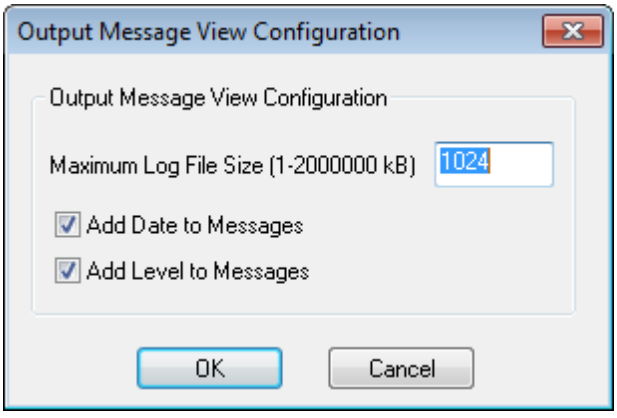
7.5.1 'Message View' Menu



Command	Description
Copy	Copies the contents of the message view to the clipboard
Clear	Deletes the contents of the message view
Configuration	Opens the 'Output Message View Configuration' dialog

7.5.2 'Message View Configuration' Dialog

This dialog is used to configure the message view.



Name	Description	Choices / Range	Default
Maximum Log File Size	Maximum size of log file	1 - 2000000 kB	1024 kB
Add Date to Messages	Add date field to entries	selected / not selected	selected

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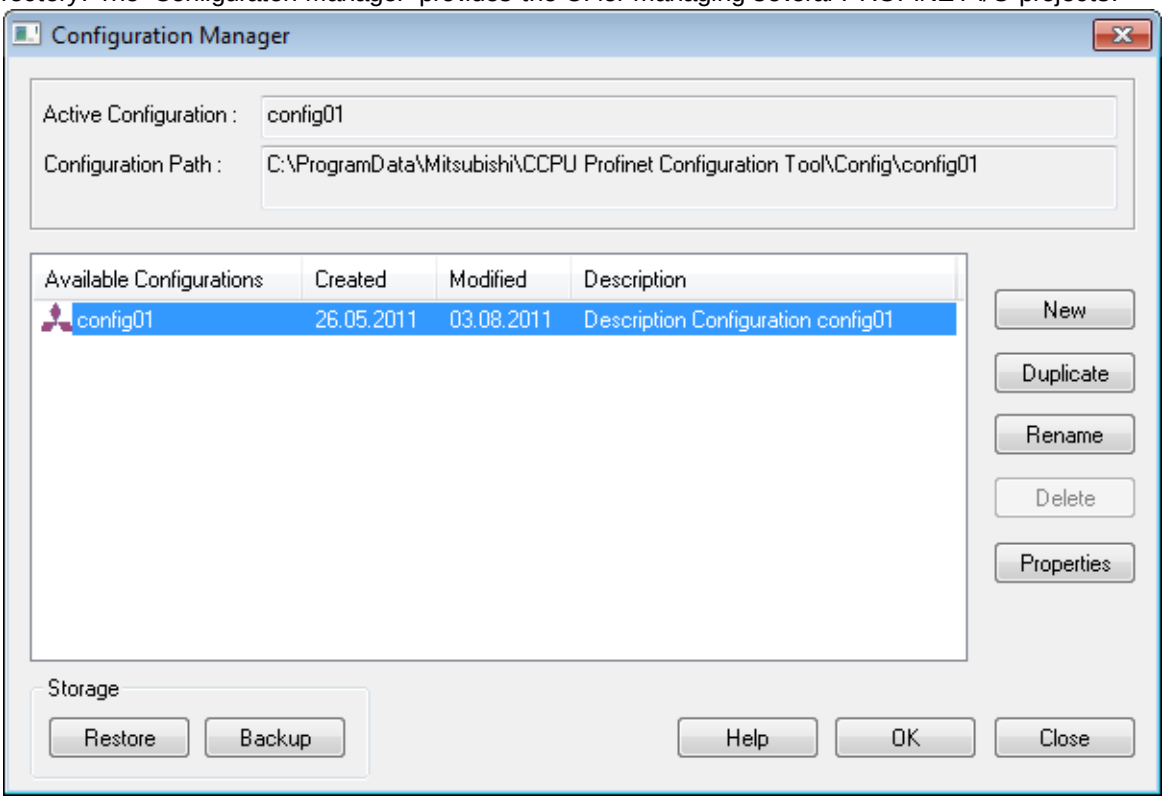
Name	Description	Choices / Range	Default
Add Level to Messages	Add level field to entries	selected / not selected	selected
OK	Close the dialog and save changes	-	Default
Cancel	Close the dialog and discard changes	-	-

7.6 Configuration Manager

Each project with the settings for a PROFINET Controller is a ‘configuration’ and stored in a fixed directory. The ‘Configuraton Manager’ provides the UI for managing several PROFINET I/O projects.



Name	Description	Choices / Range	Default
Active Configuration	Name of currently open controller project	read-only	-
Configuration Path	Directory of active configuration	read-only	-
Available Configurations	Names of existing configurations	read-only (to change press 'Rename')	-

Name	Description	Choices / Range	Default
Created	Date, when configuration has been created	read-only	-
Modified	Date, when configuration has been modified for the last time	read-only	-
Description	Descriptive text of configuration	read-only (to change press 'Properties')	-
New	Create a new configuration Opens the 'New Configuration' dialog	-	-
Duplicate	Create a copy of the selected configuration Opens the 'Duplicate Configuration' dialog	Enabled, if a configuration is selected; otherwise disabled	-
Rename	Opens the 'Rename Configuration' dialog for the selected configuration	Enabled, if a configuration is selected; otherwise disabled	-
Delete	Delete the selected configuration	Enabled, if a configuration is selected and it is not the only one; otherwise disabled	-
Properties	Opens the 'Configuration Properties' dialog for the selected configuration	Enabled, if a configuration is selected; otherwise disabled	-
Restore	Opens a file dialog for selecting a *.mit file created as backup before, which is added to the list of configurations	-	-
Backup	Opens a file dialog for selecting a *.mit file, the selected configuration is exported to	-	-
OK	Close dialog and save changes	-	-
Close	Close dialog and discard changes	-	-
Help	Open online help	-	-

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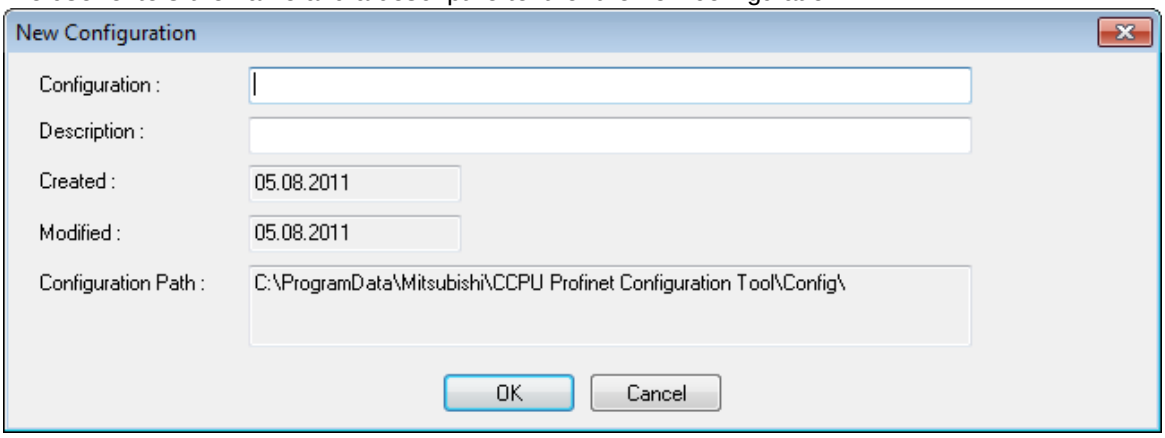
7.6.1 'New Configuration' Dialog

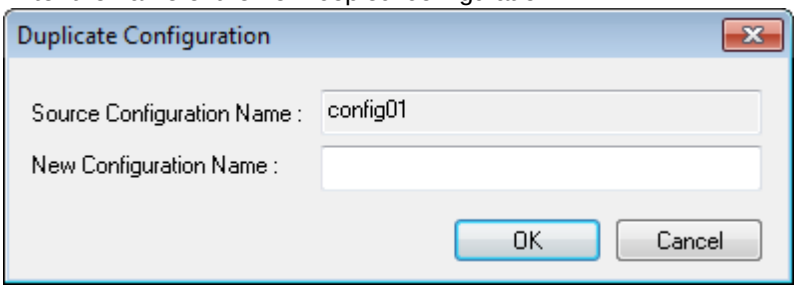
The user enters the name and a descriptive text for the new configuration.



Name	Description	Choices / Range	Default
Configuration	Name of the selected configuration	1-124 characters	-
Description	Descriptive text of configuration	-	-
Created	Date, when configuration has been created	read-only	-
Modified	Date, when configuration has been modified for the last time	read-only	-
Configuration Path	Directory of configuration	read-only	-
OK	Close dialog and save changes	-	Default
Cancel	Close dialog and discard changes	-	-

7.6.2 'Duplicate Configuration' Dialog

Enter the name of the new 'copied' configuration.



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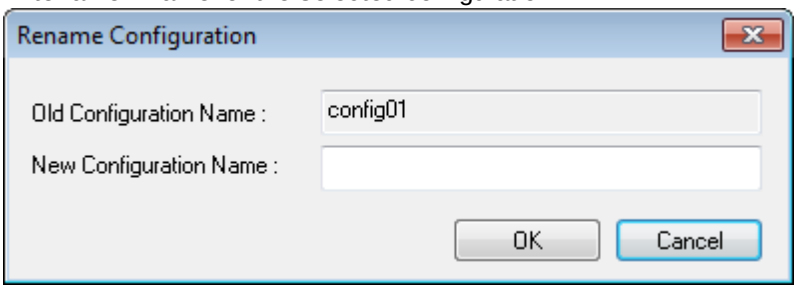
Name	Description	Choices / Range	Default
Source Configuration Name	Name of the selected original configuration	read-only	-
New Configuration Name	New name for the copy of the selected configuration	1-124 characters	-
OK	Close dialog and save changes	-	Default
Cancel	Close dialog and discard changes	-	-

7.6.3 'Rename Configuration' Dialog

Enter a new name for the selected configuration.



Name	Description	Choices / Range	Default
Old Configuration Name	Current name of the selected configuration	read-only	-
New Configuration Name	New name for the selected configuration	1-124 characters	-
OK	Close dialog and save changes	-	-
Cancel	Close dialog and discard changes	-	Default

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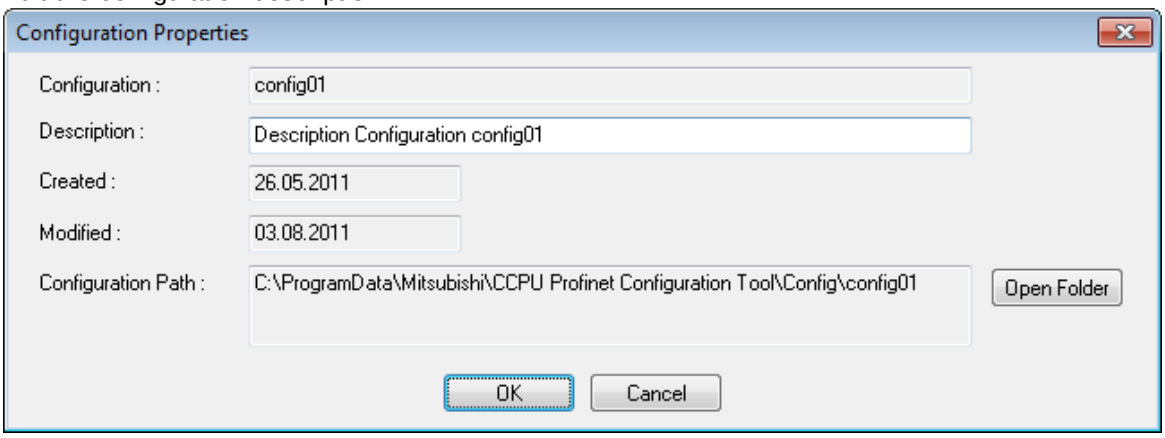
7.6.4 'Configuration Properties' Dialog

Edit the configuration description.



Name	Description	Choices / Range	Default
Configuration	Name of the selected configuration	read-only	-
Description	Descriptive text of configuration		-
Created	Date, when configuration has been created	read-only	-
Modified	Date, when configuration has been modified for the last time	read-only	-
Configuration Path	Directory of configuration	read-only	-
Open Folder	Opens the Windows file explorer and selects the configuration directory	-	-
OK	Close dialog and save changes	-	Default
Cancel	Close dialog and discard changes	-	-

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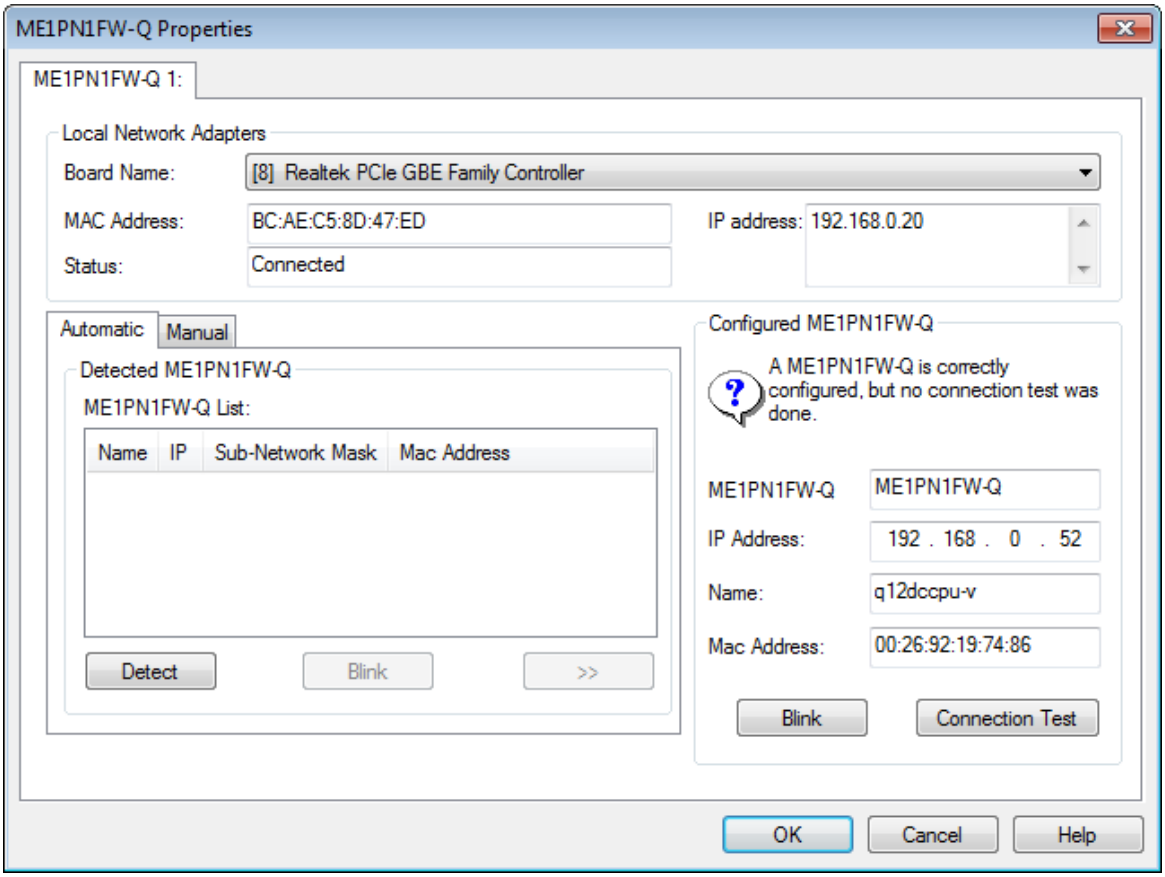
7.7 'ME1PN1FW-Q Properties' Dialog

Address settings of a ME1PN1FW-Q can be manually entered or copied from station found during a network scan.



Name	Description	Choices / Range	Default
Board Name	List of local Ethernet interfaces to select the one, the PROFINET Controller is connected to	local Ethernet interfaces	-
MAC Address	MAC address of selected Ethernet interface	6 pairs of hex digits separated by colons	-
Status	Connection status of selected Ethernet interface	read-only	-
IP address	IP address(es) assigned to selected Ethernet interface	read-only	-
Detect	Scan the network of the selected network adapter for suitable network stations. The controllers found are added to the list.	-	-
Blink	Flashes the LED display on the PROFINET Controller	Enabled, if a module entry in the table is selected	-

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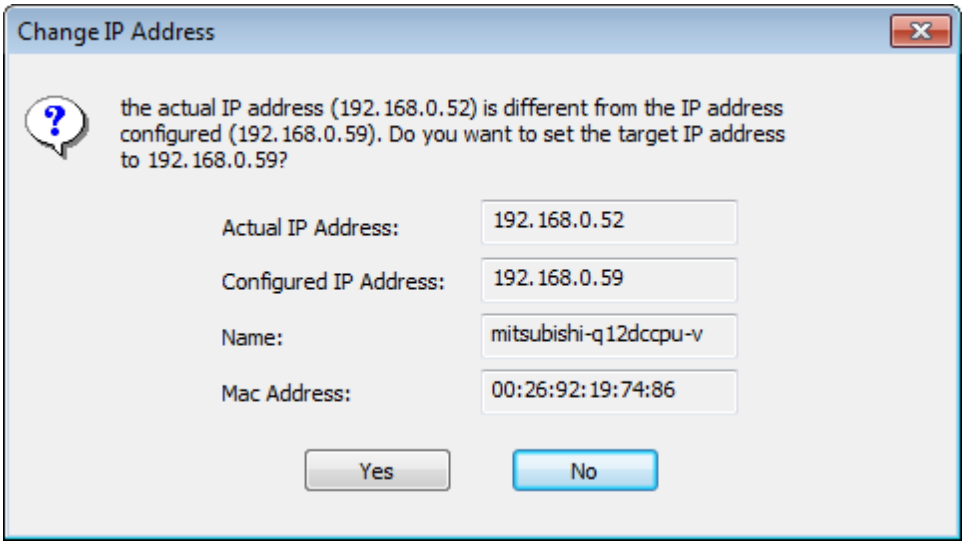
Name	Description	Choices / Range	Default
>>	Copies the address of the selected PROFINET Controller to the 'Configured...' section	Enabled, if a module entry in the table is selected	-
ME1PN1FW-Q	Controller model name	read-only	ME1PN1FW-Q
IP Address	Controller IP address	4 integers in the range of 0-254	0.0.0.0
Name	Controller name		
MAC Address	MAC address of selected controller	6 pairs of hex digits separated by colons	-
Blink	Flashes the LED display on the PROFINET Controller	-	-
Connection Test	Tries to connect to the PROFINET Controller	-	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

Changing the Controller IP Address

If a different IP address has been entered and the dialog has been closed by pressing 'OK', the user is asked, whether the IP address should also be changed online on the PN controller.



The IP address can only be changed on the controller, if the PROFINET cyclic data exchange is stopped. If the data exchange has been started, the attempt to change the IP address online causes an error entry in the log.

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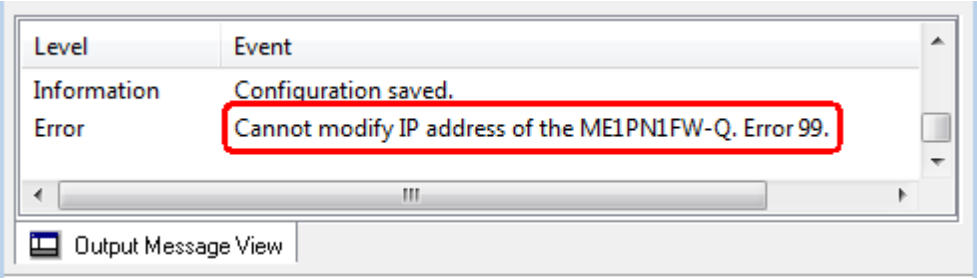
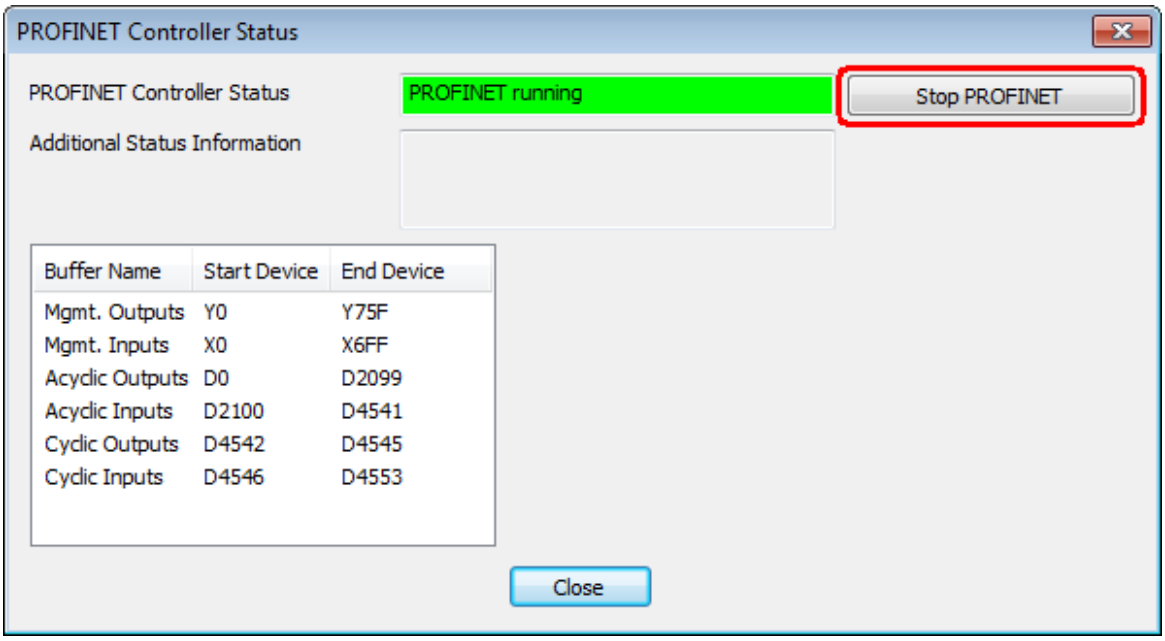


The data exchange can be stopped via the 'PROFINET Controller Status' dialog.



7.8 'IO-Device Configuration' Dialog

This dialog is displayed, when a new device is added to the network view, and when the item 'Properties' is selected from the context menu of the device in the network view. The settings of a PROFINET I/O slave device are accessed via the following tab pages in this dialog

- 'Device - General Configuration' Tab
- 'Device - Module Configuration' Tab
- 'Device - Parameters' Tab
- 'Device - Connection Information' Tab
- 'Device - I/O Data' Tab
- 'Device - GSDML File' Tab

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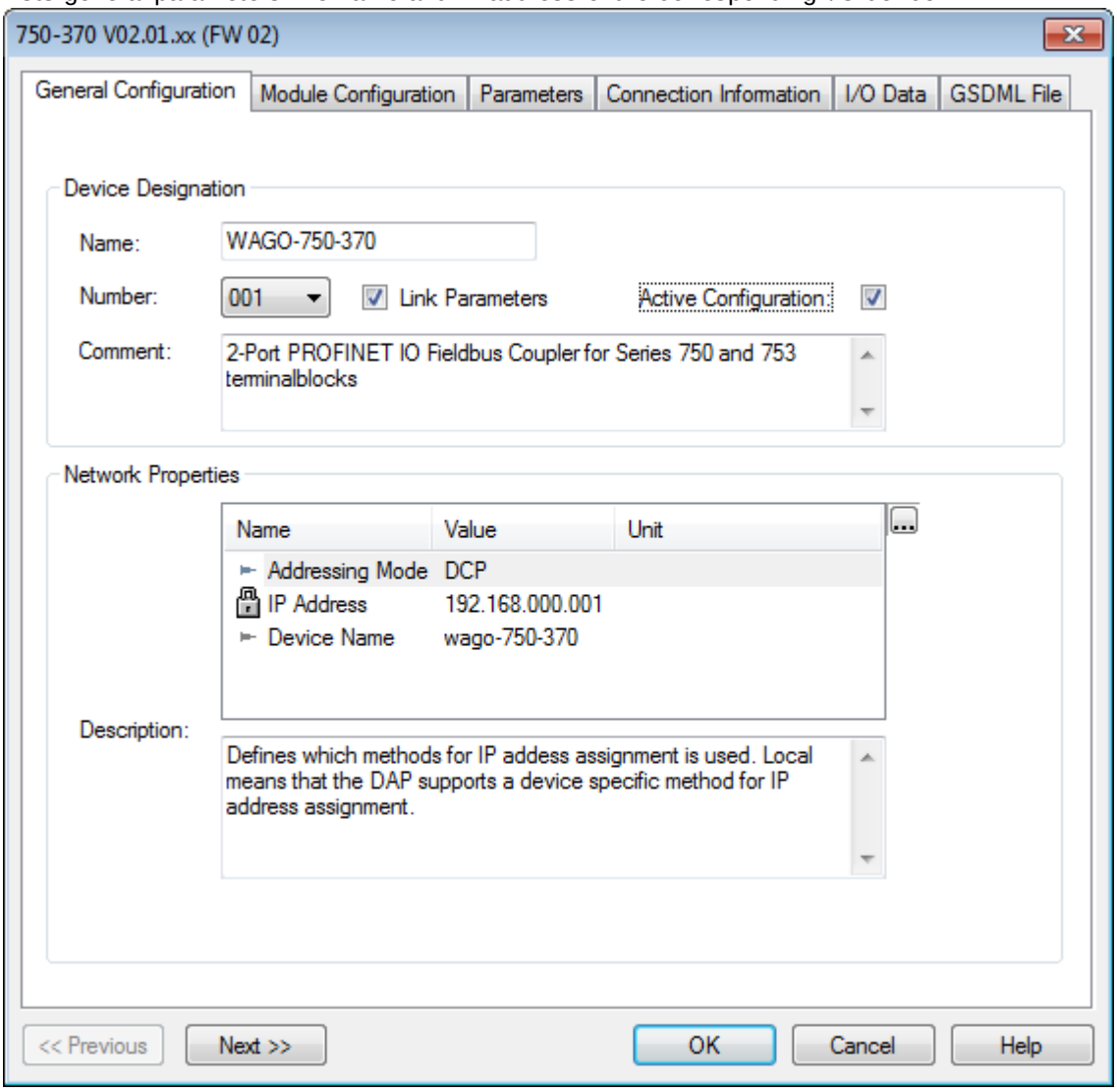
7.8.1 'Device - General Configuration' Tab

Lists general parameters like name and IP address of the corresponding I/O device.



Name	Description	Choices / Range	Default
Name	Name of the IO-device		Model name
Number	Device ID to be chosen from the list of devices not configured.	0 - 127	
Link Parameters	Checkbox to activate the link of the device number with the device IP address: the device number will then correspond to the station number of the IP address.		
Active Configuration	Checkbox to activate the configuration of the device in the IO-Controller: used to delete a device from IO-Controller, whilst keeping its configuration in the console.		

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Name	Description	Choices / Range	Default
Comments	Free text related to a device. The total number of characters must not exceed 80.	0 - 80 characters	
Addressing Mode	Defines the way of obtaining the IP configuration which may be DCP, Local or DHCP. The modes vary according to the contents of the GSD for the IO-Device. **DCP**: during the connection, the IO-Controller sets the IP address of the IO-Device. **DHCP**: during the connection, the IO-Controller compares the IP address of the IO-Device with that configured. If they are identical, the connection can go ahead. If not, the connection fails. **Local**: during the connection, the IO-Controller uses the configured IP address.		
IP Address	This IP address will be the IP address of the IO-Device after connection if the selected addressing is DCP. This IP address shall be the same as the IP address configured inside the IO-Device if the selected addressing mode is different than DCP.		
Device Name	This field shall be the same as name configured inside the IO-Device. (See Name an IO-Device)		
Description	Provides help on the selected field.	read-only	-
Previous	Get settings of previous I/O device (slave)	disabled for first device	-
Next	Get settings of next I/O device (slave)	disabled for last device	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

Note: when creating a configuration from the 'Network Detection View' (aka 'automatic configuration mode'), IP address and name of the device are already set. When manually adding the device, these items must be entered by the user.

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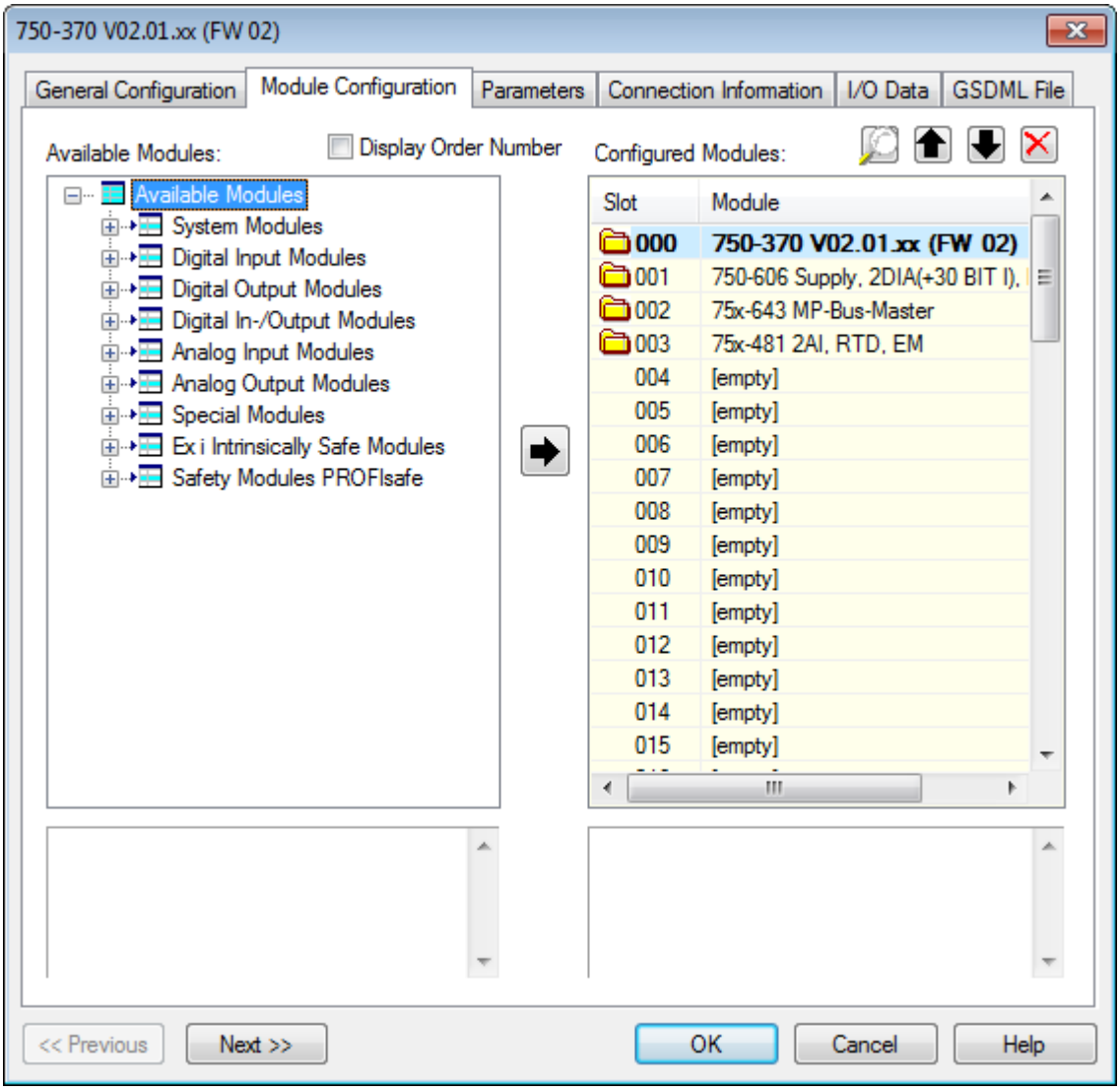
7.8.2 'Device - Module Configuration' Tab

This tab is used to select the modules in the IO-Device.



Name	Description	Choices / Range	Default
Available Modules	Contains the list of modules compatible with the IO-Device configured. This list was established from the device library. From this list, it is possible to add the modules present on the IO-Device to the list of configured modules. When a module can be configured, double-clicking the slot opens an editor for the module settings. The settings displayed are taken from the GSD file. Therefore the settings differ from between modules.	-	-
Display Order	If selected, only the order number from the	selected / not	not selected

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Name	Description	Choices / Range	Default
Number	GSDML file is displayed, otherwise the module type name	selected	
Configured Modules	Modules in the I/O device per slot with their type names : Opens the 'Module Configuration' dialog. : Moves the selected module up in the list : Moves the selected module down in the list : Deletes the selected module; same as pressing the [Del] key.	-	-
	Adds a module from the list of modules available to the list of those configured. Other ways of carrying out this command: • Double click the module to be added Drag and drop the module to be added	-	-
Previous	Get settings of previous I/O device (slave)	disabled for first device	-
Next	Get settings of next I/O device (slave)	disabled for last device	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

Note: when creating a configuration from the 'Network Detection View' (aka 'automatic configuration mode'), the module list is already filled. When manually adding the device, the modules must be added by the user.

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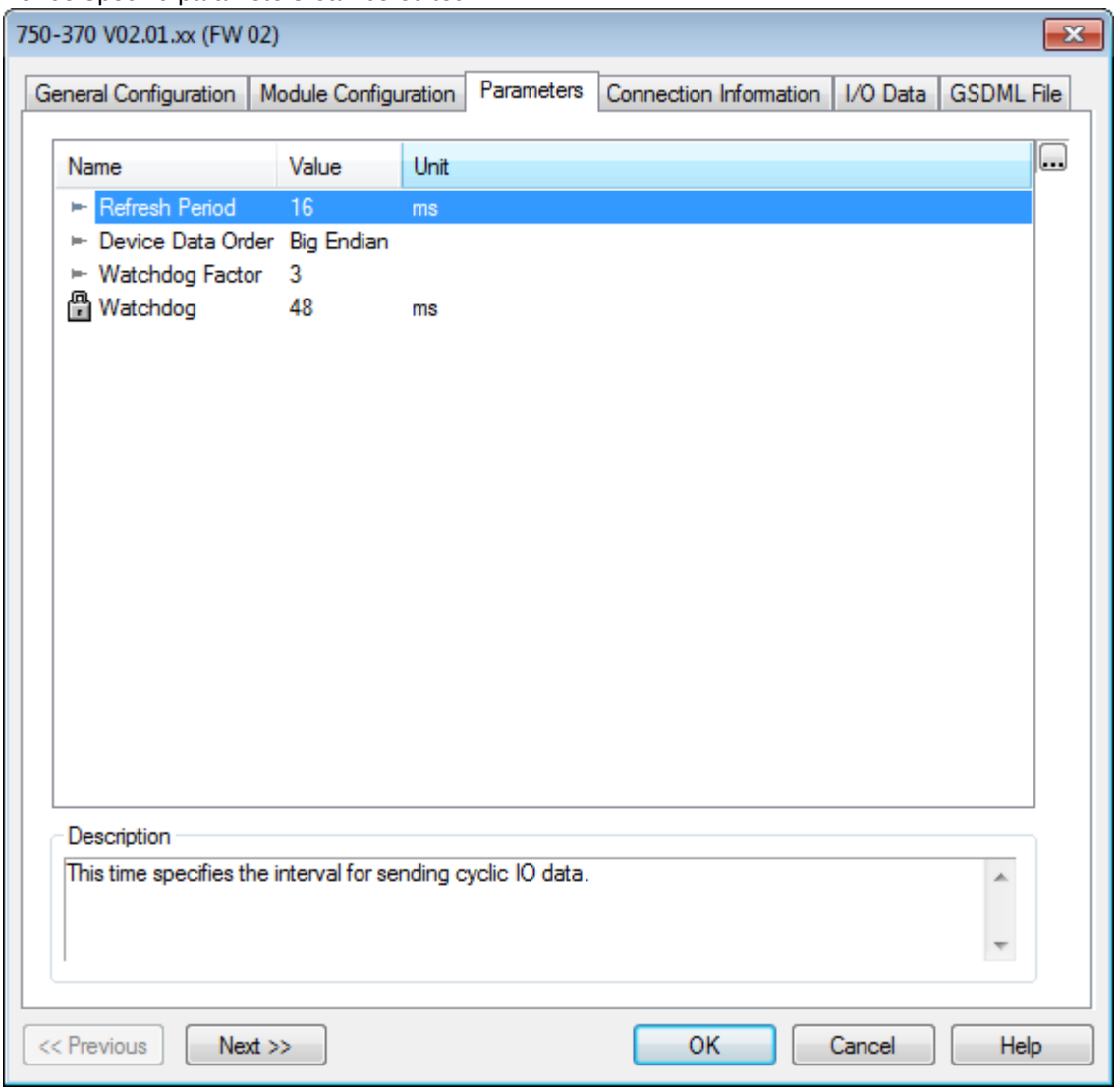
7.8.3 'Device - Parameters' Tab

Device specific parameters can be edited.



Name	Description	Choices / Range	Default
Refresh Period	Time interval in milliseconds between the transmission of each production frame and the reception of each consumption frame.	-	16 ms
Device Data Order	Data order for the device Used to specify the data format in memory of the 16 and 32-bit words: "Little Endian (Intel)" format: In increasing address order: low order byte – high order byte. "Big Endian (Motorola)" format: In increasing address order: high order byte - low order byte	'Little Endian' / 'Big Endian'	'Big Endian'

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Name	Description	Choices / Range	Default
Watchdog Factor	This value is used to calculate the production and consumption time out period. Time out period = Refresh period * Watchdog factor The result is displayed in the Watchdog field.	-	3
Watchdog	Production and consumption timeout period	read-only	-
Description	Provides help on the selected field.	read-only	-
Previous	Get settings of previous I/O device (slave)	disabled for first device	-
Next	Get settings of next I/O device (slave)	disabled for last device	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

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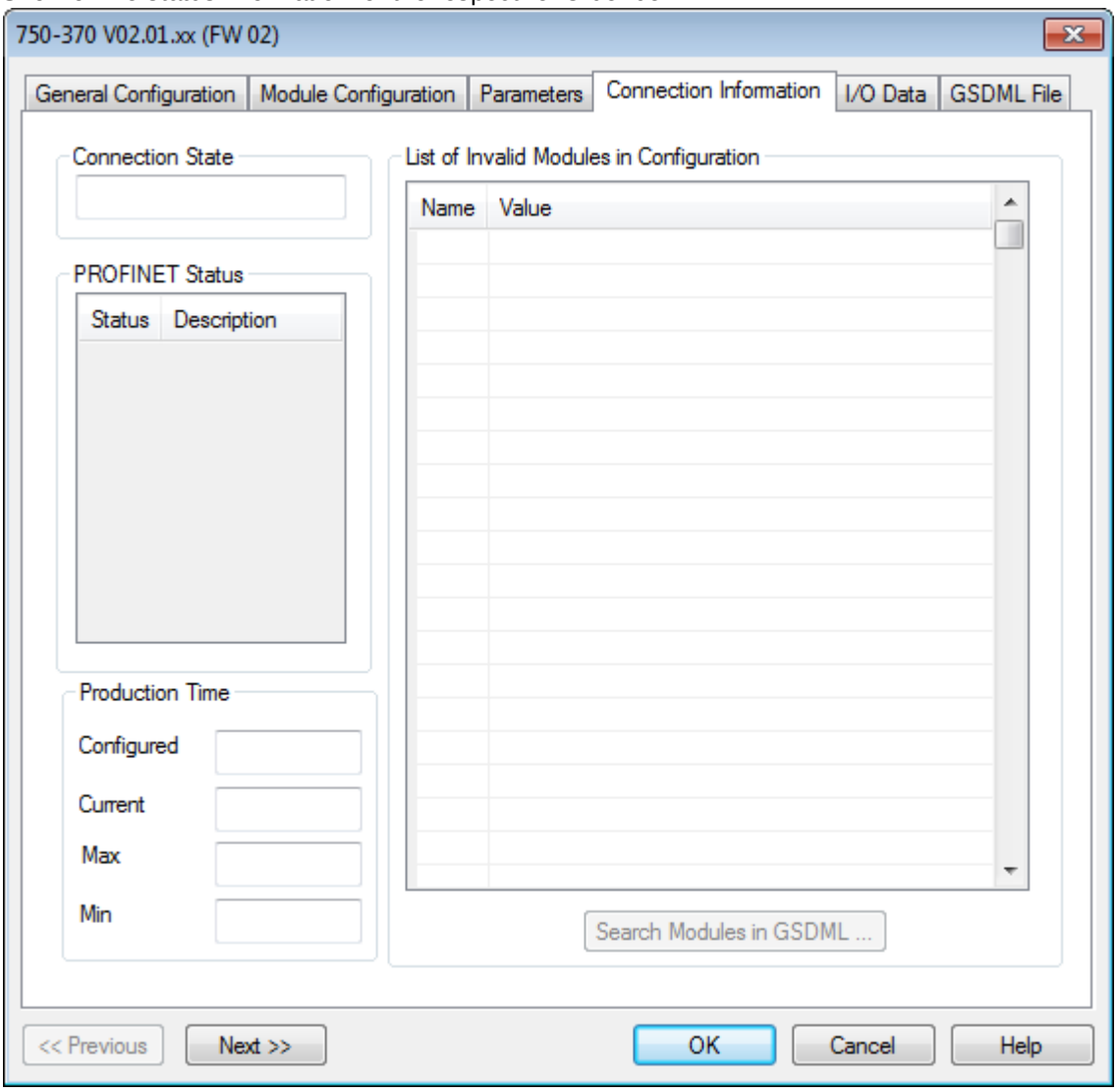
7.8.4 'Device - Connection Information' Tab

Show online status information for the respective IO-device.



Name	Description	Choices / Range	Default
Connection State	Indicates, whether the IO-Controller is **connected to** or **disconnected from** the IO-Device.	-	-
PROFINET Status	The values of the stati displayed are those defined by the PROFINET standard.	-	-
List of Invalid Modules in Configuration	The IO-Controller may connect to an IO-Device with an imprecise module configuration. In this case, the IO-Device may accept the connection while indicating the differences between the configured modules and the modules making up the IO-Device. **Configured identification Number**: corresponds to the module configured in the engineering tool	-	-

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Name	Description	Choices / Range	Default
	Actual identification Number: the value for the module present in the IO-Device **Module status**: current status of the module in the IO-Device		
Production Time	Shows the configured and the current cycle time for the device as well as the maximum and minimum cycle time since starting the cyclic data exchange	-	-
Search Modules in GSDML	Lookup module information in the GSDML files	-	-
Previous	Get settings of previous I/O device (slave)	disabled for first device	-
Next	Get settings of next I/O device (slave)	disabled for last device	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

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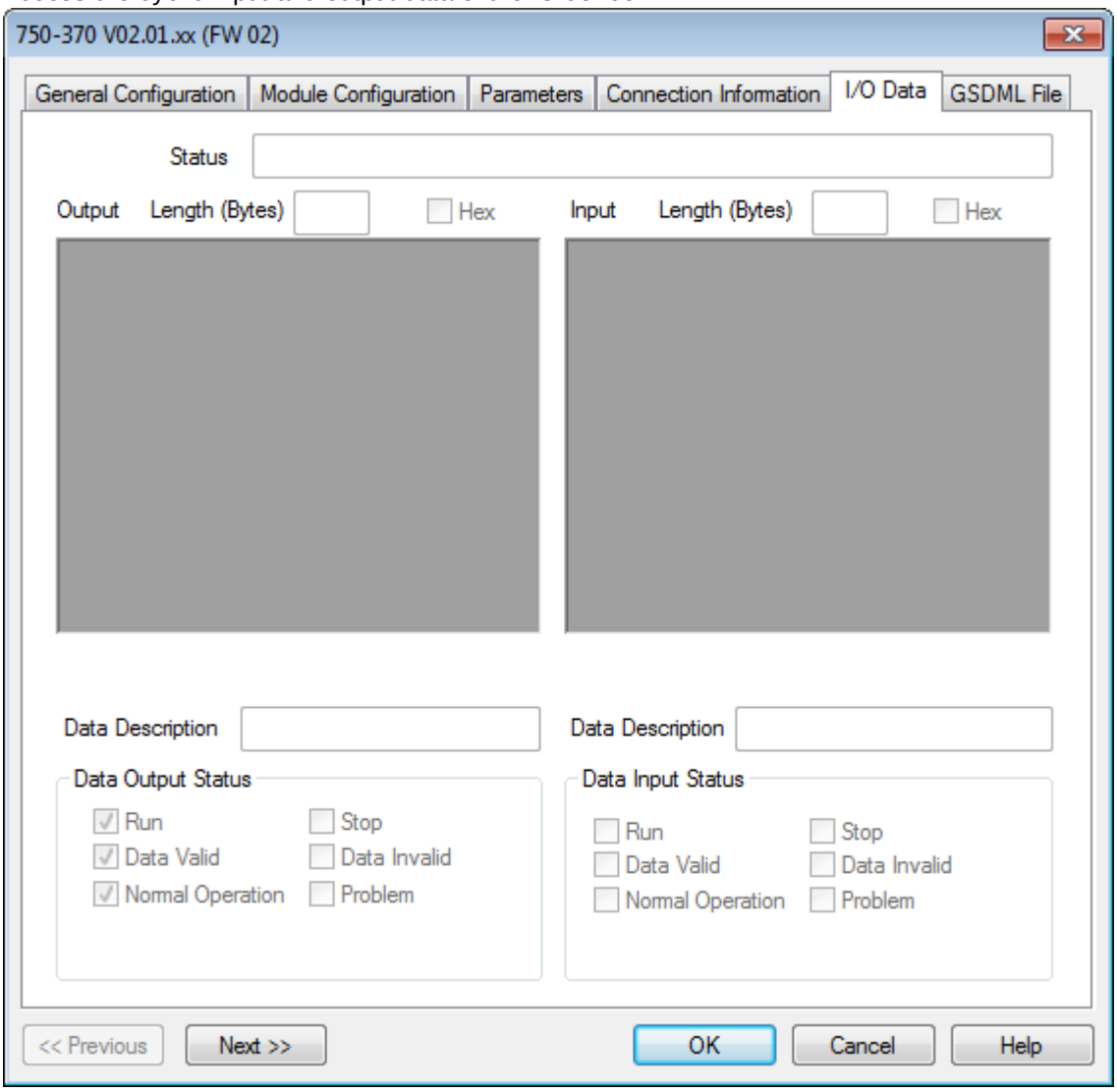
7.8.5 'Device - I/O Data' Tab

Access the cyclic input and output data of the IO-device.



Name	Description	Choices / Range	Default
Status	Indicates whether the connection has been established (OK) or not. A detailed status is given in the information on the connection tab.		
Output	Displays the output values for the IO-Device. The output values may be changed by clicking them.		
Input	Displays the input values for the IO-Device. The input and output views include either: Data : the background of the cell is yellow IOPS (IO provider status) and IOCS (IO consu-	read-only	

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Name	Description	Choices / Range	Default
	mer status): the background of the cell is green if the value is GOOD, if not the background of the cell is red		
Set Values	Writes the modified output values to the device		
Dismiss modifications	Returns to the initial values		
Data Description	The field gives the slot number, sub-slot number and the type of data item selected simply by clicking a value. A data item may be: IOCS: Represents a consumption status IOPS: Represents a production status Data: Represents data.		
Data Output Status	Shows the status of the outputs production frame called the production APDU Status..		
Data Input Status	Shows the status of the inputs production frame called the production APDU Status.		
Run / Stop	Where the IO-Controller is in stop mode, the IO-Devices must not consume the data received and vice-versa.	For inputs read-only	-
Data Valid / Data Invalid	If the IO-Controller is in Invalid data mode, the IO-Device must close the connection.		-
Normal Operation / Problem	If the IO-Controller is in Problem mode, the IO-Device must close the connection.		-
Previous	Get settings of previous I/O device (slave)	disabled for first device	-
Next	Get settings of next I/O device (slave)	disabled for last device	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

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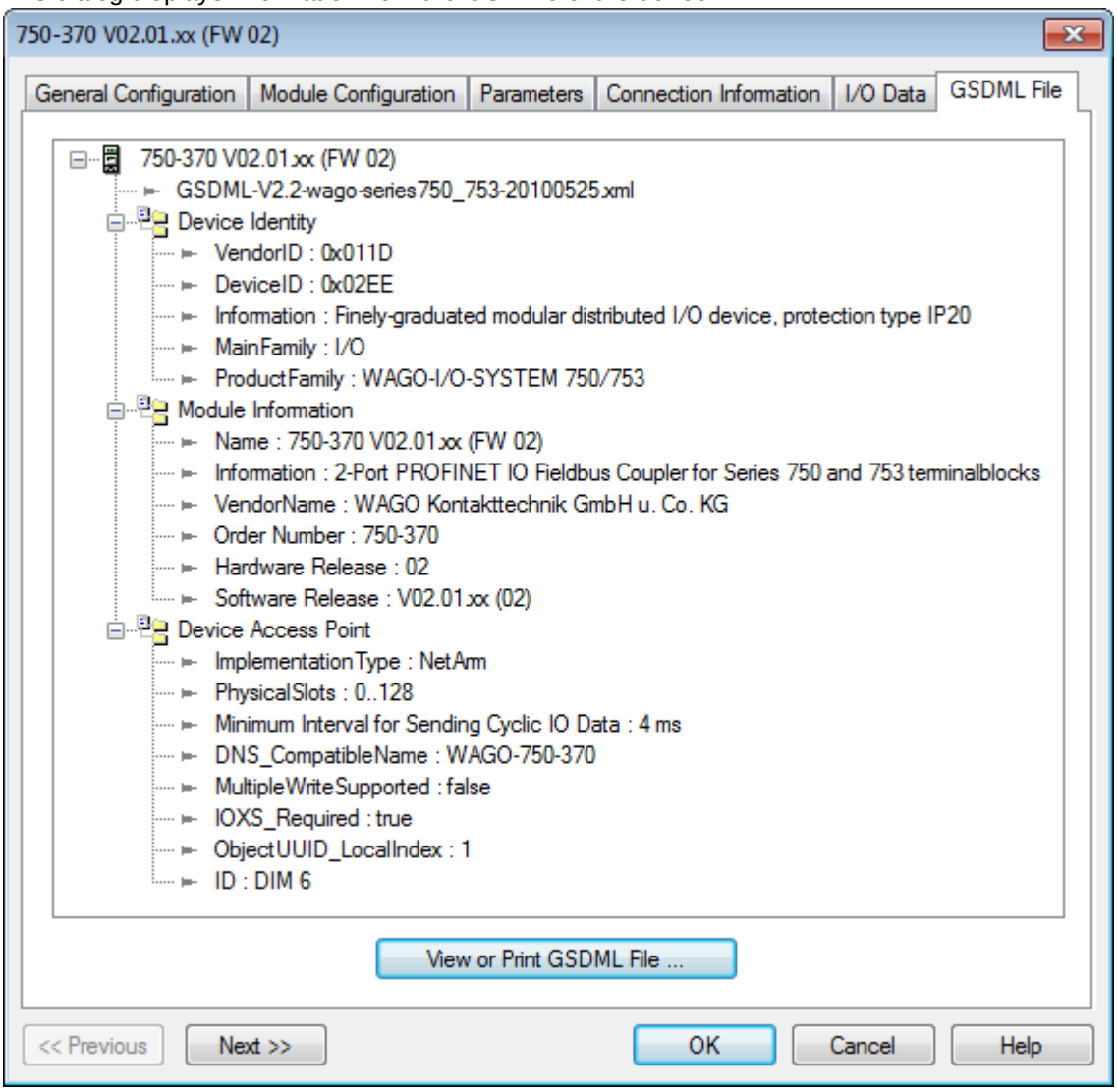
7.8.6 'Device - GSDML File' Tab

This dialog displays information from the GSD file of the device.



Name	Description	Choices / Range	Default
Tree	Lists the entries of the GSDML file	-	-
View or Print GSDML File…	Displays the file in a Windows text editor. This text editor can be used to print the file. What is displayed is a copy of the GSD with the .txt extension.	-	-
Previous	Get settings of previous I/O device (slave)	disabled for first device	-
Next	Get settings of next I/O device (slave)	disabled for last device	-
OK	Close dialog and save changes	-	Default

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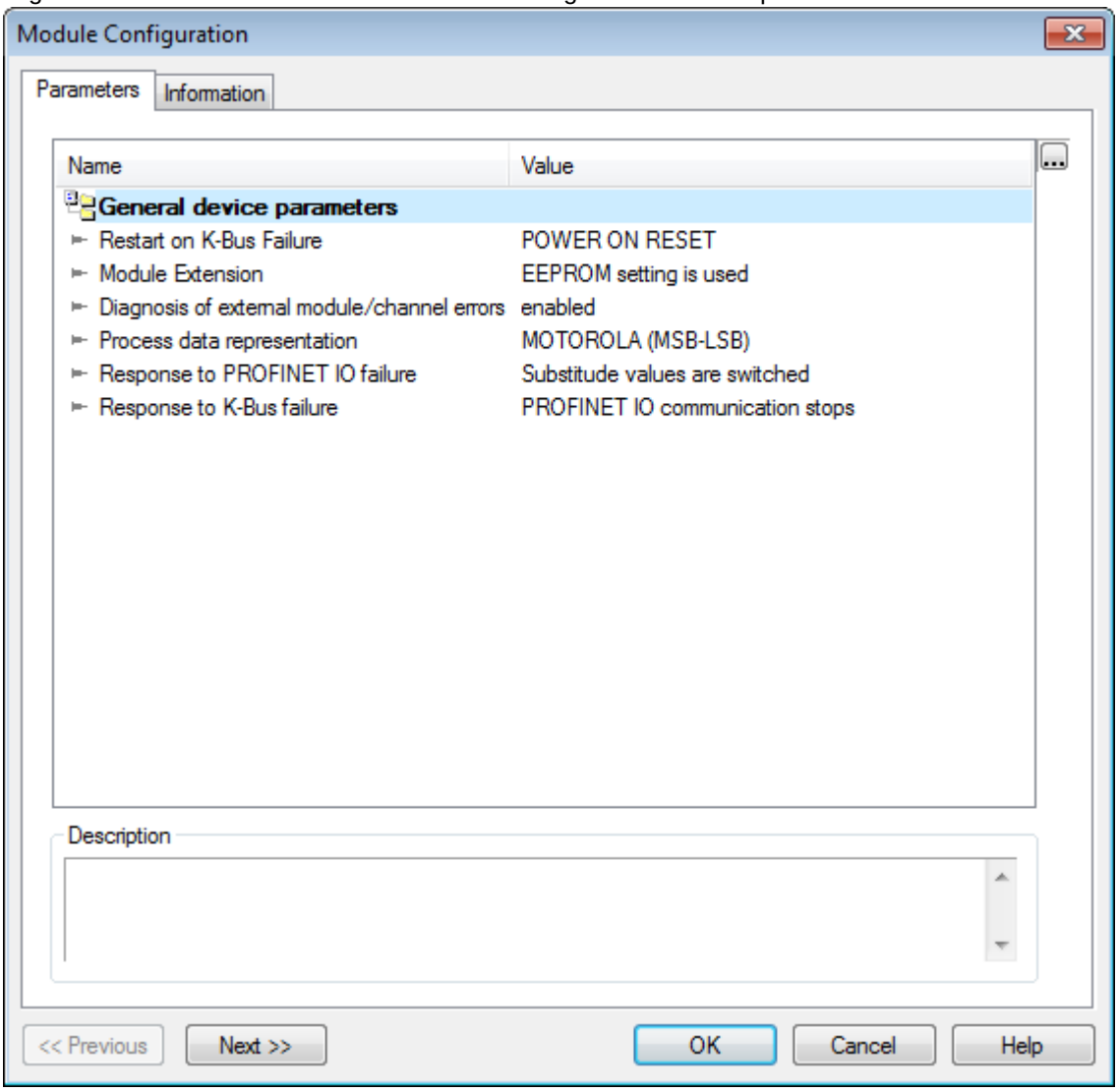
Name	Description	Choices / Range	Default
			button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

7.9 'Module Configuration' Dialog

The 'Module Configuration' dialog provides access to module-specific parameters.
It contains the 'Module Parameters' tab and the 'Module Information' tab.

7.9.1 'Module Parameters' Tab

Lists the parameters of the selected module as defined in the GSD file of the device type. The settings in this tab will be sent to the IO-Device during the connection phase.



Name	Description	Choices / Range	Default
Name	Parameter name	read-only	-
Value	Parameter value	device specific	device specific
Description	Descriptive text for parameter	read-only	-
Previous	Go to the previous module of the device	disabled for the first module	-
Next	Go to the next module of the device	disabled for the last module	-
OK	Close dialog and save changes	-	Default button
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

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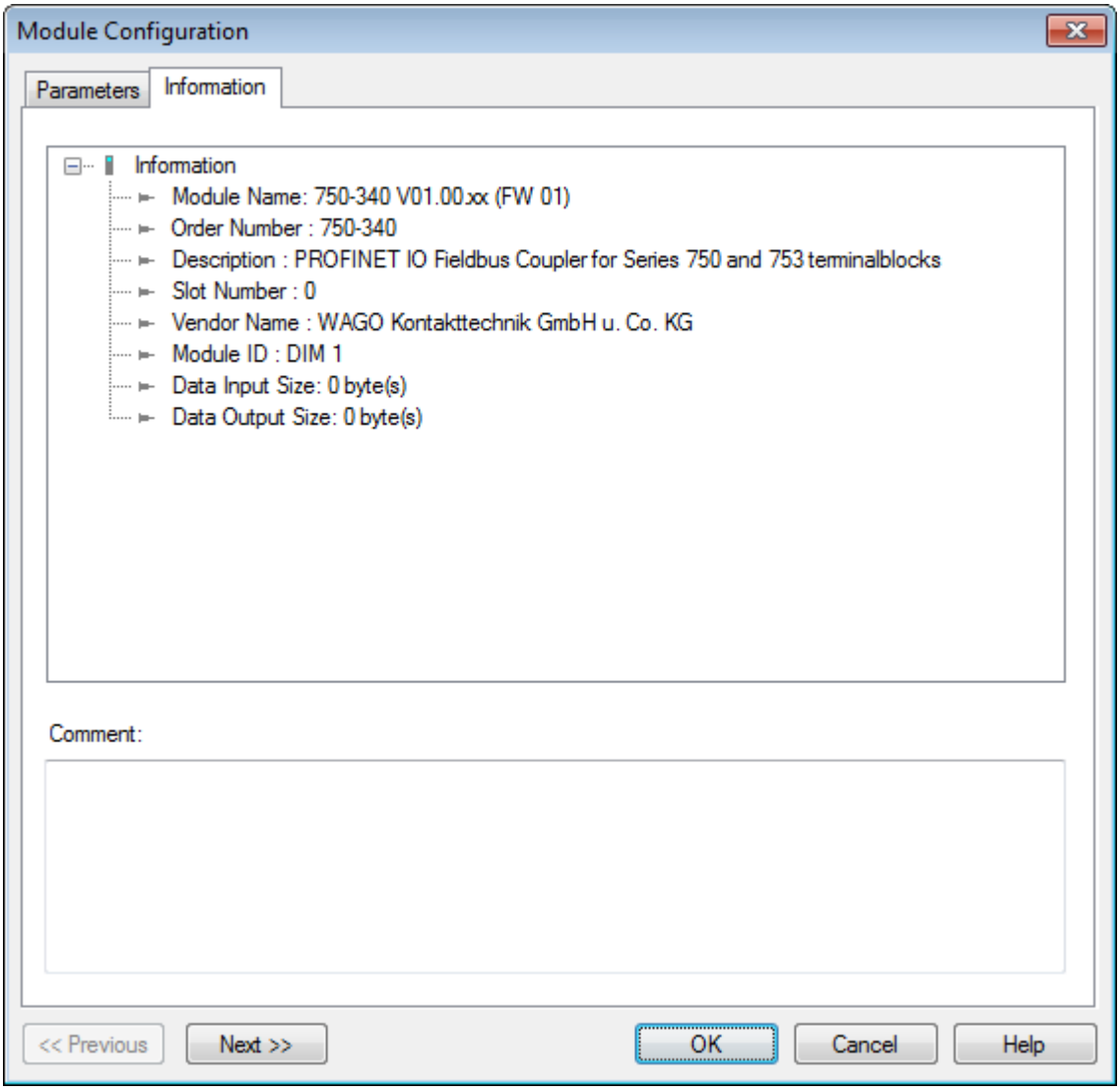
7.9.2 'Module Information' Tab

Show information on the selected module taken from the GSD file of the IO-device.



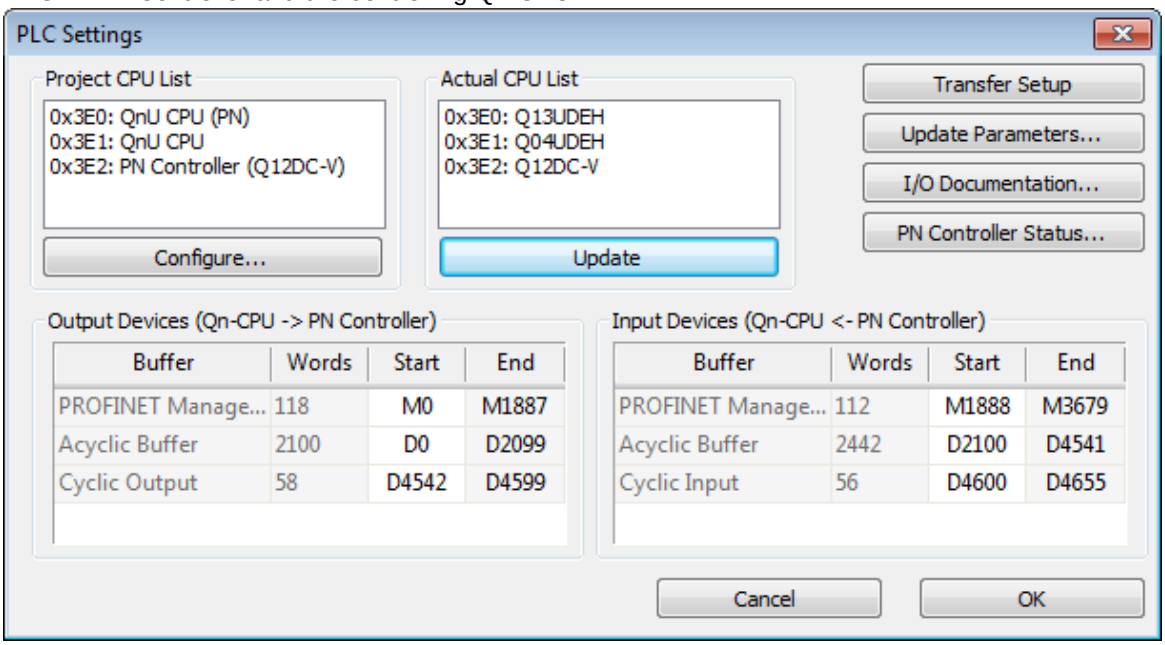
Name	Description	Choices / Range	Default
Information	Lists properties of the module	read-only	-
Comment	User comment for the module		-
Previous	Go to the previous module of the device	disabled for the first module	-
Next	Go to the next module of the device	disabled for the last module	-
OK	Close dialog and save changes	-	Default button

Name	Description	Choices / Range	Default
Cancel	Close dialog and discard changes	-	-
Help	Open online help	-	-

Note: the values contained in this tab come from analyzing the GSD for the IO-Device. Depending on the version of the GSD and IO-Device, the values will differ. They are displayed for information only.

7.10 'PLC Settings' Dialog

The 'PLC Settings' dialog provides the user interface for configuring the data exchange between the PROFINET Controller and the controlling Qn-CPU.



Name	Description	Choices / Range	Default
Project CPU List	lists the CPU types from the current configuration	-	-
Configure	opens the 'Multiple CPU Settings' dialog to configure in a multiple CPU configuration other high speed transmission enabled CPUs like motion or CNC controller	-	-
Actual CPU List	lists the CPUs found in the connected PLC	-	-
Update	refreshes the list of actual CPU types after reading it online from the CPU	-	-
Output Devices	lists the output buffers (QCPU ->	for input in	-

Name	Description	Choices / Range	Default
	PROFINET Controller); only the device addresses in the 'Start' column are editable, other columns are readonly	the 'Start' column see 'Supported PLC Device Types' below	
Input Devices	lists the input buffers (QCPU <- PROFINET Controller); only the device addresses in the 'Start' column are editable, other columns are readonly		-
Transfer Setup	opens the transfer setup editor for the configuration of the connection to the Q-series PLC	-	-
Update Parameters	opens the 'Update Parameters' dialog and executes the listed updates	-	-
IO Documentation	generates an HTML document with global variables and buffer devices	-	-
PN Controller Status	opens the 'PROFINET Controller Status' dialog, which shows the status of the PN controller and permits to start/stop the PROFINET communication	-	-
OK	close dialog and save changes	-	Default button
Cancel	close dialog and discard changes	-	-

Supported PLC Device Types

The following table lists the supported device types and their respective address ranges.

Device Type	Address Range
X	0x0 – 0x1FFF
Y	0x0 – 0x1FFF
L	0 – 32767
M	0 – 61439
D	0 – 4891647
R	0 – 32767
B	0x0 – 0xEFFF
W	0x0 – 0x4A1FFF
ZR	0 – 4849663

The CPU devices L, R and ZR are not available for Q-series motion CPUs.

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Default Device Addresses

For a new project GX Configurator-PN assigns default device addresses to the refresh buffers according to the following schema

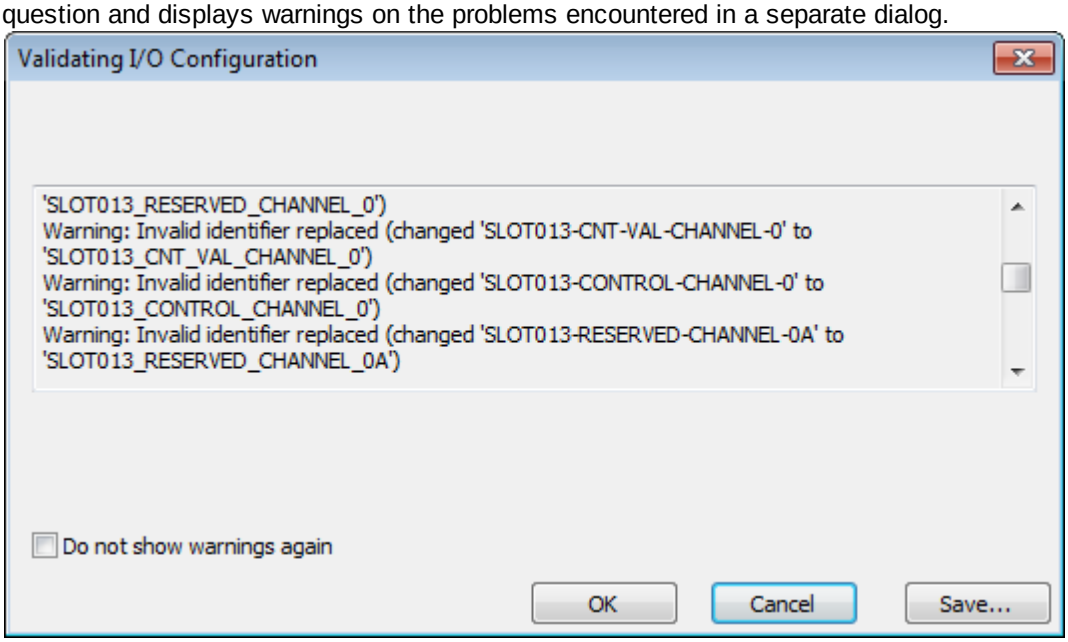
Buffer	Default Device Address
PROFINET Management (Outputs)	Y100
PROFINET Management (Inputs)	X100
Acyclic Buffer (Outputs)	D0
Acyclic Buffer (Inputs)	D2100
Cyclic Output	D4542
Cyclic Input	D4542 + <cyclic output size>

The default device address of the cyclic input area is the first D-device behind the area occupied by the cyclic outputs. It depends therefore on the cyclic output size of the network configuration.
Note: the default device address is only assigned in a new project and is not adjusted, when the cyclic output size changes due to changes in the network configuration.

Validation of IO Identifiers

Both functions 'IO Documentation' and 'Export PLC Code' validate the identifiers used in the IO configuration. These identifiers include the names of DUT elements listed in the 'Items' tables as well as the global variable names of the instances of these DUTs. The identifiers must conform to specification IEC 61131. Some of the restrictions checked are:
- global variable names must be unique within the PLC project
- identifiers must not exceed 32 characters in length
- identifiers must not contain 'hyphen' characters
- identifiers must not contain multiple consecutive underscores and must not end with one

If any of these restrictions are violated, GX Configurator-PN attempts to modify the identifiers in question and displays warnings on the problems encountered in a separate dialog.



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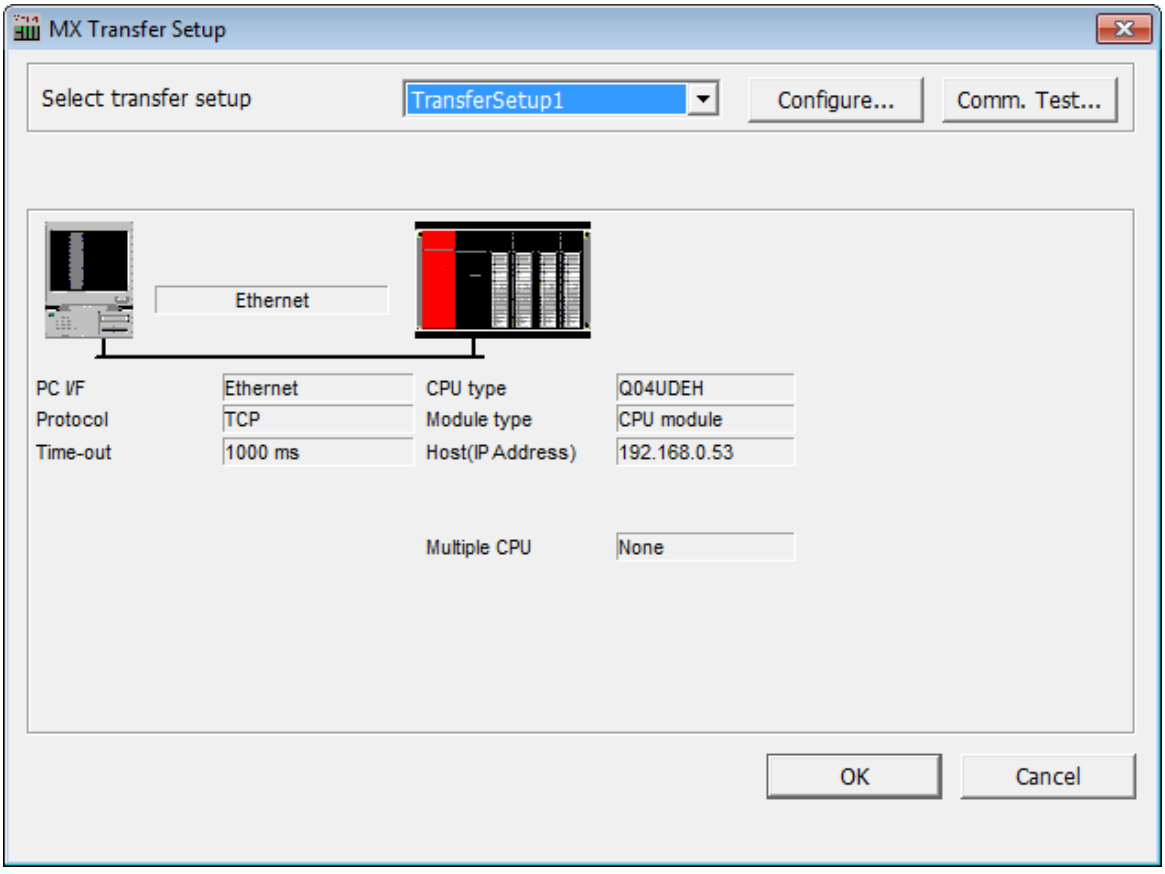
Name	Description	Choices / Range	Default
List	Messages on violations to IEC 61131 restrictions	-	-
Do not show warnings again	If checked, this dialog is no longer displayed, when warnings are encountered, but the respective function (documentation or POU export) is directly executed. **Note**: this option is de-selected, when the program is restarted.	selected / not selected	not selected
OK	Close dialog and proceed	-	Default button
Cancel	Close dialog and do not display IO documentation or export PLC code	-	-
Save	Store the displayed messages in a text file	-	-

'Transfer Setup' Dialog



The transfer setup dialog is used to specify the settings of the connection to the control CPU in the target PLC. Except for the PROFINET controller, which can only be updated via its own Ethernet interface, all CPUs can be updated via the one connection defined in the transfer setup. Internally the starting I/O number is used to access the different CPUs via the one connection defined.

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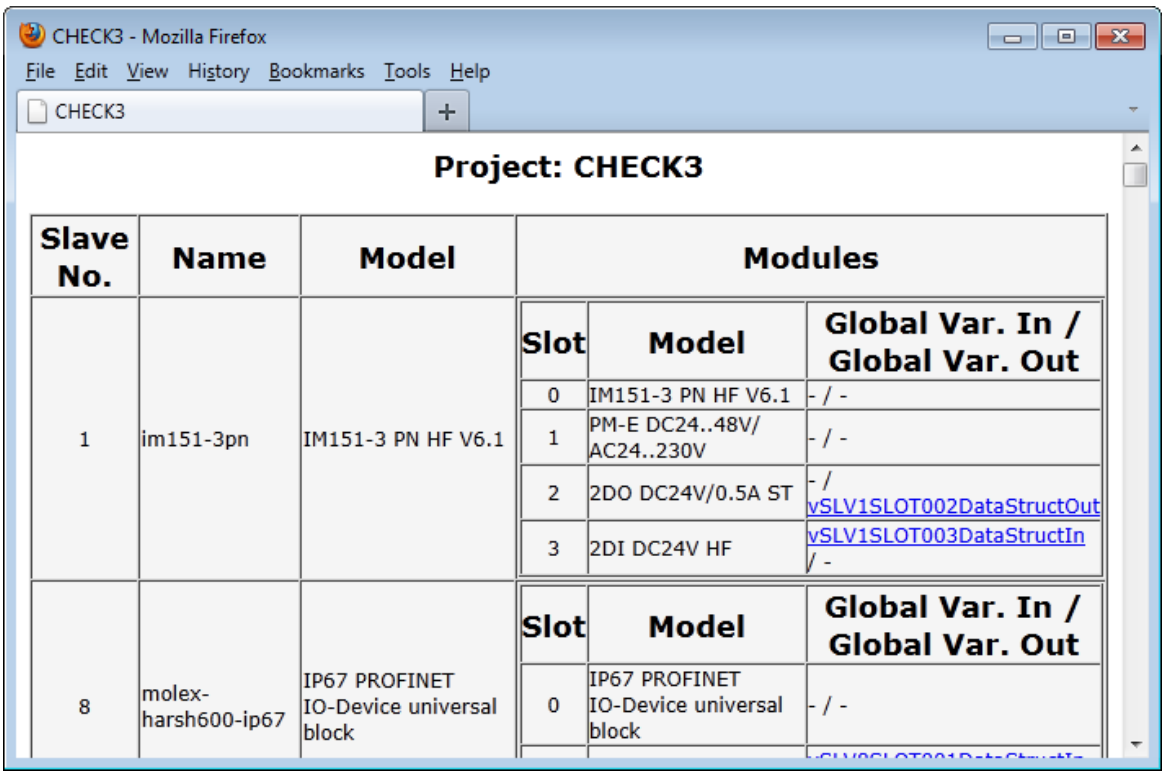
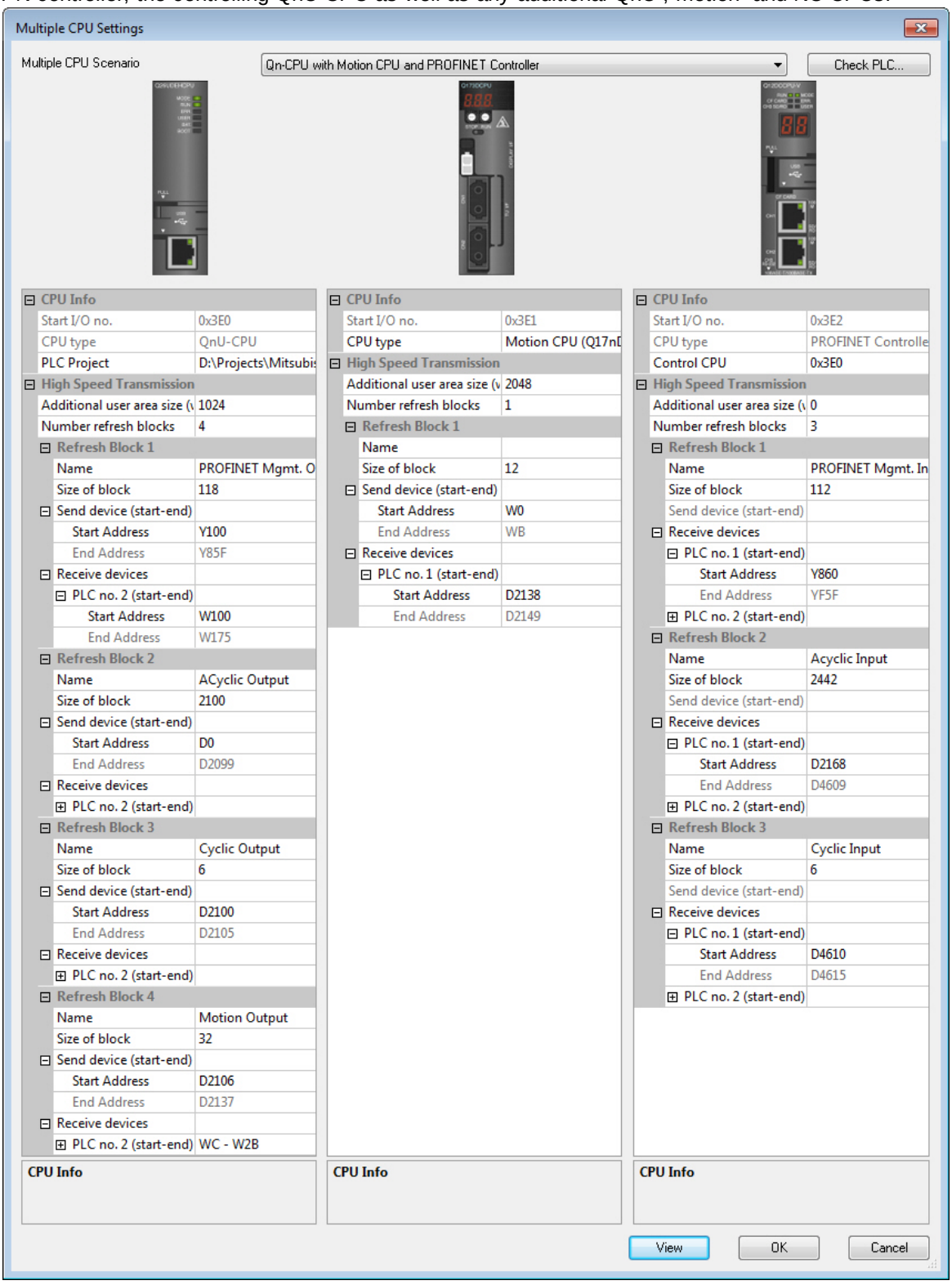
IO Documentation

An HTML document with the global variables and corresponding buffer devices is generated and displayed in the default web browser. The document can be saved or printed for documentation purposes.



7.10.1 'Multiple CPU Settings' Dialog

This dialog enables the user to configure the high speed memory on up to three CPUs including the PN controller, the controlling QnU-CPU as well as any additional QnU-, motion- and NC-CPUs.



Name	Description	Choices / Range	Default
Multiple CPU Scenario	list of supported combinations of multiple CPUs, which are supported in combination	see 'Multiple CPU Scenarios' for possible entries	-
Check PLC	connects to the PLC and reads the list of CPUs within the rack. For details see 'Check PLC' Function.	-	
Icons	displays icons for Q-CPU, PN Controller, Motion CPU only D/DS models and CNC CPU Q17nNC	Q-CPU, PN Controller, Motion CPU (only D/DS models), CNC CPU Q173NC and empty slot	-
CPU Info	combines general settings for the respective slot	for details see 'CPU specific Property Grids' **Note**: the refresh blocks for PROFINET cannot be modified. The number and size depends on the PROFINET configuration, the buffer devices are entered in the 'PLC Settings' dialog	
High Speed Transmission	defines structure of the high speed memory		
Refresh Block <n>	each refresh block defines a memory area, which can be mapped to a device area		
<Info field>	shows a descriptive text for the selected parameter	see 'Info Texts for Parameters'	-
View	opens the documentation of the current configuration in an HTML browser window; see 'Documentation of Multiple CPU Settings' for details	-	-
OK	close dialog and save changes after checking for overlapping device addresses and restrictions for high speed memory transfer	-	Default button
Cancel	close dialog and discard changes	-	-

Some combinations of CPU models have restricted access to some properties. In general it is not possible to alter the size and the number of the refresh buffers for the PN Controller. The first three refresh blocks of the controlling CPU are read- only as well. The user may add more refresh blocks, but cannot change the refresh block size of the first three blocks, which are defined by the PROFINET configuration.

'Check PLC' Function

This function assists the user by comparing the current assignment of CPU types in the dialog with the actual situation in the connected PLC rack.
If the CPU types in the current configuration match those in the PLC, a confirmation message is displayed.

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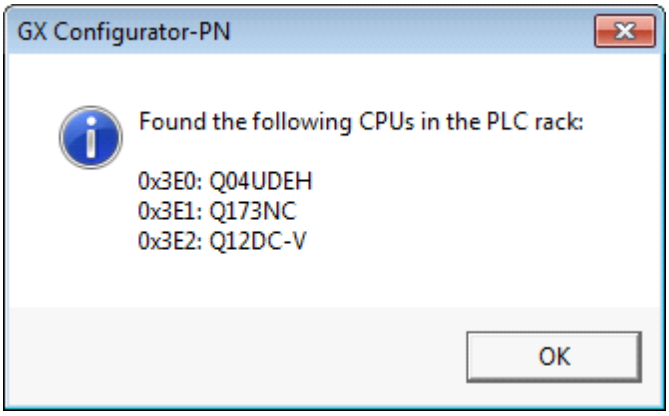
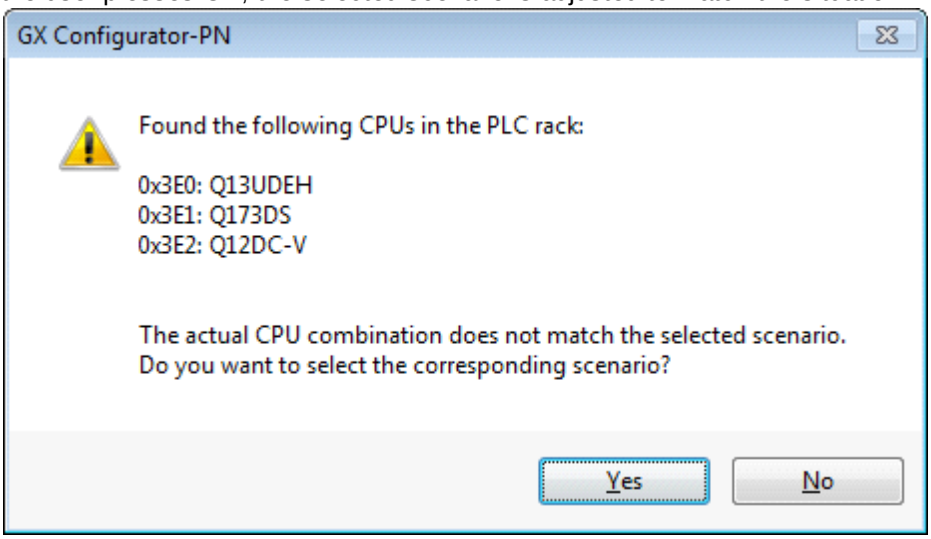


If the CPU types in the PLC differ from those selected in the configuration, a warning is displayed. If the user presses OK, the selected scenario is adjusted to match the situation in the PLC.



Multiple CPU Scenarios

A ‘scenario’ specifies a predefined combination of multiple CPUs within a PLC rack. The user can choose the appropriate scenario for his requirements and does not have to take care of the order, in which the CPUs must be placed. The following scenarios are available:

Scenario	CPU List
Qn-CPU with PROFINET Controller	Slot 1: QnU-CPU Slot 2: PN Controller Slot 3: empty
Qn-CPU with empty slot and PROFINET Controller	Slot 1: QnU-CPU Slot 2: empty Slot 3: PN Controller
Qn-CPU with Motion CPU and PROFINET Controller	Slot 1: QnU-CPU Slot 2: Motion CPU (Q17nD/DS) Slot 3: PN Controller
Qn-CPU with NC CPU and PROFINET Controller	Slot 1: QnU-CPU

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Scenario	CPU List
	Slot 2: NC CPU (Q17nNC) Slot 3: PN Controller
Two Qn-CPUs and PROFINET Controller	Slot 1: QnU-CPU Slot 2: QnU-CPU Slot 3: PN Controller

The configuration of the refresh buffers for both the PN Controller and its controlling host CPU is always copied to the new position of either CPU on the rack.

CPU Specific Property Grids

The contents of the property grids below the CPU icons in 'Multiple CPU Settings' Dialog depends on the type of the selected CPU.
For a PROFINET Controller:

⊟ CPU Info	
Start I/O no.	0x3E2
CPU type	PROFINET Controller
Control CPU	0x3E0
⊟ High Speed Transmission	
Additional user area size	0
Number refresh blocks	3
⊟ Refresh Block 1	
Name	PROFINET Mgmt. Input
Size of block	112
Send device (start-end)	
⊟ Receive devices	
⊟ PLC no. 1 (start-end)	
Start Address	X0
End Address	X6FF
⊞ PLC no. 2 (start-end)	
⊟ Refresh Block 2	
Name	ACyclic Input
Size of block	2442
Send device (start-end)	
⊟ Receive devices	
⊞ PLC no. 1 (start-end)	D2100 - D4541
⊞ PLC no. 2 (start-end)	
⊟ Refresh Block 3	
Name	Cyclic Input
Size of block	4
Send device (start-end)	
⊟ Receive devices	
⊞ PLC no. 1 (start-end)	D4550 - D4553
⊞ PLC no. 2 (start-end)	

For the controlling QnU-CPU:

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⊟ CPU Info	
Start I/O no.	0x3E0
CPU type	QnU-CPU
PLC Project	P:\Mitsubishi\Doc\PROFINE
⊟ High Speed Transmission	
Additional user area size	0
Number refresh blocks	3
⊟ Refresh Block 1	
Name	PROFINET Mgmt. Output
Size of block	118
⊟ Send device (start-end)	
Start Address	Y0
End Address	Y75F
⊟ Receive devices	
⊟ PLC no. 2 (start-end)	
Start Address	W100
End Address	W175
⊟ Refresh Block 2	
Name	ACyclic Output
Size of block	2100
⊞ Send device (start-end)	D0 - D2099
⊟ Receive devices	
⊞ PLC no. 2 (start-end)	
⊟ Refresh Block 3	
Name	Cyclic Output
Size of block	8
⊞ Send device (start-end)	D4542 - D4549
⊟ Receive devices	
⊞ PLC no. 2 (start-end)	

For NC-CPUs:

⊟ CPU Info	
Start I/O no.	0x3E1
CPU type	NC CPU (Q17nNC)
Control CPU	0x3E0
CNC File Path	d:\tmp\NC project\nc.prm
⊟ High Speed Transmission	
Additional user area size	3072
Number refresh blocks	0

Name	Description	Choices / Range	Default
Start I/O No.	fixed value shows the starting I/O number according to the slot position	read-only 0x3E0, 0x3E1, 0x3E2 and 0x3E3	-

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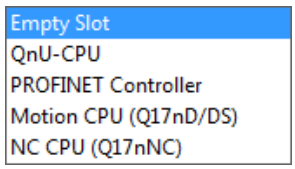
Name	Description	Choices / Range	Default
CPU Type	type of CPU in the slot	 available types depend on the scenario; the item is read-only for the controlling QnU-CPU and the PN controller	empty slot
Control CPU	the starting I/O number of the corresponding control CPU, i.e. the CPU, with which data is exchanged Only the starting I/O numbers of mounted QnU-CPUs are allowed	starting I/O numbers of QnU CPUs only	0x3E0
Additional user area size	minimum size of the user area required by the application in words; the actual size is usually greater and depends on the additional refresh blocks	0 - 14384 words	3072 for NC-CPUs, 1024 for motion-CPUs, 0 for PN controllers
Number refresh blocks	number of refresh blocks If the CPU is the control CPU of a PN controller, the first three refresh blocks are reserved for data exchange with the PN controller. For a PN controller this value is fixed to 3.	0 - 32	3 for PN controller and corresponding control CPU, 0 for other CPUs
Name	user label for the refresh block Note: this is not part of the CPU configuration, but for documentation purposes	printable characters	Default names for PROFINET, otherwise empty
Size of block	size of the respective refresh block in words **Note**: only even word sizes are allowed	0 - 14384 words	specific sizes for PROFINET, otherwise 0
Send device	the device on the CPU, which contains the data that is automatically copied to the shared memory block The sub items show the start	only for QnU- and QMotion-CPUs for device types and ranges see 'Supported Device Ranges'	none

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Name	Description	Choices / Range	Default
	and end address. For details see 'Device Address Property'.		
Start Address	start address of CPU device area	for device types and ranges see 'Supported Device Ranges'.	blank
End Address	calculated end address of the device area	read-only	blank
Receive devices	group item of CPU devices which contain the data read from the refresh block on the specified CPU For details see 'Device Address Property'.	only for QnU- and QMotion-CPUs as receiving CPUs read-only for device types and ranges see 'Supported Device Ranges'.	blank
PLC No.	the CPU number this CPU device belongs to.	read-only	blank
Start Address	start address of CPU device area CPU device addresses are checked for valid CPU device type and range	for device types and ranges see 'Supported Device Ranges'.	blank
End Address	calculated end address of the device area	read-only	blank
PLC Project	for QnU-CPUs: path of GD/GID/GXW2 project file, which contains the programming project for the respective CPU	any valid Windows path with max. 256 characters must end either with *.gpj (GD), *.pro (GID), *.gxw(GXW2) or *.gd2 (GXW2)	none
CNC File Path	the ASCII parameter file, which can be handled by the 'Remote Monitor Tool'	any valid Windows path with max. 256 characters must end with *.prm (Remote Monitor)	none

Info Texts for Parameters

Property	Info Text
Start I/O No.	Starting I/O number of this CPU

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Property	Info Text
CPU Type	Type of this CPU
Control CPU	Starting I/O number of the controlling CPU
Additional user area size	Minimum size of the user area in words (0-14336 words)
Number refresh blocks	Number of memory blocks for automatic refresh (0-32)
Name	Name of the refresh block
Size of block	Size of the refresh block in words (must be even!)
Send device	Device, which contains the data to be copied to the refresh block
Receive device	Device, where the respective CPU receives data from the refresh block
PLC No.	Device on CPU <n>, where the data from this refresh block is copied to
PLC Project	Path of project with PLC program and parameters
CNC File Path	Path of the CNC parameter file

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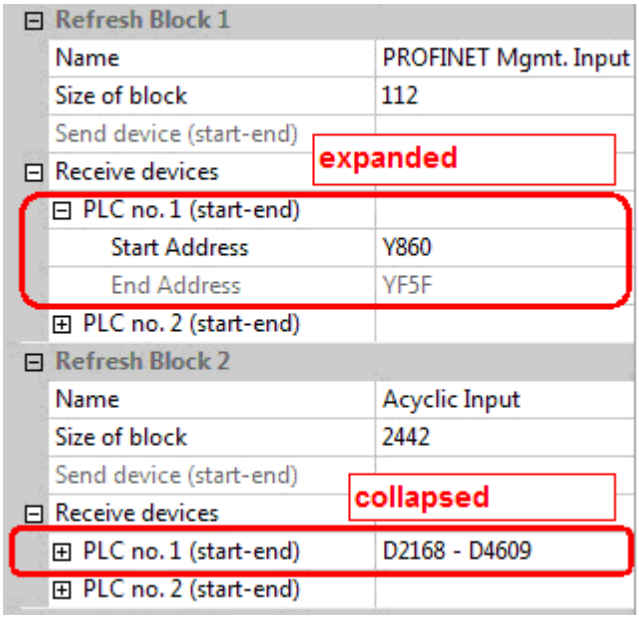
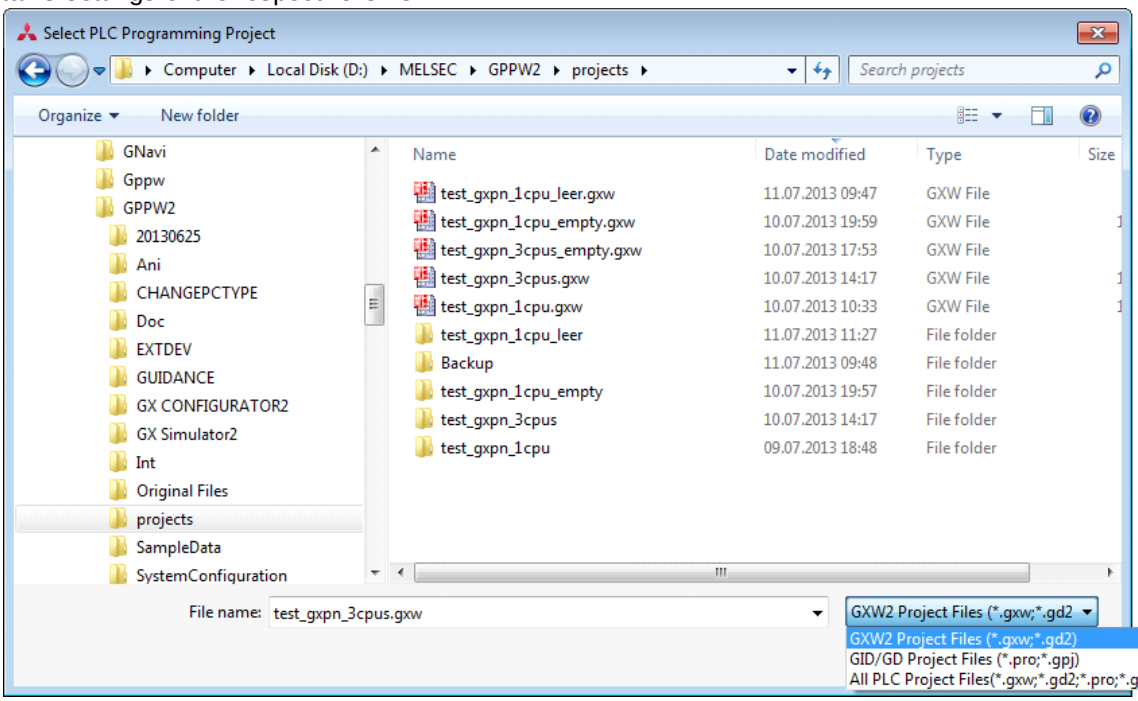
Device Address Property

The properties ‘Send device’ and ‘Receive devices’ are expandable. In the ‘collapsed’ state start and end address are shown in the value field. In the ‘expanded’ state the original value field is empty and start and end address are displayed as two separate properties.



Select PLC Project for QnU-CPUs

Select a GD (gppw.gppj), GID (softctrl.pro) or GXW2 (*.gxw or Project.gd2) project file, which contains settings of the respective CPU.



Note: GXW2 supports two different project file formats. The older ‘Workspace Format Project’ and the newer ‘Single File Format Project’. The file ‘Project.gd2’ is supported only in the ‘Workspace Format Project’ and is a dummy file to identify this type of project format.

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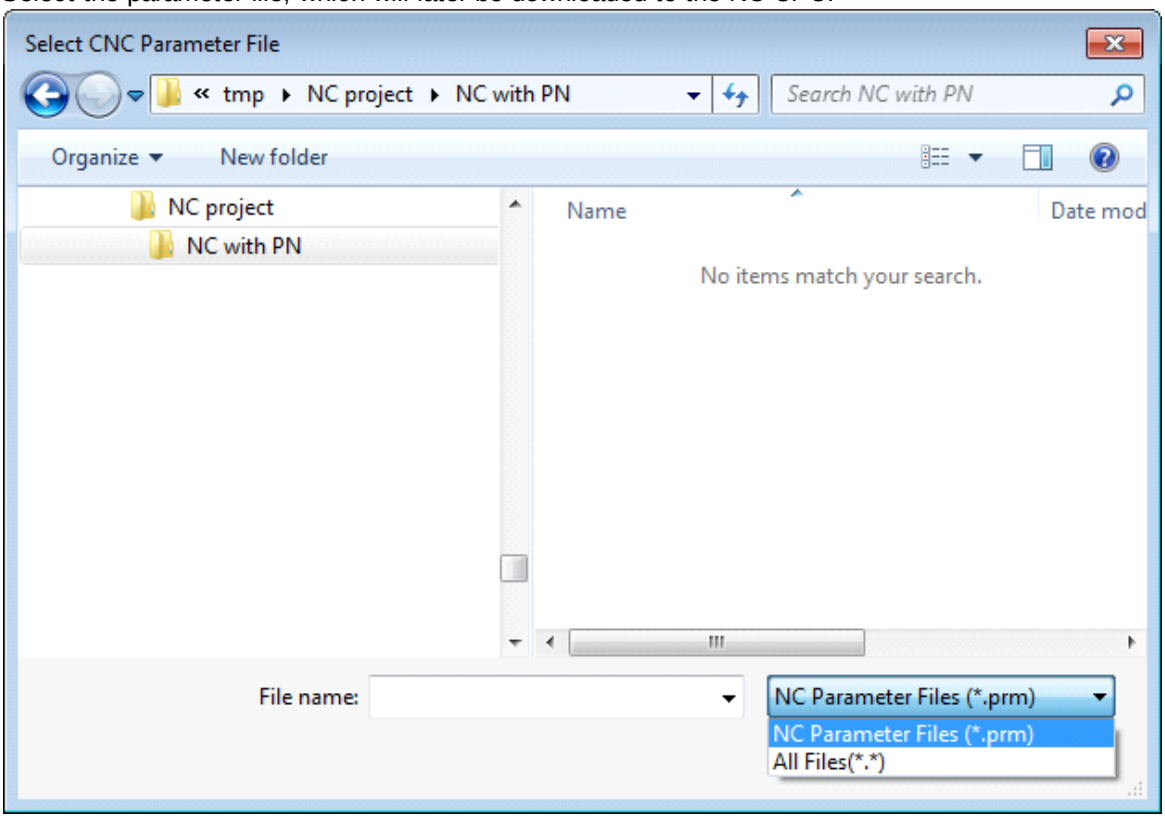
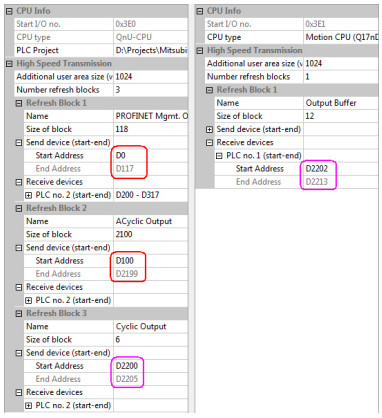
Select NC Parameter File

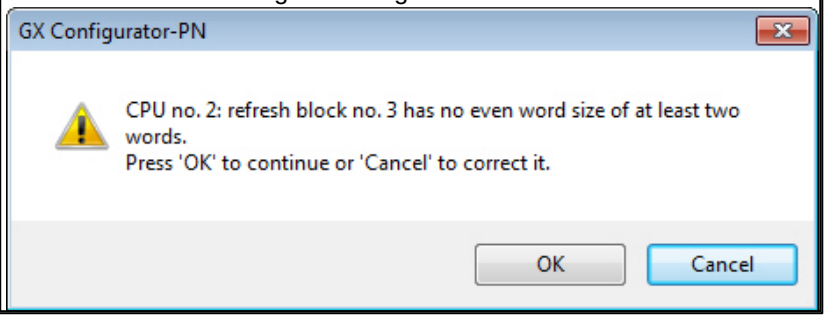
Select the parameter file, which will later be downloaded to the NC-CPU.



Data checks on OK button action

The following context-based verifications are performed, when the dialog is closed by pressing OK.

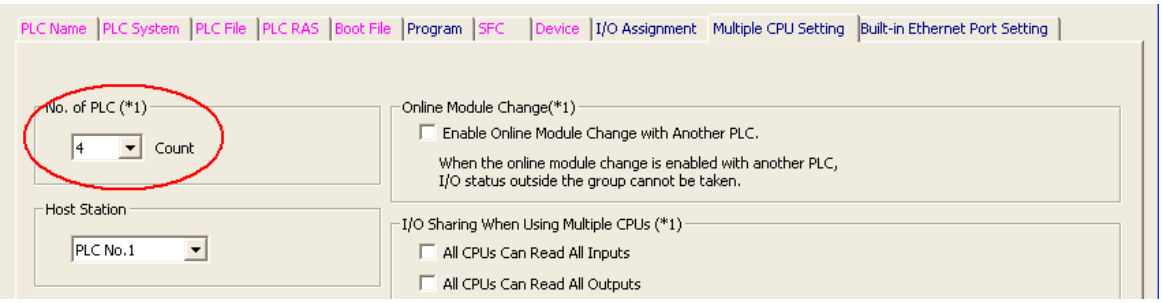
Data	Check
Total high speed transmission area.	Checks the size against the upper limit of the high speed transmission area. This area consists of the user, the refresh and the system area. The total amount must not exceed 16k words. By default for each CPU 1k words are reserved as system area.
Overlapping CPU device addresses	Each CPU configured is checked against overlapping of CPU device addresses for both send and receive devices. If overlapping device addresses are found, they are automatically corrected.  In the sample shown on the left two CPU device ranges overlap and will be corrected automatically. The send CPU device ranges marked in red and the receive and send CPU device ranges marked in magenta overlap.

Data	Check
CPU position	The CPU position is checked for QnU-CPUs and PN controller. QnU-CPUs must be on the left of every other CPU type including PN controller, QMotion and Q17nNC CPUs. The PN controller must always be the last CPU on the rack. Only one PN controller is supported.
Even word size of refresh block	The size of each refresh block must be an even number of words. The following message is displayed and allows to return and correct the size or to continue closing the dialog: 

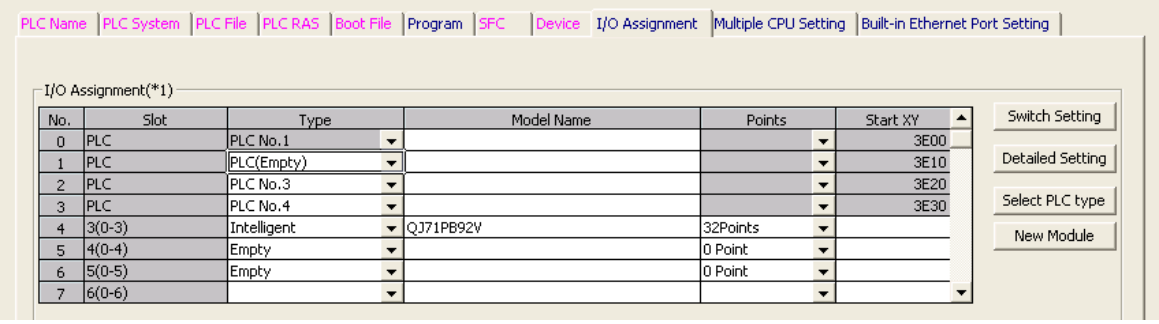
Sequence when configuring Multiple PLC Settings

The 'Multiple CPU Settings' dialog allows the configuration of high speed transmission settings on the CPUs in the PLC rack. However the PLC I/O assignment, which includes the number and slots of CPUs, must be set in the first QnU-CPU using GX Works2 (GXW2), GX Developer (GD) or GX IEC Developer (GID). The following screenshots demonstrate, how the I/O assignment is set with GXW2.

In the 'Q Parameter Setting' dialog the number of slots reserved for CPUs is entered in the tab 'Multiple CPU Setting'.



After this the tab 'I/O Assignment' can be used to set empty slots and assign the controlling CPU for additional intelligent modules.



The I/O assignment must be consistent between the CPUs in the same PLC rack. GX Configurator-PN attempts to set a consistent I/O assignment with the following steps:

1. if the first QnU-CPU has a PLC project path assigned and the PLC project contains an I/O assignment with at least the same number of CPUs as in the GXPN configuration

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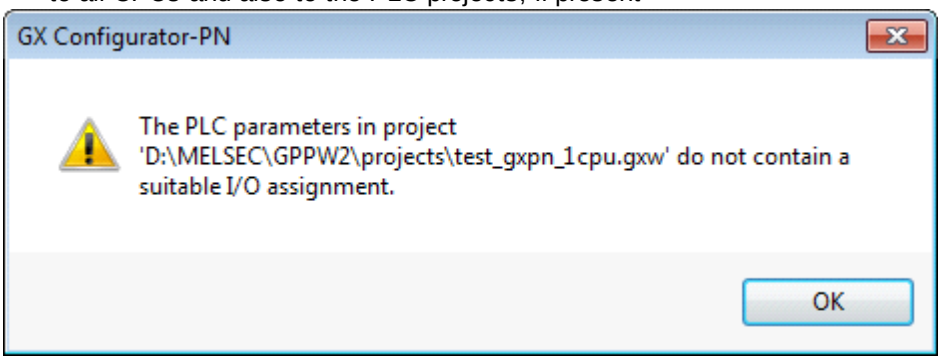
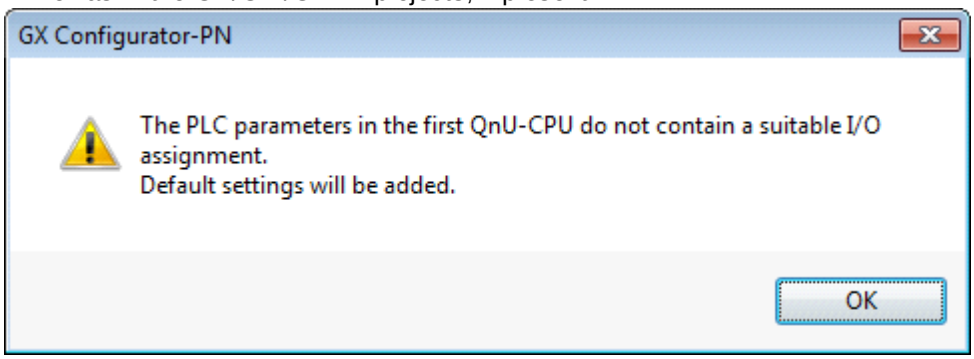
-> I/O assignment from the GD/GID/GXW2 project is copied to all CPUs including the first QnU-CPU itself

2. if the first QnU-CPU has no PLC project path assigned or the PLC project contains no suitable I/O assignment, but a suitable I/O assignment can be read online from the first CPU
   -> the following message is displayed and the I/O assignment is copied from the first QnU-CPU to all CPUs and also to the PLC projects, if present



3. if there is neither a suitable I/O assignment in the PLC project nor in the CPU itself
   -> the following message is displayed and a default I/O assignment is inserted in all CPUs as well as in the GD/GID/GXW2 projects, if present



Note: After changing the position of CPUs in the PLC rack it may be necessary to once set the I/O assignment on the motion CPU with MT Developer2.

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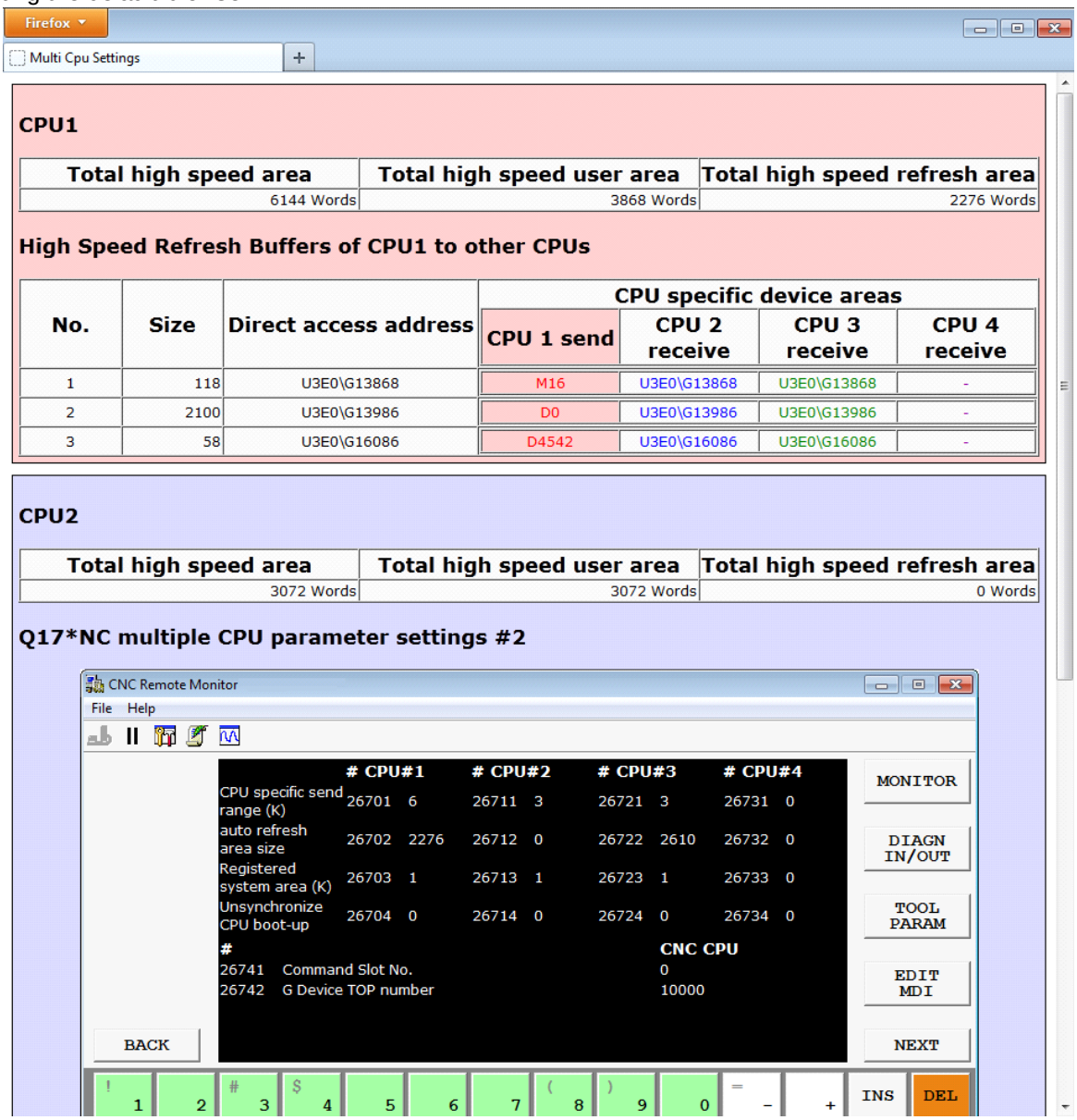
7.10.1.1 Documentation of Multiple CPU Settings

The multi-CPU settings are output to an HTML document, which is displayed by automatically starting the default browser.



Name	Description
Total high speed area	Total high speed transmission size in words with k words alignment
Total high speed user area	Total high speed transmission user area size in words
Total high speed refresh area	Total high speed transmission refresh area size in words
No.	Refresh block number starting at 1
Size	Size of refresh block in words

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Name	Description
Direct access address	Shared memory address for direct access
CPU specific device areas	Shared memory or CPU device address for each CPU and each refresh block
CPU1	Shared memory or CPU device address for CPU no. 1 and each refresh block
CPU2	Shared memory or CPU device address for CPU no. 2 and each refresh block
CPU3	Shared memory or CPU device address for CPU no. 3 and each refresh block
CPU4	Shared memory or CPU device address for CPU no. 4 and each refresh block
Q17*NC multiple CPU parameter settings	multi-CPU settings as they would be displayed in the ‘CNC Remote Monitor Tool’

For better distinction between the address and size information of different CPUs colours are used for background and font.

7.10.1.2 Configuration Samples

The following samples show possible combinations of a QnU-CPU and a PN controller with an additional CPU.

Sample 1: additional motion CPU

1. Slot: QnU-CPU
2. Slot: Motion CPU
3. Slot: PN controller

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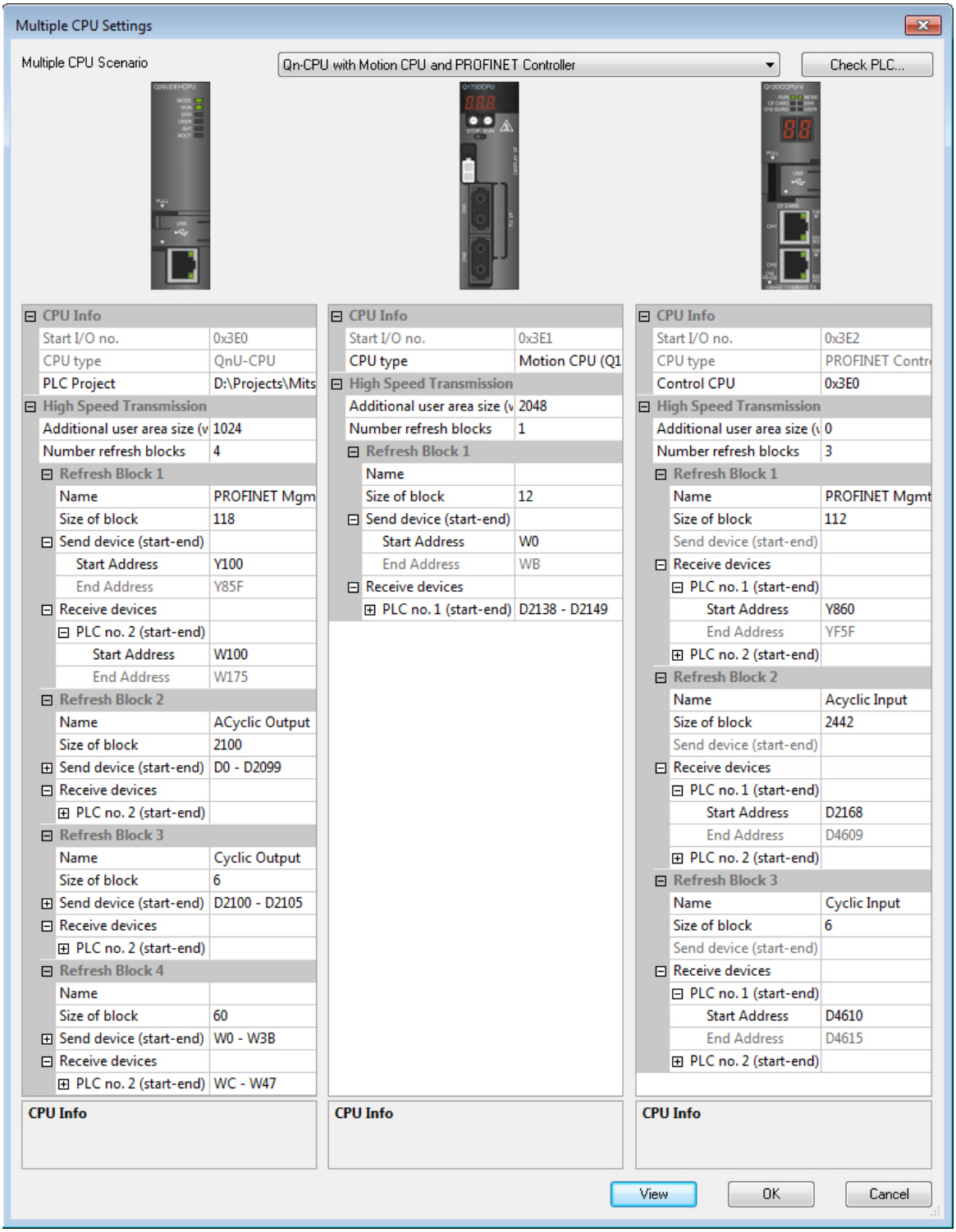

The send (outputs) and the receive (inputs) CPU devices on the controlling CPU should be configured with the 'PLC Settings' Dialog. Additional refresh blocks and the user area for both the QMotion- and the QnU-CPU must be entered in the 'Multiple CPU Settings' dialog.

Sample 2: additional NC CPU

1. Slot: QnU-CPU
2. Slot: Q17nNC-CPU
3. Slot: PN controller

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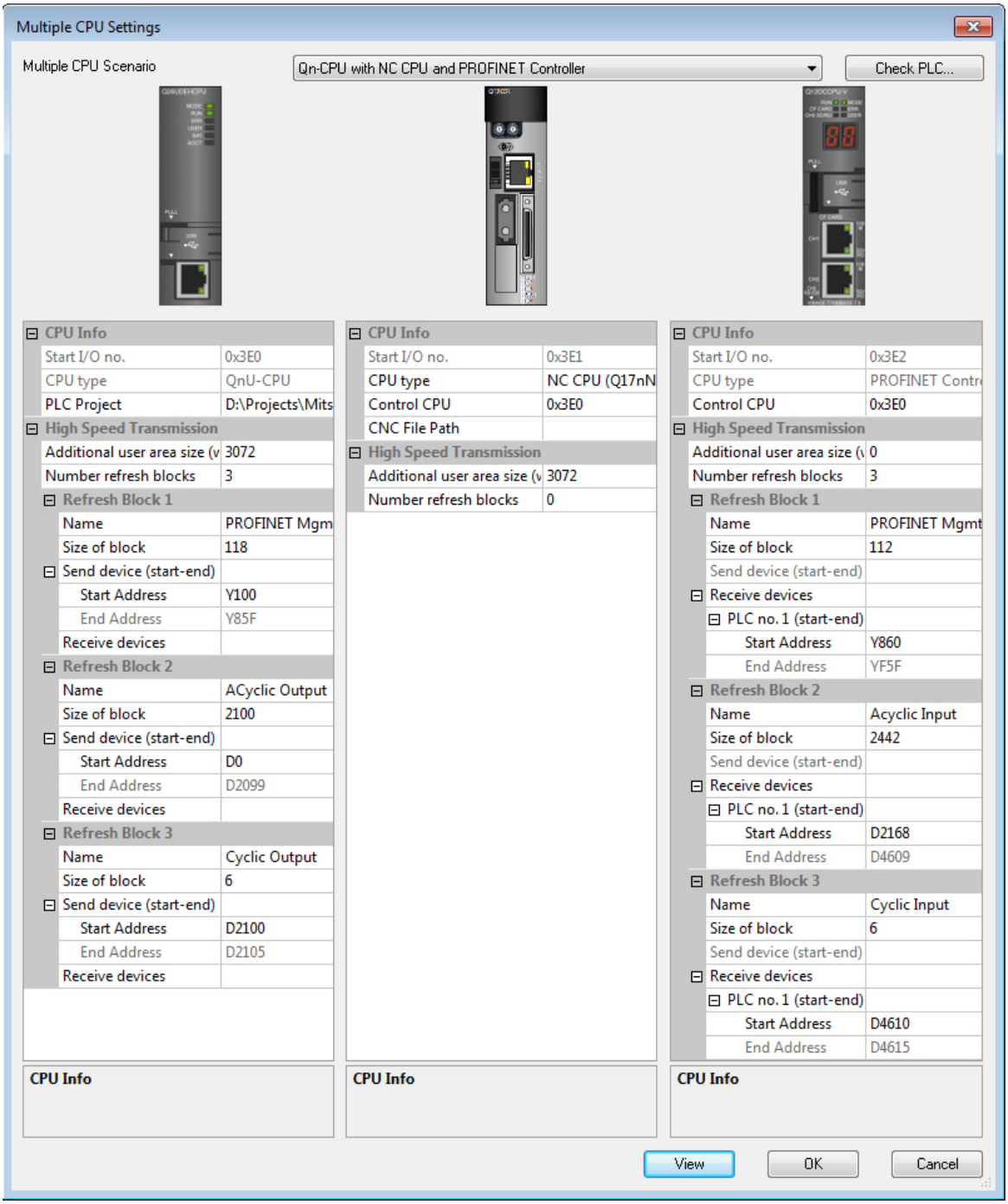

The send (output) and the receive (input) CPU devices on the controlling CPU should be configured with the 'PLC Settings' dialog. An additional user area for both the Q17nNC- and the QnU-CPU must be entered in the 'Multiple CPU Settings' dialog.

Sample 3: additional QnU-CPU

1. Slot: QnU-CPU
2. Slot: QnU-CPU
3. Slot: PN controller

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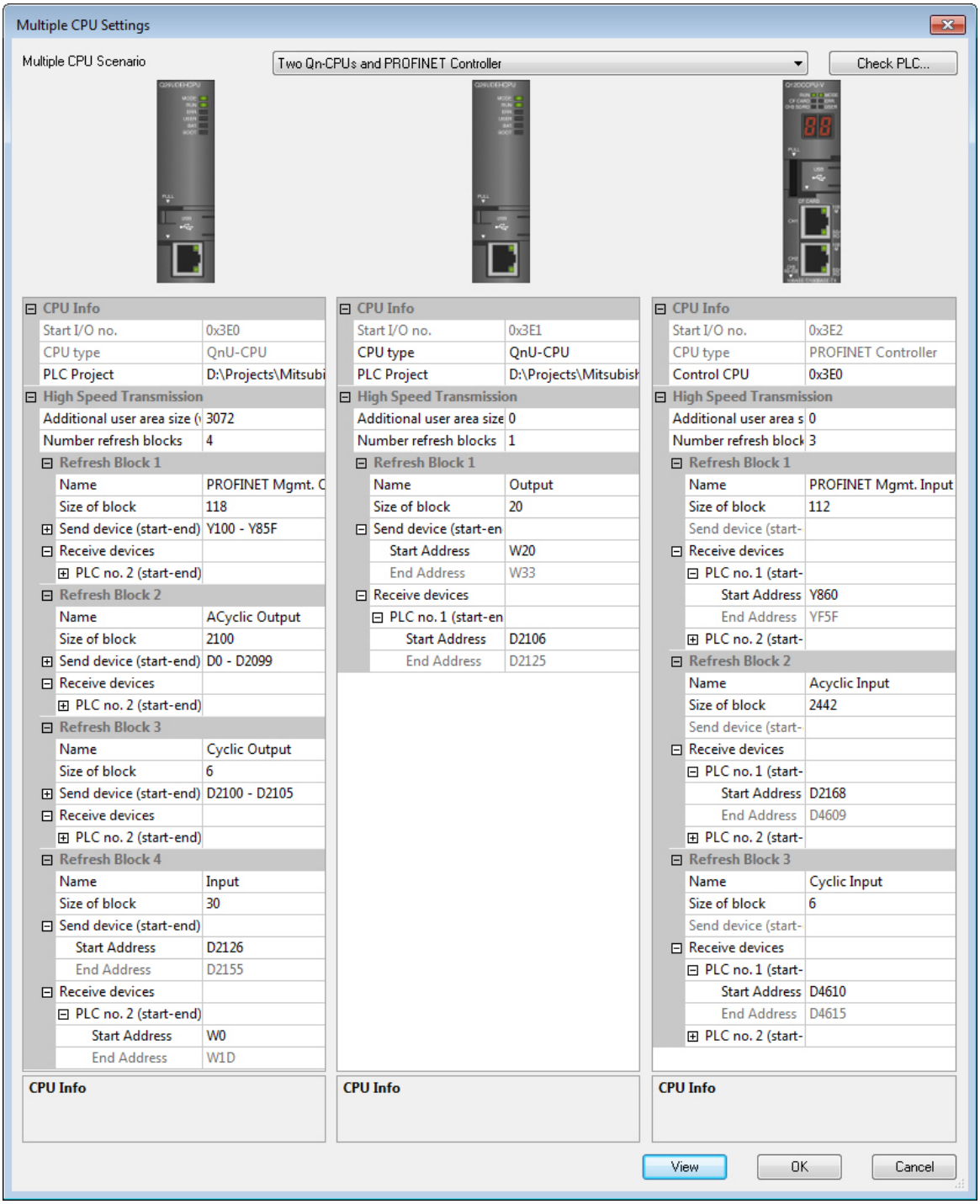


The send (output) and the receive (input) CPU devices on the controlling CPU should be configured with the 'PLC Settings' dialog. Additional refresh blocks and user areas for both the controlling and the second QnU-CPU must be entered in the 'Multiple CPU Settings' dialog.

7.10.1.3 Hints for configuring multiple CPU settings and high speed memory

In general parameters for both the PN controller and the controlling QnU-CPU cannot be altered in the 'Multiple CPU Settings' dialog. These parameters are calculated from the project settings of GX Configurator-PN. In particular this means that:

1. the size of the user area and the refresh blocks is calculated from the PROFINET network configuration. An additional user area for example to provide data for a Q17nNC CPU can be entered in the property 'Additional user area size'. This additional user area space will be added to the total

refresh area size needed for data exchange between PN controller and controlling CPU.
2. there is no input corresponding to the 'CPU Specific Send Range' in the 'Multiple CPU Setting' tab of the GXW2 'Q Parameter Setting' dialog. This value is always calculated from the value of the 'Additional user area size' and the auto refresh area size (added sizes of the configured refresh blocks).
3. the number of refresh blocks is fixed to 3 for both the PN controller and the controlling QnU CPU. Only on the controlling QnU-CPU additional auto refresh blocks can be configured for example to exchange data with a motion CPU.
4. the CPU type property of both the PN controller and the controlling CPU is read only. The position of either CPU in the rack can be changed by manually selecting a different scenario or by scanning the rack online via the 'Check PLC' button. If the actual rack position differs from the configuration in the dialog, the user can have the dialog automatically updated.

When the 'Multiple CPU Settings' dialog must be used

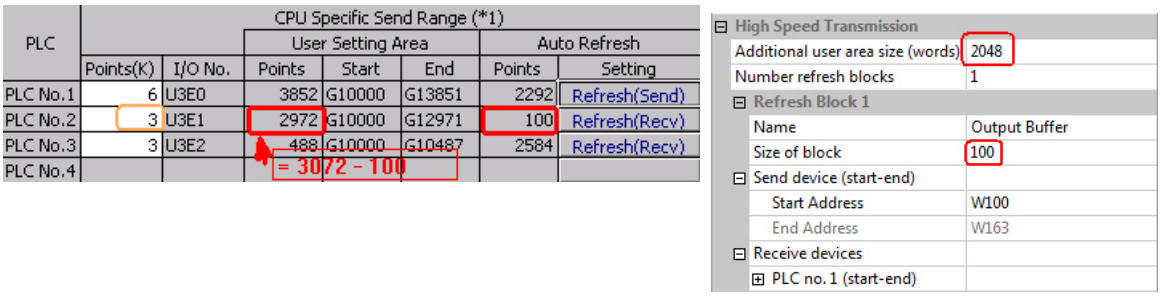
The 'Multiple CPU Settings' dialog is needed,

- if additional CPUs beside the PN controller and the controlling QnU-CPU are mounted or if empty slots between CPUs are required
- if PLC program projects and/or parameter files should be updated in order to assign the file paths

If additional CPUs such as a Q17nNC or a motion CPU are mounted, the following configuration options are supported:

1. specifying the additional user area size for Q17nNC and motion CPUs. The CPU specific send range is calculated based on this value and the auto refresh area size.
2. configuring refresh blocks for motion CPUs only. For Q17nNC CPU this property cannot be changed and is always 0.

Comparison of GXW2 'Multiple CPU Setting' tab and GXPN 'Multiple CPU Settings' dialog



In GXW2 the user starts by entering the 'CPU Specific Send Range', here e.g. 3k. In GX Configurator-PN this value is calculated by adding the 'Additional user area size' of 2048 words and the total size of all refresh blocks, here 100 words and then rounding up this sum to the next multiple of 1k words. The memory section to the next multiple of 1k words, in this example 924 words (= 3k - 2148), is technically part of the user area, which explains the difference between the 'Additional user area size' of 2048 words entered by the user and the actual user area size of 2972 words (= 2048 + 924) set in the CPU, which is displayed in GXW2 as 'User Setting Area - Points'.

Configuring Send CPU Devices

The refresh blocks differ from the user area in high speed memory in the fact, that they can be associated to device addresses in the respective CPU. The CPU, on which the refresh block is located, contains the so-called 'Send device', from which data is copied to the refresh block on the same CPU. Any of the other CPUs, which support device addresses, can read the data from the 'sending' CPU by specifying a 'Receive device'. The contents of the refresh block on the 'sending' CPU are then automatically copied to the 'receive device', where they can be processed by the receiving CPU.
Note: it is important to remember that refresh blocks are not necessarily for a one-to-one, but a one-to-many communication, i.e. the data provided by one CPU can be simultaneously read by any of

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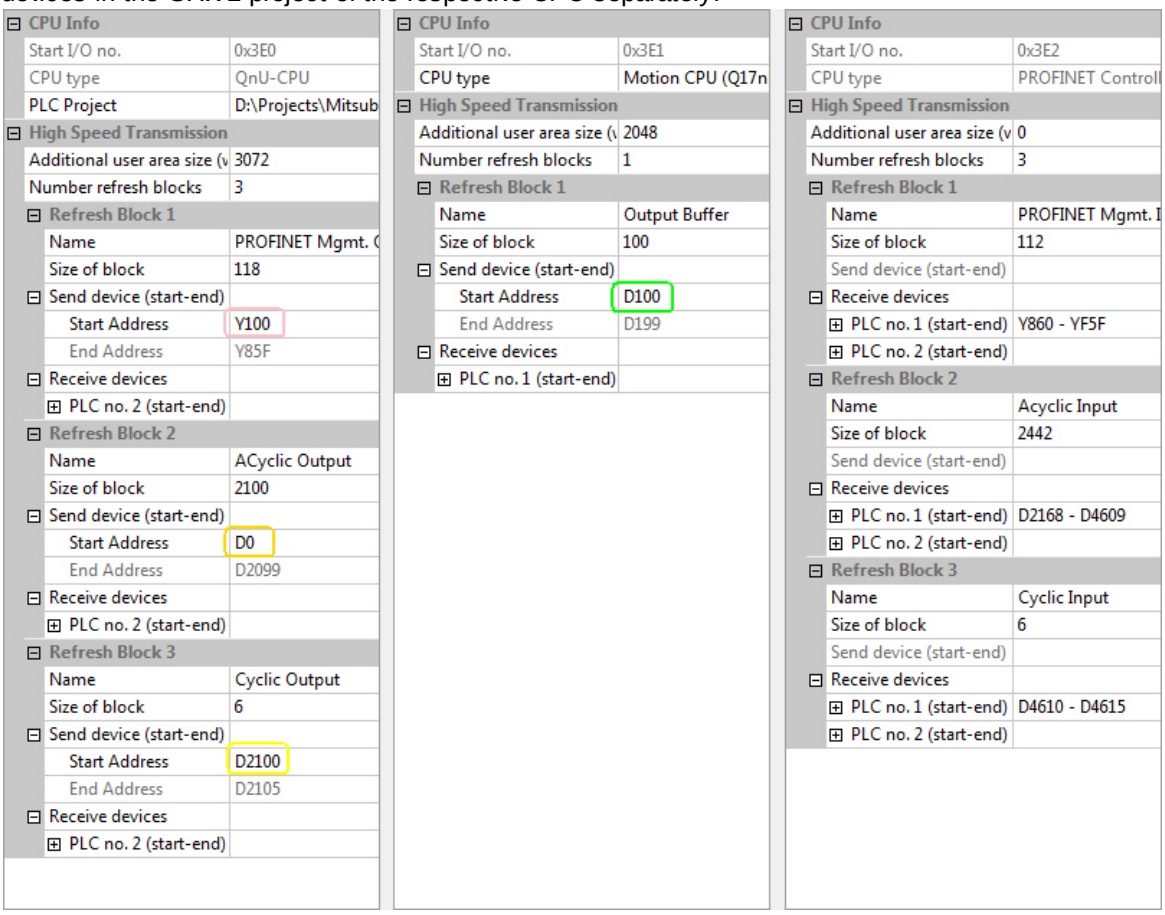
the other CPUs, provided that they support refresh blocks and device addresses.
The following screenshots show the corresponding input of send devices in GXW2 and in GXPN marked with the same color. While the 'Multiple CPU Settings' dialog provides a single user interface for setting send and receive devices on all CPUs, in GXW2 the user must enter the send and receive devices in the GXW2 project of the respective CPU separately.



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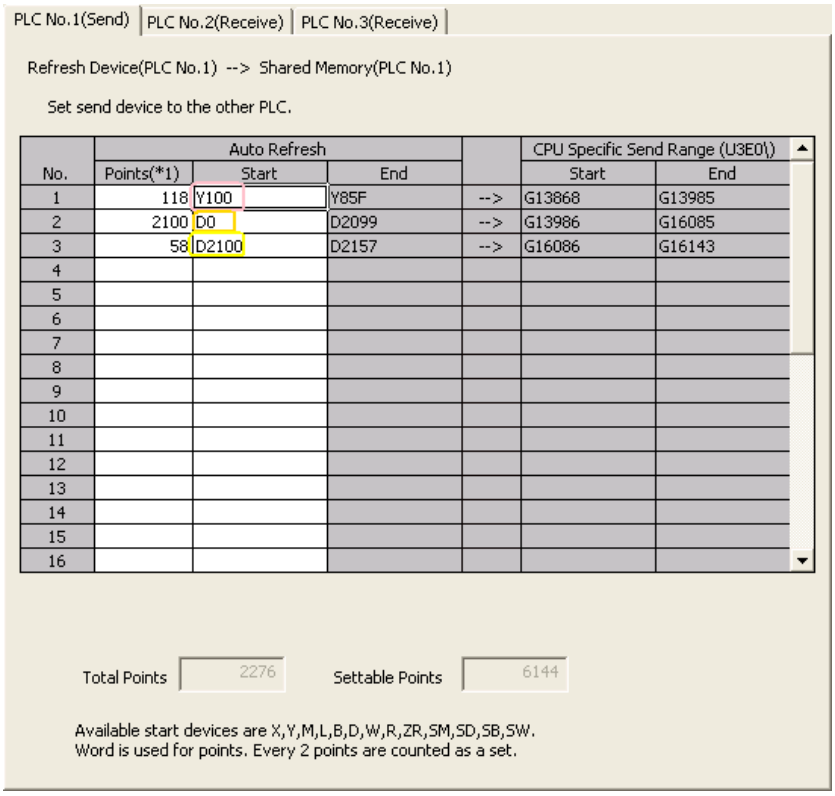
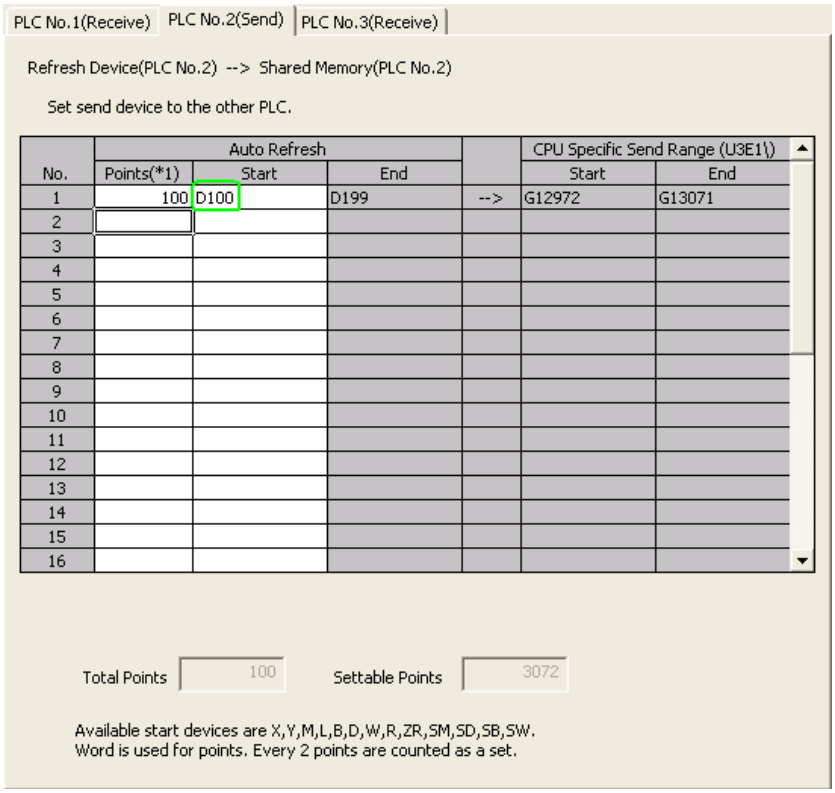
GXW2 PLC project 1



GXW2 PLC project 2



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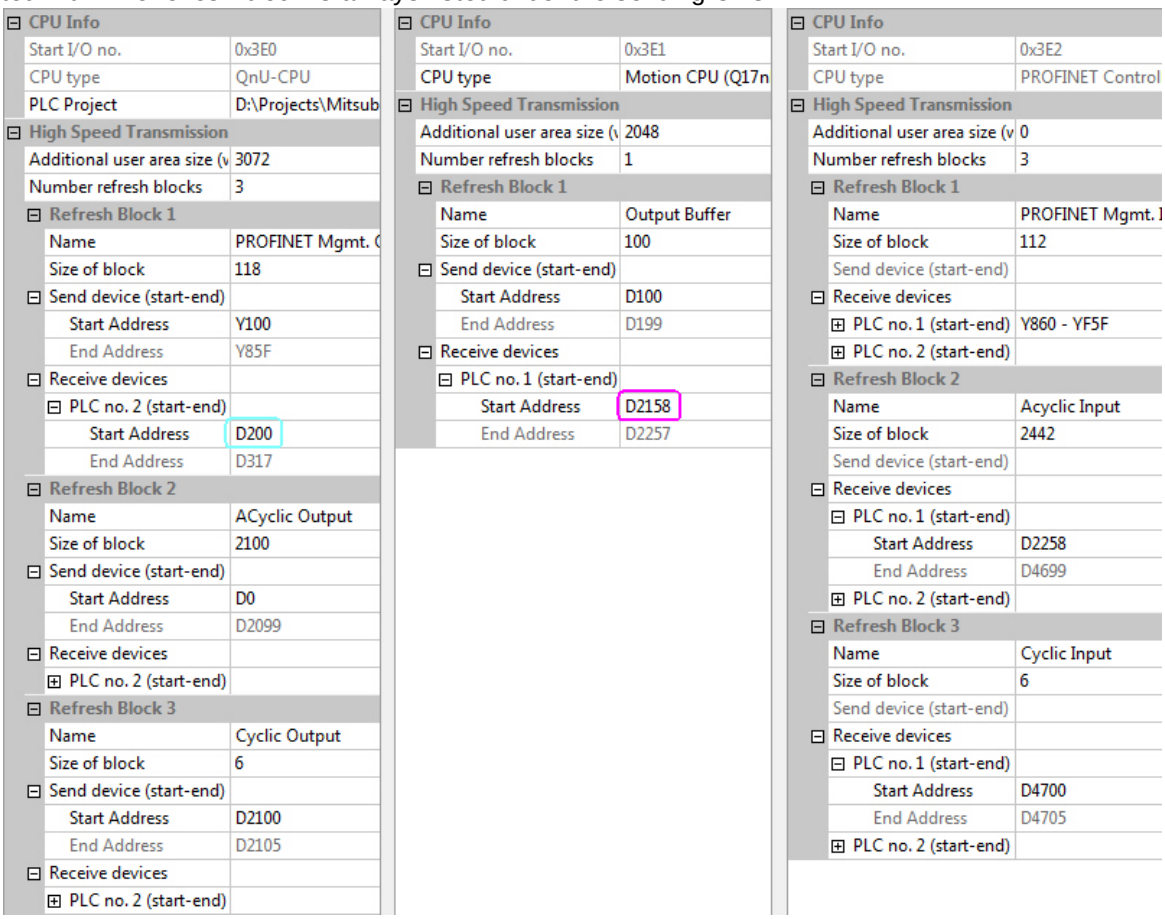
Configuring Receive CPU Devices

The configuration of receive devices is mostly equivalent to that of send devices. In the 'Multiple CPU Settings' dialog the receive devices are entered in the settings of the refresh block, they are associated with. The refresh block is always listed under the sending CPU.



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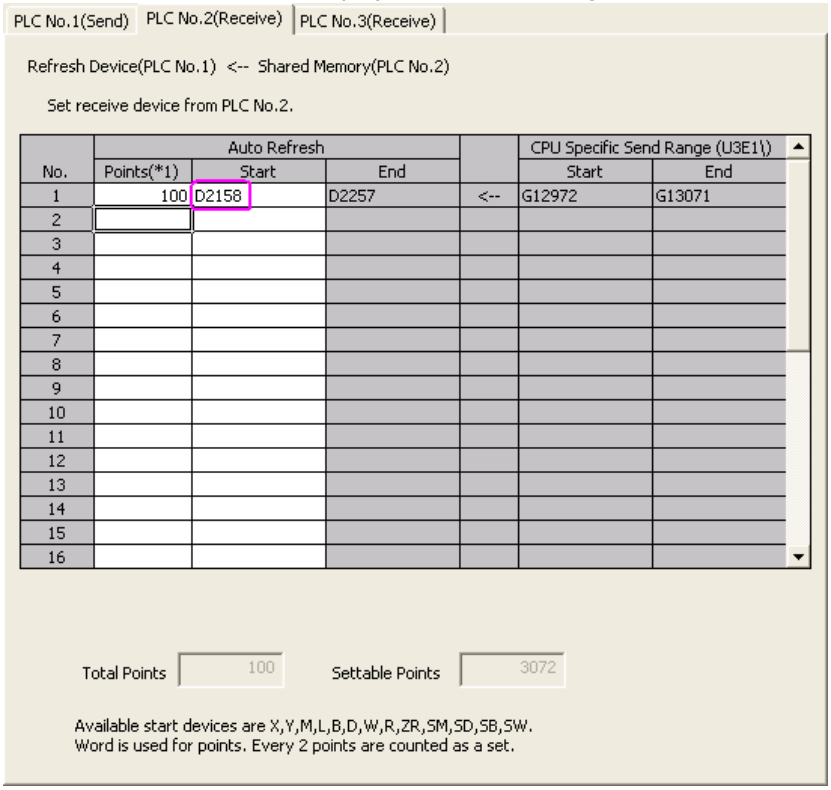
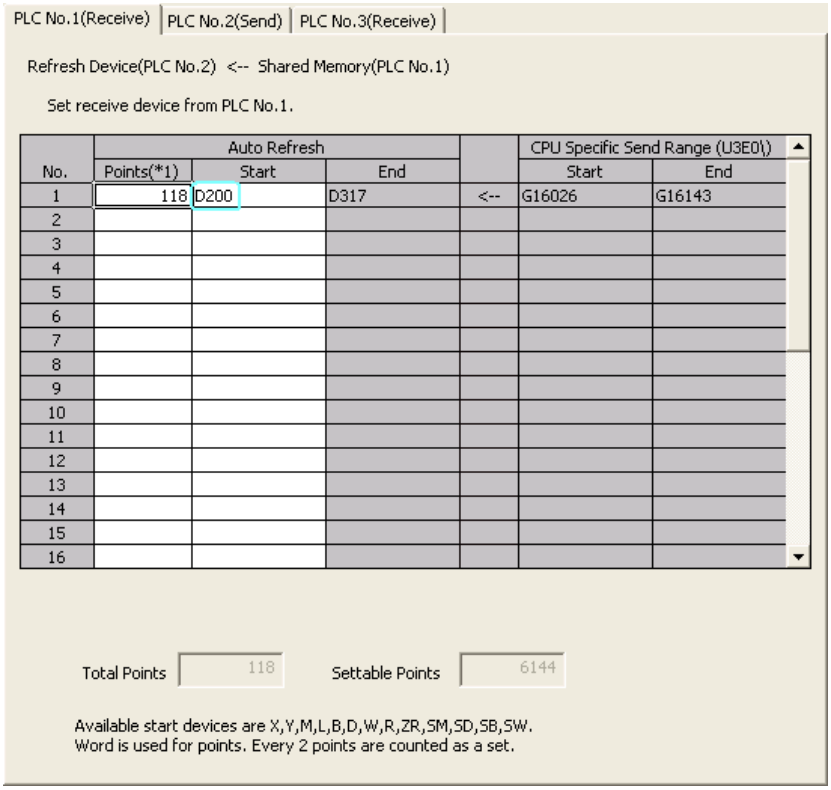
Using GXW2 the receive devices are entered in the GXW2 project of the receiving CPU.

GXW2 PLC project 1



GXW2 PLC project 2



If no CPU device is configured for an auto refresh block, the shared memory can be accessed by its memory address in U\G device address format. The U\G device addresses of the refresh blocks are displayed in the documentation view.

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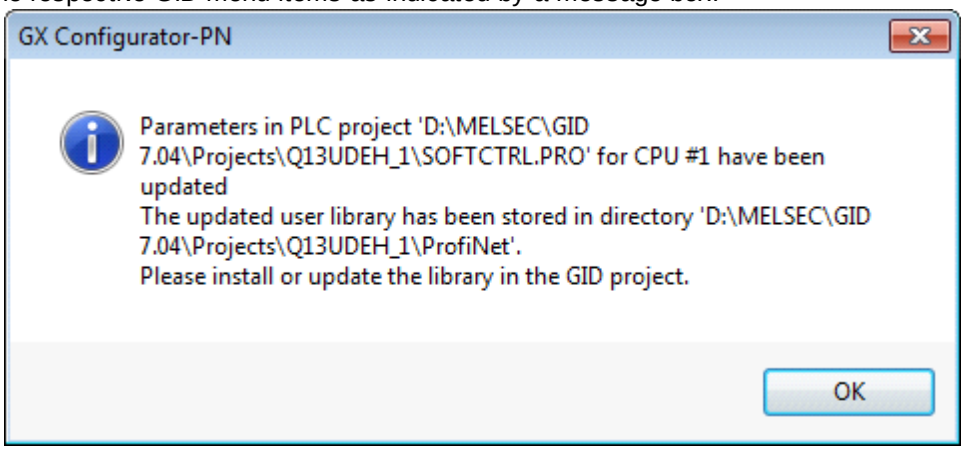
7.10.1.4 User Library Export

In case a GXW2 or a GID project path have been assigned to a QnU-Model CPU in the 'Multiple CPU Settings' dialog, GX Configurator-PN generates a user library for accessing the PROFINET data in GID and GXW2 projects.
If a GID project path has been assigned, the user library is generated in a sub folder of the GID project directory. This corresponds to the process for GXW2 projects in workspace format as described in 'GX Works2 Support. The difference between GID and GXW2 projects is that in case of GID the user library is not automatically installed in the PLC project. The user must do this manually using the respective GID menu items as indicated by a message box.



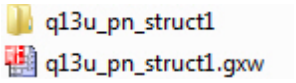
For GXW2 projects the user library is generated and automatically installed in the project. This is explained in more detail in section 'GX Works2 Support'.

7.10.1.5 GX Works2 Support

GX Configurator-PN can update both the parameter data and the PROFINET user library (POU) in a GXW2 project, if at least version 1.501X of GX Works2 is installed on the same computer.
The update is performed, when the QnU-CPU download option is selected as described in 'Update Parameters' dialog.
Only QnU-Model CPU projects are updated. The user library (.sul) exported by GX Configurator-PN is directly installed in the GXW2 project of theQnU-CPU, which communicates with the PN controller. The multi-CPU settings are updated in the GXW2 projects of all CPUs.
Both formats (single file and workspace) of GXW2 project files are supported. The location and the name of the user library differ for both project formats.

Single File Format Project: the user library is stored in a sub folder of the directory, where the GXW2 project is located. The sub folder is named as the corresponding GXW2 project file. The user library is stored in this folder with the fixed file name 'PROFINET_IO_ME1PN1FW_Q.sul'.

Example:



Workspace Format Project: the user library is stored in a sub folder of the GXW2 project directory. The sub folder name is always 'ProfiNet'. The name of the user library file is fixed to 'PROFINET_IO_ME1PN1FW_Q.sul' like for single file format projects.

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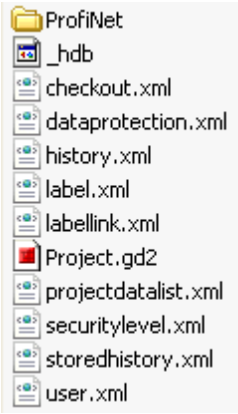
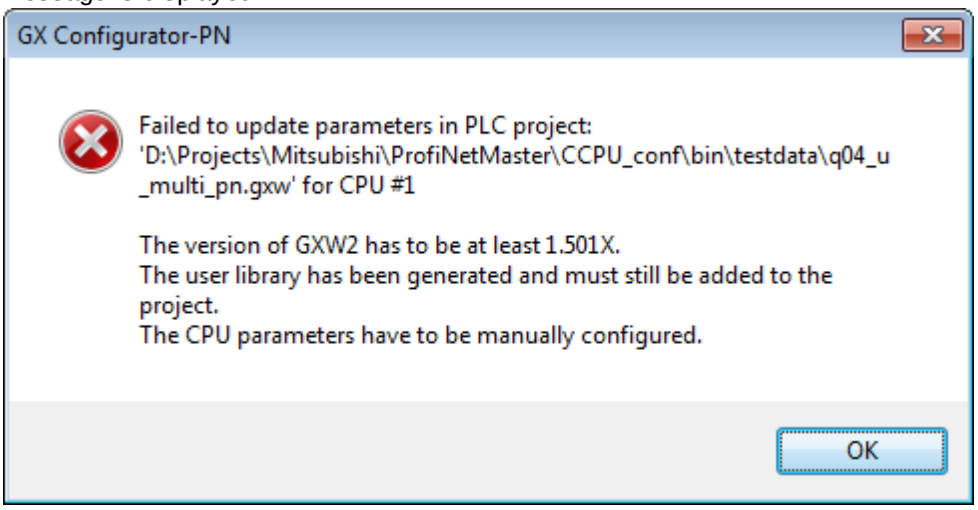
Example:



Error Handling when Updating GX Works2 Projects

GXW2 Missing or Version older than 1.87R

GX Configurator-PN identifies the GXW2 installation directory via specific registry entries. It then loads the 'Call DLL' module from that directory to interact with GXW2. If the GXW2 installation is missing, the module cannot be loaded or the installed version of GXW2 is not at least 1.87R, GXPN cannot access the GXW2 project. However the PROFINET user library is generated and an error message is displayed.



In the case GXW2 cannot be accessed or the version installed does not support adding user libraries, the user library file is created in a sub directory of the GXW2 project For the location of the user library please see section 'User library location and name'.

GXW2 Version between 1.87R and 1.501X

If the version of GXW2 installed is equal or newer than 1.87R, but not 1.501X or newer, the user library can be inserted to the GXW2 project. However the parameters cannot be updated with these versions and the following error message is displayed:

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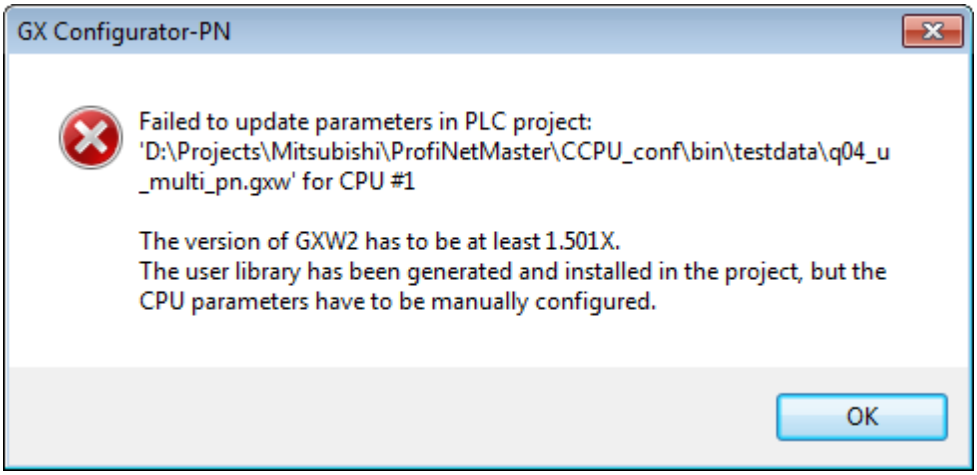
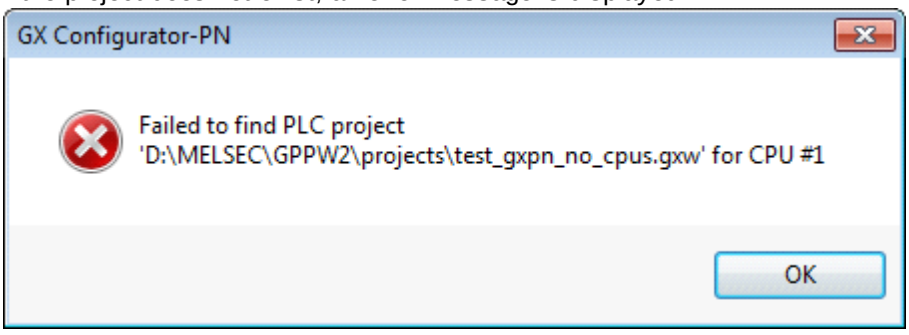


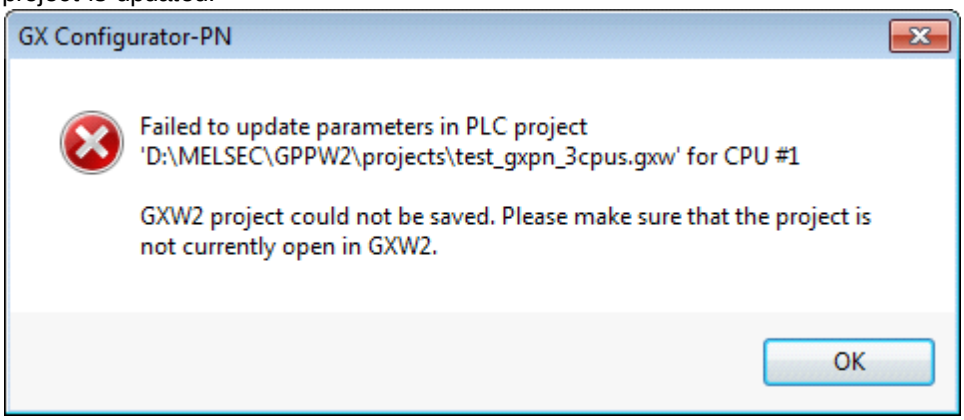
GXW2 Project Missing

If the project does not exist, an error message is displayed.



GXW2 Project Already Open

If the project is already open in another instance of GXW2, an error message is displayed, when the project is updated.



GXW2 Project is 'Simple Type'

If the GXW2 project is not a 'structured', but a 'simple' type project, the parameters in the project can be updated, however the user library cannot be added.

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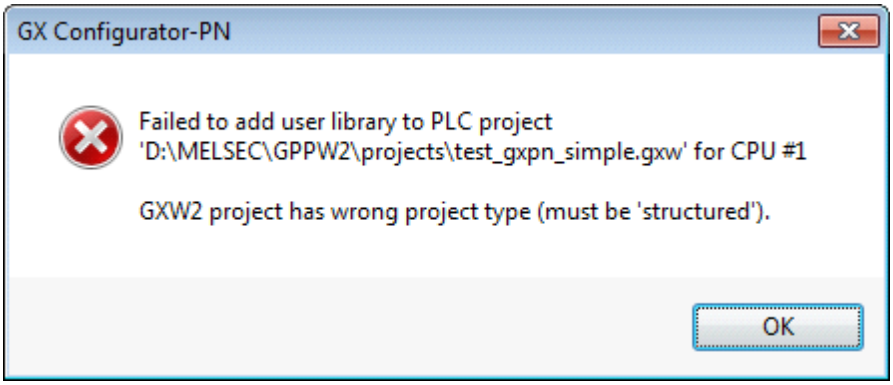
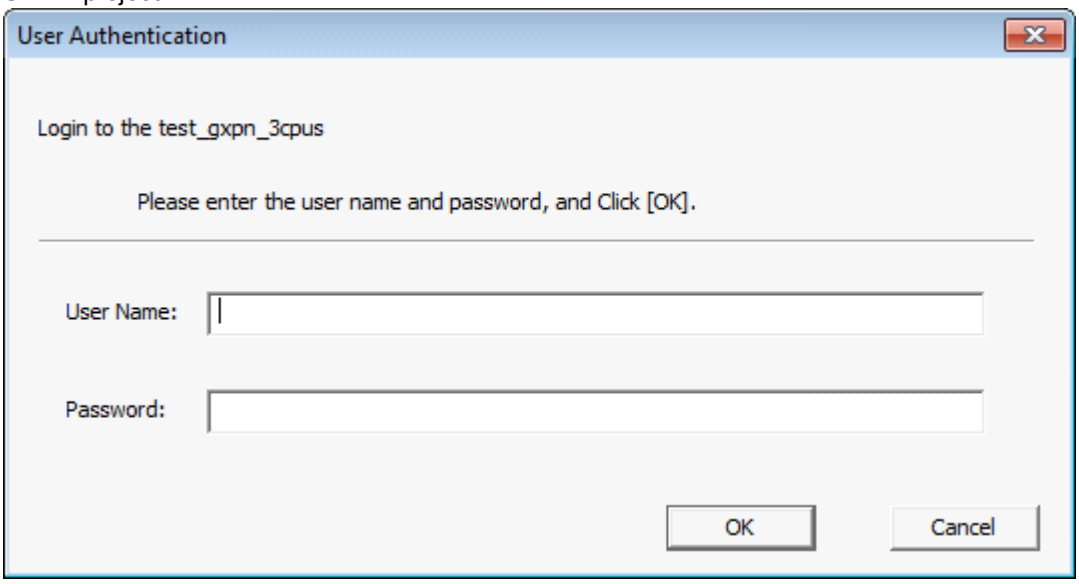


Note: the user library file is however generated and not removed, after the above message has been displayed.

GXW2 Project is Password Protected

If a password is set for a GXW2 project, the user is prompted for credentials when accessing the GXW2 project.



This dialog is displayed during the update when retrieving the current settings from the GXW2 project of the first QnU-CPU and for each GXW2 project with password protection, when it is updated.

Note: this implies that the dialog may be displayed twice for the project of the first QnU-CPU, once when retrieving the current parameters and once when updating them.

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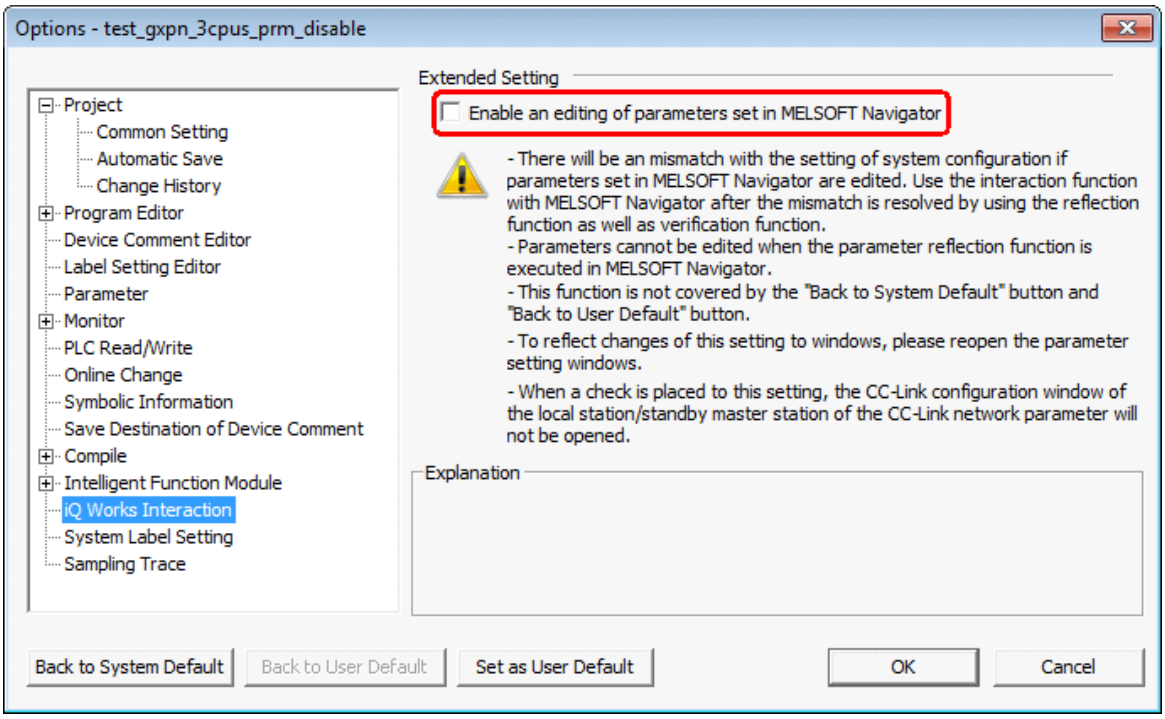
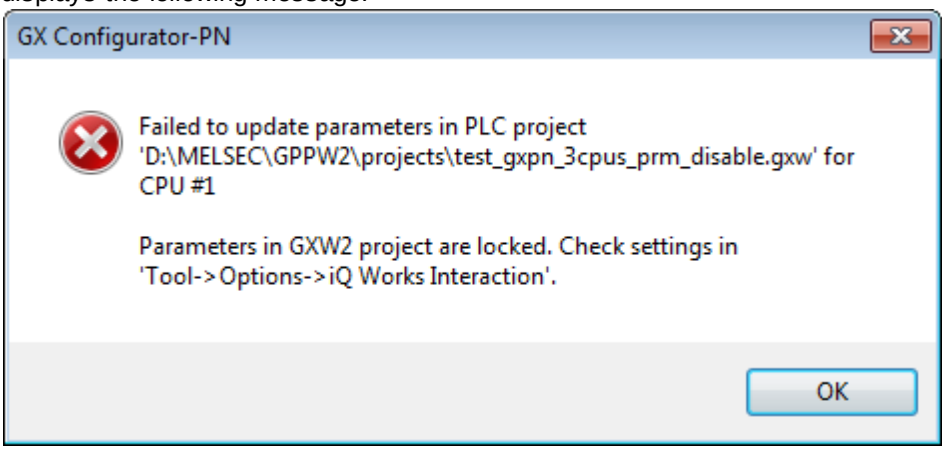
Parameters in GXW2 Project are Locked

Write access to parameters in a GXW2 project can be disabled via the 'Tool->Options' menu item in GXW2.



If the flag marked above has been cleared, GX Configurator-PN cannot update the parameters and displays the following message.



7.10.2 'Update Parameters' Dialog

Whenever the PROFINET or the multi-CPU configuration is changed, settings in the CPUs and the corresponding PLC projects must be updated. This dialog gives the user the choice of selecting, what is to be updated.

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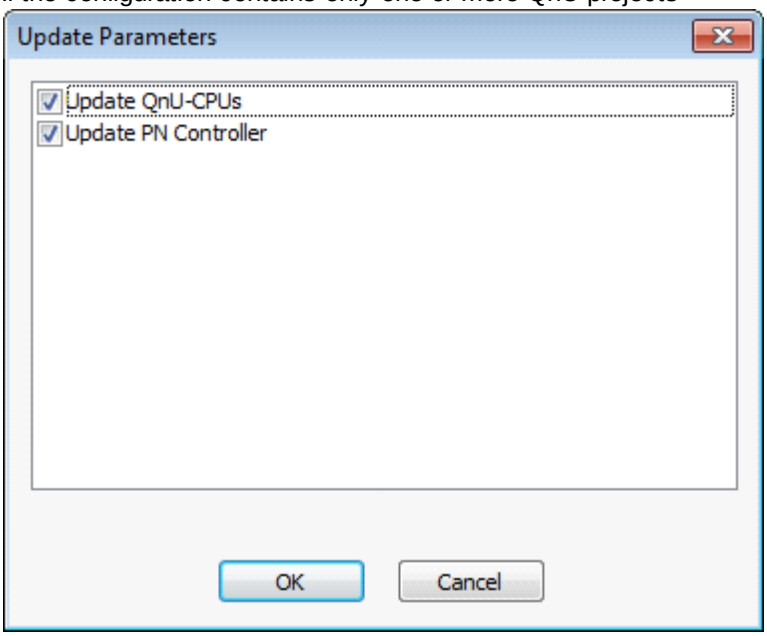
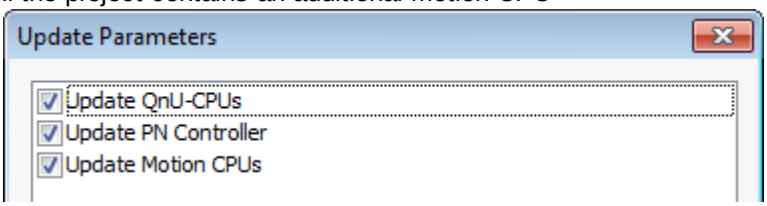
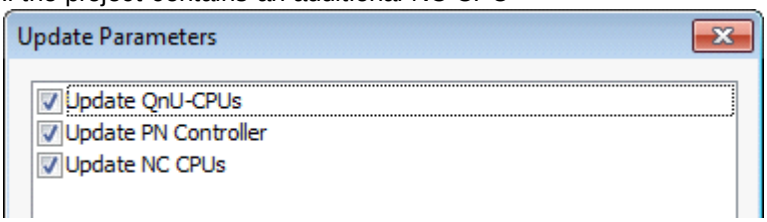
If the configuration contains only one or more QnU-projects



If the project contains an additional motion CPU



If the project contains an additional NC CPU



Name	Description	Choices / Range	Default
Update QnU-CPUs	updates the parameter on QnU-CPUs and, if assigned, in the respective GD/GID/ GXW2 project. If the CPU is the controlling CPU of the PN controller and a GXW2 project has been assigned, the user library for PROFINET is added to that project. If a GID project has been assigned, the user library is copied to a sub folder in the GID project directory and must be manually installed by the user.	selected / not selected	selected
Update PN Control-	updates the parameters on the PN control-	selected / not	selec-

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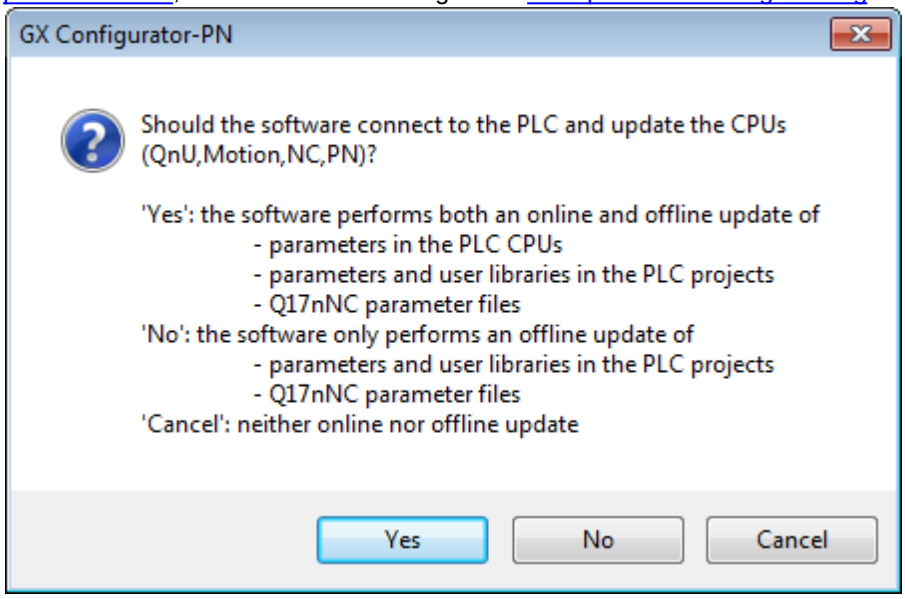
Name	Description	Choices / Range	Default
ler	ler	selected	ted
Update Motion CPUs	updates the parameters on motion CPUs **Note**: this option is only displayed, if the project contains a motion CPU.	selected / not selected /	selected
Update NC CPUs	updates the parameters on NC CPUs and, if assigned, in the respective NC parameter file **Note**: this option is only displayed, if the project contains an NC CPU.	selected / not selected /	selected
OK	Close dialog and perform the selected updates	-	Default button
Cancel	Close dialog without performing any updates	-	-

Online and Offline Parameters Update

After selecting, which CPU types will be updated, the user can choose between a combined online and offline or an offline only update. 'Offline' means an update of the GXW2/GID/GD projects and NC parameter files, which have been assigned in 'Multiple CPU Settings' dialog.



Choosing 'Yes' executes both an online and an offline update, while selecting 'No' results in an update of the only the projects and parameter files. For details on offline parameter data update refer to Update of PLC Projects and Parameter Files.
If the configuration contains no GXW2/GID/GD project or NC parameter file paths, the user can only choose between an online or no update.

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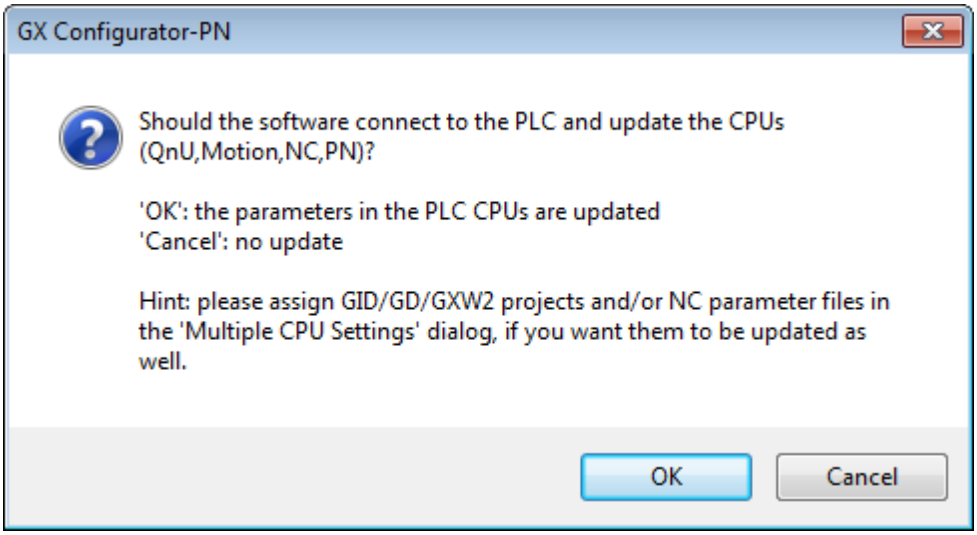
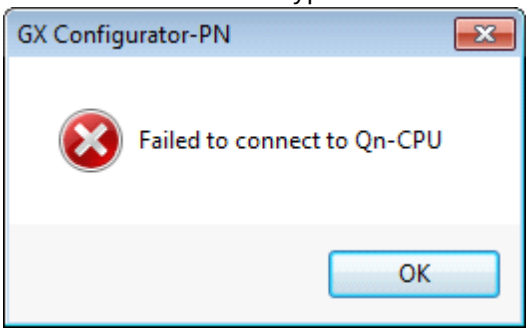
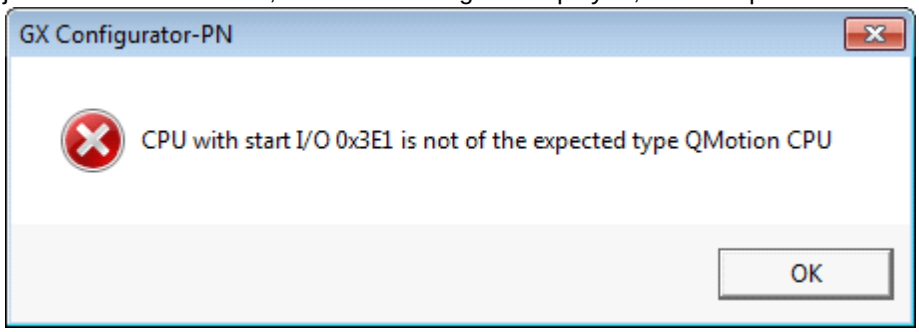


Checking CPU Types

If the user has chosen to also update the CPUs online, GX Configurator-PN first connects to each CPU and determines its type. If the connection fails, an error message is displayed.



If the actual type of a CPU at a certain starting I/O number differs from the CPU type set in the project for that I/O number, an error message is displayed, for example



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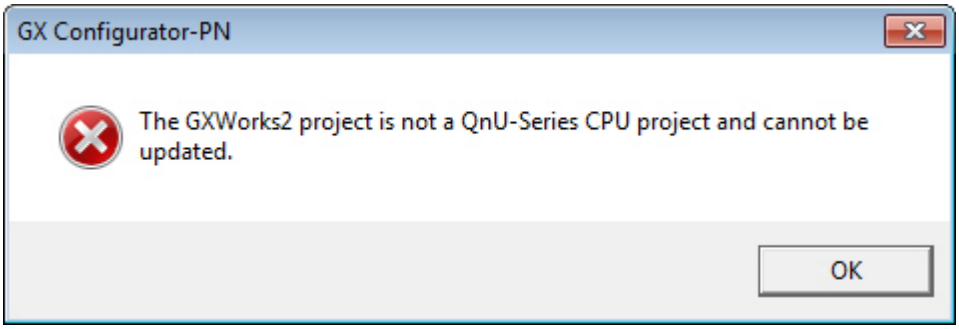
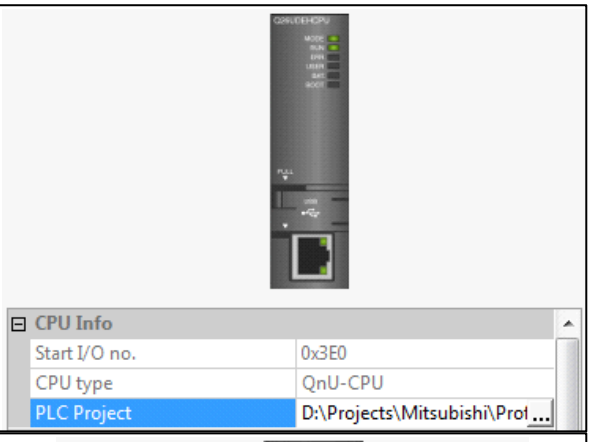
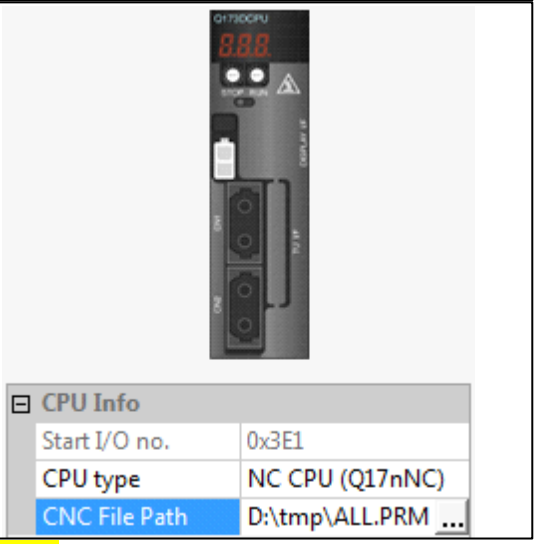
If PLC projects are updated, the CPU type of the PLC project can only be determined for GX Works2 projects. If the GXW2 project is not for a QnU-CPU, the following error is displayed and the update is aborted.



Update of PLC Projects and Parameter Files

If paths to projects or parameter files have been assigned in the 'Multiple CPU Settings' dialog, these projects/files are updated as well. At present for QnU-CPUs GD-, GID- and GXW2-projects and for NC-CPUs the ASCII parameter files handled by the 'Remote Monitor Tool' are supported.

Parameters file in a GID/GD/GXW2-project for a QnU-CPU	
Parameter file for Q17nNC CPUs, generated with the 'Remote Monitor Tool'	

Note: there is no offline parameter update for motion-CPUs.

Sequence when updating Parameters

A prerequisite for setting the multi-CPU settings is the 'I/O Assignment'. The 'I/O Assignment' is part of the CPU parameters and for example set in the 'Q Parameter Setting' dialog of GX Works2.

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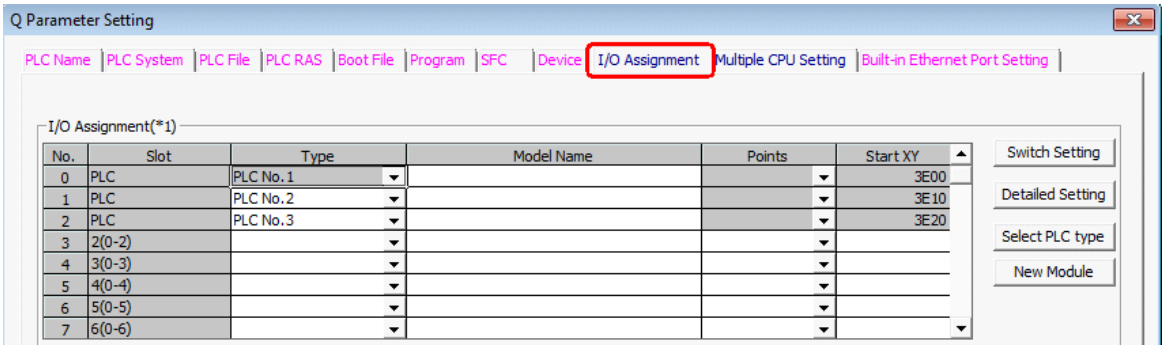
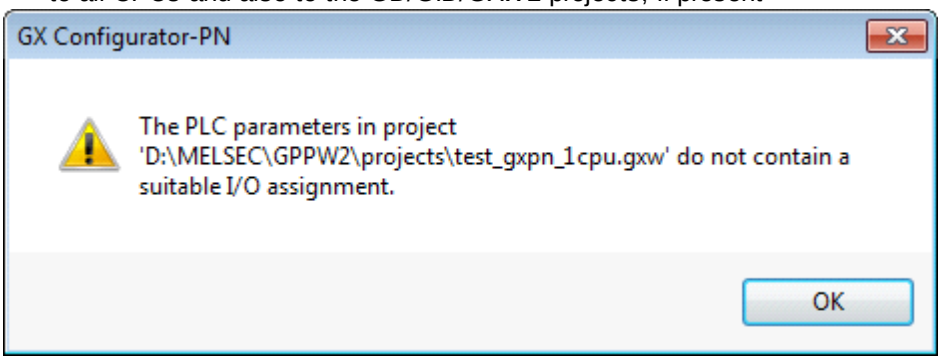


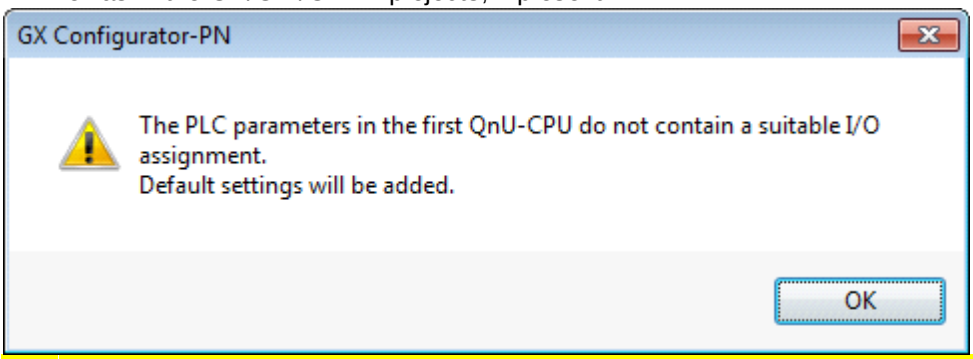
The I/O assignment must be identical on all CPUs. Therefore GX Configurator-PN copies the I/O assignment from the first QnU-CPU to the other CPUs, handling the following situations:

1. the first QnU-CPU has a PLC project path assigned and the GD/GID/GXW2 project contains an I/O assignment with at least the same number of CPUs as in the GXPN configuration
   -> I/O assignment from the GD/GID/GXW2 project is copied to all CPUs including the first QnU-CPU itself

2. the first QnU-CPU has no PLC project path assigned or the GD/GID/GXW2 project contains no suitable I/O assignment, however the CPU itself has a correct I/O assignment
   -> the following message is displayed and the I/O assignment is copied from the first QnU-CPU to all CPUs and also to the GD/GID/GXW2 projects, if present



3. there is neither a suitable I/O assignment in the PLC project or in the CPU itself
   -> the following message is displayed and a default I/O assignment is inserted in all CPUs as well as in the GD/GID/GXW2 projects, if present



Note: After changing the position of CPUs in the PLC rack it may be necessary to once set the I/O assignment on the motion CPU with MT Developer2.

Integration with PLC Programming Packages

The following table lists the supported MELSOFT software packages for PLC programming and the respective functionality.

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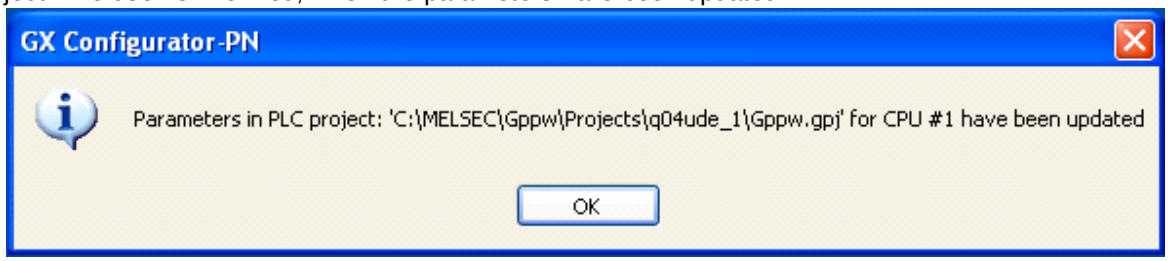
Software	Version	Available Functions
GX Developer	8.89	update of CPU parameters in project no user library
GX IEC Developer	7.04	update of CPU parameters in project user library generated in sub directory of project, but not installed in project
GX Works2	< 1.87R	no update of CPU parameters in project user library generated in sub directory of project, but not installed in project
	>= 1.87R < 1.501X	no update of CPU parameters in project user library generated in sub directory and installed in project
	>= 1.501X	update of CPU parameters in project user library generated in sub directory and installed in project

Note: only with GX Works2 of version 1.87R or newer the project CPU type is checked. In case the CPU type does not support high speed transfer an error message is displayed.

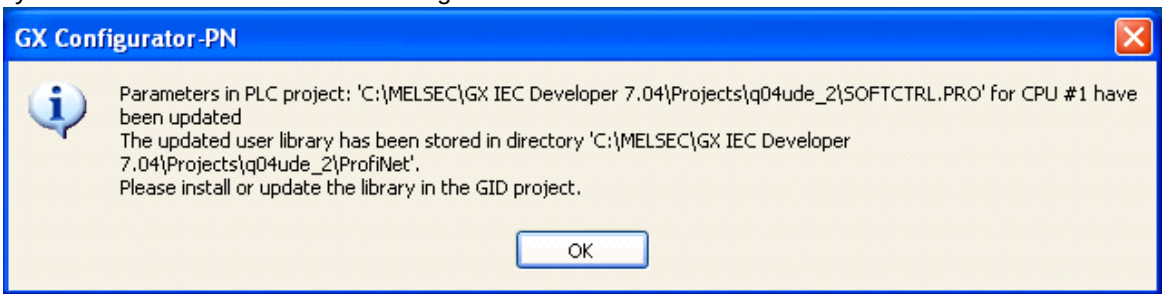
GX Developer (GD)

GX Configurator-PN cannot generate PLC code for GD, but only update the parameters in a GD project. The user is informed, when the parameters have been updated.



GX IEC Developer (GID)

For GID projects GX Configurator-PN cannot install the user library in the project. This must be done by the user as indicated in the message box.



GX Works2 (GXW2)

The best integration of GX Configurator-PN is with GXW2. For details please see section 'GX Works2 Support'.

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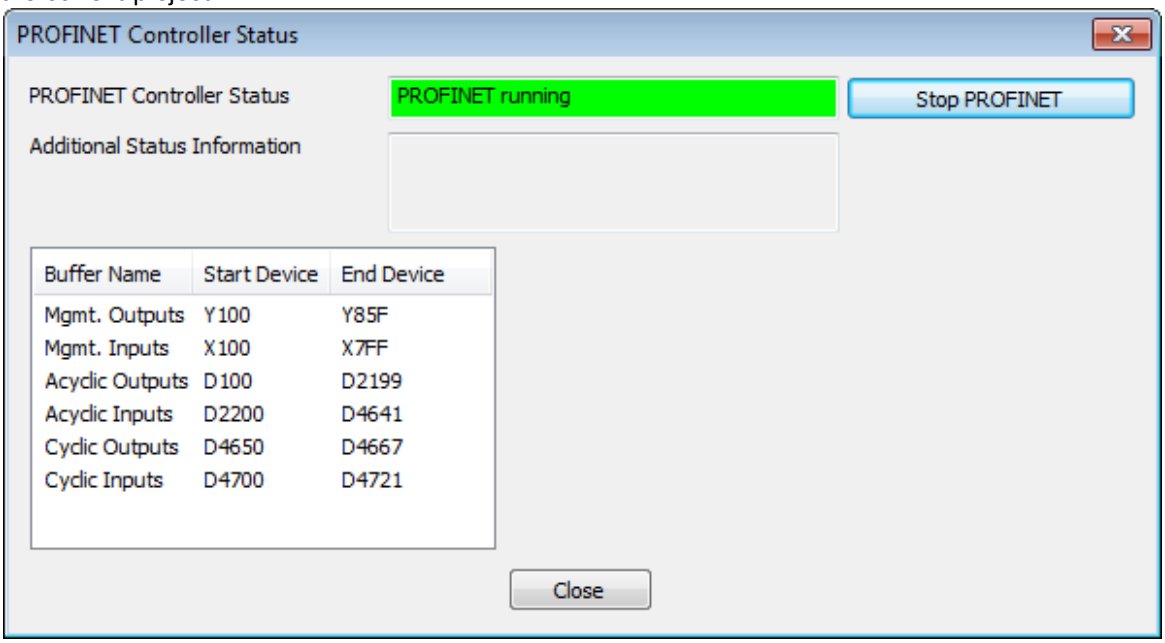
7.10.3 'PROFINET Controller Status' Dialog

This dialog displays the current status of the PROFINET controller and provides means to start/stop the data exchange in the PROFINET network. It retrieves the multi-CPU settings including the buffer device addresses online from the CPUs independently of the current GX Configurator-PN configuration. Only the IP address of the PN controller and the transfer setup for the QnU-CPU are taken from the current project.



Name	Description	Choices / Range	Default
PROFINET Controller Status	current status of the PN controller (see list below)	-	-
Additional Status Information	additional information for specific status codes	-	-
Start PROFINET or Stop PROFINET	starts respectively stops the cyclic data exchange by the PN controller text depends on the state of the IOC_STS_STARTED flag	button is only enabled, if the PN ctrl has the flag 'IOC_STS_CONFIG_OK' set, otherwise the button is disabled	-
Buffer Devices	displays the currently configured devices for the PROFINET refresh buffers	-	-
Close	close dialog and proceed	-	Default button

To obtain the currently active device addresses the dialog first reads the start I/O number of the controlling QnU-CPU from the PN controller. It then reads the multi-CPU settings including buffer devices from that QnU-CPU, independent of the settings in the current GX Configurator-PN project. These active device addresses are displayed in the status dialog.

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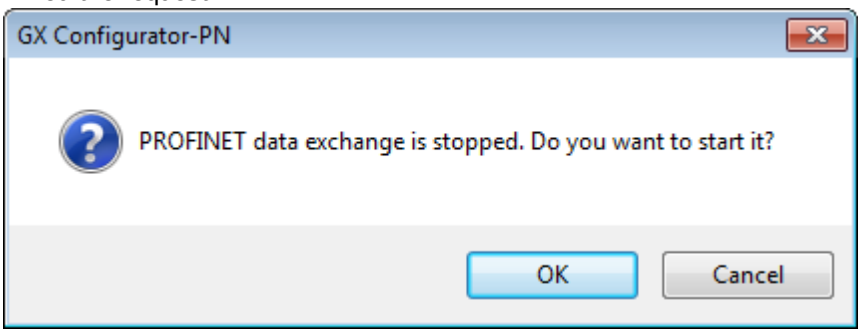
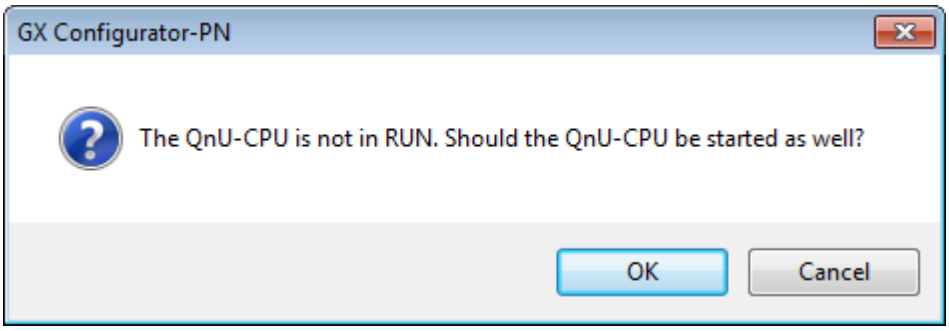
Start/Stop PROFINET

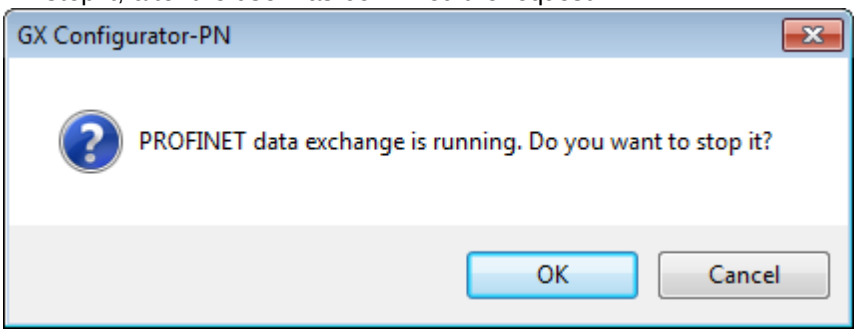
The data exchange on the PN controller can only be started, if the controller is configured and not already running (controller status ‘PROFINET stopped’). The start flag is set, after the user has confirmed the request.



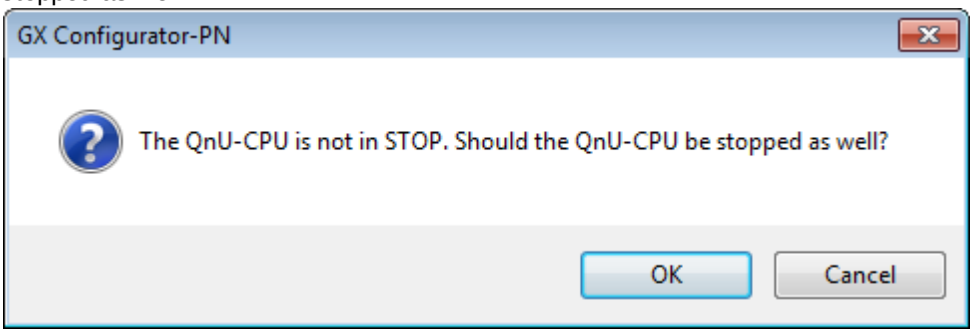
In case the PN controlling CPU is not in RUN mode, the user is asked, whether the CPU should be started as well.



If the data exchange has been started (controller status ‘PROFINET started’), pressing the button will stop it, after the user has confirmed the request.



In case the PN controlling CPU is not in STOP mode, the user is asked, whether the CPU should be stopped as well.



After the start or stop request the user can check the ‘PROFINET Controller Status’ field to see, whether the request has been successful. The field is automatically updated.

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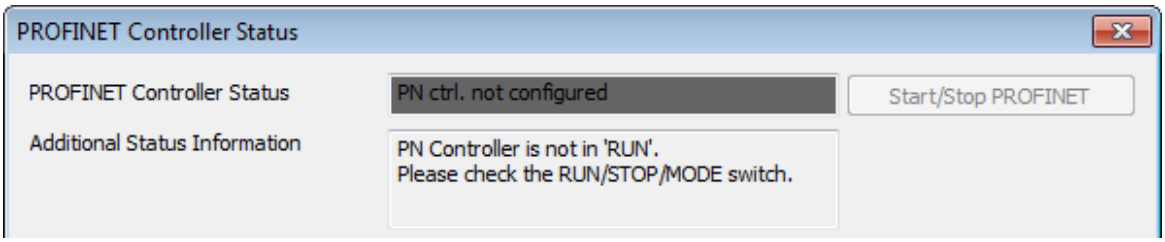
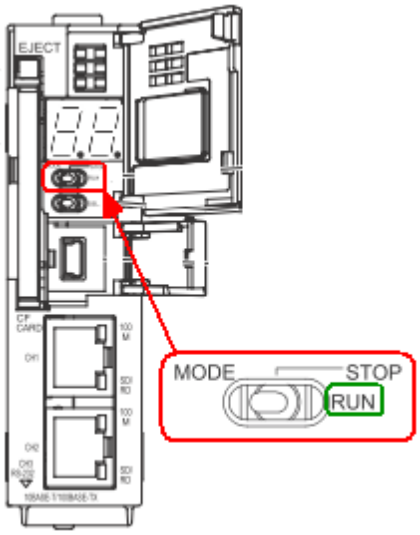
Incorrect Status Due to 'MODE' Switch



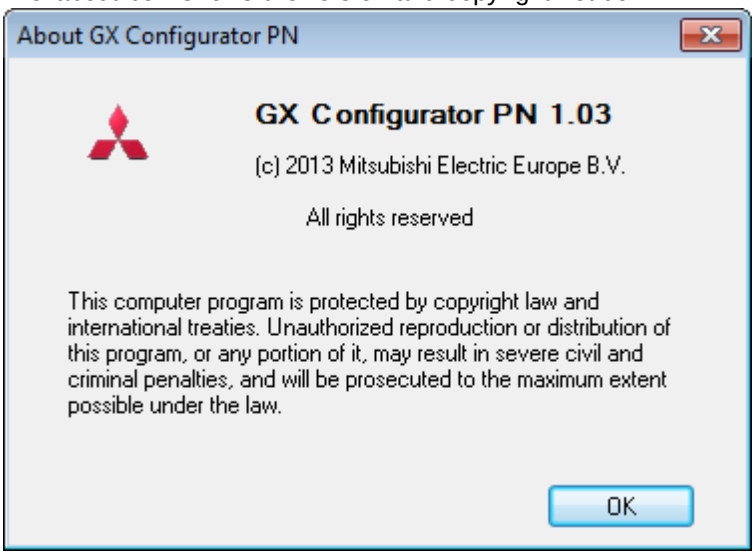
If the status displays 'Not configured', the reason may not be a missing PROFINET configuration.



The 'RUN/STOP/MODE' switch on the ME1PN1FW-Q must be in the 'RUN' position, otherwise any status information from the PROFINET Controller may be incorrect.

7.11 Aboutbox

The 'about box' shows the version and copyright notice.



8 PLC Code for PROFINET Controller

GX Configurator-PN can export PLC program code for 'GX Works2' (GXW2) and 'GX IEC Developer' (GID), which assists the application programmer in accessing the PROFINET Controller.

8.1 Function Blocks

GX Configurator-PN can export PLC code for integrating PROFINET I/O into a 'GX IEC Developer' (GID) or a 'GX Works2' (GXW2) PLC application program. The exported code contains 'Function Blocks' (FBs), 'Data Unit Types' (DUTs) and global variable lists (GVLs).

Call of Function Blocks

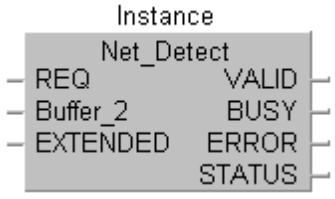
All services used in the function blocks access the same data area, defined in the instances of the DUTs. If a function block is in use (output “Busy” is true), no other function block call is allowed. The user must ensure that the function blocks are interlocked against simultaneous use. Two function blocks can only be used simultaneously, if one uses a different request/response buffer pair than the other.

GX Configurator-PN adds global variables to the exported PLC code, which are mapped to the corresponding buffer devices. The PLC program can use the variable identifiers and does not have to access the buffer devices directly. The following table lists the variable names for both acyclic communication buffer pairs.

Buffer	Global Variables for Acyclic Communication Buffers	
	Buffer Pair 1	Buffer Pair 2
Request handshake bits	vPN_MGMT_OUTPUTS.ACYC_HSK_Y_REQ1_EXECUTE	vPN_MGMT_OUTPUTS.ACYC_HSK_Y_REQ2_EXECUTE
Response handshake bits	vPN_MGMT_INPUTS.ACYC_HSK_X_RES1_ACCEPTED vPN_MGMT_INPUTS.ACYC_HSK_X_RES1_COMPLETED	vPN_MGMT_INPUTS.ACYC_HSK_X_RES2_ACCEPTED vPN_MGMT_INPUTS.ACYC_HSK_X_RES2_COMPLETED
Request buffer	vPN_ACYCLIC_REQ1	vPN_ACYCLIC_REQ2
Response buffer	vPN_ACYCLIC_RES1	vPN_ACYCLIC_RES2

8.1.1 Function Block 'Net_Detect'

This FB detects IO-devices present on the network. It includes two services: network detection and IO-device detection. The network detection returns only the number of IO-devices found on the network. The following IO-Device detection reads type information from each detected IO-device and stores it in the global variable 'vPN_DEVICE_DETECT_DATA'.



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Variable	Class	Type	Description
REQ	Input	Bool	Start the network detection
BUFFER_2		Bool	0= Buffer 1 for acyclic request is used 1= Buffer 2 for acyclic request is used
EXTENDED		Bool	0= Only the standard information (first eight words) is returned 1= The extended device information is returned
VALID	Output	Bool	Data in the global variable 'vPN_DEVICE_DETECT_DATA' is valid
BUSY		Bool	The function block is in use
ERROR		Bool	Error detected
STATUS		Word	Last detected status, possible values: 0= Status OK 1= Profinet stack not started 4= Reception buffer too small (stack internal error) 5= No more IO-device 6= ”Network detection” service never called

The global variable 'vPN_DEVICE_DETECT_DATA' is defined as an array of DUTs (the DUT type name is 'vPN_DEVICE_DETECT_DATA'). The number of devices in the network equals the number of array elements.

Standard Device Information (Input 'EXTENDED' is not set)

If 'EXTENDED' has been set to 'FALSE', only standard device data is returned. For each detected device the variable 'vPN_DEVICE_DETECT_DATA' contains the following information:

Variable Pos Offset	ID	Value
1	VendorID	VendorID of the device
2	DeviceID	DeviceID of the device
3	IP_Address	IP address of the Device
4	Subnetmask	Subnet mask of the Device
5	Gateway	Gateway IP Address of the Device
6	Mac_Address_Bytes1_2	Mac Address of the Device, first word
7	Mac_Address_Bytes3_4	Mac Address of the Device, second word

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Variable Pos Offset	ID	Value
8	Mac_Address_Bytes5_6	Mac Address of the Device, third word

Extended Device Information (Input 'EXTENDED' is set)

If 'EXTENDED' has been set to 'TRUE', additional device data is returned. The DUT 'tPN_DEVICE_DETECT_DATA' must be expanded by appending an 'ARRAY [0..134] OF WORD' to the standard structure. For each detected device the variable 'vPN_DEVICE_DETECT_DATA' contains the following information:

Variable Pos Offset	ID	Value
1	VendorID	VendorID of the device
2	DeviceID	DeviceID of the device
3	IP_Address	IP address of the Device
4	Subnetmask	Subnet mask of the Device
5	Gateway	Gateway IP Address of the Device
6	Mac_Address_Bytes1_2	Mac Address of the Device, first word
7	Mac_Address_Bytes3_4	Mac Address of the Device, second word
8	Mac_Address_Bytes5_6	Mac Address of the Device, third word
9	Data[0]	Size of the device name (240 bytes max)
10	Data[1]	Device name
9 + n	Data[n]	Size of “Type” field (25 bytes max)
10 + n	Data[n+1]	Type of Device

Note: the IO-devices are returned in the order, in which they answered to the DCP identify request. Two consecutive calls to 'Net_Detect' can result in two different lists.

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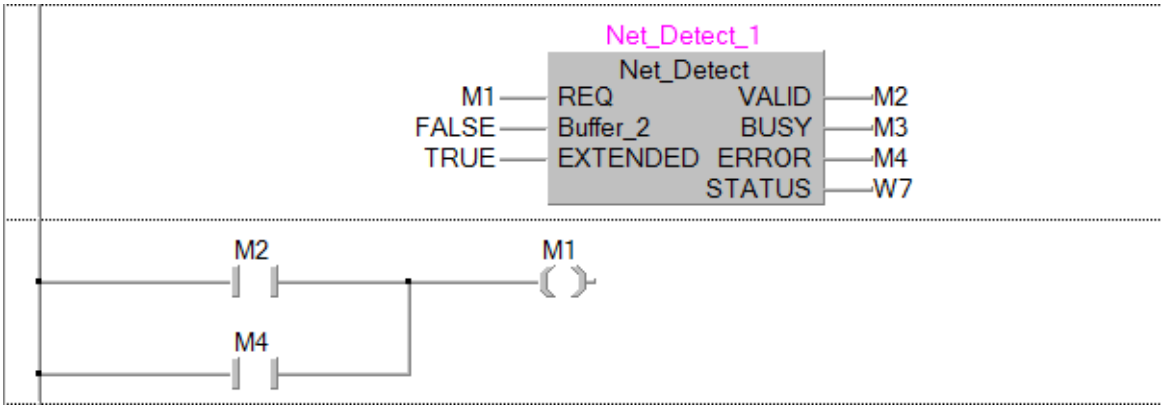
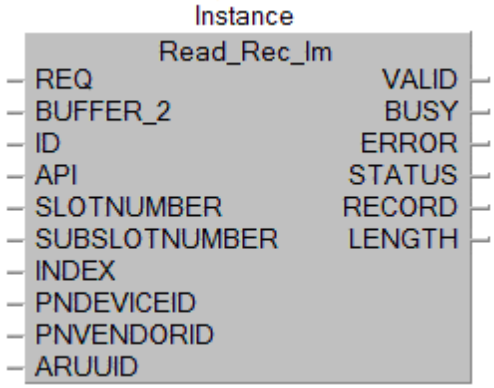
Call FB 'Net_Detect'



By setting M1 the network detection is started. M2 shows that the network detection data was written to the global variable 'vPN_DEVICE_DETECT_DATA'.

8.1.2 Function Block 'Read_Rec_Im'

This FB reads information from an IO-device, which has not been included in the configuration of the PROFINET Controller.



Variable	Class	Type	Description
REQ	Input	Bool	Start read record
BUFFER_2		Bool	0=Buffer 1 for acyclic request is used 1=Buffer 2 for acyclic request is used
ID		DWord	Device-ID, shall contain the IP-Address
API		DWord	API number, used to perform the read
SLOTNUMBER		Word	Slot number target
SUBSLOTNUMBER		Word	Sub-slot number target
INDEX		Word	Index of the record block
PNDEVICEID		Word	PN-Device ID (taken from the GSDML-file)

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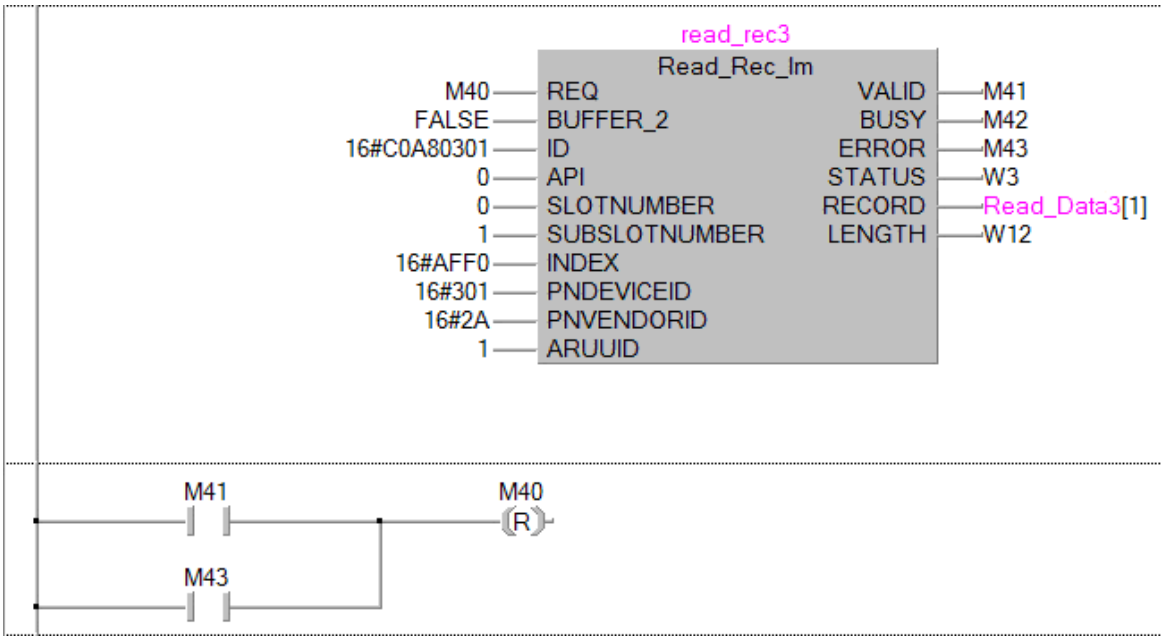
Variable	Class	Type	Description
PNVENDORID		Word	Vendor ID (taken from the GSDML-file)
ARUUID		Word	Object UUID Local ID (taken from the GSDML-file)
VALID	Output	Bool	Data in the global variable “DEVICE_DATA” is valid
BUSY		Bool	The function block is in use
ERROR		Bool	Error detected
STATUS		Word	Last detected status, possible values: 0=Status OK 1=Profinet stack not started 2= No Ethernet link 3= No IO-Device detected 4=Reception buffer too small (stack internal error) 8= Profinet error
RECORD		Word	Read data
LENGTH		Int	Read data size in byte

The read data is moved to the output 'RECORD' by using a block move operation. The user has to configure an array-Variable for this output with the corresponding number of elements.

Call FB 'Read_Rec_Im'



The input 'ID' contains the IP-address of the IO-device: 16#C0A80301 = 192.168.3.1. The index for

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the read data is 16#AFF0, indicating to read the I&M data (Identification & Maintenance) of the device. Reading of data starts if M40 is set. M41 indicates that the read data has been written to the global variable 'Read_Data3'. The values for the inputs PNDEVICEID, PNVENDORID and ARUUID are taken from the GSDML-file.

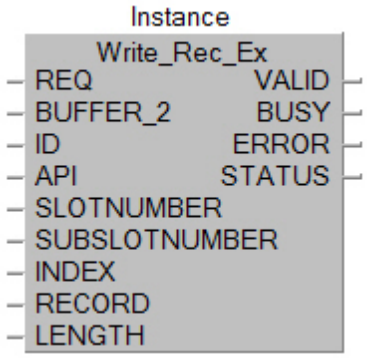
FB Input	GSDML Node and Attribute
PNDEVICEID	DeviceIdentity/@VendorID
PNVENDORID	DeviceIdentity/@DeviceID
ARUUID	DeviceAccessPointItem/@ObjectUUID_LocalIndex

Extract from the sample GSDML-file used for the FB call above:

```
<ProfileBody>
  <DeviceIdentity VendorID="0x002A" DeviceID="0x0301">
    <ApplicationProcess>
      <DeviceAccessPointList>
        <DeviceAccessPointItem ID="DIM 1" PhysicalSlots="0..63"
           ModuleIdentNumber="0x00000300" MinDeviceInterval="32"
           ImplementationType="NetArm" DNS_CompatibleName="IM151-3PN" Fixe-
dInSlots="0"
           ObjectUUID_LocalIndex="1">
```

8.1.3 Function Block 'Write_Rec_Ex'

This FB writes data to an IO-Device which is connected to the Profinet.



Variable	Class	Type	Description
REQ	Input	Bool	Start write record
BUFFER_2		Bool	0=Buffer 1 for acyclic request is used 1=Buffer 2 for acyclic request is used
ID		DWord	Device-ID, shall contain the IP-Address
API		DWord	API number, used to perform the read
SLOTNUMBER		Word	Slot number target

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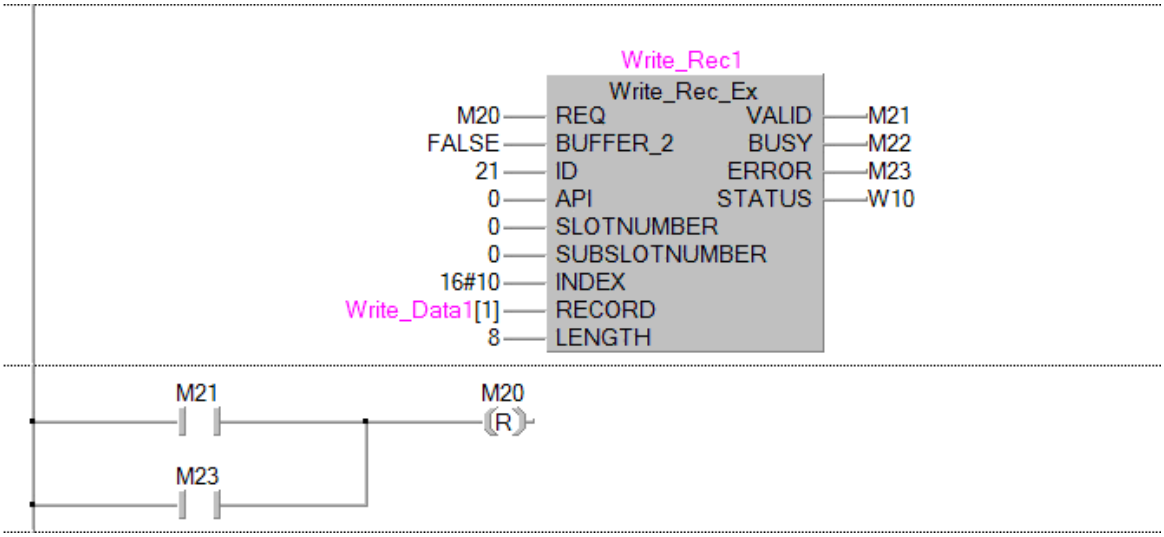
Variable	Class	Type	Description
SUBSLOTNUMBER		Word	Sub-slot number target
INDEX		Word	Index of the record block
RECORD		Word	Write data
LENGTH		Int	Write data size in byte
VALID	Output	Bool	Data in the global variable “DEVICE_DATA” is valid
BUSY		Bool	The function block is in use
ERROR		Bool	Error detected
STATUS		Word	Last detected status, possible values: 0= Status OK 1= Profinet stack not started 2= No Ethernet link 3= No IO-Device detected 6= Device not connected 7= Device not configured 8= Profinet error

The data to write is moved from the input 'RECORD' by using a block move operation to the transfer buffer. The user has to configure an array variable for this input with the corresponding number of elements.

Call FB 'Write_Rec_Ex'



The input 'ID' contains the IO-device number '21'. The index for the data to write to is 16#10. By setting M40 the writing of the data is started. M41 indicates that the data from the global variable 'Write_Data1' has been successfully transferred to the IO-device.

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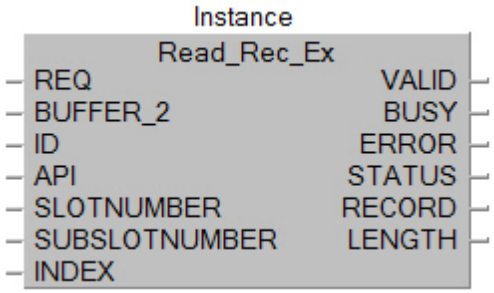
8.1.4 Function Block 'Read_Rec_Ex'

This FB reads information from an IO-Device which is connected to the Profinet.



Variable	Class	Type	Description
REQ	Input	Bool	Start read record
BUFFER_2		Bool	0=Buffer 1 for acyclic request is used 1=Buffer 2 for acyclic request is used
ID		DWord	Device-ID, shall contain the IP-Address
API		DWord	API number, used to perform the read
SLOTNUMBER		Word	Slot number target
SUBSLOTNUMBER		Word	Sub-slot number target
INDEX		Word	Index of the record block
VALID	Out-put	Bool	Data in the output “RECORD” is valid
BUSY		Bool	The function block is in use
ERROR		Bool	Error detected
STATUS		Word	Last detected status, possible values: 0= Status OK 1= Profinet stack not started 2= No Ethernet link 3= No IO-Device detected 4= Reception buffer too small (stack internal error) 6= Device not connected 7= Device not configured 8= Profinet error
RECORD		Word	Read data

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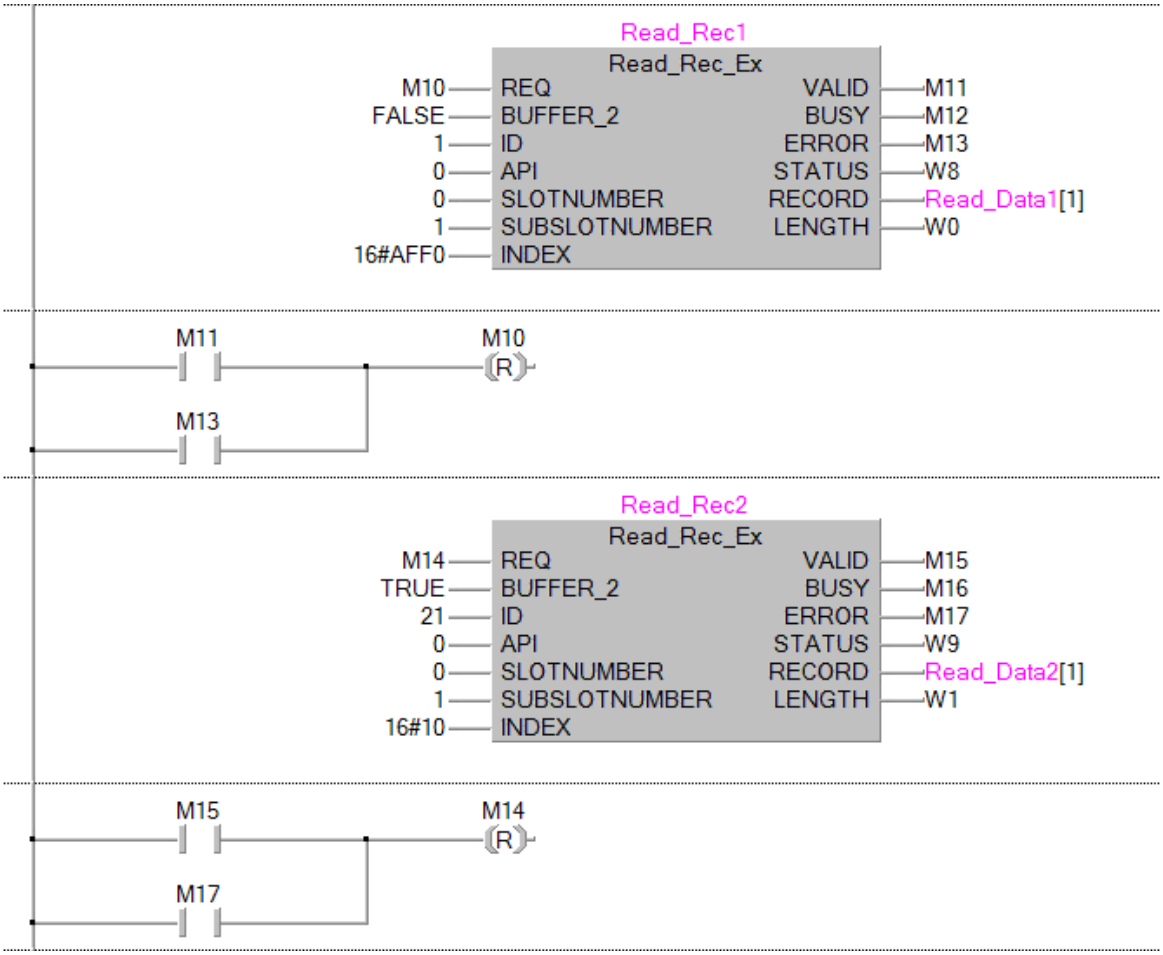
Variable	Class	Type	Description
LENGTH		Int	Read data size in byte

The read data is moved to the output 'RECORD' by using a block move operation. The user has to configure an array variable for this output with the corresponding number of elements.

Call FB 'Read_Rec_Ex'



First call:
The index for the read data is 16#AFF0, indicating to read the I&M data (Identification & Maintenance) of the device. The first acyclic buffer is used.
By setting M10 reading the data is started. M11 indicates that the read data has been written to the global variable 'Read_Data1'.

Second call:
The index for the read data is 16#10, indicating to read the parameter data from index 10 of the device. The second acyclic buffer is used.
By setting M14 reading the data is started. M15 indicates that the read data has been written to the global variable 'Read_Data2'.

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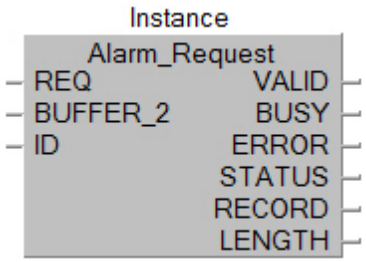
8.1.5 Function Block 'Alarm_Request'

With this function block the PLC program requests an alarm received from a specific IO-device.



Variable	Class	Type	Description
REQ	Input	Bool	Start alarm request
BUFFER_2		Bool	0=Buffer 1 for acyclic request is used 1=Buffer 2 for acyclic request is used
ID		DWord	Device-ID, shall contain the IP-Address
VALID	Output	Bool	Data in the output “RECORD” is valid
BUSY		Bool	The function block is in use
ERROR		Bool	Error detected
STATUS		Word	Last detected status, possible values: 0= Status OK 1= Profinet stack not started 7= Device not configured 8= Profinet error 9= No Alarm for this device
RECORD		Word	Read data
LENGTH		Int	Read data size in byte

The read alarm data is moved to the output 'RECORD' by using a block move operation. The user has to configure an array variable for this output with the corresponding number of elements.

Word Offset	ID	Value
0	API	API number used to perform the alarm
1		
2	Priority	Alarm priority High priority: 0x06 Low priority: 0x05
3	Type	Alarm type

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Word Offset	ID	Value
4	Slot number	Slot number of the alarm
5	SubSlot number	Subslot number of the alarm
6	Specifier	Alarm specifier
7	Module ident number	Module ID of the Alarm
8		
9	SubModule ident number	Submodule ID of the Alarm
10		
11	Data length	Data Size in byte
12 + Data length / 2 - 1	Data	0 to 1432 bytes

Alarm Types

Value (hex)	ID
0x0000	Reserved
0x0001	Diagnosis
0x0002	Process
0x0003	Pull
0x0004	Plug
0x0005	Status
0x0006	Update
0x0007	Media Redundancy
0x0008	Controlled by supervisor. Logical “Pull” of a submodule to withdraw ownership
0x0009	Released. Logical “Plug” of a submodule to return ownership or trigger a re-parameterization
0x000A	Plug Wrong Submodule
0x000B	Return of Submodule
0x000C	Diagnosis disappears
0x000D	Multicast communication mismatch notification
0x000E	Port data change notification
0x000F	Sync data changed notification
0x0010	Isochronous mode problem notification

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Value (hex)	ID
0x0011	Network component problem notification
0x0012	Time data changed notification
0x0013	Dynamic Frame Packing problem notification
0x0014	MRPD problem notification
0x0015	System Redundancy
0x0016 - 0x001D	Reserved
0x001E	Upload and retrieval notification
0x001F	Pull module
0x0020 - 0x007F	Manufacturer specific
0x0080 - 0x00FF	Reserved for profiles
0x0100 - 0xFFFF	Reserved

Alarm Specifier

Bits	Description	Value
0 - 10	Sequence number	0 to 2,047, incremented upon each indication
11	Diagnosis channel	0x00: No diagnosis available 0x01: Diagnosis available
12	Specific diagnosis	0x00: No diagnosis available 0x01: Diagnosis available
13	Diagnosis sub-module	0x00: No diagnosis available 0x01: Diagnosis available
14	Reserved	0x00
15	AR diagnosis	0x00: No diagnosis available 0x01: Diagnosis available

Alarm Management

By default the PROFINET stack can handle alarms automatically without reporting any indication to the PLC program. The PLC program can overwrite this default setting per device in order to manage alarms for a device by itself. To select 'manual handling' for alarms of a specific device a bit, which corresponds to the device, must be set in the global variable 'vPN_MGMT_OUTPUTS', which contains the PROFINET management output structure.

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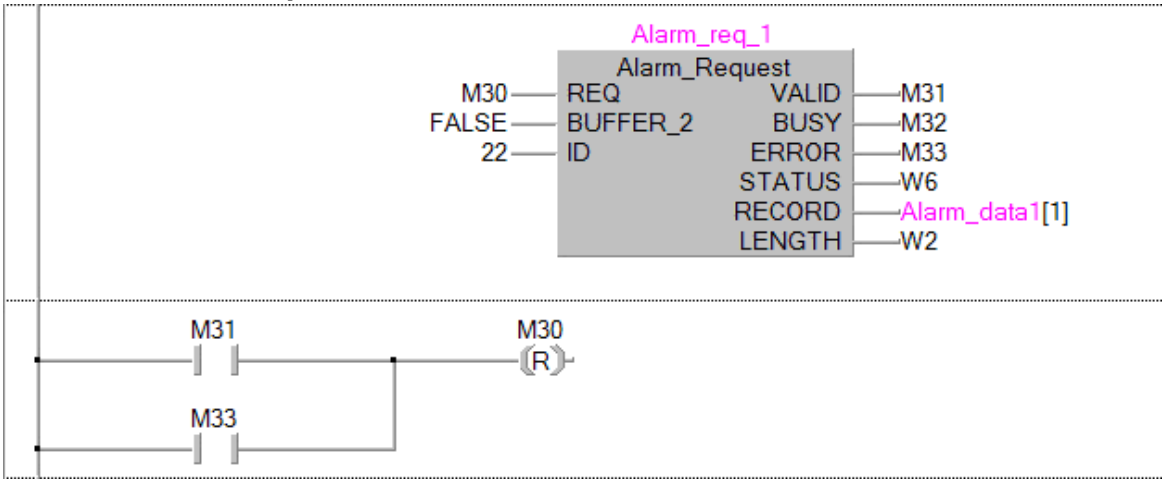
Alarm Handling	Variable Setting
Automatic handling	vPN_MGMT_OUTPUTS.IOD_MGT_ALARM[device index] = 0
Manual handling	vPN_MGMT_OUTPUTS.IOD_MGT_ALARM[device index] = 1

If automatic handling has been selected for an IO-device, the IO-controller automatically acknowledges each alarm received from the respective IO-device and the alarm indication flags 'vPN_MGMT_INPUTS.IOD_ALARM_IND' are not used. If manual handling has been selected, an alarm indication is passed to the PLC program by setting the bit with the index of the respective IO-device in 'vPN_MGMT_INPUTS.IOD_ALARM_IND[device index]'.

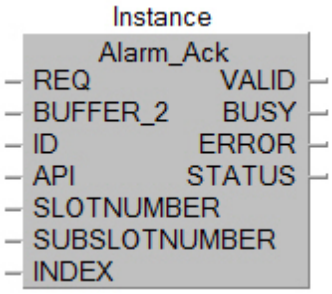
Call FB 'Alarm_Request'



The input 'ID' contains the IO-device number '22'. By setting M30 the alarm request is started. M31 indicates that the requested data has been written to the global variable 'Alarm_data1'. This function block accesses the global variables 'vPN_MGMT_INPUTS' and vPN_MGMT_OUTPUTS.

8.1.6 Function Block 'Alarm_Ack'

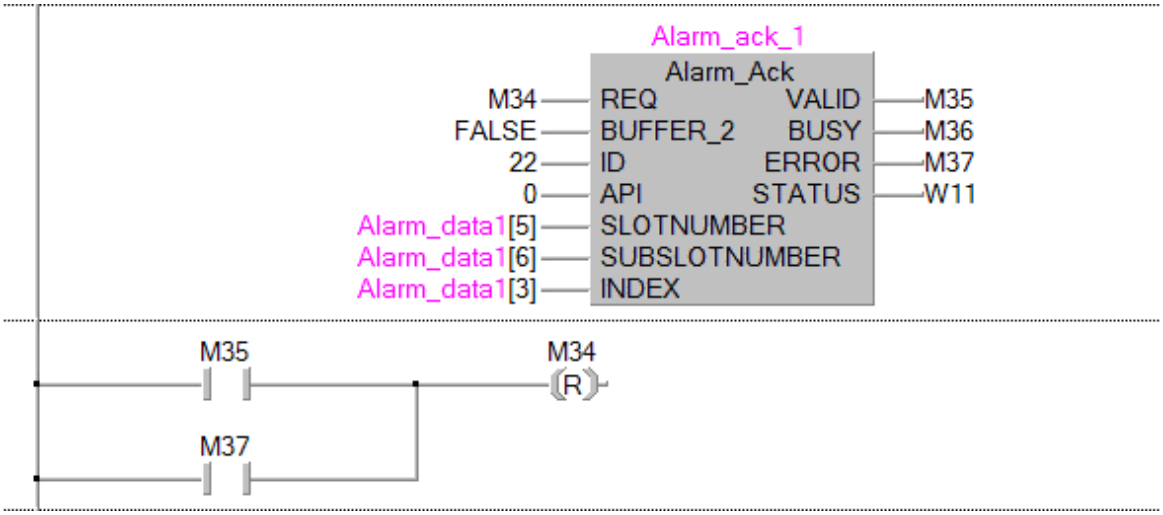
This function block sends the 'acknowledge alarm' frame to the IO-device.



Variable	Class	Type	Description
REQ	Input	Bool	Start alarm ack.
BUFFER_2		Bool	0=Buffer 1 for acyclic request is used 1=Buffer 2 for acyclic request is used

Variable	Class	Type	Description
ID		DWord	Device-ID, shall contain the IP-Address
API		DWord	API number, used to perform the ack
SLOTNUMBER		Word	Slot number target
SUBSLOTNUMBER		Word	Sub-slot number target
INDEX		Word	Must contain the alarm priority
VALID	Output	Bool	Ack has been send
BUSY		Bool	The function block is in use
ERROR		Bool	Error detected
STATUS		Word	Last detected status, possible values: 0= Status OK 1= Profinet stack not started 7= Device not configured 8= Profinet error 9= No Alarm for this device

Call FB 'Alarm_Ack'



The input 'ID' contains the IO-device number '22'. By setting M34 the alarm acknowledge is started. M35 indicates that the acknowledge data has been written to the requested device. This function block accesses the global variables 'vPN_MGMT_INPUTS' and vPN_MGMT_OUTPUTS.

The data for the function block inputs 'SLOTNUMBER', 'SUBSLOTNUMBER' and 'INDEX' must come from the previous call to the function block 'Alarm_Request'. This is achieved by assigning to the inputs of 'Alarm_Ack' the same variable 'Alarm_data1', which has been assigned to the output 'RECORD' of the 'Alarm_Request' function block. The table below shows the structure of the 'Alarm_Request.RECORD' output data and its relation to the 'Alarm_Ack' function block.

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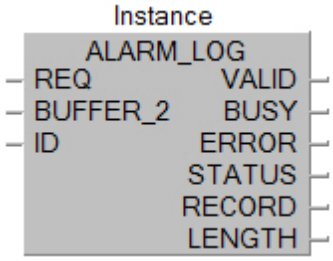
Word Offset	ID	Value	Variable	FB 'Alarm_Ack' Input
0	API	API number used to perform the alarm	Alarm_data1 [1]	
1			Alarm_data1 [2]	
2	Priority	Alarm priority High priority: 0x06 Low priority: 0x05	Alarm_data1 [3]	INDEX
3	Type	Alarm type	Alarm_data1 [4]	
4	Slot number	Slot number of the alarm	Alarm_data1 [5]	SLOTNUMBER
5	SubSlot number	Subslot number of the alarm	Alarm_data1 [6]	SUBSLOTNUMBER

8.1.7 Function Block 'Alarm_Log'

This function block retrieves an alarm description from the internal alarm log. Each call of the function block retrieves only one alarm description. If several alarms are stored, the function block must be called multiple times. The oldest alarm is returned first.



Variable	Class	Type	Description
REQ	Input	Bool	Start read alarm log
BUFFER_2		Bool	0=Buffer 1 for acyclic request is used 1=Buffer 2 for acyclic request is used
ID		DWord	Device-ID, shall contain the IP-Address
VALID	Output	Bool	Data in the output 'RECORD' is valid
BUSY		Bool	The function block is in use
ERROR		Bool	Error detected
STATUS		Word	Last detected status, possible values: 0= Status OK

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Variable	Class	Type	Description
			1= Profinet stack not started 2= No Ethernet link 7= Device not configured 8= Profinet error 9= No Alarm in log for this device
RECORD		Word	Read data
LENGTH		Int	Read data size in byte

The read alarm log data is moved to the output 'RECORD' by using a block move operation. The user has to configure an array variable for this output with the corresponding number of elements.

Word Offset	Value
0	Date of the ME1PN1FW-Q when the frame has been received
1	
2	Time of the ME1PN1FW-Q when the frame has been received
3	
4	Alarm Type
5	API number used to perform the alarm
6	
7	Alarm Priority
8	ID of the module. Manufacturer specific.
9	
10	ID of the submodule. Manufacturer specific.
11	
12	Slot number of the alarm
13	Subslot number of the alarm
14	Alarm specifier

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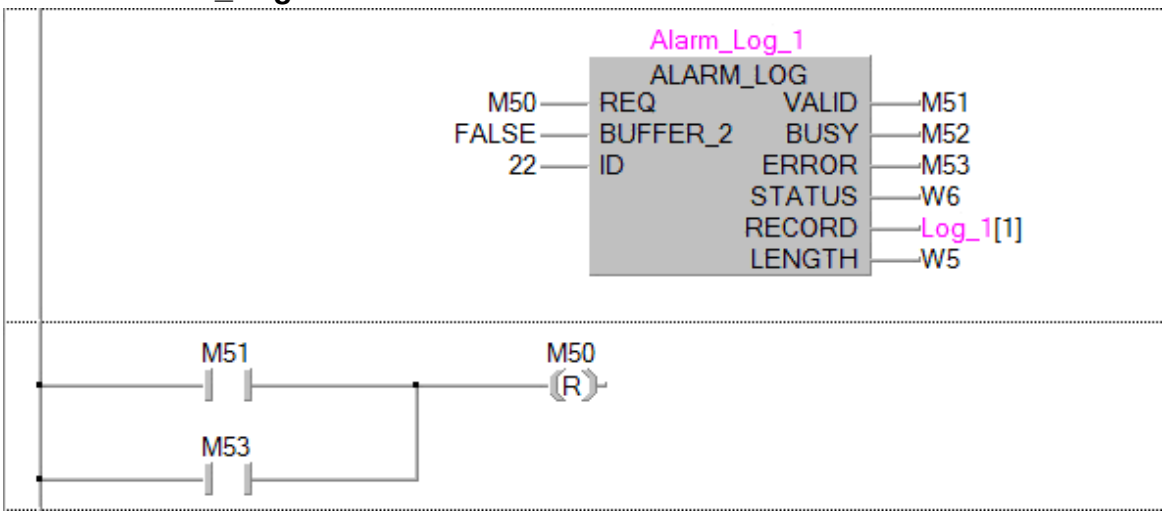
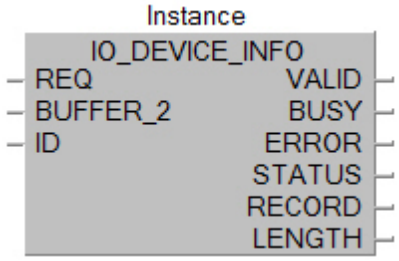
Call FB 'Alarm_Log'



The input 'ID' contains the IO-device number '22'. By setting M50 the alarm request is started. M51 indicates that the requested data has been written to the global variable 'Log_1'.

8.1.8 Function Block 'IO_Device_Info'

This function block reads type information from the specified IO-device.



Variable	Class	Type	Description
REQ	Input	Bool	Start read IO-device information
BUFFER_2		Bool	0=Buffer 1 for acyclic request is used 1=Buffer 2 for acyclic request is used
ID		DWord	Device-ID, shall contain the IP-Address
VALID	Output	Bool	Data in the output 'RECORD' is valid
BUSY		Bool	The function block is in use
ERROR		Bool	Error detected
STATUS		Word	Last detected status, possible values: 0= Status OK 1= Profinet stack not started 10= Device not configured

Variable	Class	Type	Description
RECORD		Word	Read data
LENGTH		Int	Read data size in byte

The read IO-Device information data is moved to the output 'RECORD' by using a block move operation. The user has to configure an array variable for this output with the corresponding number of elements.

Content of the IO-Device information data:

Word Offset	Value
0	MAC address
1	
2	
3	IP address
4	
5	Input area in High Speed Area
6	
7	Output area in High Speed Area
8	
9	Input length
10	Output length
11	Refresh period
12	Number of successful connections
13	Number of disconnections
14	State (Connected / Not Connected)
15	Management (Manual / Automatic)
16	Current Profinet Status

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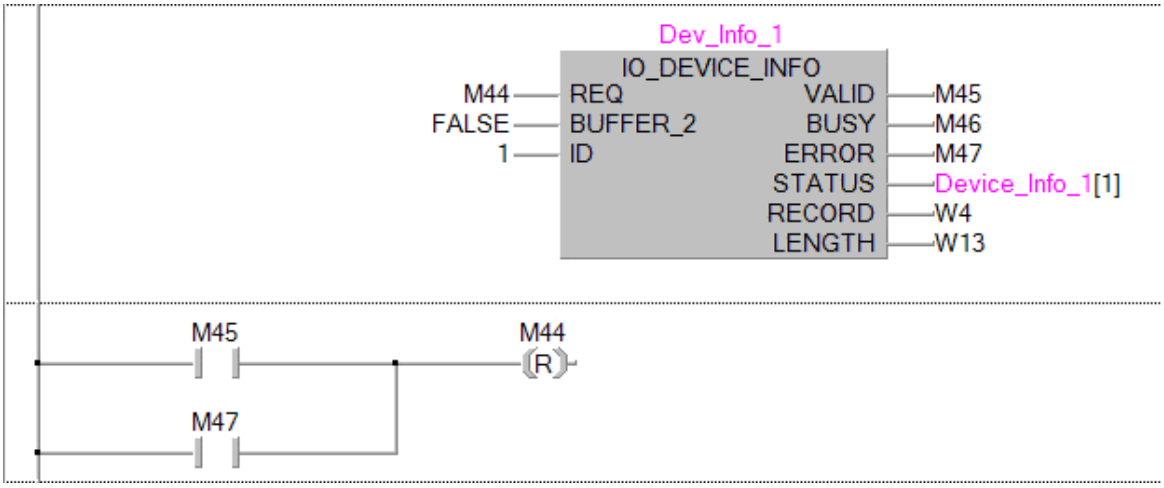
Call FB 'IO_Device_Info'



The input 'ID' contains the IO-device number '1'. By setting M44 the alarm request is started. M45 indicates that the requested data has been written to the global variable 'Device_Info_1'.

8.2 Global Variables

The exported PLC code contains several global variables for addressing the interface of the PROFINET Controller. There are two types of variables:

1. project-independent variables with fixed names and structures related to the PROFINET management and acyclic communication buffers in the PROFINET Controller

2. project-specific variables with editable names and structures related to the cyclic communication data of I/O devices and their modules

The following table lists the global variables and the respective 'Data Unit Types' (DUTs), of which the structure is independent of the IO devices in the network.

Identifier	Type	Contents
vPN_MGMT_OUTPUTS	tPN_MGMT_OUTPUTS: STRUCT IOC_START_STOP: BOOL; IOD_MGT_MODE: ARRAY [0..127] OF BOOL; IOD_START_STOP_DEV: ARRAY [0..127] OF BOOL; IOD_CMD_HSK_Y: ARRAY [0..127] OF BOOL; IOD_MGT_ALARM: ARRAY [0..127] OF BOOL; IOD_CONSIST: ARRAY [0..127] OF BOOL; IOD_INPUT_HSK_Y: ARRAY [0..127] OF BOOL;	Outputs to control the PROFINET Controller (request bits etc.)

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	IOD_OUTPUT_HSK_Y: ARRAY [0..127] OF BOOL; ACYC_HSK_Y_REQ1_EXECUTE: BOOL; ACYC_HSK_Y_REQ2_EXECUTE: BOOL; END_STRUCT;	
vPN_ACYCLIC_REQ1 vPN_ACYCLIC_REQ2	tPN_ACYCLIC_REQ: STRUCT RequestID: DWORD; ServiceID: WORD; Status: WORD; DeviceID: DWORD; API: DWORD; SlotNumber: WORD; SubslotNumber: WORD; Index: WORD; DataLength: INT; PNDeviceID: WORD; PNVendorID: WORD; ARUUID: ARRAY [0..7] OF WORD; Reserve: ARRAY [0..7] OF WORD; Data: ARRAY [0..719] OF WORD; END_STRUCT;	Request buffer for acyclic communication Note: this buffer does not contain I/O data. The I/O data is included in the DUTs/GVs specific to the configured I/O-devices
vPN_CYCLIC_OUTPUTS	tPN_CYCLIC_OUTPUTS: STRUCT LIVE_WORD_Y: WORD; END_STRUCT;	Watchdog request for cyclic communication
vPN_MGMT_INPUTS	tPN_MGMT_INPUTS: STRUCT IOC_STS_CONFIG_OK: BOOL; IOC_STS_CONFIG_DOWNLOADING: BOOL; IOC_STS_KEYFILE_ERROR: BOOL; IOC_STS_STARTED: BOOL; IOC_STS_ERROR_DIAG_SET: BOOL; IOC_STS_PLC_WD_ERR: BOOL; IOD_CMD_HSK_X: ARRAY [0..127] OF BOOL;	Inputs from the PROFINET Controller (handshake, status etc.)

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	IOD_INPUT_HSK_X: ARRAY [0..127] OF BOOL; IOD_OUTPUT_HSK_X: ARRAY [0..127] OF BOOL; ACYC_HSK_Y_RES1_COMPLETED: BOOL; ACYC_HSK_Y_RES2_COMPLETED: BOOL; ACYC_HSK_Y_RES1_ACCEPTED: BOOL; ACYC_HSK_Y_RES2_ACCEPTED: BOOL; IOD_ALARM_IND: ARRAY [0..127] OF BOOL; IOD_CONN_STS: ARRAY [0..127] OF BOOL; IOD_ERR_STS: ARRAY [0..127] OF BOOL; END_STRUCT;	
vPN_ACYCLIC_RES1 vPN_ACYCLIC_RES2	tPN_ACYCLIC_RES: STRUCT RequestID: DWORD; ServiceID: WORD; Status: WORD; DeviceID: DWORD; DataLength: INT; ErrorDecode: WORD; ErrorCode1: WORD; ErrorCode2: WORD; Reserve: ARRAY [0..9] OF WORD; Data: ARRAY [0..729] OF WORD; END_STRUCT;	Response buffer for acyclic communication Note: this buffer does not contain I/O data. The I/O data is included in the DUTs/GVs specific to the configured I/O-devices
vPN_ACYCLIC_DIAG_INPUTS	tPN_ACYCLIC_DIAG_INPUTS: STRUCT ADV_DIAG_ERR_CODE: WORD; ADV_DIAG_ERR_CODE2: WORD; ADV_DIAG_ADD_INFO: ARRAY [0..17] OF WORD; CNF_CRC: ARRAY [0..1] OF WORD; IOD_ADV_STS: ARRAY [0..63] OF	Extended diagnostic information

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	WORD; END_STRUCT;	
vPN_CYCLIC_INPUTS	tPN_CYCLIC_INPUTS: STRUCT LIVE_WORD_X: WORD; END_STRUCT;	Watchdog response for cyclic communication
vPN_DEVICE_DETECT_DATA This is the default type specified in the exported PLC code. User can change the type to the extended version (see below).	tPN_DEVICE_DETECT_DATA: STRUCT VendorID: WORD:=0; DeviceID: WORD:=0; IP_Address: DWORD:=0; Subnetmask: DWORD:=0; Gateway: DWORD:=0; MAC_Address_Bytes1_2: WORD; MAC_Address_Bytes3_4: WORD; MAC_Address_Bytes5_6: WORD; END_STRUCT;	Basic type information of the connected IO devices
vPN_DEVICE_DETECT_DATA This type must be specified for this global variable by the user, if the user sets the 'EXTENDED' input of the function block 'Net_Detect' to 1.	tPN_DEVICE_DETECT_DATA: STRUCT VendorID: WORD:=0; DeviceID: WORD:=0; IP_Address: DWORD:=0; Subnetmask: DWORD:=0; Gateway: DWORD:=0; MAC_Address_Bytes1_2: WORD; MAC_Address_Bytes3_4: WORD; MAC_Address_Bytes5_6: WORD; **Data: ARRAY [0..134] OF WORD;** END_STRUCT;	Extended type information of the connected IO devices This type consists of the structure 'tPN_DEVICE_DETECT_DATA' with an additional word array element to store additional device information.

The global variables are assigned to device addresses in the buffers, which the user has entered in the 'PLC Settings' dialog.

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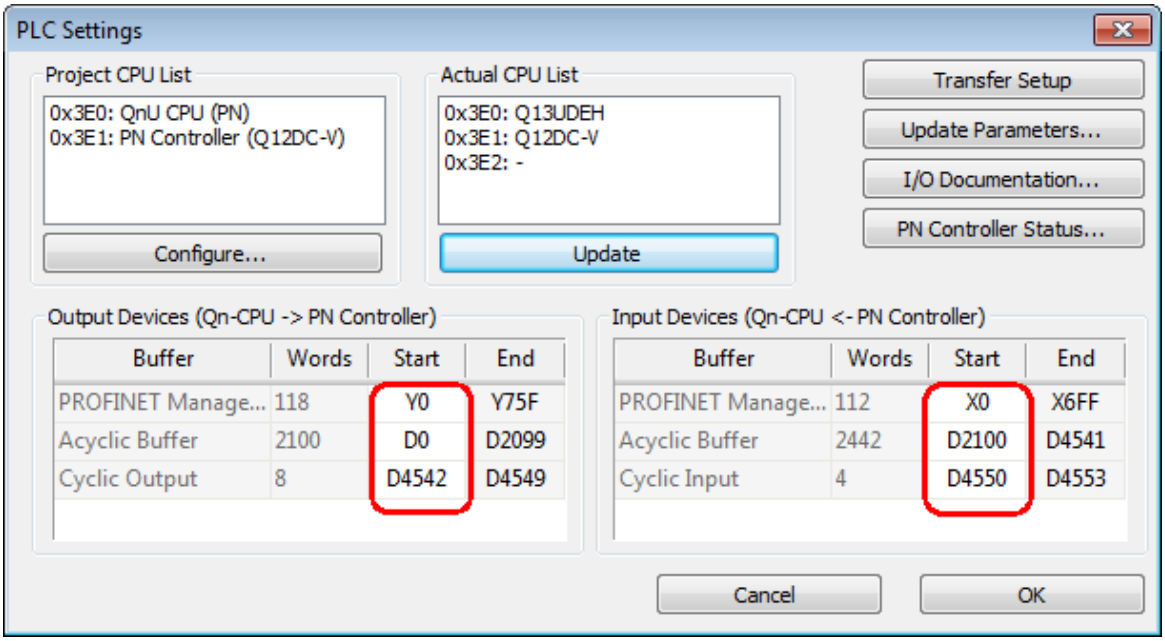
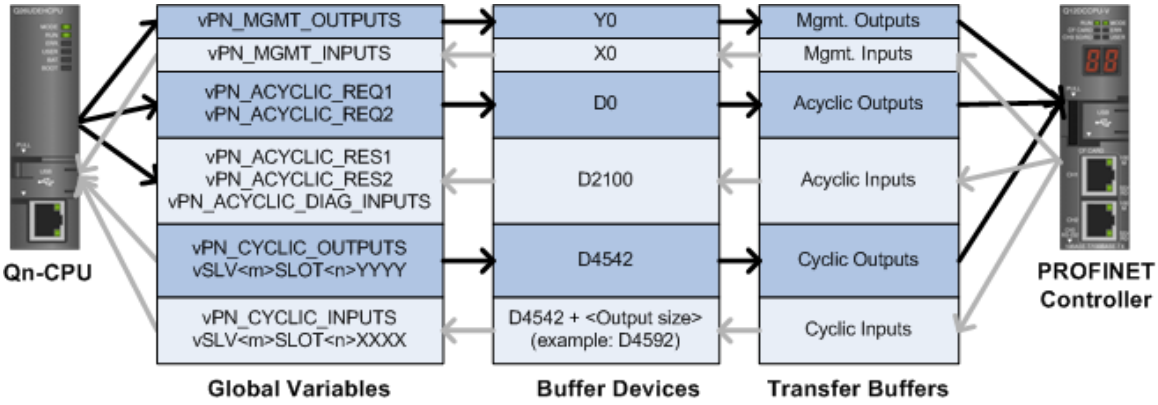


The automatic refresh executed by the Qn-CPU automatically copies the output contents from the buffer devices to the transfer buffers in shared memory and the input contents in the opposite direction. The global variables reference these buffer devices. Thus a read/write access by the PLC program to a global variable equals a read/write access to the respective buffer device.

The following diagram shows the relation between transfer buffers, devices and global variables.



With the default buffer device addresses as shown in the previous screenshot the export PLC code contains the following global variable definitions:

Identifier	Type
vPN_MGMT_OUTPUTS	

Name	Type	MIT-Addr.	IEC-Addr.
IOC_START_STOP	BOOL	Y0	%QX0
IOD_MGT_MODE	ARRAY [0..127] OF BOOL	Y10	%QX16
IOD_START_STOP_DEV	ARRAY [0..127] OF BOOL	Y90	%QX144
IOD_CMD_HSK_Y	ARRAY [0..127] OF BOOL	Y110	%QX272
IOD_MGT_ALARM	ARRAY [0..127] OF BOOL	Y190	%QX400
IOD_CONSIST	ARRAY [0..127] OF BOOL	Y210	%QX528
IOD_INPUT_HSK_Y	ARRAY [0..127] OF BOOL	Y290	%QX656
IOD_OUTPUT_HSK_Y	ARRAY [0..127] OF BOOL	Y310	%QX784
ACYC_HSK_Y_REQ1_EXE(	BOOL	Y390	%QX912
ACYC_HSK_Y_REQ2_EXE(	BOOL	Y391	%QX913

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vPN_ACYCLIC_REQ1

Name	Type	MIT-Addr.	IEC-Addr.
RequestID	DWORD	D0	%MW0.0
ServiceID	WORD	D2	%MW0.2
Status	WORD	D3	%MW0.3
DeviceID	DWORD	D4	%MW0.4
API	DWORD	D6	%MW0.6
SlotNumber	WORD	D8	%MW0.8
SubslotNumber	WORD	D9	%MW0.9
Index	WORD	D10	%MW0.10
DataLength	INT	D11	%MW0.11
PNDeviceID	WORD	D12	%MW0.12
PNVendorID	WORD	D13	%MW0.13
ARUUID	ARRAY [0..7] OF WORD	D14	%MW0.14

vPN_ACYCLIC_REQ2

Name	Type	MIT-Addr.	IEC-Addr.
RequestID	DWORD	D750	%MW0.750
ServiceID	WORD	D752	%MW0.752
Status	WORD	D753	%MW0.753
DeviceID	DWORD	D754	%MW0.754
API	DWORD	D756	%MW0.756
SlotNumber	WORD	D758	%MW0.758
SubslotNumber	WORD	D759	%MW0.759
Index	WORD	D760	%MW0.760
DataLength	INT	D761	%MW0.761
PNDeviceID	WORD	D762	%MW0.762
PNVendorID	WORD	D763	%MW0.763
ARUUID	ARRAY [0..7] OF WORD	D764	%MW0.764

vPN_CYCLIC_OUTPUTS

Name	Type	MIT-Addr.	IEC-Addr.
LIVE_WORD_Y	WORD	D4542	%MW0.4542

vPN_MGMT_INPUTS

Name	Type	MIT-Addr.	IEC-Addr.
IOC_STS_CONFIG_OK	BOOL	X0	%IX0
IOC_STS_CONFIG_DOWNLOADING	BOOL	X1	%IX1
IOC_STS_KEYFILE_ERROR	BOOL	X2	%IX2
IOC_STS_STARTED	BOOL	X3	%IX3
IOC_STS_ERROR_DIAG_SET	BOOL	X10	%IX16
IOC_STS_PLC_WD_ERR	BOOL	X11	%IX17
IOD_CMD_HSK_X	ARRAY [0..127] OF BOOL	X20	%IX32
IOD_INPUT_HSK_X	ARRAY [0..127] OF BOOL	XA0	%IX160
IOD_OUTPUT_HSK_X	ARRAY [0..127] OF BOOL	X120	%IX288
ACYC_HSK_X_RES1_COMPLETED	BOOL	X1A0	%IX416
ACYC_HSK_X_RES2_COMPLETED	BOOL	X1A1	%IX417
ACYC_HSK_X_RES1_ACCEPTED	BOOL	X1A8	%IX424

vPN_ACYCLIC_RES1

Name	Type	MIT-Addr.	IEC-Addr.
RequestID	DWORD	D2100	%MW0.2100
ServiceID	WORD	D2102	%MW0.2102
Status	WORD	D2103	%MW0.2103
DeviceID	DWORD	D2104	%MW0.2104
DataLength	INT	D2106	%MW0.2106
ErrorDecode	WORD	D2107	%MW0.2107
ErrorCode1	WORD	D2108	%MW0.2108
ErrorCode2	WORD	D2109	%MW0.2109
Reserve	ARRAY [0..9] OF WORD	D2110	%MW0.2110
Data	ARRAY [0..729] OF WORD	D2120	%MW0.2120

vPN_ACYCLIC_RES2

Name	Type	MIT-Addr.	IEC-Addr.
RequestID	DWORD	D2850	%MW0.2850
ServiceID	WORD	D2852	%MW0.2852
Status	WORD	D2853	%MW0.2853
DeviceID	DWORD	D2854	%MW0.2854
DataLength	INT	D2856	%MW0.2856
ErrorDecode	WORD	D2857	%MW0.2857
ErrorCode1	WORD	D2858	%MW0.2858
ErrorCode2	WORD	D2859	%MW0.2859
Reserve	ARRAY [0..9] OF WORD	D2860	%MW0.2860
Data	ARRAY [0..729] OF WORD	D2870	%MW0.2870

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vPN_ACYCLIC_DIAG_INPUTS

Name	Type	MIT-Addr.	IEC-Addr.
ADV_DIAG_ERR_CODE	WORD	D3600	%MW0.3600
ADV_DIAG_ERR_CODE2	WORD	D3601	%MW0.3601
ADV_DIAG_ADD_INFO	ARRAY [0..17] OF WORD	D3602	%MW0.3602
CNF_CRC	ARRAY [0..1] OF WORD	D3876	%MW0.3876
IOD_ADV_STS	ARRAY [0..63] OF WORD	D3878	%MW0.3878

vPN_CYCLIC_INPUTS

Name	Type	MIT-Addr.	IEC-Addr.
LIVE_WORD_X	WORD	D4592	%MW0.4592

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9 Appendix

9.1 Troubleshooting

9.1.1 Factory Default Settings

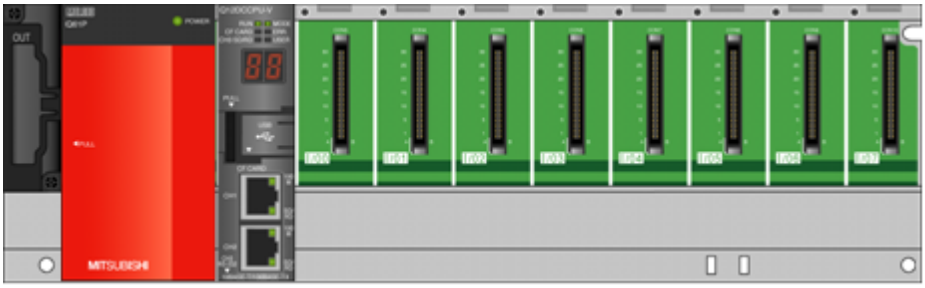
Problem

The ME1PN1FW-Q cannot be accessed from GX Configurator-PN, although network address settings and cabling are correct.

Solution

To reset the ME1PN1FW-Q to its factory default settings execute the following operations.

Important: the ME1PN1FW-Q must be placed alone in the first slot (marked 'CPU') of the PLC backplane and the CF card must be removed from its card reader slot!).



Note: the position of the LEDs and the switches is indicated in the section 'PROFINET Controller ME1PN1FW-Q'.

1. set the MODE/STOP/RUN switch on the front to the MODE position

2. reset the module by setting the RESET/SELECT switch to the RESET position and then back to the middle position or power-cycle the CPU

3. confirm that the mode LED shows an **orange** light and the 7-segment LED displays '**00**'

4. set the MODE/STOP/RUN switch to the STOP position

5. set the RESET/SELECT switch to the SELECT position multiple times, until the 7-segment display displays '**11**'

6. set the MODE/STOP/RUN switch to the RUN position

7. confirm that the **green** RUN LED is flashing first and then turns off with the 7-segment LED displaying '**00**'

8. set the MODE/STOP/RUN switch to the STOP position

9. reset the module by setting the RESET/SELECT switch to the RESET position and then back to the middle position

10. confirm that the MODE LED shows a steady **green** light and both RUN and USER LEDs show a flashing **green** light

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11. confirm that after a while both RUN and USER LEDs turn off and the MODE LED flashes **green**

Note: for the following steps the controlling Qn-CPU can be inserted into the PLC rack and the PROFINET Controller module can be moved to the slot next to it, after power has been turned off.

Activate the PROFINET functionality on the ME1PN1FW-Q with these operations

1. insert the CF card with the PROFINET I/O software and reset the module.

2. wait, until the 7-segment LED shows '**AA**'

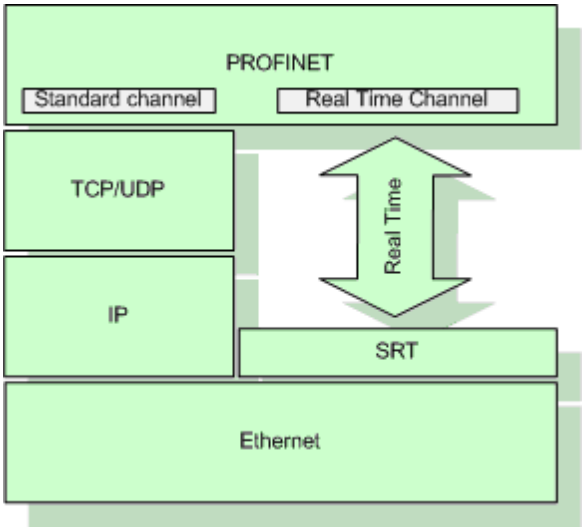
3. start GX Configurator-PN and download the configuration (this includes setting the IP address from the default setting 192.168.3.3 to the address assigned in the GX Configurator-PN project)

9.2 Introduction to PROFINET IO

PROFINET is an industrial communications protocol based on Ethernet which was created by PROFIBUS International. Depending on the tasks to be carried out, PROFINET uses different communication layers of the OSI model:

- ✓ Layer 4 (transport): "TCP/UDP" for all configuration exchanges.
- ✓ Layer 2 (Link): "Ethernet" for process data exchanges such as inputs/outputs and alarms.

The network controller is called the IO-Controller (Master) and the Devices called IO-Device (Slave). With PROFINET, different network topologies may be realized. The most common are the star and the bus.



Protocols Used by PROFINET

Discovery and basic Configuration Protocol (DCP)

This protocol is based on Ethernet (level 2). Amongst other things it enables the presence of an IO-Device to be detected on the network and its IP configuration to be read or written. This protocol will be mainly used in two phases:

- Network configuration: assignment of names and IP addresses to the IO-Devices.
- Establishing a connection: detection of the presence of the IO-Device and the control/adaptation of its IP address

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Remote Procedure Call (RPC)

This protocol is based on TCP/UDP. It is used to execute the connection phase to an IO-Device together with all data block read/write accesses.

Real Time Acyclic (RTA)

This protocol is based on Ethernet (level 2). This protocol is used to exchange alarms between the IO-Device and the IO-Controller.

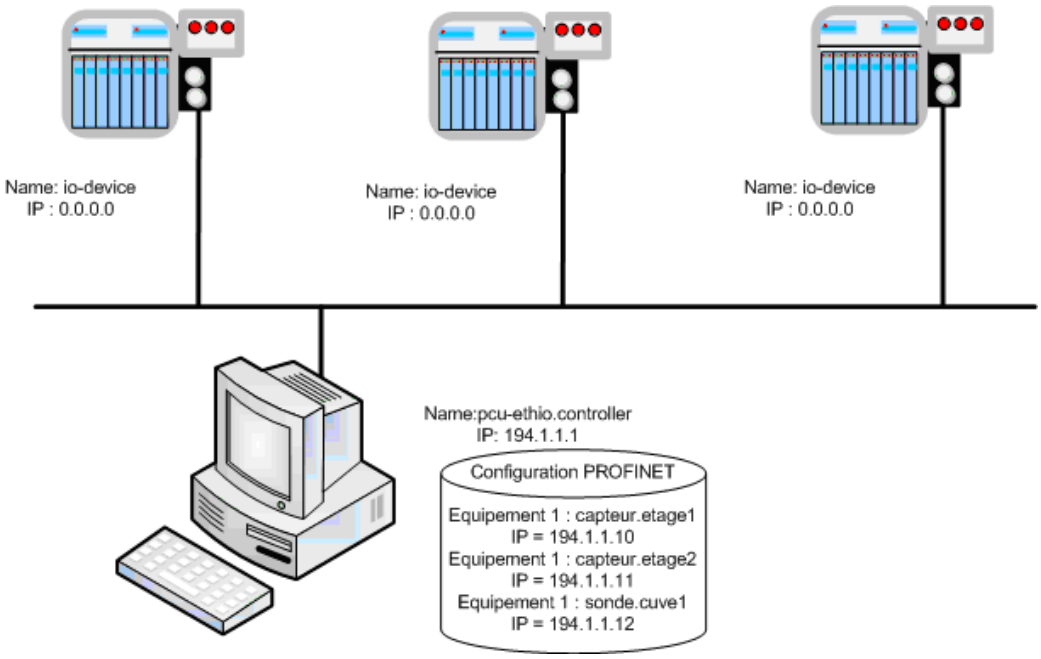
Real Time Cyclic (RTC)

This protocol is based on Ethernet (level 2). This protocol is used to exchange cyclic input/output data.

Addressing of PROFINET components on the Ethernet network

The DCP protocol is used to detect the presence of a PROFINET station on the network. DCP is a layer 2 protocol (Ethernet). For this reason it does not use IP addressing to find PROFINET components, but their PROFINET name. One of the features of the PROFINET protocol is that each PROFINET component must be named. This name is known as its PROFINET name (DCP Name). Then once the component has been identified on the network, DCP gives the option of assigning the IP configuration of the IO-Device. This addressing is mandatory as PROFINET uses TCP/UDP and IP layers.
When a PROFINET network is installed, the first thing to do is to name all the IO-Devices present on the network uniquely. This task can be carried out using the 'Online Action Tool' in GX Configurator-PN.

A newly-wired PROFINET network:



Note that at startup, each IO-Device has the same name and same IP address.

A PROFINET network with IO-Devices named correctly from the engineering tool:

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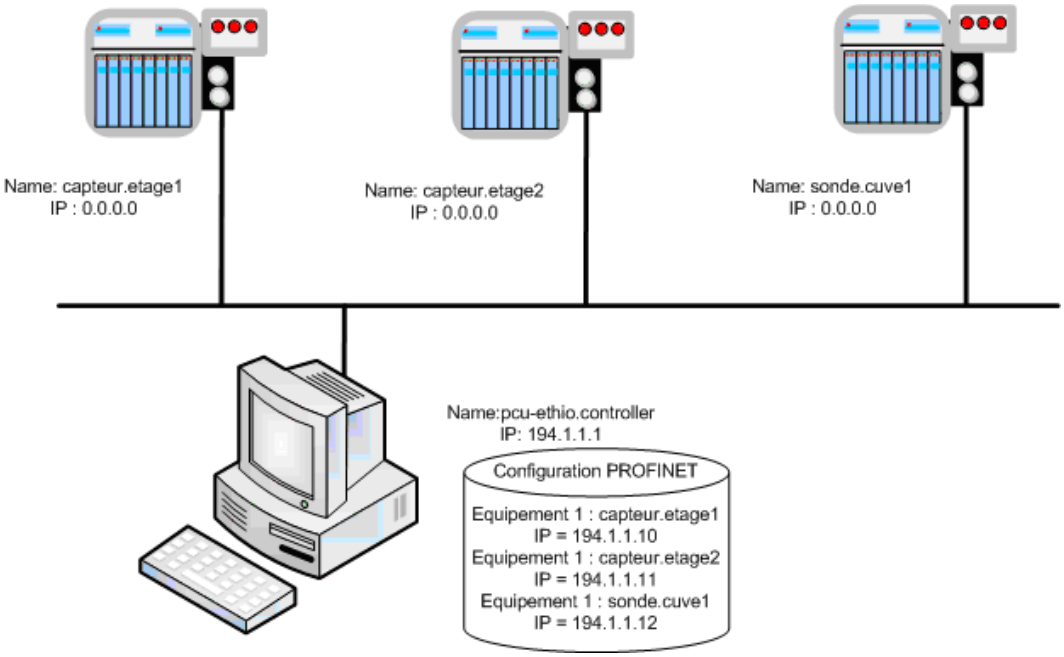
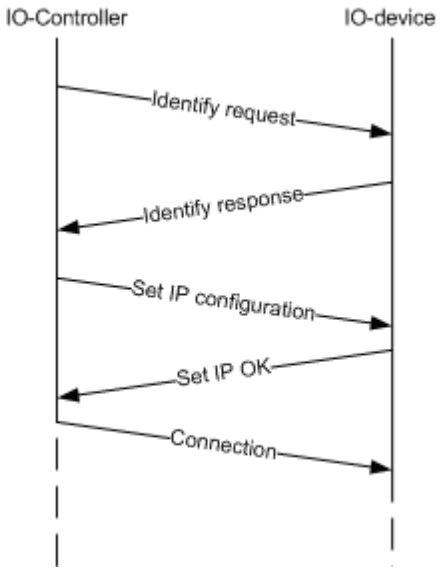


Note that all the IO-Devices present have a unique name (sensor.stage1, sensor.stage2 and probe.tank1). However, the IP addresses of these IO-Devices remain set to 0.0.0.0.

During a connection phase, the IO-Controller starts by searching for an IO-Device using a multicast request commonly called "identify". When the IO-Device replies, the IO-Controller checks if the IP parameters of the IO-Device are definitely those configured. If not, then the IP-Controller assigns the correct IP configuration to the IO-Device. Once this sequence has been completed, the IO-Controller will be able to establish a connection with the IO-Device.



A PROFINET network with IO-Devices connected to an IO-Controller:

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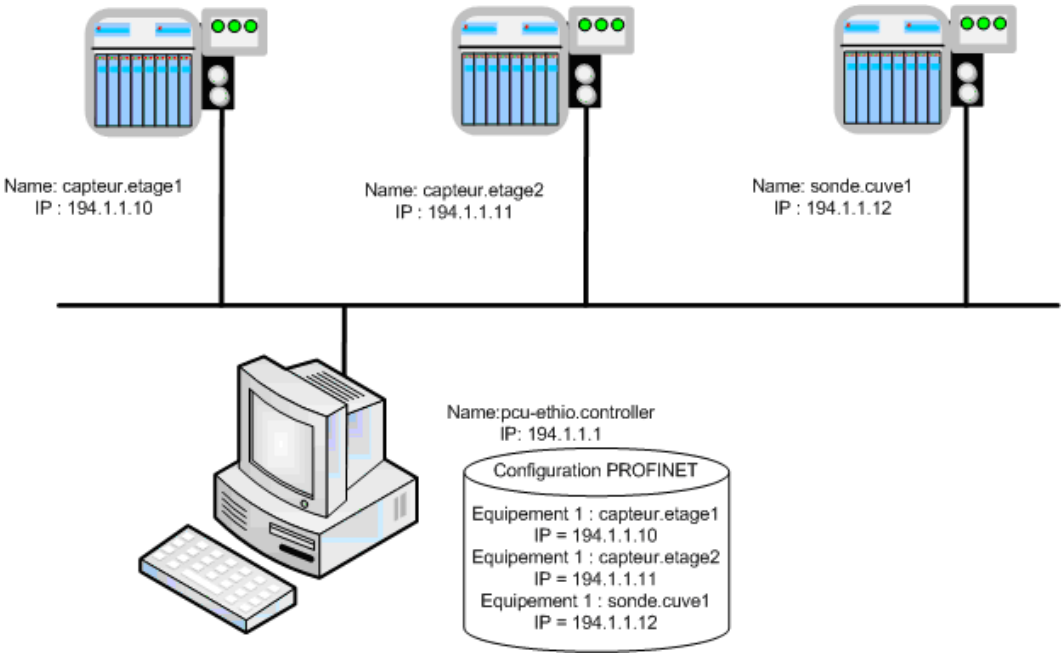
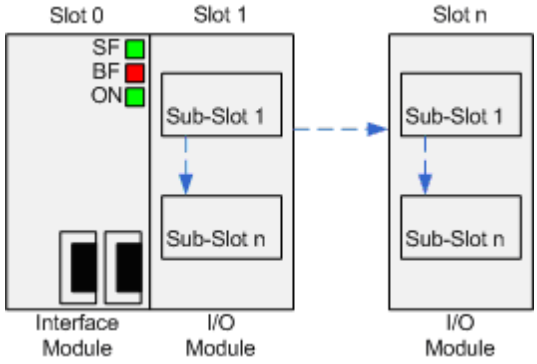


During the connection, the IO-Controller assigns the IP address to each of the IO-Devices.
After this, the PROFINET network is correctly configured. IP address conflicts have been avoided.
The whole of this sequence is made possible by the DCP protocol.

Architecture of an IO-Device

The PROFINET IO input/output devices obey a uniform device model. This model allows compact field devices to be configured as modules.



A PROFINET IO input/output device is made up of slots, themselves made up of sub-slots. The input/output data is situated at sub-slot level. This organization may reflect a real or virtual situation.
In addition to the input/output modules, each IO-Device contains at least one DAP (Device Access Point). To establish a connection, the IO-Controller connects to the DAP. The standard defines the DAP as an input module like any other. However, the DAP is often a module found on slot 0 of the IO-Device with an output size equal to 0.
A PROFINET IO-Device is configured by means of a GSD file. This file, in XML format, concentrates all the features and essential data in one place:

- Properties of the device (transmission parameters, etc.)
- Number and size of compatible modules
- Configuration of each module
- Module parameters

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The GSD files are provided by the manufacturer of your equipment.

Data Exchange (I/O)

The exchange of input/output data in PROFINET-IO is based on the producer/consumer model. This model is asynchronous. The IO-Controller produces outputs for the IO-Device and the IO-Controller consumes inputs from the IO-Device and vice versa.
The refresh period determines the production/consumption time. This time is defined for each IO-Device. In a complete configuration, the network cycle time is equivalent to the largest refresh period of the configuration.

Example

IO-Device Name	Refresh Period
io-device1	8 ms
io-device2	32 ms
io-device3	16 ms

In the case of configuration 1, the largest refresh period is 32 ms (io-device2). The network cycle time is 32 ms. This means that every 32 ms, all inputs/outputs will have been refreshed at least once.
The diagnostic model of PROFINET input/output exchanges defines, in addition to process data, IOxS (IOPS or IOCS) typed data:

IOPS - Input Output Object Provider Status

An IOPS is associated with the input/outputs from each slot/sub-slot. This status indicates the quality of the data produced from each slot/sub-slot to the consumer.
The possible values are:

- GOOD (0x80)
- BAD_BY_DEVICE (0x60)
- BAD_BY_CONTROLLER (0x40)
- BAD_BY_SUBSLOT (0x00)

IOCS - Input Output Object Consumer Status

An IOCS is associated with the input/outputs from each slot/sub-slot. This status indicates the quality of the data consumed at each slot/sub-slot to the producer.
The possible values are:

- GOOD (0x80)
- BAD_BY_DEVICE (0x60)
- BAD_BY_CONTROLLER (0x40)
- BAD_BY_SUBSLOT (0x00)

The representation of the inputs/outputs of an IO-Device in engineering tool includes the process data (I/O data) and the diagnostic data (IOPS and IOCS).
Example 1: The inputs/outputs of an IO-Device contains the process data (I/O data) and the diagnostic data (IOPS and IOCS)

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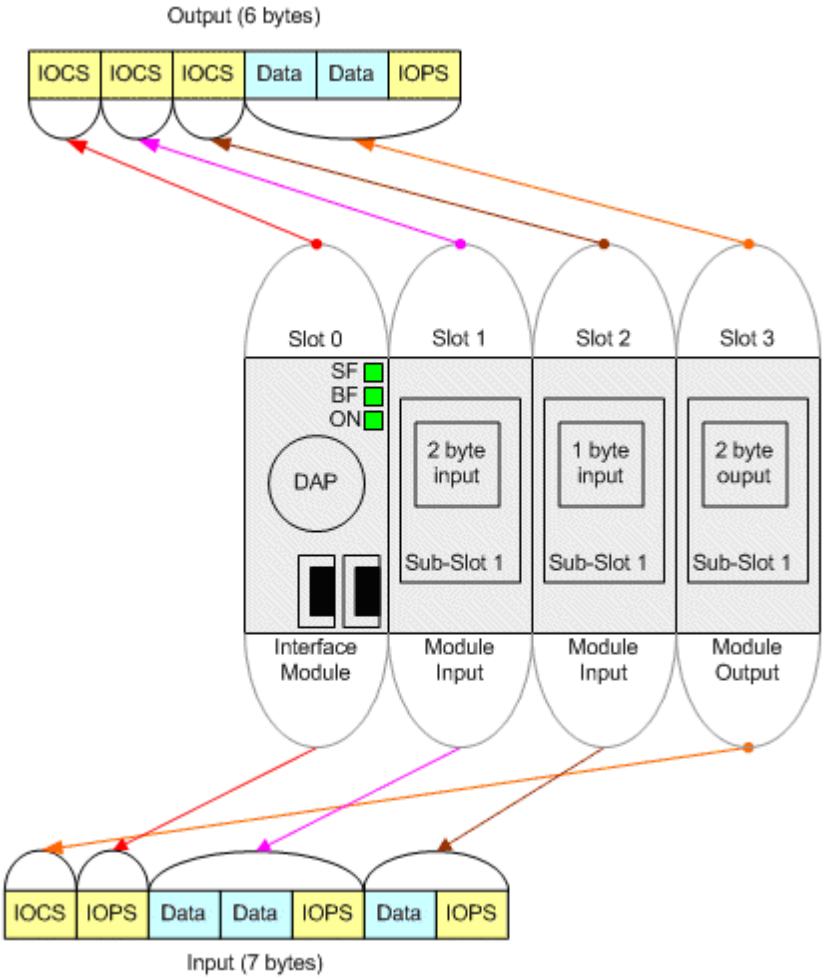

In the example above, the IO-Device is made up of:

- 1 2-byte input module
- 1 1-byte input module
- 1 2-byte output module

For the IO-Device taken in the example, with 2 process output bytes and 3 input bytes, the IO-Controller has to manage 7 input bytes and 6 output bytes.

	Slot 0			Slot 0			Slot 0			Slot 0		
	IOPS	IOCS	data	IOPS	IOCS	data	IOPS	IOCS	data	IOPS	IOCS	data
Output = 6 bytes		1			1			1		1		2
Input = 7 bytes	1		0	1		2	1		1		1	

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