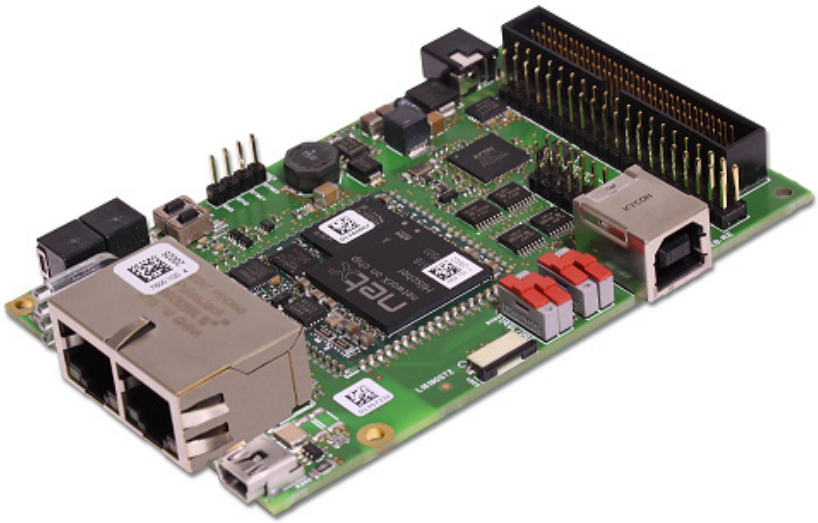
Getting Started

netRAPID Chip Carrier



Hilscher Gesellschaft für Systemautomation mbH

www.hilscher.com

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1 Introduction

1.1 About this document

1.1.1 Description of the contents

This Getting Started Guide describes typical use cases for the Hilscher netRAPID chip carrier and the netRAPID Evaluation Boards. The purpose of this document is to provide OEM developers, who want to integrate (design-in) the netX based netRAPID communication interface into their own host device, with the information they need in order to successfully test and evaluate the netRAPID chip carrier (respectively the netRAPID Evaluation Boards) before they build a host device prototype or baseboard for the netRAPID.

Technical details needed for physically embedding the netRAPID into the host device/baseboard of the OEM manufacturer are not subject of this document. Technical details like dimensions/footprints, soldering profiles, signal descriptions and pin assignments are provided in the
Design Guide *netRAPID Chip Carrier*, DOC111004DGxxEN,
which is stored on the **netRAPID Evaluation DVD** (NRPEB product DVD) in the `Documentation\1. netRAPID Manuals` directory.

1.1.2 List of revisions

Index	Date	Chapter	Revisions
1	2013-12-12	All	Created
2	2014-07-31	All	One hour time restriction replaces 2 Byte I/O data restriction in limited RTE firmware
		1.1.4	Reference to PROFINET IO Device firmware **V3.6** in section *Reference to hardware, firmware, software and drivers* added
		1.2	Section *netRAPID products* with pictures added
		3.2	Description of time restriction in limited RTE firmware in section *Choosing the right firmware* added
		4.3.2	Section *Configuring NRP 51-RE/ECS or NRP 52-RE*/ECS with SYCON.net updated (1 Byte I/O data restriction in limited EtherCAT has been replaced by one hour time restriction)
		5	Chapter *LED Descriptions* added
		6	Chapter *Technical Data* added
3	2016-12-14	All	POWERLINK Controlled Node and VARAN Client added Firmware and software versions updated Paths on NRPEB product DVD updated References to combined SSBL-firmware image deleted
		1.2.2	Wording of limitations of PROFIBUS DP Slave corrected to “2 bytes output / 2 bytes input”
		3.2	Error Code for one our time limitation of OpenModbus/TCP limited firmware added
		5	Chapter *LED Descriptions* updated
		5.9	Section *Ethernet/IP Adapter LEDs on NRPEB 52-RE* added
		5.10	Section *POWERLINK Controlled Node LEDs on NRPEB 52-RE* added
		5.11	Section *VARAN Client LEDs on NRPEB 52-RE* added
4	2017-09-06	Title	Title image changed
		All	New products *NRP 51-RE* and *NRPEB 51-RE* (evaluation board) added. *NRPEB-CCS* renamed to *NRPEB 10-CCS*, *NRPEB-DPS* renamed to *NRPEB 10-DPS*, and *NRPEB-RE2* renamed to *NRPEB 52-RE*
		1.4	Section *Legal notes* updated
		2.2	Section *netRAPID Evaluation Boards* revised
		3.4.4	Section *Downloading firmware from PC via USB and SPM host interface (NRPEB 51-RE only)* added
		4.2.5	Section *Downloading firmware to the NRPEB 51-RE via SPM USB interface* added

Table 1: List of revisions

1.1.3 Conventions in this Document

Notes, operation instructions and results of operation steps are marked as follows:

Notes

Important: <important note>

Note: <note>

<note, where to find further information>

Operation instructions

1. <Operational step>
   - ➢ <Instruction>
   - ➢ <Instruction>
2. <Operational step>
   - ➢ <Instruction>
   - ➢ <Instruction>

Results

- ⇘ <Intermediate result>
- ⇨ <Final result>

1.1.4 Reference to hardware, firmware, software and drivers

netRAPID Chip Carriers

This document relates to the following netRAPID Chip Carriers and their firmware:

netRAPID	Part no.	For network protocol	Firmware name	Part no. firmware	Firmware file	Firmware version
NRP 10-DPS	Device: 7650.420 Tray: 7652.420	PROFIBUS DP Slave	NRPLFW-DPS	7601.420	R0502000.nxf *Limited version: R05Z2000.nxf*	2.9
NRP 10-CCS	Device: 7650.740 Tray: 7652.740	CC-Link Slave	NRPLFW-CCS	7601.740	R0509000.nxf *Limited version: R05Z9000.nxf*	2.11
NRP 51-RE	Device: 7660.101 Tray: 7662.101	EtherCAT Slave	NRPLFW-ECS	7601.120	R060F000.nxf *Limited version: R06ZF000.nxf*	4.7
		PROFINET IO Device	NRPLFW-PNS	7601.850	R060D000.nxf *Limited version: R06ZD000.nxf*	3.12
		Sercos Slave	NRPLFW-S3S	7601.160	R060J000.nxf *Limited version: R06ZJ000.nxf*	3.5
		Open Modbus/TCP	NRPLFW-OMB	7601.860	R060L000.nxf *Limited version: R06ZL000.nxf*	2.6
		EtherNet/IP Adapter	NRPLFW-EIS	7601.830	R060H000.nxf *Limited version: R06ZH000.nxf*	2.13
		POWERLINK Controlled Node	NRPLFW-PLS	7601.180	R060K000.nxf *Limited version: R06ZK000.nxf*	3.3
		VARAN Client	NRPLFW-VRS	7601.810	R060T000.nxf *Limited version: R06ZT000.nxf*	1.1

Table 2: Reference to Chip Carriers and firmware (1)

netRAPID	Part no.	For network protocol	Firmware name	Part no. firmware	Firmware file	Firmware version
NRP 51-RE/F8T (planned)	Device: 7660.100 Tray: 7662.100	EtherCAT Slave	NRPLFW-ECS	*tbd*	*tbd*	*tbd*
		PROFINET IO Device	NRPLFW-PNS	*tbd*	*tbd*	*tbd*
		Sercos Slave	NRPLFW-S3S	*tbd*	*tbd*	*tbd*
		Open Modbus/TCP	NRPLFW-OMB	*tbd*	*tbd*	*tbd*
		EtherNet/IP Adapter	NRPLFW-EIS	*tbd*	*tbd*	*tbd*
		POWERLINK Controlled Node	NRPLFW-PLS	*tbd*	*tbd*	*tbd*
		VARAN Client	NRPLFW-VRS	*tbd*	*tbd*	*tbd*
NRP 52-RE	Device: 7670.100 Tray: 7672.100	EtherCAT Slave	NRPLFW-ECS	7601.120	R070F000.nxf *Limited version: R07ZF000.nxf*	4.7
		PROFINET IO Device	NRPLFW-PNS	7601.850	R070D000.nxf *Limited version: R07ZD000.nxf*	4.3
		Sercos Slave	NRPLFW-S3S	7601.160	R070J000.nxf *Limited version: R07ZJ000.nxf*	3.5
		Open Modbus/TCP	NRPLFW-OMB	7601.860	R070L000.nxf *Limited version: R07ZL000.nxf*	2.6
		EtherNet/IP Adapter	NRPLFW-EIS	7601.830	R070H000.nxf *Limited version: R07ZH000.nxf*	3.3
		POWERLINK Controlled Node	NRPLFW-PLS	7601.180	R070K000.nxf *Limited version: R07ZK000.nxf*	3.3
		VARAN Client	NRPLFW-VRS	7601.810	R070T000.nxf *Limited version: R07ZT000.nxf*	1.1

Table 3: Reference to Chip Carriers and firmware (2)

netRAPID Evaluation Boards

This document relates to the following netRAPID Evaluation Boards. Each Evaluation Board is equipped with a soldered-on netRAPID Chip Carrier:

Evaluation Board	Part no. hardware	For network protocol	Equipped with netRAPID
NRPEB 10-DPS	7600.420	PROFIBUS DP Slave	NRP 10-DPS
NRPEB 10-CCS	7600.740	CC-Link Slave	NRP 10-CCS
NRPEB 51-RE	7600.100	EtherCAT Slave	NRP 51-RE/F8T
		PROFINET IO Device	
		Sercos Slave	
		Open Modbus/TCP	
		EtherNet/IP Adapter	
		POWERLINK Controlled Node	
		VARAN Client	
NRPEB 52-RE	7600.200	EtherCAT Slave	NRP 52-RE
		PROFINET IO Device	
		Sercos Slave	
		Open Modbus/TCP	
		EtherNet/IP Adapter	
		POWERLINK Controlled Node	
		VARAN Client	

Table 4: Reference to Evaluation Boards

Software

This document relates to the following versions of software tools for configuration and downloading firmware:

Software	Version	File name	Path on NRPEB product DVD
SYCON.net	1.400.x.x	SYCONnet netX setup.exe	`Software\SYCON.net`
netX Bootwizard	1.4.x.x	bootwizard_1.4.x.x_setup	`Tools\Bootwizard`
netHOST Device Test Application	1.2.x.x	netHOST.exe	`Tools\netHost\x64 [or] x86`
cifX Driver Test Application	1.2.x.x	Included in cifX Device Driver Installation	
cifX Driver Setup Utility	1.2.x.x		

Table 5: Reference to Software

Drivers

This document relates to the following driver versions:

Driver	Version	File name	Path on NRPEB product DVD
cifX Device Driver	1.3.x.x	cifX Device Driver Setup	`Driver and Toolkit\Device Driver (NXDRV-WIN)\Installation`
USB drivers for Windows	drivers	setup	`Driver and Toolkit\USB Diagnostic Driver`

Table 6: Reference to Drivers

1.2 netRAPID products

1.2.1 netRAPID TRAY (24 pieces)

netRAPID Chip Carriers can be obtained in trays containing 24 pieces.

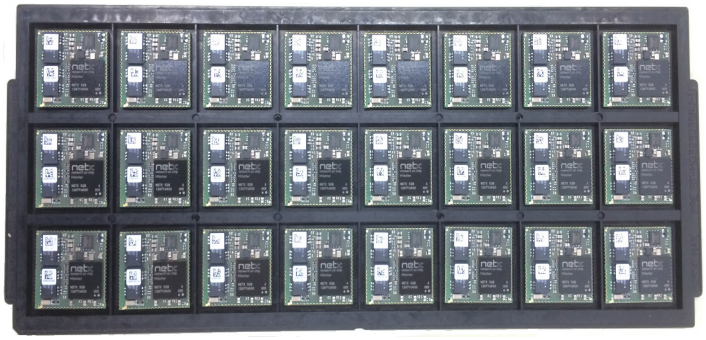

Figure 1: netRAPID TRAY

NRP 10-DPS TRAY: 24 pieces of NRP 10-DPS Chip Carriers (PROFIBUS DP Slave), Part no.: 7652.420

NRP 10-CCS TRAY: 24 pieces of NRP 10-CCS Chip Carriers (CC-Link Slave), Part no.: 7652.740

NRP 51-RE TRAY: 24 pieces of NRP 51-RE Chip Carriers (Real-Time-Ethernet Slave), Part no.: 7662.101

NRP 51-RE\F8T TRAY (planned): 24 pieces of NRP 51-RE\F8T Chip Carriers (Real-Time-Ethernet Slave), Part no.: 7662.100

NRP 52-RE TRAY: 24 pieces of NRP 52-RE Chip Carriers (Real-Time-Ethernet Slave), Part no.: 7672.100

1.2.2 netRAPID Evaluation Boards

netRAPID Evaluation Boards (NRPEB) for evaluating the netRAPID can be obtained from Hilscher. Each Evaluation Board is equipped with a soldered-on netRAPID and is shipped with three extra netRAPID Chip Carriers.

Figure 2: netRAPID Evaluation Board

NRPEB 10-DPS: netRAPID PROFIBUS Evaluation Board, Part no.: 7600.420

NRPEB 10-CCS: netRAPID CC-Link Evaluation Board, Part no.: 7600.740

NRPEB 51-RE: netRAPID Real-Time-Ethernet Evaluation Board, Part no.: 7600.100

NRPEB 52-RE: netRAPID Real-Time-Ethernet Evaluation Board, Part no.: 7600.200

The **netRAPID Evaluation DVD** (NRPEB product DVD) containing the accompanying software can be downloaded from our Hilscher website in the **Support** > **Downloads** section:
https://www.hilscher.com/support/downloads/

The **netRAPID Evaluation DVD** features:

- Limited versions of Loadable Firmware (LFW) for testing and evaluation purposes for all netRAPID types. The limitations are:

  PROFIBUS DP Slave:
  - 2 bytes output / 2 bytes input.
  - Fixed station address `32`

  CC-Link Slave:
  - 2 bytes I/O data exchange
  - Fixed station address `32`.
  - `Remote IO Station` only

  Real-Time Ethernet slaves:
  (EtherCAT Slave, PROFINET IO Device, EtherNet/IP Adapter, Sercos Slave, Open Modbus/TCP, POWERLINK Controlled Node, VARAN Client):
  - Communication task stops after one hour

- Software tools for configuring the netRAPID, for downloading firmware and for testing I/O communication
- C-Toolkit (source code for developers of non-Windows target platforms and embedded systems)
- USB drivers for Windows (needed for accessing the USB diagnostic interface of the netRAPID from a Windows configuration PC)
- cifX Device Driver (needed for accessing the host interface of the netRAPID from a Windows PC via PCI)
- PDF documentation for users and developers

1.2.3 Standard Loadable Firmware DVDs

DVDs containing licensed Standard Loadable Firmware with full standard functionality for the netRAPID and the chosen network communication protocol can be obtained from Hilscher under a simple license agreement. The firmware needs to be acquired once and can then be used on an infinite number of netRAPIDs.

NRPLFW-DPS: Loadable PROFIBUS DP Slave Firmware for NRP 10-DPS, Part no.: 7601.420

NRPLFW-CCS: Loadable CC-Link Slave Firmware for NRP 10-CCS, Part no.: 7601.740

NRPLFW-ECS: Loadable EtherCAT Slave Firmware for NRP 51-RE, NRP 51-RE\F8T and NRP 52-RE, Part no.: 7601.120

NRPLFW-PNS: Loadable PROFINET IO Device Firmware for NRP 51-RE, NRP 51-RE\F8T and NRP 52-RE, Part no.: 7601.850

NRPLFW-S3S: Loadable Sercos Slave Firmware for NRP 51-RE, NRP 51-RE\F8T and NRP 52-RE, Part no.: 7601.160

NRPLFW-OMB: Loadable Open Modbus/TCP Firmware for NRP 51-RE, NRP 51-RE\F8T and NRP 52-RE, Part no.: 7601.860

NRPLFW-EIS: Loadable EtherNet/IP Adapter Firmware for NRP 51-RE, NRP 51-RE\F8T and NRP 52-RE, Part no.: 7601.830

NRPLFW-PLS: Loadable POWERLINK Controlled Node Firmware for NRP 51-RE, NRP 51-RE\F8T and NRP 52-RE, Part no.: 7601.180

NRPLFW-VRS: Loadable VARAN Client Firmware for NRP 51-RE, NRP 51-RE\F8T and NRP 52-RE, Part no.: 7601.810

1.3 Documentation overview

This section lists documents that are relevant to the user of the netRAPID Chip Carrier.

Basic documents

Title	Contents	Document ID	Path on the NRPEB product DVD
Getting Started *netRAPID Chip Carrier* **(this document)**	Describes typical use cases of the netRAPIDs and the netRAPID Evaluation Boards, like downloading firmware, configuration and testing of I/O data	DOC131104GSxxEN	`Documentation\1. netRAPID Manuals \EN\netRAPID Getting Started GS xx EN.pdf`
Design Guide *netRAPID Chip Carrier*	Provides technical details for integrating (embedding) the netRAPID into the hardware of the host system of the OEM (design-in manufacturer)	DOC111004DGxxEN	`Documentation\1. netRAPID Manuals \EN\netRAPID Chip Carrier Design Guide xx EN.pdf`

Table 7: Basic documentation for netRAPID

Programming manuals

Title	Contents	Document ID	Path on the NRPEB product DVD
Dual-Port Memory Interface Manual *Dual-Port Memory Interface – netX based Products*	Describes the user interface respectively the dual-port memory for netX-based products	DOC060302DPMxxEN	`Documentation\5. Programming Manuals\EN\2. Dual-Port Memory Interface Manual\netX Dual-Port Memory Interface DPM xx EN`
Toolkit Manual *cifX/netX Toolkit – DPM*	Describes the implementation of the cifX/netX Toolkit and the porting to own operating systems	DOC090203TKxxEN	`Documentation\5. Programming Manuals\EN\1. Driver Toolkit Manual\cifX netX Toolkit - DPM TK xx EN`

Table 8: Programming manuals for netX-based products

netRAPID as PROFIBUS DP Slave

If you are using an **NRP 10-DPS**, you might also find the following documents useful:

Title	Contents	Document ID	Path on the NRPEB product DVD
Protocol API *PROFIBUS DP Slave*	Describes the application interface of the PROFIBUS DP slave stack implementation on the netX chip	DOC050401APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\PROFIBUS DP Slave\DP Slave Protocol API xx EN.pdf`
Operating Instruction Manual *DTM for Hilscher PROFIBUS DP Slave Device*	Description of the device type manager for Hilscher PROFIBUS DP slave devices	DOC091001OIxxEN	`Documentation\2. Configuration Manuals\EN\2. SYCON.net Protocol Specific Configuration Dialogs\PROFIBUS DP Slave DTM OI xx EN.pdf`

Table 9: Additional documentation for NRP 10-DPS

netRAPID as CC-Link Slave

If you are using an **NRP 10-CCS**, you might also find the following documents useful:

Title	Contents	Document ID	Path on the NRPEB product DVD
Protocol API *CC-Link Slave*	Describes the application interface of the CC-Link Slave Stack implementation on the netX chip	DOC071101APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\CC-Link Slave\CC-Link Slave Protocol API xx EN.pdf`
Operating Instruction Manual *netSLAVE DTM for Hilscher netX Slave Devices*	Description of the device type manager for Hilscher slave devices	DOC080801OIxxEN	`Documentation\2. Configuration Manuals\EN\2. SYCON.net Protocol Specific Configuration Dialogs\netSlave DTM OI xx EN.pdf`

Table 10: Additional documentation for NRP 10-CCS

netRAPID as EtherCAT Slave

If you are using the EtherCAT Slave protocol, you might also find the following documents useful:

Title	Contents	Document ID	Path on the NRPEB product DVD
Protocol API *EtherCAT Slave V4.6.0*	Describes the application interface of the EtherCAT Slave Stack implementation on the netX chip	DOC110909APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\EtherCAT Slave V4\EtherCAT Slave V4 Protocol API xx EN.pdf`
Operating Instruction Manual *DTM for Hilscher EtherCAT Slave Device*	Description of the device type manager for Hilscher EtherCAT slave devices	DOC110702OIxxEN	`Documentation\2. Configuration Manuals\EN\2. SYCON.net Protocol Specific Configuration Dialogs\EtherCAT Slave DTM OI xx EN.pdf`

Table 11: Additional documentation for NRP 51/52-RE/ECS

netRAPID as PROFINET IO Device

If you are using the PROFINET IO Device protocol, you might also find the following documents useful:

Title	Contents	Document ID	Path on the NRPEB product DVD
Protocol API *PROFINET IO Device - Supplement V4*	Describes the differences between the PROFINET IO RT/IRT Device Stack V3.5 and the PROFINET IO RT Device Stack V4	DOC140103APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\PROFINET IO Device V3.6\PROFINET IO Device Supplement V4 API xx EN.pdf`
Protocol API *PROFINET IO RT/IRT Device V3.10.0*	Describes the application interface of the PROFINET IO Device Stack implementation on the netX chip	DOC111110APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\PROFINET IO Device V3.6\PROFINET IO Device V3.10 Protocol API xx EN.pdf`
Operating Instruction Manual *DTM for Hilscher PROFINET IO-Device*	Description of the device type manager for Hilscher PROFINET IO devices	DOC060303OIxxEN	`Documentation\2. Configuration Manuals\EN\2. SYCON.net Protocol Specific Configuration Dialogs\PROFINET IO Device DTM OI xx EN.pdf`

Table 12: Additional documentation for NRP 51/52-RE/PNS

netRAPID as Sercos Slave

If you are using the Sercos Slave protocol, you might also find the following documents useful:

Title	Contents	Document ID	Path on the NRPEB product DVD
Protocol API *sercos Slave V3.3.0*	Describes the packet interface of the sercos slave device implementation on the netX chip	DOC100205APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\sercos Slave\sercos Slave Protocol API xx EN.pdf`
Operating Instruction Manual *DTM for Hilscher sercos Slave Device*	Description of the device type manager for Hilscher Sercos slave devices	DOC110701OIxxEN	`Documentation\2. Configuration Manuals\EN\2. SYCON.net Protocol Specific Configuration Dialogs\sercos Slave DTM OI xx EN.pdf`

Table 13: Additional documentation for NRP 51/52-RE/S3S

netRAPID as Open Modbus/TCP device

If you are using the Modbus/TCP protocol, you might also find the following documents useful:

Title	Contents	Document ID	Path on the NRPEB product DVD
Protocol API *Open Modbus/TCP V2.6.0*	Describes the application interface of the Open Modbus/TCP protocol stack	DOC071103APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\openModbus MessagingDevice\OpenModbusTCP Protocol API xx EN.pdf`
Protocol API *TCP/IP Packet Interface V2.1.x.x*	Describes the application interface of the TCP/IP and UDP/IP protocol stack	DOC050201APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\openModbus MessagingDevice\TCP IP - Packet Interface API xx EN.pdf`
Operating Instruction Manual *netSLAVE DTM for Hilscher netX Slave Devices*	Description of the device type manager for Hilscher slave devices	DOC080801OIxxEN	`Documentation\2. Configuration Manuals\EN\2. SYCON.net Protocol Specific Configuration Dialogs\netSlave DTM OI xx EN.pdf`

Table 14: Additional documentation for NRP 51/52-RE/OMB

netRAPID as EtherNet/IP Adapter

If you are using the EtherNet/IP Adapter protocol, you might also find the following documents useful:

Title	Contents	Document ID	Path on the NRPEB product DVD
Protocol API *EtherNet/IP Adapter V3.3.0*	Describes the user interface of the EtherNet/IP Adapter implementation on the netX chip	DOC150401APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\EtherNetIP Adapter\EtherNetIP Adapter V3 Protocol API xx EN.pdf`
Operating Instruction Manual *DTM for EtherNet/IP Adapter Devices*	Description of the device type manager for EtherNet/IP Adapter Devices	DOC061202OIxxEN	`Documentation\2. Configuration Manuals\EN\2. SYCON.net Protocol Specific Configuration Dialogs\EtherNetIP Adapter DTM OI xx EN.pdf`

Table 15: Additional Documentation for NRP 51/52-RE/EIS

netRAPID as POWERLINK Controlled Node

If you are using the POWERLINK Controlled Node protocol, you might also find the following documents useful:

Title	Contents	Document ID	Path on the NRPEB product DVD
Protocol API *Ethernet POWERLINK Controlled Node V3.2.0*	Describes the application interface of the Ethernet POWERLINK Controlled Node stack	DOC160504APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\POWERLINK ControlledNode\Powerlink Controlled Node Protocol V3 API xx EN.pdf`
Operating Instruction Manual *netSLAVE DTM for Hilscher netX Slave Devices*	Description of the device type manager for Hilscher slave devices	DOC080801OIxxEN	`Documentation\2. Configuration Manuals\EN\2. SYCON.net Protocol Specific Configuration Dialogs\netSlave DTM OI xx EN.pdf`

Table 16: Additional documentation for NRP 51/52-RE/PLS

netRAPID as VARAN Client

If you are using the VARAN Client protocol, you might also find the following documents useful:

Title	Contents	Document ID	Path on the NRPEB product DVD
Protocol API *VARAN Client (Slave) V1.0.x.x*	Describes the user interface of the VARAN client (slave) implementation on the netX chip	DOC100613APIxxEN	`Documentation\5. Programming Manuals\EN\3. Protocol API\VARAN client\VARAN Client Protocol API xx EN.pdf`
Operating Instruction Manual *netSLAVE DTM for Hilscher netX Slave Devices*	Description of the device type manager for Hilscher slave devices	DOC080801OIxxEN	`Documentation\2. Configuration Manuals\EN\2. SYCON.net Protocol Specific Configuration Dialogs\netSlave DTM OI xx EN.pdf`

Table 17: Additional documentation for NRP 51/52-RE/VRS

1.4 Legal notes

Important notes

Utmost care was/is given in the preparation of the documentation at hand consisting of a user's manual, operating manual and any other document type and accompanying texts. However, errors cannot be ruled out. Therefore, we cannot assume any guarantee or legal responsibility for erroneous information or liability of any kind. You are hereby made aware that descriptions found in the user's manual, the accompanying texts and the documentation neither represent a guarantee nor any indication on proper use as stipulated in the agreement or a promised attribute. It cannot be ruled out that the user's manual, the accompanying texts and the documentation do not completely match the described attributes, standards or any other data for the delivered product. A warranty or guarantee with respect to the correctness or accuracy of the information is not assumed.

We reserve the right to modify our products and the specifications for such as well as the corresponding documentation in the form of a user's manual, operating manual and/or any other document types and accompanying texts at any time and without notice without being required to notify of said modification. Changes shall be taken into account in future manuals and do not represent an obligation of any kind, in particular there shall be no right to have delivered documents revised. The manual delivered with the product shall apply.

Under no circumstances shall Hilscher Gesellschaft für Systemautomation mbH be liable for direct, indirect, ancillary or subsequent damage, or for any loss of income, which may arise after use of the information contained herein.

Liability disclaimer

The hardware and/or software was created and tested by Hilscher Gesellschaft für Systemautomation mbH with utmost care and is made available as is. No warranty can be assumed for the performance or flawlessness of the hardware and/or software under all application conditions and scenarios and the work results achieved by the user when using the hardware and/or software. Liability for any damage that may have occurred as a result of using the hardware and/or software or the corresponding documents shall be limited to an event involving willful intent or a grossly negligent violation of a fundamental contractual obligation. However, the right to assert damages due to a violation of a fundamental contractual obligation shall be limited to contract-typical foreseeable damage.

It is hereby expressly agreed upon in particular that any use or utilization of the hardware and/or software in connection with

- Flight control systems in aviation and aerospace;
- Nuclear fusion processes in nuclear power plants;
- Medical devices used for life support and
- Vehicle control systems used in passenger transport

shall be excluded. Use of the hardware and/or software in any of the following areas is strictly prohibited:

- For military purposes or in weaponry;
- For designing, engineering, maintaining or operating nuclear systems;
- In flight safety systems, aviation and flight telecommunications systems;
- In life-support systems;
- In systems in which any malfunction in the hardware and/or software may result in physical injuries or fatalities.

You are hereby made aware that the hardware and/or software was not created for use in hazardous environments, which require fail-safe control mechanisms. Use of the hardware and/or software in this kind of environment shall be at your own risk; any liability for damage or loss due to impermissible use shall be excluded.

Warranty

Hilscher Gesellschaft für Systemautomation mbH hereby guarantees that the software shall run without errors in accordance with the requirements listed in the specifications and that there were no defects on the date of acceptance. The warranty period shall be 12 months commencing as of the date of acceptance or purchase (with express declaration or implied, by customer's conclusive behavior, e.g. putting into operation permanently).

The warranty obligation for equipment (hardware) we produce is 36 months, calculated as of the date of delivery ex works. The aforementioned provisions shall not apply if longer warranty periods are mandatory by law pursuant to Section 438 (1.2) BGB, Section 479 (1) BGB and Section 634a (1) BGB [Bürgerliches Gesetzbuch; German Civil Code] If, despite of all due care taken, the delivered product should have a defect, which already existed at the time of the transfer of risk, it shall be at our discretion to either repair the product or to deliver a replacement product, subject to timely notification of defect.

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2 Device descriptions

2.1 netRAPID Chip Carrier

Hilscher netRAPIDs are compact hardware devices carrying a netX 10, a netX 51 or a netX 52 controller and an SPI Flash memory. They are intended for integration into a host device or host system in order to provide I/O data for automation devices via parallel or serial (SPI) Dual-Port Memory.

A netRAPID chip carrier can be soldered onto the baseboard of the host system either by hand (e.g. in prototyping) or by SMD production process (e. g. in mass production). Because the netRAPID is a complete netX based communication interface containing all necessary circuits and operating components, the design-in development of the communication hardware is reduced to having to add only interface connectors, LEDs and address switches. The OEM manufacturer can thus carry out the baseboard in a simple 2-layer design.

Technical details like dimensions/footprints, soldering profiles, signal descriptions and pin assignments, which are needed for physically embedding the netRAPID into the host device/host system of the OEM manufacturer, are provided in the Design Guide *netRAPID Chip Carrier*, DOC111004DGxxEN, which is stored on the **NRPEB product DVD** in the `Documentation\1. netRAPID Manuals` directory.

Note: The **NRP 51-RE\F8T** featuring a netX 51 controller, 8 Mbyte serial flash and a TPM (Trusted Platform Module) chip is planned.

Note: Please note the following difference between netX 10-based netRAPIDs (NRP 10-DPS and NRP 10-CCS) and netX 51 and netX 52-based netRAPIDs (NRP 51-RE and NRP 52-RE):

Unlike the NRP 10, the NRP 51-RE and the NRP 52-RE are not equipped with a **Security Memory** (SecMem) chip for storing the device-specific identification data of the netRAPID.
On the NRP 51-RE and NRP 52-RE, this data is instead stored in the flash memory of these devices, along with their firmware.
In order to protect this device-specific identification data in the flash memory from accidently overwriting it, a so-called **Flash Device Label** was defined by Hilscher. The Hilscher **netX Bootwizard** application version ≥ 1.3.15xxx.x (which is provided on the NRPEB product DVD) is capable of recognizing the Flash Device Label and of downloading files to the flash memory without overwriting the device-specific data marked with this label.

2.2 netRAPID Evaluation Boards

netRAPID chip carriers can easily be tested (or “evaluated”) by using a netRAPID Evaluation Board (**NRPEB**). Each Evaluation Board is equipped with a soldered-on netRAPID and all the hardware parts needed for serving as a fully operative communication interface. After downloading the appropriate firmware and a configuration file, the netRAPID Evaluation Board is ready-to-use for testing network communication with the netX controller and for programming and debugging a host application for the netRAPID.

The Evaluation Board can also serve as a model for designing your own baseboard for integrating the netRAPID chip carrier into your OEM host device. Technical details of the netRAPID Evaluation Boards are provided in the Design Guide *netRAPID Chip Carrier*.

2.2.1 NRPEB 10-CCS and NRPEB 10-DPS Evaluation Boards

The following figure shows the **NRPEB 10-DPS** board for PROFIBUS and the **NRPEB 10-CCS** board for CC-Link.
Note that both evaluation boards are identical in design, except for their fieldbus interface connector (position 17) and the *S0* rotary switch for setting the baud rate (position 18), which is implemented only on the NRPEB 10-CCS (CC-Link) board. (The name of the basic PCB comprising both the NRPEB 10-DPS board and the NRPEB 10-CCS board is **NRPEB-FB**)

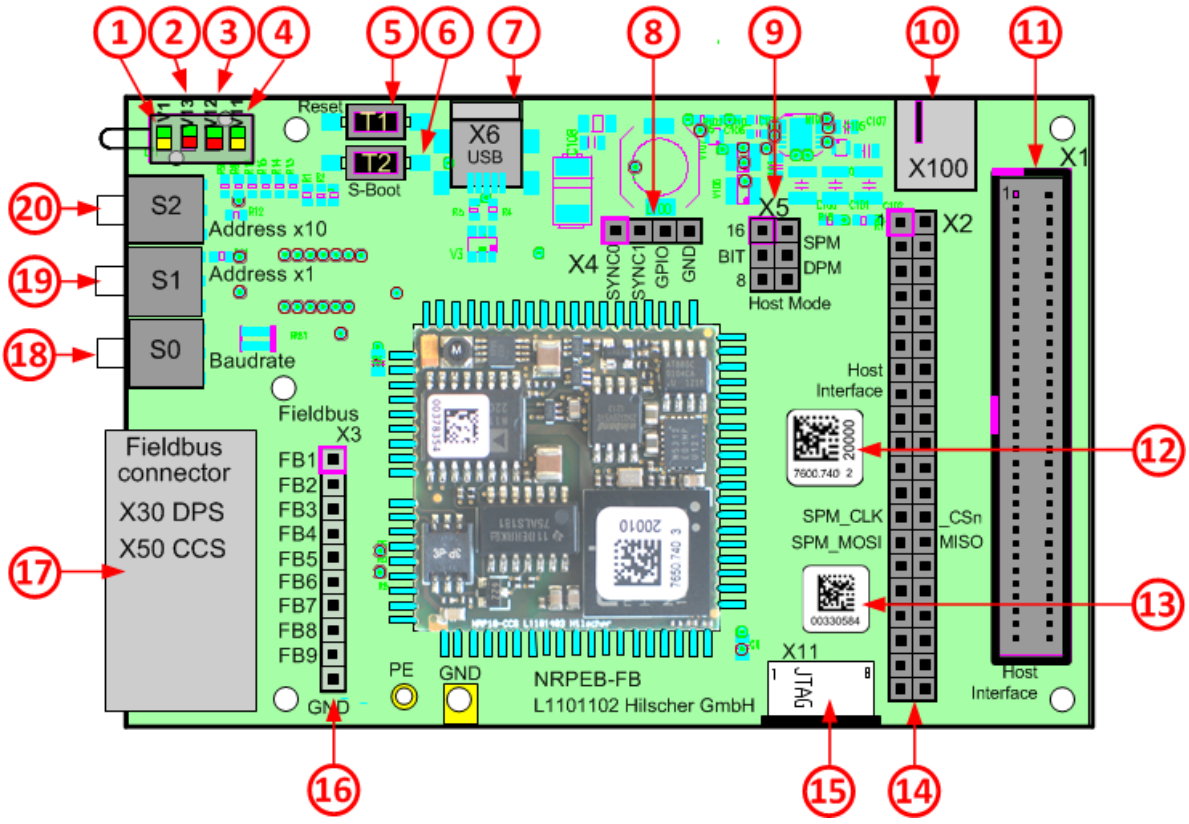


Figure 3: NRPEB-FB (NRPEB 10-CCS and NRPEB 10-DPS) printed circuit board

No. in figure	Name	Description	
1	V1	LED GPIO	See also chapter *LED Descriptions* on page 120
2	V13	LED COM1	
3	V12	LED COM0	
4	V11	LED SYS	
5	T1	Reset button	
6	T2	Button for serial boot mode	
7	X6	USB interface (Mini-USB)	
8	X4	SYNC and GPIO measuring points	
9	X5	Host interface mode setting (for more information, see section *Host interface mode NRPEB 10-CCS, NRPEB 10-DPS, and NRPEB 52-RE (X5)* in the Design Guide *netRAPID Chip Carrier*, DOC111004DGxxEN)	
10	X100	Connector for power supply	
11	X1	Host interface	
12	-	Matrix label (part number, hardware revision and serial number)	
13	-	Label with production number	
14	X2	Host interface measuring points	
15	X11	JTAG interface, foil connector (for Hilscher development and production only)	
16	X3	Fieldbus interface measuring points	
17	X30	PROFIBUS DP connector (NRPEB 10-DPS)	
	X50	CC-Link connector (NRPEB 10-CCS)	
18	S0	Rotary switch CC-Link baud rate (implemented only on NRPEB 10-CCS)	
19	S1	Rotary switch Station address * 1	
20	S2	Rotary switch Station address * 10	

Table 18: Positions on NRPEB-FB (NRPEB 10-CCS and NRPEB 10-DPS)

2.2.2 NRPEB 51-RE Evaluation Board

The following figure shows the NRPEB 51-RE Evaluation Board for Real-Time Ethernet.

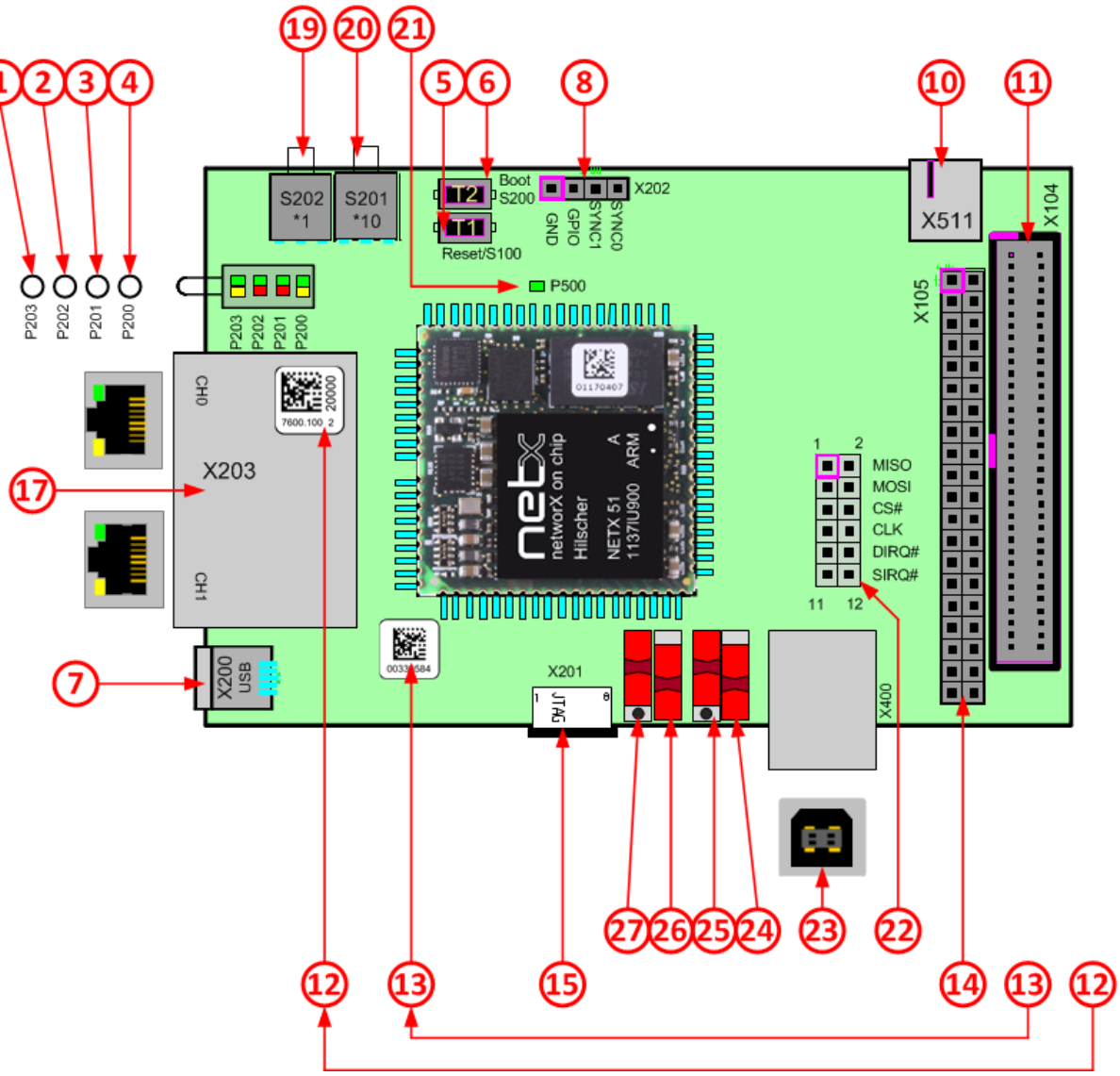


Figure 4: NRPEB 51-RE printed circuit board

Note: Positions 9, 16 and 18 are omitted in the figure above in order to keep identical numbering with the other evaluation boards.

No. in figure	Name	Description	
1	P203	LED GPIO	See also chapter *LED Descriptions* on page 120
2	P202	LED COM1	
3	P201	LED COM0	
4	P200	LED SYS	
5	S100	Reset button	
6	S200	Button for serial boot mode	
7	X200	USB interface (Mini-USB)	
8	X202	SYNC and GPIO measuring points	
-	-	-	
10	X511	Connector for power supply	
11	X104	Host interface	
12	-	Matrix label (part number, hardware revision and serial number)	
13	-	Label with production number	
14	X105	Host interface measuring points	
15	X201	JTAG interface, foil connector (for Hilscher development and production only)	
-	-	-	
17	X203	Ethernet interface (RJ45 socket)	
-	-	-	
19	S202	Address switch * 1	
20	S201	Address switch * 10	
21	P500	Power LED	
22	X300	SPM pin header	
23	X400	USB interface for SPM	
24	S301	Switch between SPM via USB / via pin header	For more information, see section *Host interface mode NRPEB 51-RE (S203, S204, S300, S301)* in the Design Guide *netRAPID Chip Carrier*, DOC111004DGxxEN
25	S300	Switch between DPM/SPM	
26	S204	Host interface mode setting	
27	S203	8/16 bit mode setting in parallel dual-port memory mode	

Table 19: Positions on NRPEB 51-RE

2.2.3 NRPEB 52-RE Evaluation Board

The following figure shows the NRPEB 52-RE Evaluation Board for Real-Time Ethernet.

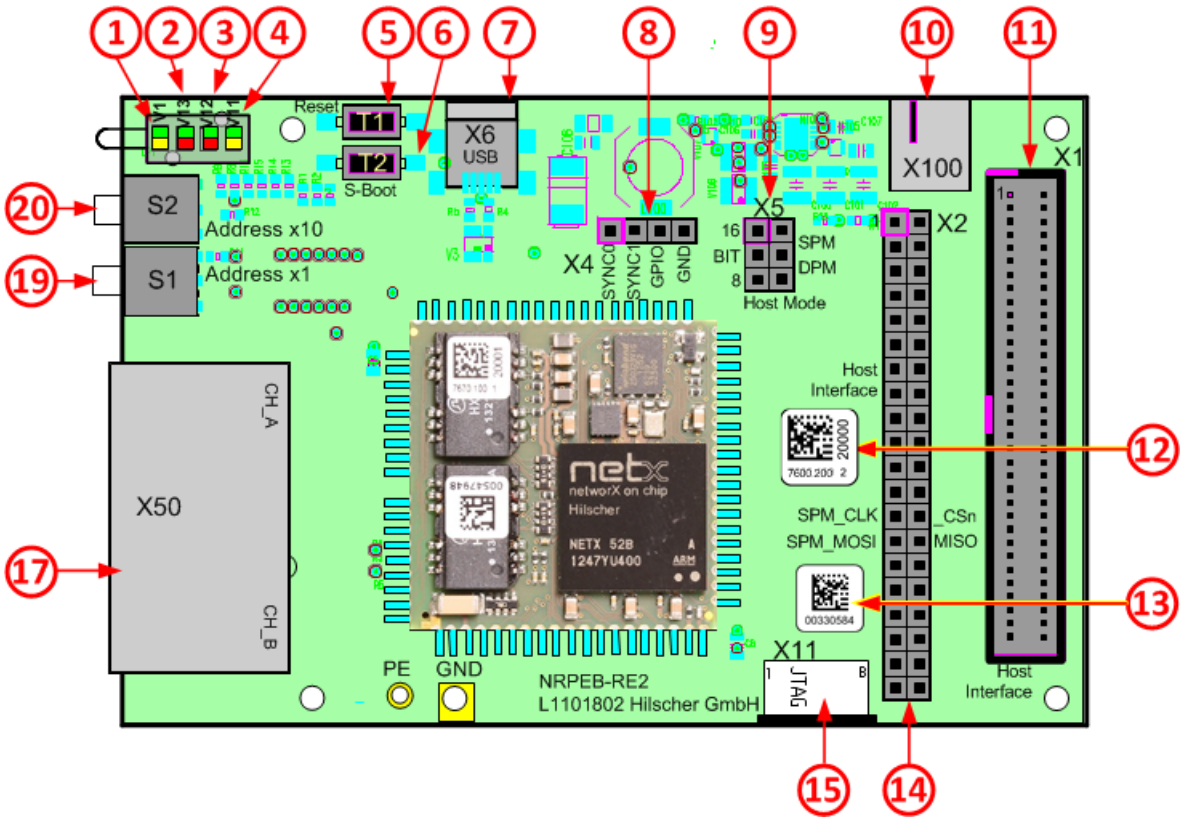


Figure 5: NRPEB 52-RE printed circuit board

Note: Positions 16 and 18 are omitted in the figure above in order to keep identical numbering with the other evaluation boards.

No. in figure	Name	Description	
1	V1	LED GPIO	See also chapter *LED Descriptions* on page 120
2	V13	LED COM1	
3	V12	LED COM0	
4	V11	LED SYS	
5	T1	Reset button	
6	T2	Button for serial boot mode	
7	X6	USB interface (Mini-USB)	
8	X4	SYNC and GPIO measuring points	
9	X5	Host interface mode setting (for more information, see section *Host interface mode NRPEB 10-CCS, NRPEB 10-DPS, and NRPEB 52-RE (X5)* in the Design Guide *netRAPID Chip Carrier*, DOC111004DGxxEN)	
10	X100	Connector for power supply	
11	X1	Host interface	
12	-	Matrix label (part number, hardware revision and serial number)	
13	-	Label with production number	
14	X2	Host interface measuring points	
15	X11	JTAG interface, foil connector (for Hilscher development and production only)	
-	-	-	
17	X50	Ethernet interface (RJ45 socket)	
-	-	-	
19	S1	Address switch Station address * 1	
20	S2	Address switch Station address * 10	

Table 20: Positions on NRPEB 52-RE

3 Firmware

3.1 What is Standard Loadable Firmware ?

The netX controller on the netRAPID chip carrier can be operated with ready-made Standard Loadable Firmware (LFW). Standard Loadable Firmware is a binary code with an executable image containing a protocol stack and the rcX operating system for the netX controller. All LFW files are in the NXF format, and can thus be recognized by their **.nxf** file extension.

LFW is “ready-to-use”: after downloading the firmware and a configuration file to the netRAPID, the device is immediately ready for network communication. Once stored in the non-volatile flash memory of the netRAPID, the firmware is available on each netX boot process.

If you are using an **NRP 51-RE** or an **NRP 52-RE**, you can even switch the Real-Time Ethernet protocol by just downloading a new LFW file containing the desired protocol stack and a corresponding configuration file.

Using LFW is ideal for users who want to utilize the Dual Port Memory (DPM) of the netX in a double-chip architecture, in which the netX on the netRAPID is accessed and controlled by an application running in the processor of a customer-engineered host system or Windows PC.
By using LFW, the OEM design-in manufacturer can concentrate on the hardware aspects of integrating the netRAPID chip carrier into its host system, on testing network communication with the netX controller and on programming and debugging his host application.

Note: The Standard Loadable Firmware for the netRAPID (NRPLFW) has a fixed range of functionality and does not necessarily support every hardware option that a netRAPID offers. For example, the UART interface of the netRAPID is deactivated by the firmware and the SYNC interface supported instead. (The pins of the UART interface on the netRAPID are shared with the pins of the SYNC interface.)

3.2 Choosing the right firmware

The **netRAPID Evaluation DVD** (NRPEB product DVD), which can be downloaded under https://www.hilscher.com/support/downloads, provides LFW files with limited functionality for testing and evaluation purposes.
The `Firmware\netRAPID_Ltd` directory contains firmware files for the following devices and protocols with the following limitations:

netRAPID	Evaluation Board	Network protocol	Firmware file	Limitations
NRP 10-DPS	NRPEB 10-DPS	PROFIBUS DP Slave V2.9	R05Z2000.nxf	2 bytes output / 2 bytes input Fixed station address: 32
NRP 10-CCS	NRPEB 10-CCS	CC-Link Slave V2.11	R05Z9000.nxf	2 Bytes I/O data exchange Fixed station address: 32 Remote IO Station only
NRP 51-RE	NRPEB 51-RE	EtherCAT Slave V4.7	R06ZF000.nxf	Communication task stops after one hour
		PROFINET IO Device V3.12	R06ZD000.nxf	Communication task stops after one hour
		Sercos Slave V3.5	R06ZJ000.nxf	Communication task stops after one hour
		Open Modbus/TCP V2.6	R06ZL000.nxf	Communication task stops after one hour
		EtherNet/IP Adapter V2.13	R06ZH000.nxf	Communication task stops after one hour
		POWERLINK Controlled Node V3.3	R06ZK000.nxf	Communication task stops after one hour
		VARAN Client V1.1	R06ZT000.nxf	Communication task stops after one hour
NRP 52-RE	NRPEB 52-RE	EtherCAT Slave V4.7	R07ZF000.nxf	Communication task stops after one hour
		PROFINET IO Device V4.3	R07ZD000.nxf	Communication task stops after one hour
		Sercos Slave V3.5	R07ZJ000.nxf	Communication task stops after one hour
		Open Modbus/TCP V2.6	R07ZL000.nxf	Communication task stops after one hour
		EtherNet/IP Adapter V3.3	R07ZH000.nxf	Communication task stops after one hour
		POWERLINK Controlled Node V3.3	R07ZK000.nxf	Communication task stops after one hour
		VARAN Client V1.1	R07ZT000.nxf	Communication task stops after one hour

Table 21: Limited evaluation firmware on NRPEB product DVD

Note: The time limitation implemented in the Real-Time-Ethernet firmware switches the bus to an offline mode (no cyclic communication to and from the bus) after one hour of operation (module-up time). After this time, no communication to the stacks (and also AP Task) will be possible.
All commands will then be rejected with the error code `0xC000F007 [TLR_E_EVALUATION_TIME_EXPIRED]`.
(For OpenModbus/TCP: `0xC0600119 [TLR_E_OMB_OMBTASK_ERROR_DUE_TO_LIMITED_VERSION]`)

Be aware, that in this state, a norm-conforming behavior of the netRAPID on the bus cannot be guaranteed!
After the one hour evaluation time has expired, the state can only be resolved by a system initialization (SystemReset), or power cycle.

After finishing the evaluation of the netRAPID, fully licensed Standard Loadable Firmware offering complete standard functionality for the netRAPID and the chosen network communication protocol can be obtained from Hilscher. The firmware needs to be acquired once and can then be loaded into the embedded netRAPIDs e.g. during the manufacturing of the host system.

The following DVDs containing fully licensed Standard Loadable Firmware can be obtained from Hilscher:

Name	For network protocol	Part no	For netRAPID	Firmware file
NRPLFW-DPS	PROFIBUS DP Slave	7601.420	NRP 10-DPS	R0502000.nxf
NRPLFW-CCS	CC-Link Slave	7601.740	NRP 10-CCS	R0509000.nxf
NRPLFW-ECS	EtherCAT Slave	7601.120	NRP 51-RE	R060F000.nxf
			NRP 52-RE	R070F000.nxf
NRPLFW-PNS	PROFINET IO Device	7601.850	NRP 51-RE	R060D000.nxf
			NRP 52-RE	R070D000.nxf
NRPLFW-S3S	Sercos Slave	7601.160	NRP 51-RE	R060J000.nxf
			NRP 52-RE	R070J000.nxf
NRPLFW-OMB	Open Modbus/TCP	7601.860	NRP 51-RE	R060L000.nxf
			NRP 52-RE	R070L000.nxf
NRPLFW-EIS	EtherNet/IP Adapter	7601.830	NRP 51-RE	R060H000.nxf
			NRP 52-RE	R070H000.nxf
NRPLFW-PLS	POWERLINK Controlled Node	7601.180	NRP 51-RE	R060K000.nxf
			NRP 52-RE	R070K000.nxf
NRPLFW-VRS	VARAN Client	7601.810	NRP 51-RE	R060T000.nxf
			NRP 52-RE	R070T000.nxf

Table 22: Fully licensed firmware for netRAPID

3.3 Loadable Firmware and Second Stage Bootloader

Standard Loadable Firmware (LFW) for netRAPIDs cannot be booted directly by the ROM code (ROM Loader) residing in the netX controller. It needs to be started by a software module called **Second Stage Bootloader** (SSBL). Therefore this SSBL must have been downloaded and must be running on the netRAPID *before* you can download or boot an LFW file.

Being a bootable binary image, the SSBL can be downloaded and stored “non-volatile” in the serial flash of the netRAPID by using the **netX Bootwizard** tool and the USB interface after the netRAPID has been put in serial boot mode. This netX Bootwizard tool is capable of communicating with the Bootmonitor function of the ROM Loader via USB. Detailed instructions for the whole download procedure of the SSBL are provided in the *Downloading executable binary image to NRP 10 via USB* section on page 37 and in the *Downloading executable binary image to NRP 51-RE* or NRP 52-RE via USB section on page 46. An installation program for the Bootwizard can be found on the NRPEB product DVD in the `Tools\Bootwizard` directory.

After download to flash, the SSBL will be started by the ROM loader after every power-on or reset of the board (given that flash boot mode is configured and not serial boot mode). The SSBL then in turn starts the firmware or (if no firmware has been downloaded yet) enables downloading firmware via USB or host interface.

The SSBL is independent from the network protocol, however, there are different SSBL files for the netX 10-based and netX 52-based netRAPIDs:

netRAPID	SSBL file name	Path on NRPEB product DVD
NRP 10-DPS	NETX10-BSL_1_4_17_1_usb_id_NRP10_disable_uart.bin	`Firmware\2nd Stage Bootloader\NRP 10`
NRP 10-CCS		
NRP 51-RE	NETX51-BSL_V1_4_18_0_usb_id_NRP51_disable_uart_4MB.bin	`Firmware\2nd Stage Bootloader\NRP 51`
NRP 51-RE\F8T	NETX51-BSL_V1_4_18_0_usb_id_NRP51_disable_uart_8MB.bin	`Firmware\2nd Stage Bootloader\NRP 51_F8T`
NRP 52-RE	NETX52-BSL_V1_4_17_1_usb_id_NRP52_disable_uart.bin	`Firmware\2nd Stage Bootloader\NRP 52`

Table 23: SSBL for netRAPID

Unlike the SSBL file, a Standard Loadable Firmware file cannot be downloaded to the flash memory of the netRAPID by using the **netX Bootwizard** application because the Bootwizard cannot cope with the file system set up by the SSBL already running on the netRAPID. Methods and tools for downloading the LFW file to a netRAPID are described in the following sections.

3.4 Downloading firmware

3.4.1 Overview

There are several ways to download firmware or configuration files to the netRAPID Chip Carrier. The **netRAPID Evaluation DVD** (NRPEB product DVD) provides software tools for downloading files from a Windows PC to the serial flash memory of the netRAPID via USB interface or via host interface/Dual-Port Memory.
Please note that downloading a LFW file requires the SSBL on the netRAPID (see section above).

3.4.2 Downloading firmware from PC via USB

The usual way to download LFW from a Windows PC to the serial flash of the netRAPID is by using the **netHOST Device Test Application** and the USB diagnostic interface of the netRAPID. Each netRAPID Evaluation Board is equipped with a Mini-USB diagnostic interface socket. If you are not using an Evaluation Board, you of course need to implement the USB interface hardware on the baseboard of your netRAPID OEM host device in order to be able to access the USB interface of the netRAPID.

The netHOST Device Test Application can be found on the product DVD in the `Tools\netHost` directory. Instructions for downloading the firmware to the netRAPID with this tool via USB are provided in the *Downloading firmware to the netRAPID via USB* section on page 56.

3.4.3 Downloading firmware from PC via PCI and host interface

If you are using a Windows PC as host device for your netRAPID, you can also download the firmware from the PC via PCI and host interface (i. e. parallel Dual-Port Memory). You need the **cifX Driver Setup Utility** software installed on your PC for this. As additional hardware components you also need a certain PCI adapter card and a cable, which can be purchased from Hilscher. Each netRAPID Evaluation Board is equipped with a suitable host interface connector socket into which you can plug-in the cable of the PCI adapter card. If you are not using an Evaluation Board, you of course need to implement the host interface connector hardware on the baseboard of your netRAPID host device in order to be able to access the host interface of the netRAPID via PCI adapter card.

The cifX Driver Setup Utility is included in the **cifX Device Driver** installation, which can be found on the product DVD in the `Driver and Toolkit\Device Driver (NXDRV-WIN)\Installation` directory. Instructions for downloading firmware to the netRAPID with the cifX Driver Setup Utility via PCI and host interface are provided in the *Downloading Firmware to the netRAPID via PCI and Host Interface* section on page 62.

3.4.4 Downloading firmware from PC via USB and SPM host interface (NRPEB 51-RE only)

The **NRPEB 51-RE** Evaluation Board allows you to easily access the serial dual-port memory of the netX over an additional USB interface (SPM-to-USB interface via FTDI chip). You can thus download a Standard Loadable Firmware file from your configuration PC to the NRPEB 51-RE via SPM USB connection.
Instructions for this are provided in section *Downloading firmware to the NRPEB 51-RE via SPM USB interface* on page 75.

3.4.5 Developing customized download function

If you are using a customer-engineered host system not based on Windows, you can, of course, also implement in your own host application a customized download function for firmware files via host interface. You can use the **cifX Toolkit**, which is provided on the product DVD in the `Driver and Toolkit\Driver Toolkit (NXDRV-TKIT)\cifXToolkit` directory, to develop a driver enabling communication between your host system and the Dual-Port Memory (parallel or serial DPM) of the netX on the netRAPID.

For more detailed information about the cifX Toolkit, please refer to the Toolkit Manual *cifX/netX Toolkit – DPM*, DOC090203TKxxEN, which is stored in the `Driver and Toolkit\Driver Toolkit (NXDRV-TKIT)\Documentation` directory of the product DVD.

4 Typical use cases of the netRAPIDs

4.1 Connecting power supply

The Evaluation Boards are powered by an external DC supply voltage of 24 V (±6V). Use the Hilscher **NXAC Power** adapter (part number 7930.000).

NOTICE

Device Destruction!

- Use only the permissible supply voltage of 24V DC (±6V) to operate the Evaluation Boards.
- Operating the Evaluation Boards with a supply voltage above the specified range leads to device destruction.

➢ Plug the barrel connector of the NXAC-POWER power supply into the power supply connector socket on the Evaluation Board as shown in the picture below.

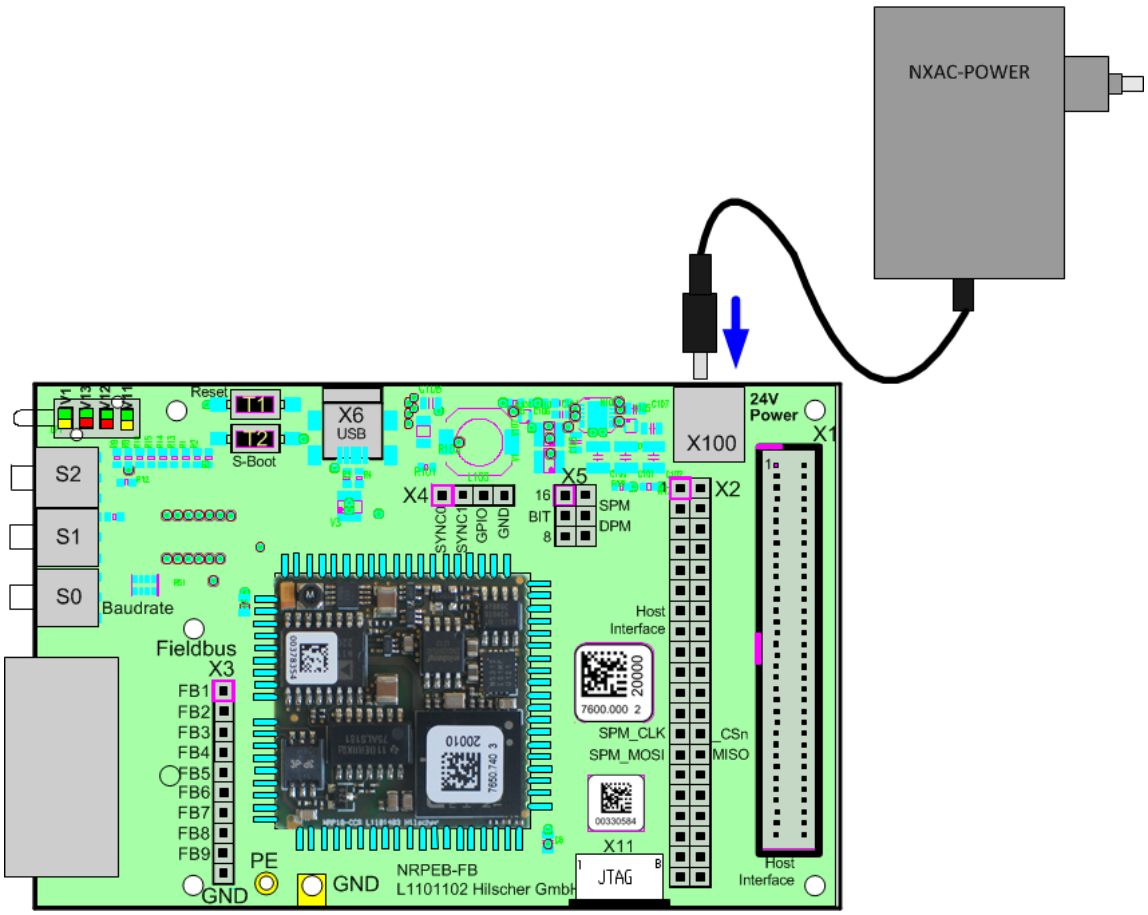


Figure 6: Connect power supply to Evaluation Board

4.2 Downloading firmware

4.2.1 Downloading executable binary image to NRP 10 via USB

4.2.1.1 Overview

This section describes how to download an executable binary image from your configuration PC to the flash memory of a netX10-based netRAPID via USB.
For this, you need the Hilscher **netX Bootwizard** application as download tool installed on your configuration PC and a USB cable with a Mini-B connector.

The executable binary image file in this case is the Second Stage Bootloader (SSBL) stored in the `Firmware\2nd Stage Bootloader\NRP 10` folder of the NRPEB product DVD.

For more detailed information about the Bootwizard, please refer to the Operating Instruction Manual *netX Bootwizard*, DOC070502OIxxEN, which is stored in the `Documentation\4. Tool Manuals\2. Bootwizard` directory of the product DVD.

The instructions in this section apply to the following devices:

- NRP 10-DPS (USB interface needs to be implemented on host device)
- NRP 10-CCS (USB interface needs to be implemented on host device)
- NRPEB 10-DPS
- NRPEB 10-CCS

4.2.1.2 Prerequisites

- You have installed the Hilscher netX Bootwizard application. (In the menu of the NRPEB product DVD, choose **Auxiliary Tools** > **Bootwizard** to open the `Tools\Bootwizard` folder, then double-click **bootwizard_1.4.x.x_setup.exe** file.) The Bootwizard installation includes the necessary USB drivers.

Note: Please use the latest version ≥ 1.4.x.x of the netX Bootwizard application provided on the NRPEB product DVD. Uninstall any old version of the Bootwizard that might have existed on your configuration PC before.

- The Evaluation Board (respectively the host device of the netRAPID) is connected to a voltage supply.
- You have a USB cable with a Mini-B connector ready.
- You have access to the image which you want to download.

4.2.1.3 Step-by-step instructions

1. Start the Bootwizard application on your PC.

➢ In the Windows **Start** menu, choose **All Programs** > **Hilscher GmbH** > **Bootwizard** > **Bootwizard**.

➢ The Bootwizard opens:

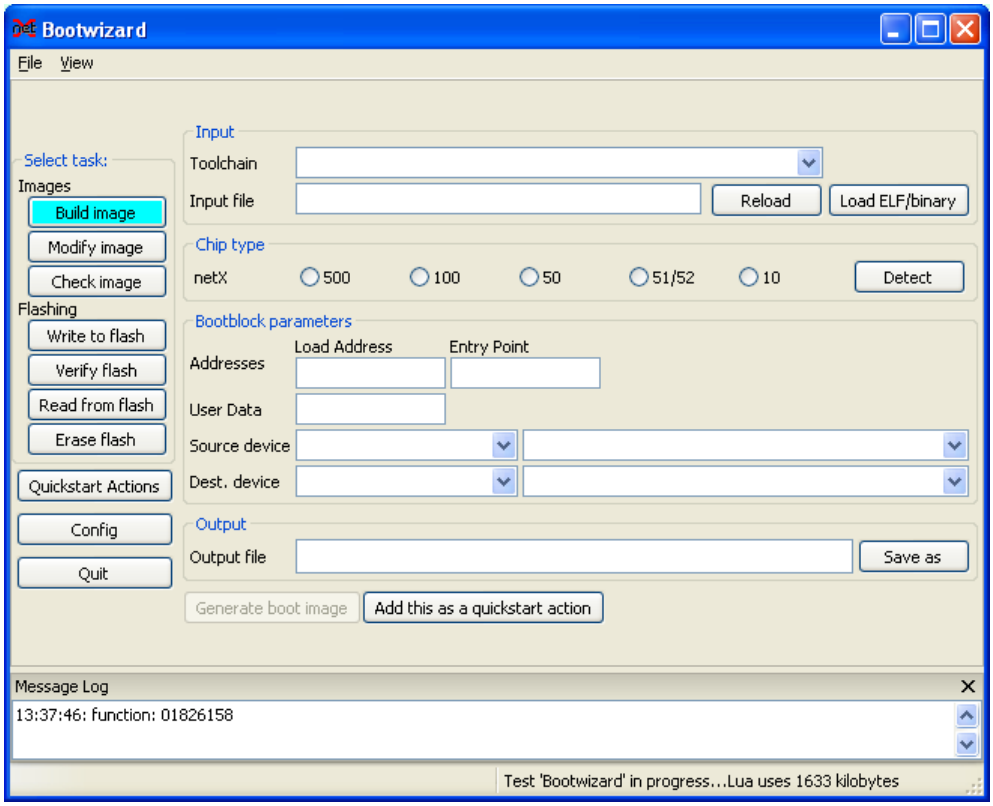


Figure 7: Bootwizard start screen

2. Choose flashing task.

➢ In the **Select Task** area, click **Write to flash** button.

The Bootwizard shows the fields and controls for the **Write to flash** task:

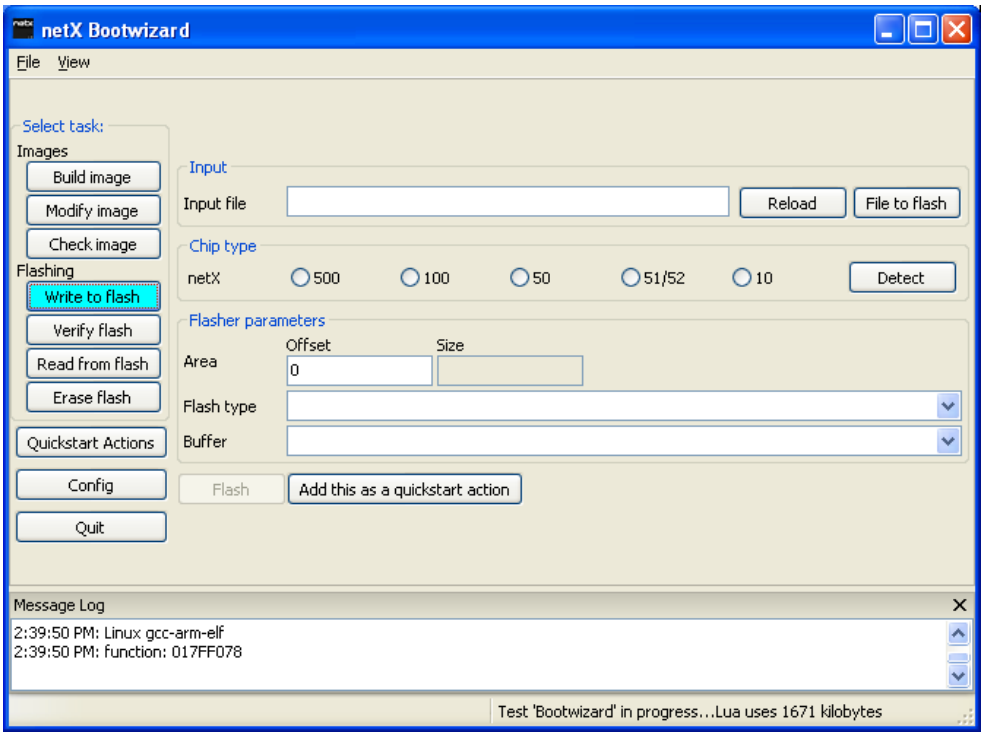


Figure 8: Bootwizard Write to flash screen

3. Select the image to be downloaded.

➢ In the **Input** area, click **File to flash** button.

The **Select an input file** dialog window opens:

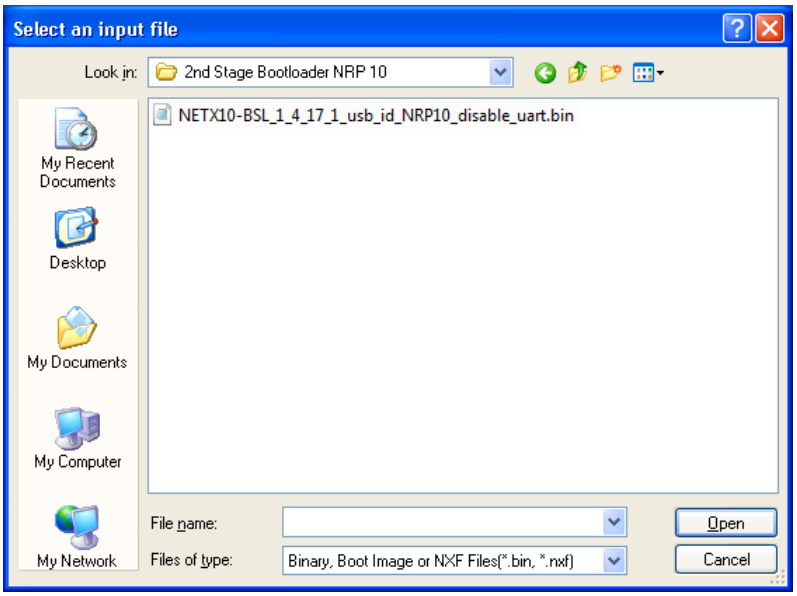


Figure 9: Select input file dialog

- Navigate to the directory where the image is stored. In this case it is the `Firmware\2nd Stage Bootloader\NRP 10` folder on the product DVD.
- Select the image file. In this case it is the **NETX10-BSL_1_4_17_1_usb_id_NRP10_disable_uart.bin** file.
- Click **Open** button.
- The Bootwizard opens the file. The following message appears:

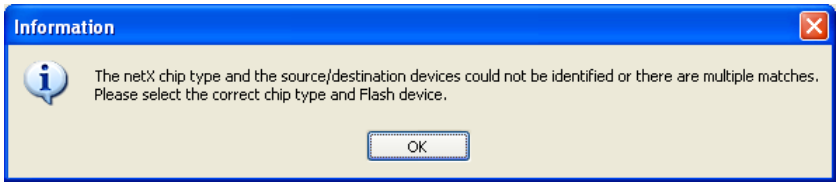


Figure 10: Bootwizard message

- Click **OK**.

4. Select Chip type.

- In the **Chip type** area, select **10**.
- The GUI should now look like this:

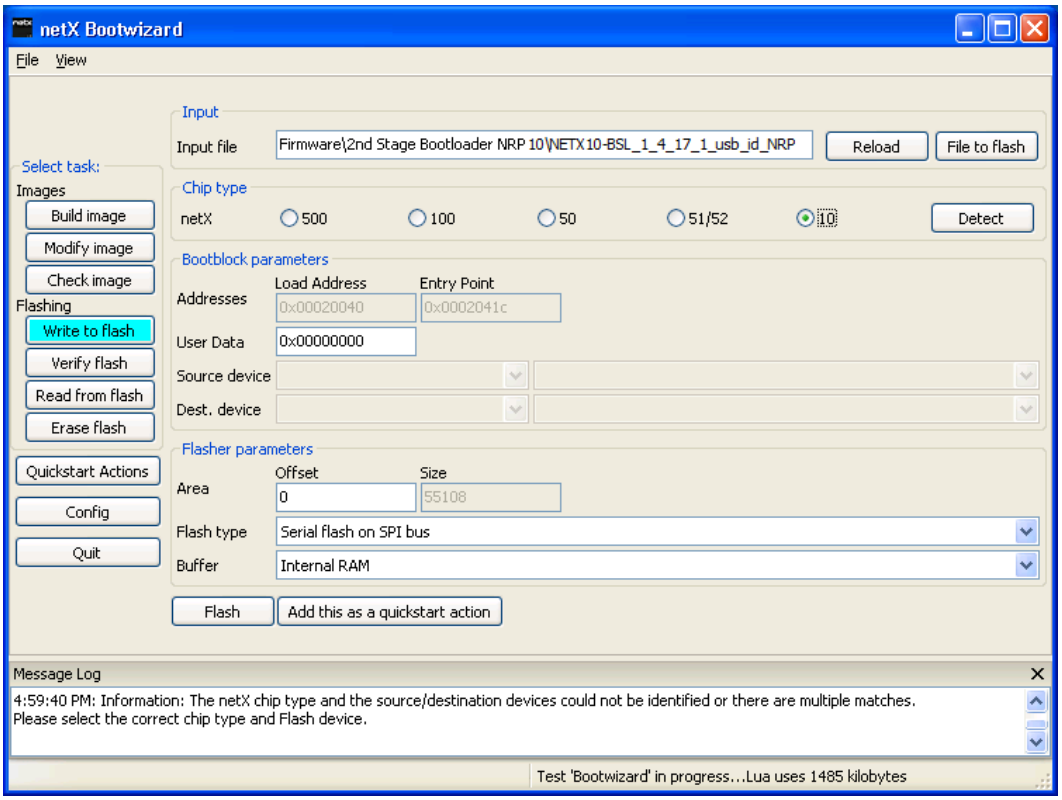


Figure 11: Selected file in Write to flash screen

5. Put the netRAPID into serial boot mode.

Note: You can skip this step if this is going to be the initial (first) download of a bootable image to the NRP 10 (i. e. no bootable image has been downloaded before), or if the flash memory has been erased. If the flash memory is empty and the ROM Loader in the netX 10 can't find a bootable image in the flash memory or in any other bootable device, it (according to the boot sequence defined in the Security Memory) automatically falls back into serial boot mode after power-on reset.

- Press down the **T2** serial boot button (**S-Boot**) on the Evaluation Board (see position ⑥ in the *NRPEB 10-CCS and NRPEB 10-DPS Evaluation Boards* section on page 24). Keep it pressed down.
- While keeping the **T2** button pressed down, push down briefly the **T1** reset button on the Evaluation Board (see position ⑤).

→ The **SYS** LED on the Evaluation Board (see position ④) is blinking yellow (on/off), indicating serial boot mode.

6. Establish an USB connection.

- Plug an USB cable into the Mini-B USB socket on the Evaluation Board (see position ⑦) and connect the USB cable to your PC.

→ The **SYS** LED on the Evaluation Board (see position ④) goes off.

Note: The **netX10 USB Bootmonitor (ROM)** driver needed for connecting the Bootwizard to the Bootmonitor running in the netX has automatically been installed on your PC by the Bootwizard setup program. However, under **Windows XP** the installation process of the USB driver needs to be completed in the **Found New Hardware Wizard**, which opens when you connect the netRAPID in serial boot mode for the first time to your PC. For finishing the installation of the USB driver in the wizard, follow the instructions given below.

Under **Windows 7** and **8**, the **Installing device driver software** message appears in the Windows task bar when you connect the netRAPID to the PC via USB cable for the first time. Windows then automatically copies the driver files to the appropriate Windows directories; you do not need to take any action in this.

If you are using Windows XP:

7. Finish installation of USB drivers in the **Found New Hardware Wizard**.

- In the start screen of the **Found New Hardware Wizard**, answer the question **Can Windows connect to Windows Update…?** by selecting the **No, not this time** option.
- Click **Next** button.
- In the next screen, answer the question **What do you want the wizard to do?** by selecting **Install the software automatically** option.
- Click **Next**.

→ Windows then copies the driver files to the Windows directories.

- In the **Completing the Found New Hardware Wizard** screen, click **Finish** button.

8. Check USB connection in Device Manager (Windows XP).

➢ In the **Start menu,** choose **Control Panel** entry.

➧ The **Control Panel** window opens.

➢ In the **Control Panel**, double-click on **System** entry.

➧ The **System Properties** sheet opens.

➢ In the **System Properties** sheet, select **Hardware** tab.

➢ In the **Hardware** tab, click **Device Manager** button.

➧ The **Device Manager** window opens.

➢ Check the entries under **Universal Serial Bus devices** for the **netX10 USB Bootmonitor (ROM)**.

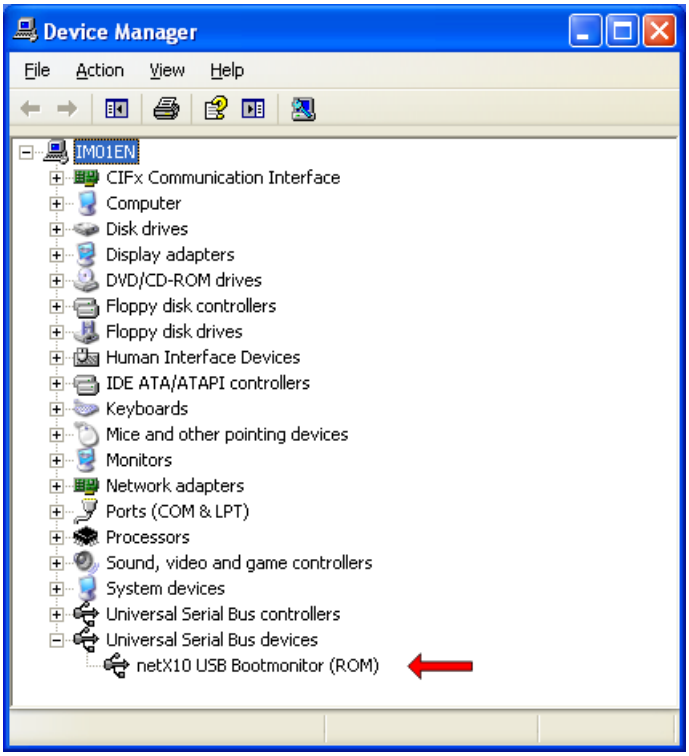


Figure 12: Check USB connection to netX 10 Bootmonitor in Windows XP

If you are using Windows 7 or 8:

8. Check USB connection in Device Manager (Windows 7 and 8):

➢ In the **Start** menu, choose **Control Panel** entry.

➢ The **Control Panel** window opens.

➢ In the **Control Panel** window, choose **Hardware and Sound** entry.

➢ The **Hardware and Sound** window opens.

➢ In the **Hardware and Sound** window, below **Devices and Printers**, click **Device Manager** entry.

➢ The **Device Manager** window opens.

➢ Check the entries under **Universal Serial Bus devices** for the **netX10 USB Bootmonitor (ROM)**.

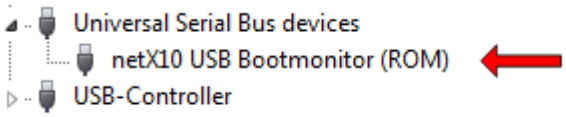


Figure 13: Check USB connection to netX 10 Bootmonitor in Windows 7

9. Download image file.

➢ In the Bootwizard, click **Flash** button.

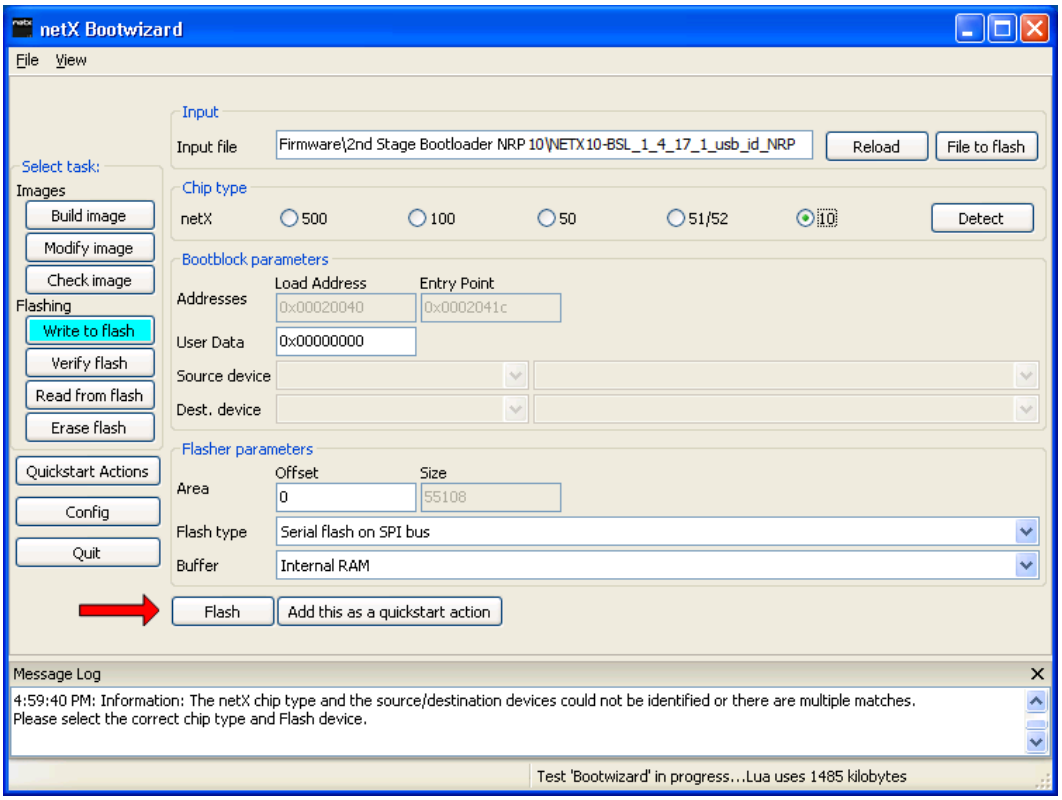


Figure 14: Write to flash screen

The plugin selector opens:

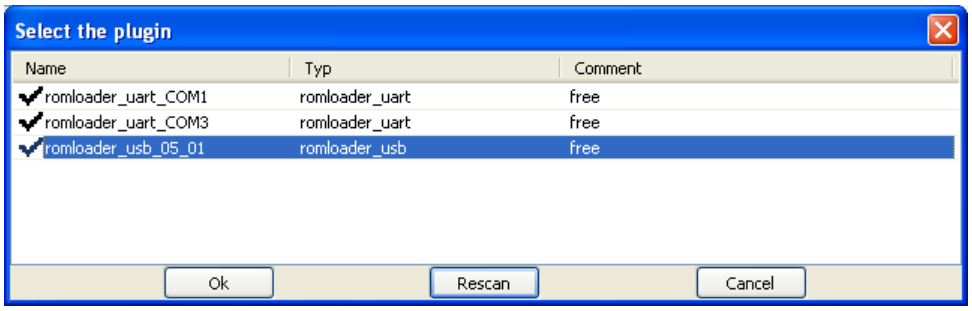


Figure 15: Plugin selector for netX 10 Rom Loader

- Select the USB connection (**romloader_usb_xx_01)** to the netX10 Bootmonitor.
- Click **OK** button (or double-click the relevant connection entry).

The Bootwizard now sends the data file and the flasher program to the netRAPID and runs the flasher. While downloading, a progress bar is shown:

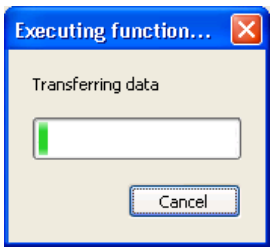


Figure 16: Progress window

Finally, a success or an error message is shown:

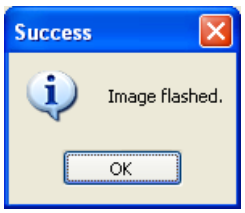


Figure 17: Flashing successful message

The **SYS** LED on the Evaluation Board (see position ④ in the *NRPEB 10-CCS and NRPEB 10-DPS Evaluation Boards* section on page 24) shows steady yellow.

10. Reset the netRAPID.

➢ Disconnect the USB cable from the Evaluation Board.

➢ Push the **Reset** button (T1) on the Evaluation Board (see position ⑤).

➪ The ROM Loader loads the executable binary image from the flash memory into the internal RAM of the netX 10.
In case of the Second Stage Bootloader, the SSBL now running in the internal RAM is searching for NXF firmware to boot and to load into the RAM. If you have not downloaded any firmware file yet, the SSBL of course won't be able to find it. This is indicated by the **SYS** LED (see position ④) alternating between yellow and green.

4.2.2 Downloading executable binary image to NRP 51-RE or NRP 52-RE via USB

4.2.2.1 Overview

This section describes how to download an executable binary image from your configuration PC to the flash memory of the NRP 51-RE or the NRP 52-RE via USB.
For this, you need the Hilscher **netX Bootwizard** application as download tool installed on your configuration PC and a USB cable with a Mini-B connector.

The executable binary image file in this case is the Second Stage Bootloader (SSBL) stored in the `Firmware\2nd Stage Bootloader\NRP 52` folder of the NRPEB product DVD.

For more detailed information about the Bootwizard, please refer to the Operating Instruction Manual *netX Bootwizard*, DOC070502OIxxEN, which is stored in the `Documentation\4. Tool Manuals\2. Bootwizard` directory of the product DVD.

The instructions in this section apply to the following devices:

- NRP 51-RE (USB interface needs to be implemented on host device)
- NRP 52-RE (USB interface needs to be implemented on host device)
- NRPEB 51-RE
- NRPEB 52-RE

Note: The netRAPIDs for Real-Time Ethernet (NRP 51-RE and NRP 52-RE) are not equipped with a security memory. Therefore, device-specific identification data of the netRAPID, which usually would be stored in the security memory, is stored in the flash memory of the device instead, along with the firmware.
The area in the flash memory storing this device-specific data is protected by a so-called **Flash Device Label**. The latest version of the Bootwizard is capable of recognizing the Flash Device Label and of downloading files to the flash memory without overwriting the device-specific data marked with this label. You must therefore use netX Bootwizard version ≥ 1.3.15xxx.x, which is provided on the NRPEB product DVD, and uninstall any older version of the Bootwizard that might have existed on your configuration PC.

4.2.2.2 Prerequisites

- You have installed the Hilscher netX Bootwizard application.
  (In the menu of the NRPEB product DVD, choose **Auxiliary Tools** > **Bootwizard** to open the `Tools\Bootwizard` folder, then double-click **bootwizard_1.4.x.x_setup.exe** file.) The Bootwizard installation includes the necessary USB drivers.

Note: Please use the latest version ≥ 1.4.x.x of the netX Bootwizard application provided on the NRPEB product DVD. Uninstall any old version of the Bootwizard that might have existed on your configuration PC before.

- The Evaluation Board (respectively the host device of the netRAPID) is connected to a voltage supply.
- You have a USB cable with a Mini-B connector ready.
- You have access to the image which you want to download.

4.2.2.3 Step-by-step instructions

1. Start the Bootwizard application on your PC.

➢ In the Windows **Start** menu, choose **All Programs** > **Hilscher GmbH** > **Bootwizard** > **Bootwizard**.

The Bootwizard opens:

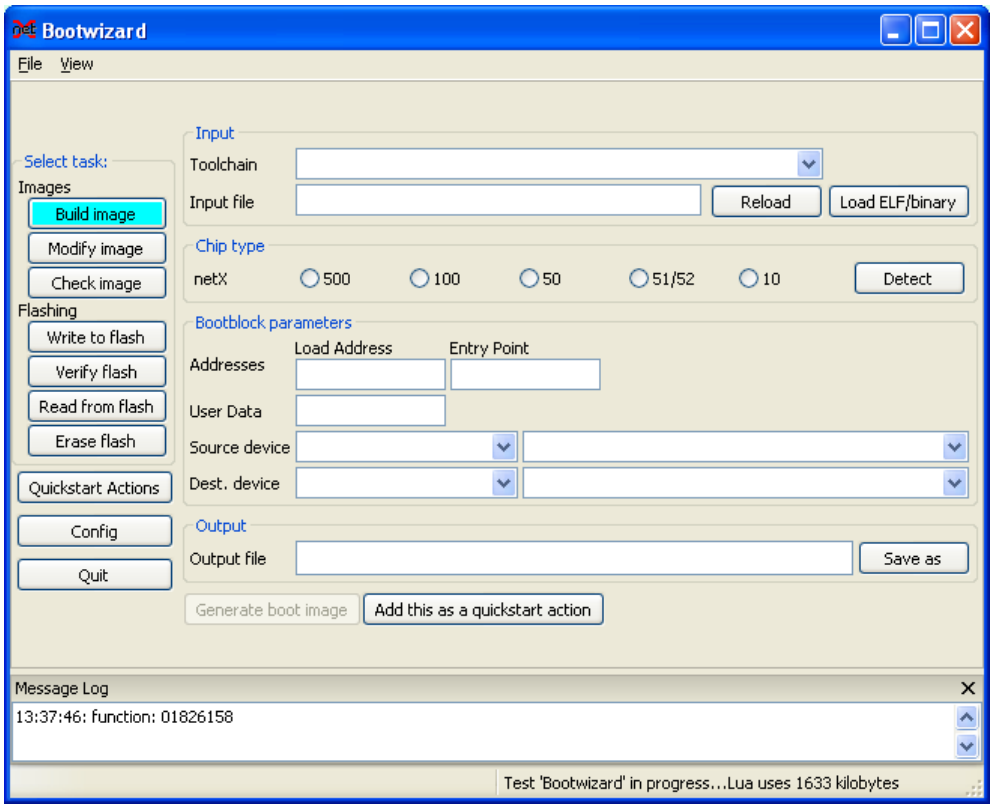


Figure 18: Bootwizard start screen

2. Choose flashing task.

➢ In the **Select Task** area, click **Write to flash** button.

➧ The Bootwizard shows the fields and controls for the **Write to flash** task:

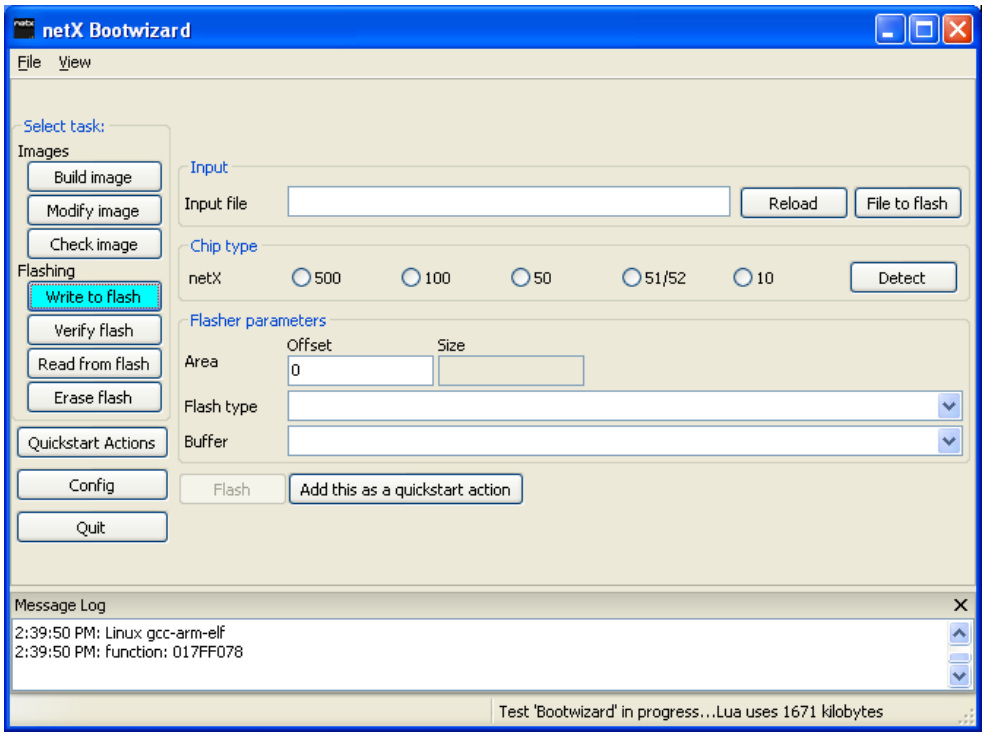


Figure 19: Bootwizard Write to flash screen

3. Select the image to be downloaded.

➢ In the **Input** area, click **File to flash** button.

➧ The **Select an input file** dialog window opens:

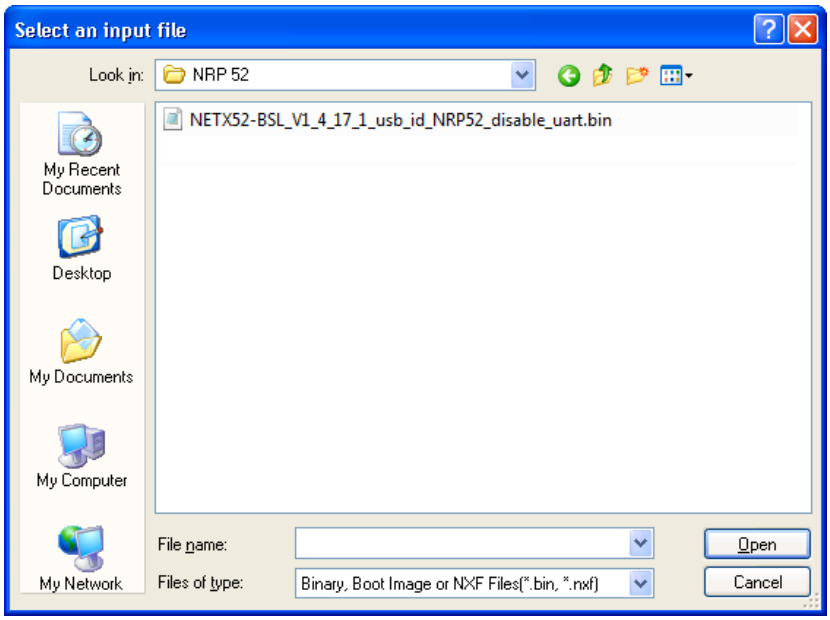


Figure 20: Select input file dialog

➢ On the product DVD, navigate to the directory where the image is stored and select the corresponding file:

If you are using a **NRP 51-RE**, go to the `Firmware\2nd Stage Bootloader\NRP 51` folder on the product DVD and select the `NETX51-BSL_V1_4_18_0_usb_id_NRP51_disable_uart_4MB.bin` file.

If you are using the **NRPEB 51-RE** board or a **NRP 51-RE\F8T** (the NRPEB 51-RE board is equipped with the NRP 51-RE\F8T), go to the `Firmware\2nd Stage Bootloader\NRP 51_F8T` folder and select the `NETX51-BSL_V1_4_18_0_usb_id_NRP51_disable_uart_8MB.bin` file.

If you are using a **NRP 52-RE** or a **NRPEB 52-RE**, go to the `Firmware\2nd Stage Bootloader\NRP 52` folder and select the `NETX52-BSL_V1_4_17_1_usb_id_NRP52_disable_uart.bin` file.

➢ After selecting the file, click **Open** button.

➢ The Bootwizard opens the file. The following message appears:

Figure 21: Bootwizard message

➢ Click **OK**.

4. Select Chip type.

➢ In the **Chip type** area, select **51/52**.

➧ The GUI should now look similar to this:

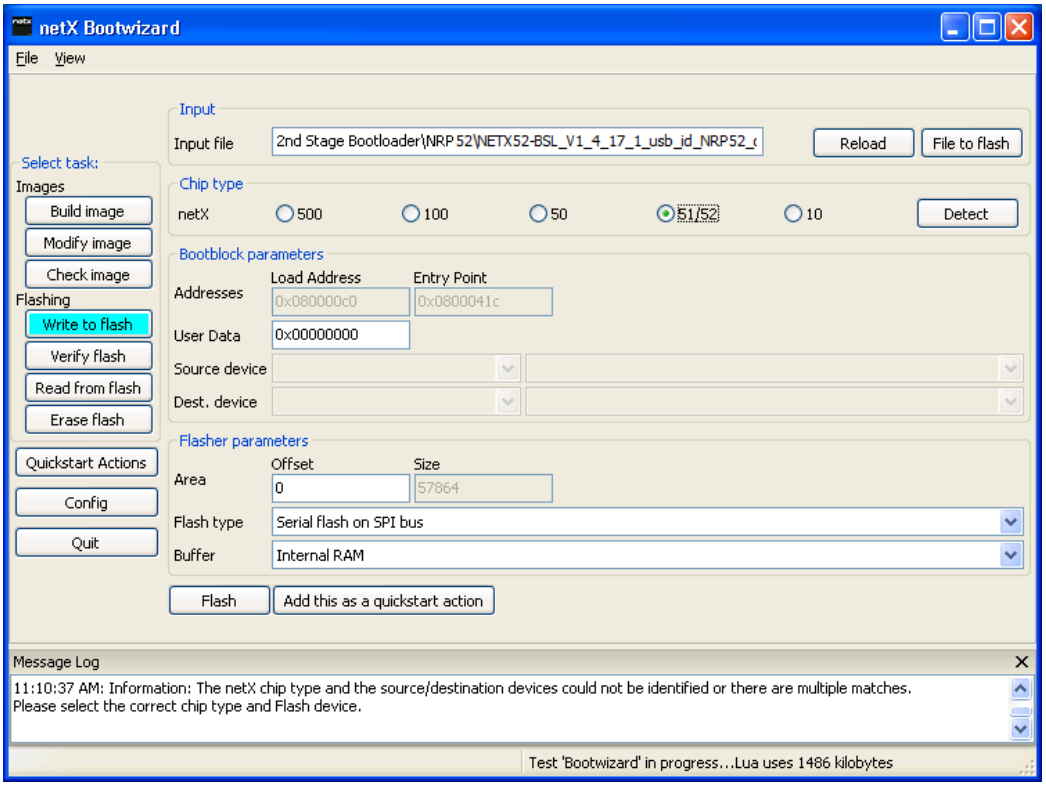


Figure 22: Selected file in Write to flash screen

5. Put the netRAPID into serial boot mode.

➢ Press down the **T2** serial boot button (**S-Boot**) on the Evaluation Board (see position ⑥ in the *NRPEB 51-RE Evaluation Board* section on page 26 respectively in the *NRPEB 52-RE Evaluation Board* section on page 28). Keep it pressed down.

➢ While keeping the **T2** button pressed down, push down briefly the **T1** reset button on the Evaluation Board (see position ⑤).

➧ The **SYS** LED on the Evaluation Board (see position ④) is blinking yellow (on/off), indicating serial boot mode.

6. Establish an USB connection.

➢ Plug an USB cable into the Mini-B USB socket on the Evaluation Board (see position ⑦) and connect the USB cable to your PC.

Note: The USB drivers needed for connecting the Bootwizard to the Bootmonitor running in the netX have automatically been installed on your PC by the Bootwizard setup program. However, under **Windows XP**, the installation process of the USB drivers needs to be completed in the **Found New Hardware Wizard**, which opens when you connect the netRAPID in serial boot mode for the first time to your PC. For finishing the installation of the USB drivers in the wizard, follow the instructions given below. The **Found New Hardware Wizard** opens twice: for the **netX51/52 Bootmonitor (CDC)** driver and for the **netX51/52 USB Bootmonitor (ROM)** driver.

Under **Windows 7** and **8**, the **Installing device driver software** message appears in the Windows task bar when you connect the netRAPID to the PC via USB cable for the first time. Windows then automatically copies the driver files to the appropriate Windows directories; you do not need to take any action in this.

If you are using Windows XP:

7. Finish installation of USB drivers in the **Found New Hardware Wizard**.

➢ In the start screen of the **Found New Hardware Wizard**, answer the question **Can Windows connect to Windows Update…?** by selecting the **No, not this time** option.

➢ Click **Next** button.

➢ In the next screen, answer the question **What do you want the wizard to do?** by selecting **Install the software automatically** option.

➢ Click **Next**.

↯ Windows then copies the driver files to the Windows directories.

➢ In the **Completing the Found New Hardware Wizard** screen, click **Finish** button.

8. Check USB connection in Device Manager (Windows XP).

➢ In the **Start menu,** choose **Control Panel** entry.

➧ The **Control Panel** window opens.

➢ In the **Control Panel**, double-click on **System** entry.

➧ The **System Properties** sheet opens.

➢ In the **System Properties** sheet, select **Hardware** tab.

➢ In the **Hardware** tab, click **Device Manager** button.

➧ The **Device Manager** window opens.

➢ Check the entries under **Ports (COM & LPT)** for the **netX52 Bootmonitor** (if you are using the NRP 52-RE or the NRPEB 52-RE board), respectively for the **netX51 Bootmonitor** (if you are using the NRP 51-RE or the NRPEB 51-RE board):

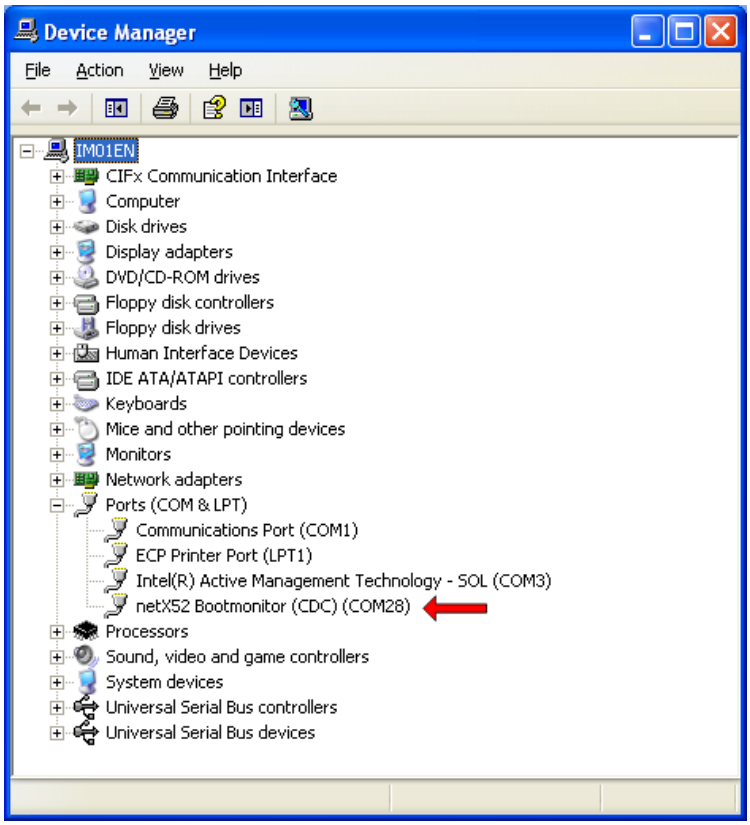


Figure 23: Check USB connection to netX 52 Bootmonitor in Windows XP

➧ The number of the COM port of your PC currently connected to the netRAPID is indicated in brackets. In this example, **COM28** is connected to the **netX52 Bootmonitor** (i. e. the ROM Loader running in the netX 52 controller on the netRAPID).

➢ Note or write down the number of the COM port (you will need the COM number in the next step), then close the **Device Manager**.

If you are using Windows 7 or 8:

8. Check USB connection (Windows 7 and 8):

- In the **Start** menu, choose **Control Panel** entry.
- The **Control Panel** window opens.
- In the **Control Panel** window, choose **Hardware and Sound** entry.
- The **Hardware and Sound** window opens.
- In the **Hardware and Sound** window, below **Devices and Printers**, click **Device Manager** entry.
- The **Device Manager** window opens.
- Check the entries under **Ports (COM & LPT)** for the **netX52 Bootmonitor** (if you are using the NRP 52-RE or the NRPEB 52-RE board), respectively for the **netX51 Bootmonitor** (if you are using the NRP 51-RE or the NRPEB 51-RE board):

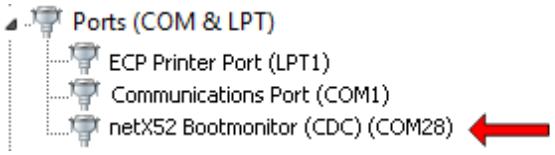


Figure 24: Check USB Connection to netX 52 in Windows 7

- The number of the COM port of your PC currently connected to the netRAPID is indicated in brackets. In this example, **COM28** is connected to the **netX52 Bootmonitor** (i. e. the ROM Loader running in the netX 52 controller on the netRAPID).
- Note or write down the number of the COM port (you will need the COM number in the next step), then close the **Device Manager**.

9. Download image file.

Note: The **Area Offset** in the **Flasher parameters** section of the Bootwizard is set to `0` by default. This **Area Offset** parameter defines the starting position of the flash operation and should be kept at `0` when flashing a file to the NRP 51-RE or the NRP 52-RE. This is because the rear area of the flash memory (starting approx. at offset `0x3ff000`) stores device identification data which is protected by a Flash Device Label. If you download a file to an area too close to the protected area (e.g. at offset `0x3fe000`), the downloaded file might get truncated in order not to violate the protected area. This may of course corrupt the downloaded file. In any case, the Bootwizard will notify you with a message if you have performed a flasher task that has been affected by a conflict with the Flash Device Label.

➢ In the Bootwizard, click **Flash** button.

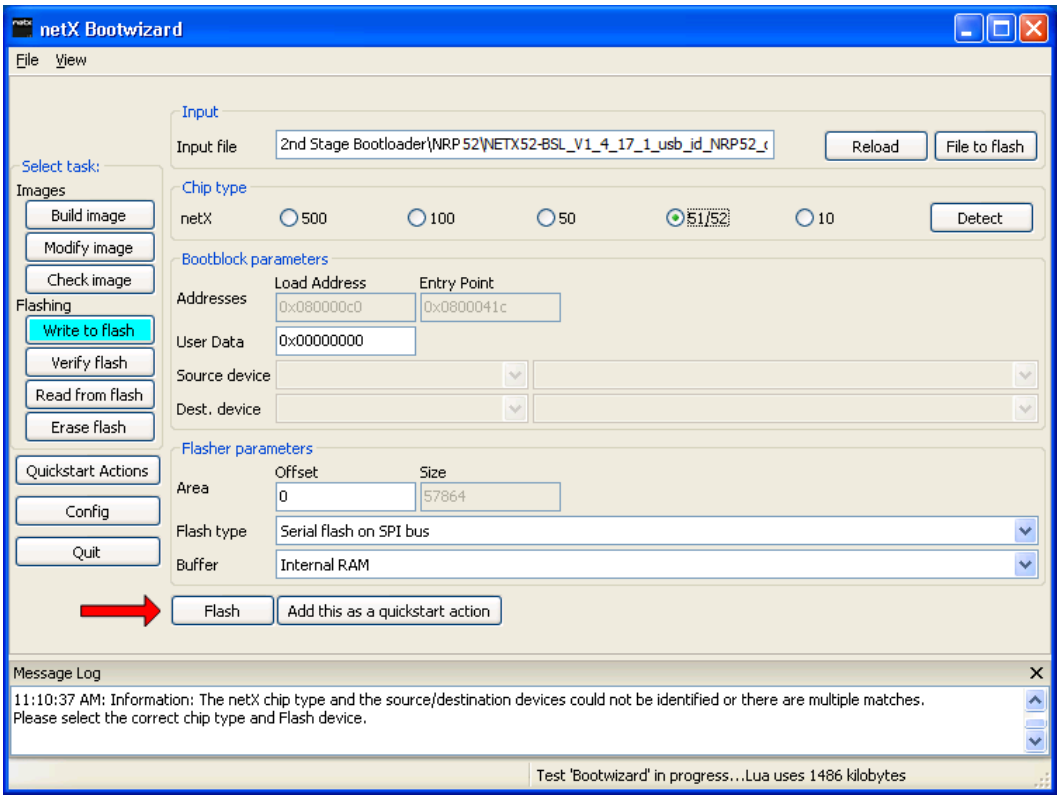


Figure 25: Write to flash screen

➢ The plugin selector opens:

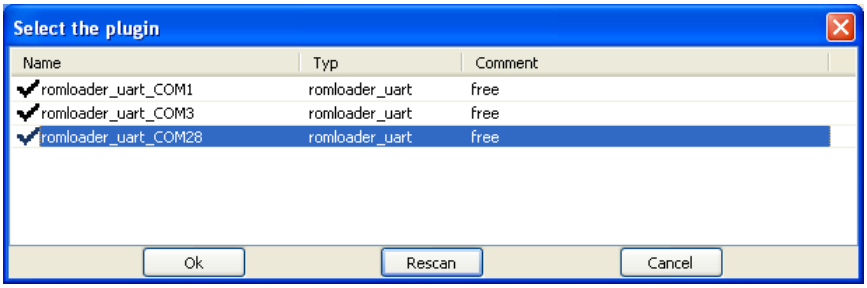


Figure 26: Plugin selector for netX 52 Rom Loader

➢ Select the COM port connected to the netX Bootmonitor (the COM number which you have found out in the Device Manager in the previous step).

➢ Click **OK** button (or double-click the relevant COM port entry).

- The Bootwizard now sends the data file and the flasher program to the netRAPID and runs the flasher. While downloading, a progress bar is shown:

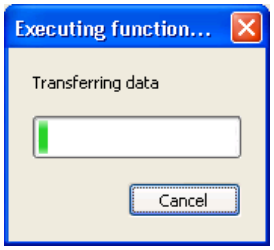


Figure 27: Progress window

- Finally, a success or error message is shown. If a conflict with the Flash Device Label occurred, you will also be told about this in the message.

Figure 28: Flashing successful message

10. Reset the netRAPID.

- Disconnect the USB cable from the Evaluation Board.
- Push the **Reset** button (T1) on the Evaluation Board (see position ⑤ in the *NRPEB 51-RE Evaluation Board* section on page 26 respectively in the *NRPEB 52-RE Evaluation Board* section on page 28).
- The ROM Loader loads the executable binary image from the flash memory into the internal RAM of the netX.
  In case of the Second Stage Bootloader, the SSBL now running in the internal RAM is searching for NXF firmware to boot and to load into the internal RAM. If you have not downloaded any firmware file yet, the SSBL of course won't be able to find it. This is indicated by the **SYS** LED (see position ④) alternating between yellow and green.

4.2.3 Downloading firmware to the netRAPID via USB

4.2.3.1 Overview

This section describes the download of a Standard Loadable Firmware file from your configuration PC to the flash memory of the netRAPID via USB.

The instructions in this section apply to the following devices:

- NRP 10-DPS (USB interface needs to be implemented on host device)
- NRP 10-CCS (USB interface needs to be implemented on host device)
- NRPEB 10-DPS
- NRPEB 10-CCS
- NRP 51-RE (USB interface needs to be implemented on host device)
- NRPEB 51-RE
- NRP 52-RE (USB interface needs to be implemented on host device)
- NRPEB 52-RE

The download of the limited PROFIBUS DP Slave firmware to the NRP 10-DPS is used as general example of how to download firmware to the netRAPID. The procedure for other netRAPIDs and Evaluation Boards or for fully licensed firmware follows the same principle.

Note that the Second Stage Bootloader (SSBL) must have been downloaded to the netRAPID before you can download or boot any Standard Loadable Firmware (LFW) on the device.
Note also that the LFW file (unlike the SSBL file) cannot be downloaded to flash memory of the netRAPID by using the **netX Bootwizard** application because the Bootwizard cannot cope with the file system set up by the SSBL already running on the netRAPID. Therefore, you need another Hilscher application to download the firmware file. This is the **netHOST Device Test Application**. The netHOST Device Test Application is stored on the **netRAPID Evaluation DVD** (NRPEB product DVD) in the `Tools\netHost` directory and can be run directly from DVD, it does not need to be installed on your PC.

4.2.3.2 Prerequisites

- You have downloaded the Second Stage Bootloader to the netRAPID.
- The Evaluation Board (respectively the host device of the netRAPID) is connected to a voltage supply.
- You have a USB cable with a Mini-B connector ready.
- You have installed the Hilscher USB device drivers on your PC. (On the NRPEB product DVD, open the `Driver and Toolkit\USB Diagnostic Driver` directory, then double-click **setup.exe** file. Follow the instructions of the installation wizard)
- You have access to the firmware file which you want to download. (On the NRPEB product DVD, firmware is stored in the `Firmware\netRAPID_Ltd` folder.)

4.2.3.3 Step-by-step instructions

1. Run the Second Stage Bootloader on the netRAPID.

➢ Push the **Reset** button (T1) on the Evaluation Board (see position ⑤ in the *NRPEB 10-CCS and NRPEB 10-DPS Evaluation Boards* section on page 24).

➧ The Second Stage Bootloader is loaded from flash memory and then runs in the internal RAM of the netX on the netRAPID, searching for firmware to boot. This is indicated by the **SYS** LED (see position ④) alternating between yellow and green.

2. Establish USB connection.

➢ Plug an USB cable into the Mini-B USB socket on the Evaluation Board (see position ⑦) and connect the USB cable to your PC.

Note: If the **Found New Hardware Wizard** opens under **Windows XP**, answer the question **Can Windows connect to Windows Update…?** by selecting the **No, not this time** option. In the next screen, answer the question **What do you want the wizard to do?** by selecting **Install the software automatically** option.

3. Check USB connection in Device Manager under **Windows XP**:

➢ In the **Start menu,** choose **Control Panel** entry

➧ The **Control Panel** window opens.

➢ In the **Control Panel**, double-click on **System** entry.

➧ The **System Properties** sheet opens.

➢ In the **System Properties** sheet, select **Hardware** tab.

➢ In the **Hardware** tab, click **Device Manager** button.

➧ The **Device Manager** window opens.

➢ Check the entries under **Ports (COM & LPT)** for the **Hilscher netRAPID** entry.

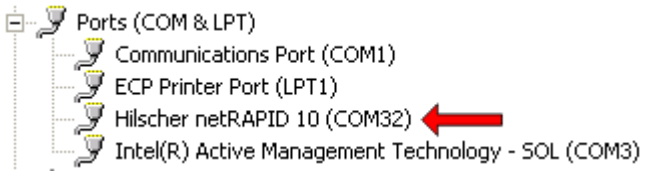


Figure 29: Check USB connection to netRAPID in Windows XP

➧ The number of the COM port of your PC currently connected to the netRAPID is indicated in brackets. In this example, **COM32** is connected to the Second Stage Bootloader running in your netRAPID.

3. Check USB connection in Device Manager under **Windows 7** or **8**:

➢ In the **Start** menu, choose **Control Panel** entry.

➮ The **Control Panel** window opens.

➢ In the **Control Panel** window, choose **Hardware and Sound** entry.

➮ The **Hardware and Sound** window opens.

➢ In the **Hardware and Sound** window, below **Devices and Printers**, click **Device Manager** entry.

➮ The **Device Manager** window opens.

➢ Check the entries under **Ports (COM & LPT)** for the **Hilscher netRAPID** entry.

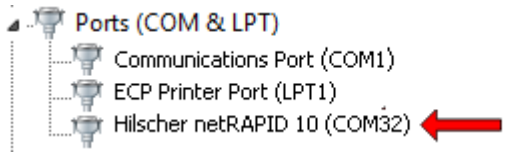


Figure 30: Check USB connection to netRAPID in Windows 7

➮ The number of the COM port of your PC currently connected to the netRAPID is indicated in brackets. In this example, **COM32** is connected to the Second Stage Bootloader running in your netRAPID.

4. Open the **netHOST Device Test Application** on your PC.

➢ Use the Windows Explorer to open the directory `Tools\netHost` on the DVD.

➢ Double-click **netHOST.exe**.

➮ The **netHOST Device Test Application** opens:

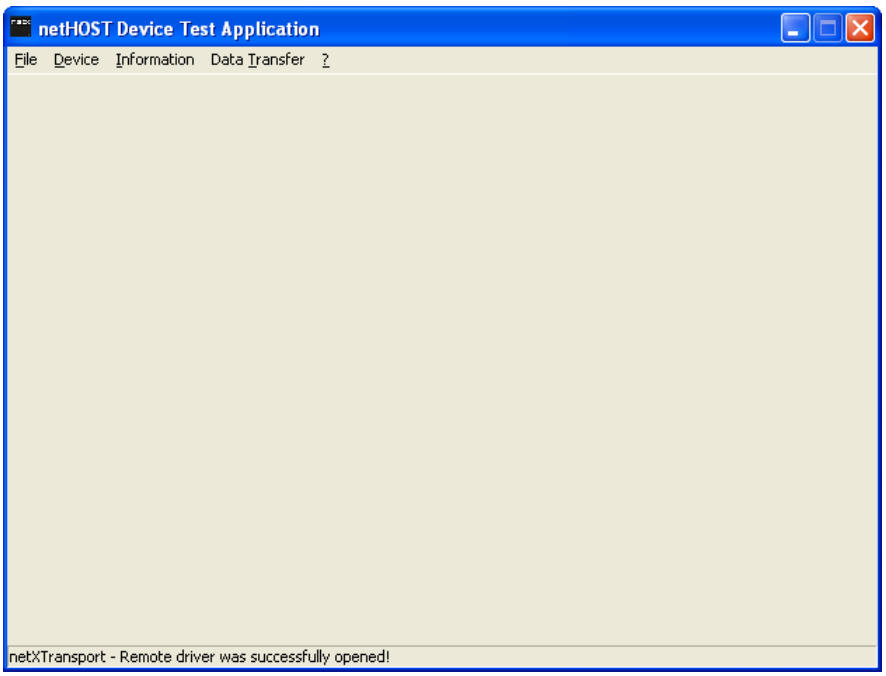


Figure 31: netHOST Device Test Application start screen

5. Open connection to netRAPID.

➢ In the menu, choose **Device** > **Open** and wait for a few seconds.

➢ After a short while, the **Channel Selection** dialog box opens:

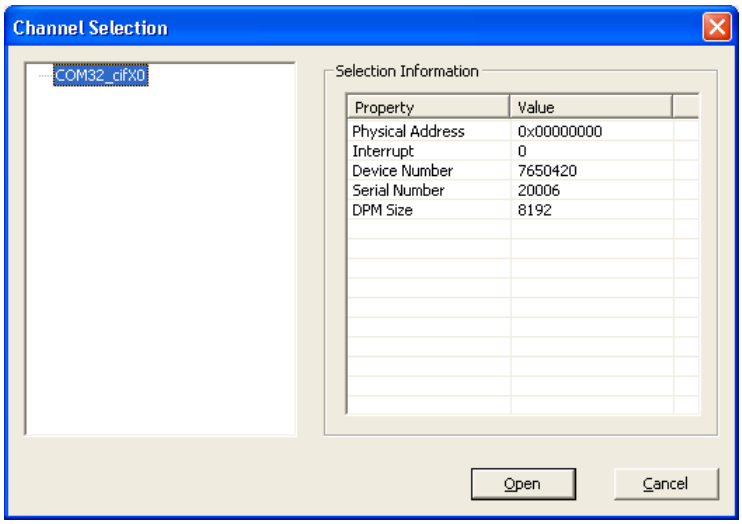


Figure 32: Channel selection dialog

➢ In the left part of the dialog box, select the COM port to which the netRAPID is connected via USB, then click **Open** button.

➢ The **Channel Selection** dialog box closes, and back in the **netHOST Device Test Application** window, the header displays the selected channel:

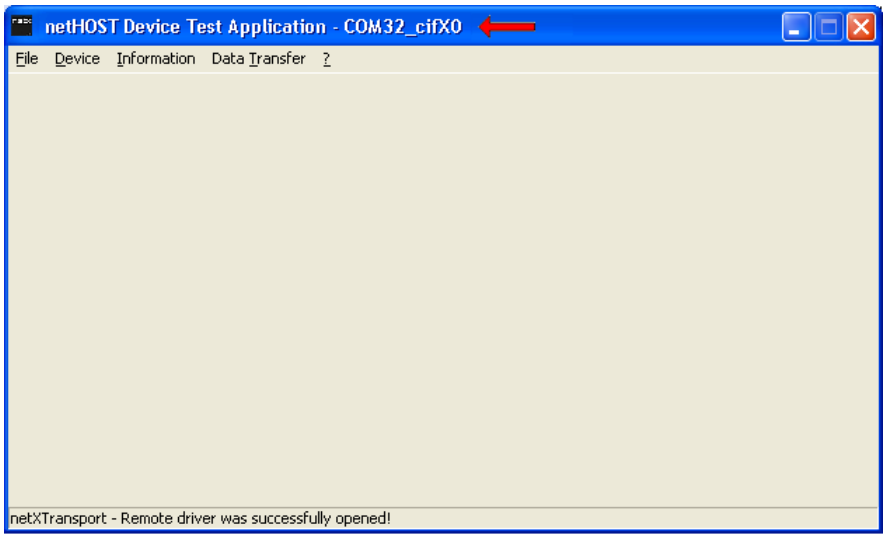


Figure 33: netHOST Device Test Application after channel selection

6. Select firmware file.

➢ In the menu, choose **Device** > **Download**.

➧ The **Download** window opens:

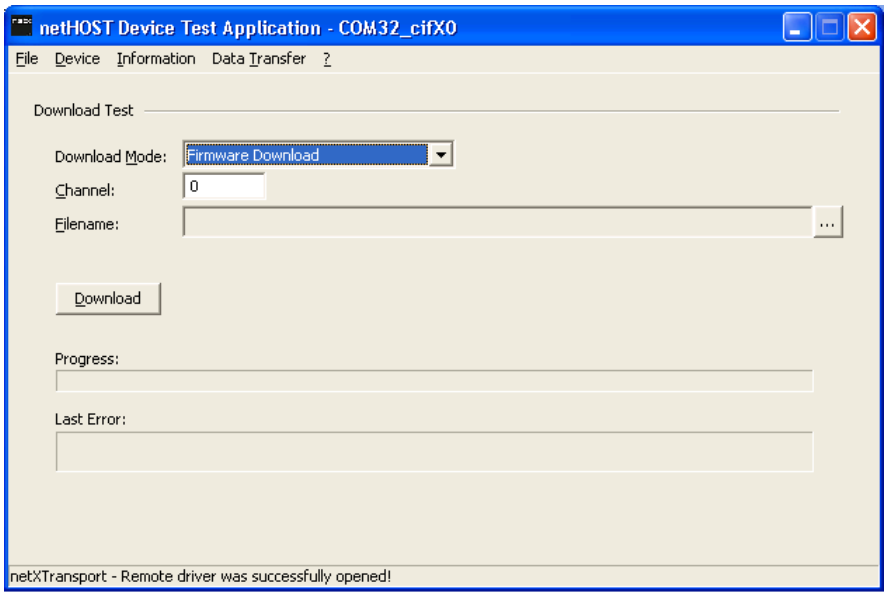


Figure 34: Download window

➢ In the **Download Mode** drop-down list, choose **Firmware Download**.

➢ Click ... button next to the **Filename** field.

➧ The Windows file selection dialog opens:

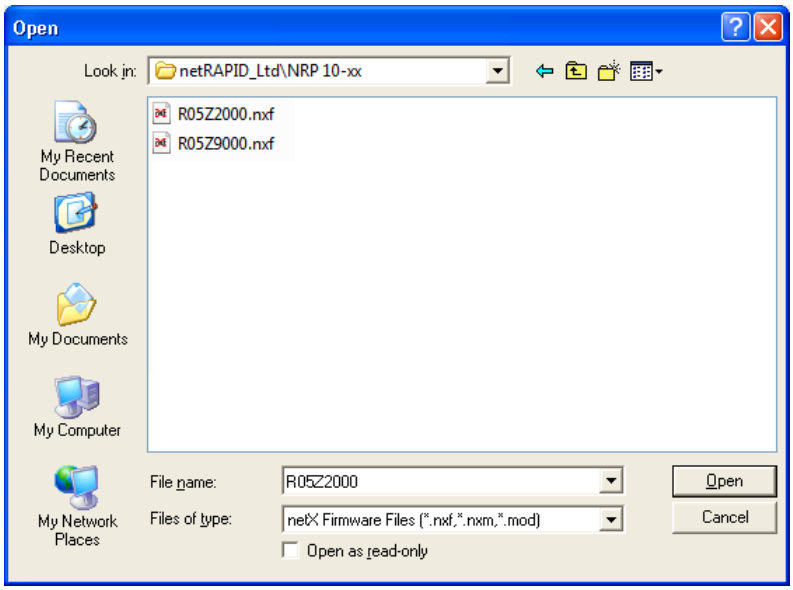


Figure 35: File selection

➢ In the Windows file selection dialog, navigate to the `Firmware\netRAPID_LTD` directory, open the `NRP 10-xx`, `NRP 51-RE` or `NRP 52-RE` folder and select the firmware file which you want to download:
PROFIBUS DP Slave for NRP 10-DPS: R05Z2000.nxf
CC-Link Slave for NRP 10-CCS: R05Z9000.nxf
PROFINET IO Device for NRP 51-RE: R06ZD000.nxf
PROFINET IO Device for NRP 52-RE: R07ZD000.nxf
EtherCAT Slave for NRP 51-RE: R06ZF000.nxf
EtherCAT Slave for NRP 52-RE: R07ZF000.nxf
Sercos Slave for NRP 51-RE: R06ZJ000.nxf
Sercos Slave for NRP 52-RE: R07ZJ000.nxf
Open Modbus/TCP for NRP 51-RE: R06ZL000.nxf
Open Modbus/TCP for NRP 52-RE: R07ZL000.nxf
Ethernet/IP Adapter for NRP 51-RE: R06ZH000.nxf
Ethernet/IP Adapter for NRP 52-RE: R07ZH000.nxf
POWERLINK Controlled Node for NRP 51-RE: R06ZK000.nxf
POWERLINK Controlled Node for NRP 52-RE: R07ZK000.nxf
VARAN Client for NRP 51-RE: R06ZT000.nxf
VARAN Client for NRP 52-RE: R07ZT000.nxf

➢ Click **Open** button.

↬ The Windows file selection dialog closes, and back in the **Download** window, the selected Firmware file is displayed in the **Filename** field.

7. Download firmware file.

➢ Click **Download** button to start the file download.

↬ While the firmware file is being downloaded to the netRAPID, a progress bar is displayed:

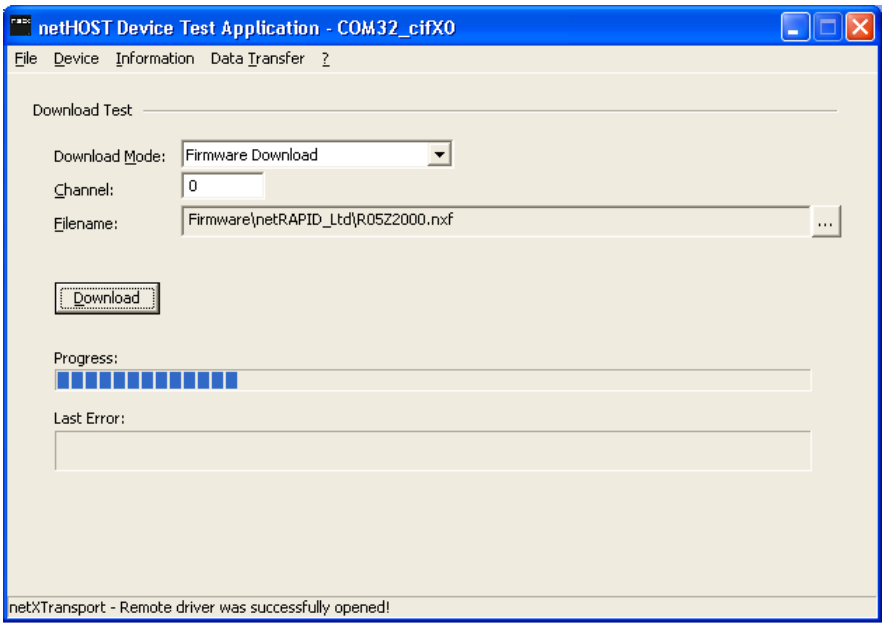


Figure 36: Firmware download in progress

Note: A completed download is indicated only by the full progress bar; there will be no extra message box popping up in order to inform you about the completion of the download.

8. Reset netRAPID to start the firmware.

➢ Disconnect the USB cable from the netRAPID.

➢ Push the **Reset** button (**T1**) on the netRAPID (see position ⑤ in the *NRPEB 10-CCS and NRPEB 10-DPS Evaluation Boards* section on page 24).

➢ The firmware is loaded by the Second Stage Bootloader. Running firmware is indicated by a steady green **SYS** LED (see position ④).
If you have downloaded a PROFIBUS DP slave firmware, the **V12** (COM 0) LED (see position ③) is blinking acyclically red, indicating that the PROFIBUS configuration is missing.

➢ In the menu of the **netHOST Device Test Application**, choose **Device** > **Close**, then choose **File** > **Quit** to exit the application.

4.2.4 Downloading Firmware to the netRAPID via PCI and Host Interface

4.2.4.1 Overview

This section describes how to download firmware via the PCI interface of your configuration PC to the flash memory of the netRAPID via **Host Interface** by using the **cifX Driver Setup Utility** and the **NXPCA-PCI Adapter Board**. If you have already downloaded the combined SSBL and LFW image, or if you have already downloaded the firmware via USB, you don't need to do this.

The instructions in this section apply to the following devices:

- NRP 10-DPS (host interface needs to be implemented on host device)
- NRP 10-CCS (host interface needs to be implemented on host device)
- NRPEB 10-DPS
- NRPEB 10-CCS
- NRP 51-RE (host interface needs to be implemented on host device)
- NRPEB 51-RE
- NRP 52-RE (host interface needs to be implemented on host device)
- NRPEB 52-RE

The download of the limited PROFIBUS DP Slave firmware to the NRP 10-DPS is used as general example of how to download firmware to the netRAPID. The procedure for other netRAPIDs and Evaluation Boards or fully licensed firmware follows the same principle.

Note that the Second Stage Bootloader (SSBL) must have been downloaded to the netRAPID before you can download or boot any Standard Loadable Firmware (LFW) on the device.

For further information about the NXPCA-PCI board, please refer to the *User Manual NXPCA-PCI*.

4.2.4.2 Prerequisites

- Hilscher **NXPCA-PCI Adapter Board** (part number 7902.100).
- Hilscher **CAB-NXPCA-PCI** cable (part number 4400.000)
- You have installed the cifX Device Driver on your PC (on the NRPEB product DVD, open the `Driver and Toolkit\Device Driver (NXDRV-WIN)\Installation` directory, then double-click **cifX Device Driver Setup.exe** file. Follow the instructions of the installation wizard).
- You have downloaded the **Second Stage Bootloader** to the netRAPID (see section *Downloading executable binary image to NRP 10 via USB* on page 37, respectively section *Downloading executable binary image to NRP 51-RE or NRP 52-RE* via USB on page 46).
- You have access to the firmware file which you want to download. Firmware files are stored on the NRPEB product DVD in the `Firmware\netRAPID_Ltd` directory.

4.2.4.3 Step-by-Step Instructions

1. Install NXPCA-PCI Adapter Board in your configuration PC.

WARNING

Lethal Electrical Shock caused by parts with more than 50V!

First disconnect the power plug of the PC !
Make sure that the power supply is off at the PC !

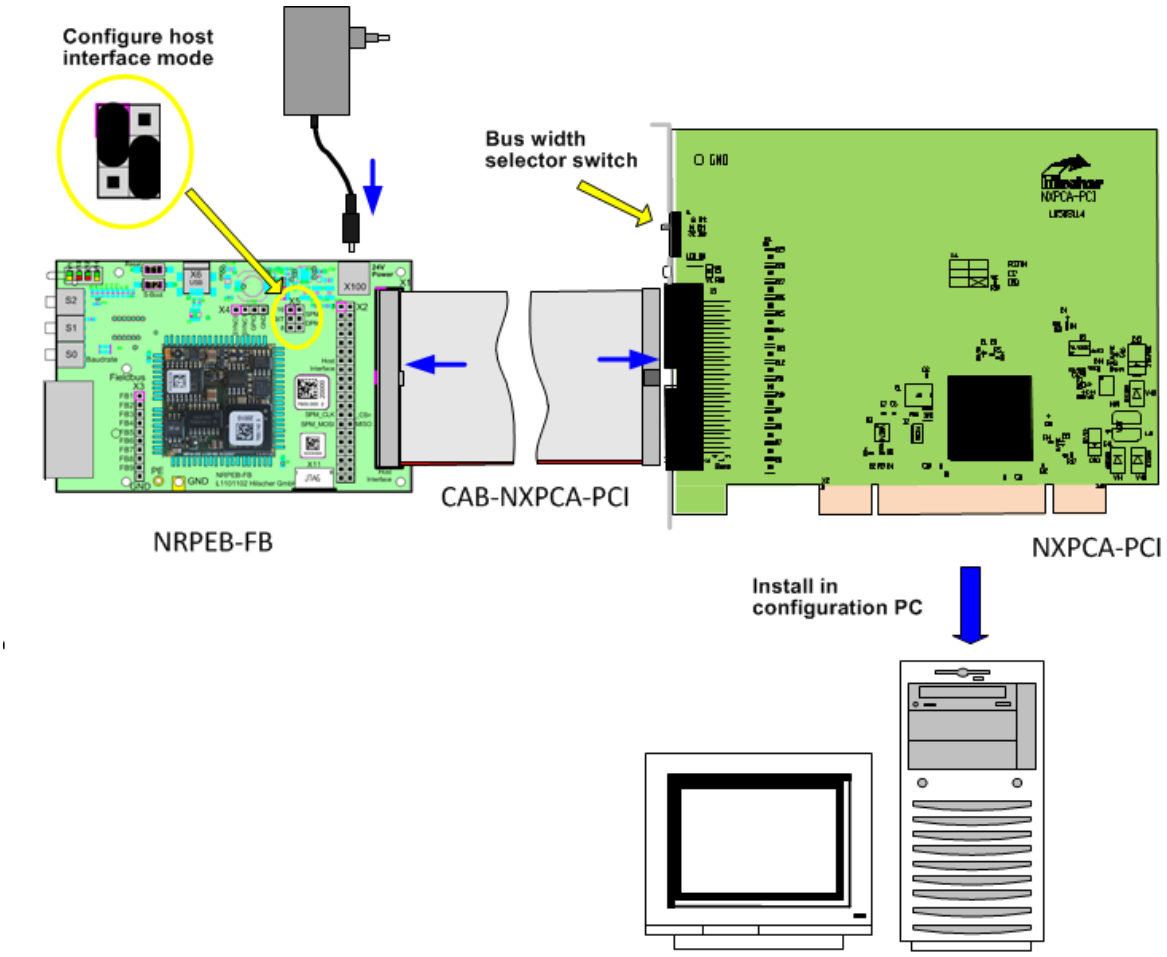


Figure 37: Connecting Evaluation Board to PC via Adapter Board

- On the NXPCA-PCI board, set the bus width selector switch (located near the 68-pin DPM connector socket) to 16 Bit mode (middle position of slide switch).
- Open the housing of your configuration PC.
- Install the NXPCA-PCI adapter board at a free PCI interface slot of the PC.
- Close the housing of your configuration PC.

2. Connect Evaluation Board to NXPCA-PCI adapter board.

- Connect one end of the CAB-NXPCA-PCI cable to the 68-pin Dual-port memory connector socket of the NXPCA-PCI adapter board (accessible through cut-out slots in PC housing).
- Connect the other end of the CAB-NXPCA-PCI cable to the **X1** host interface connector socket on the Evaluation Board (see position (11) in the *netRAPID Evaluation Boards* section on page 24).
- Reconnect your configuration PC to power supply and switch it on.

3. Finish installation of NXPCA-PCI adapter board under Windows.

After rebooting the configuration PC, Windows recognizes the new NXPCA-PCI hardware and wants to finish the installation of the appropriate driver.

If you are using Windows 7 or 8:

Under **Windows 7** and **8**, the **Installing device driver software** message appears in the Windows task bar. If you have already installed the cifX Device Driver on your PC (as recommended), Windows automatically copies the driver files to the appropriate Windows directories. You do not need to take any action in this.

If you are using Windows XP:

Under Windows XP, the **Found New Hardware Wizard** opens. If you have already installed the cifX Device Driver on your PC (as recommended), do the following:

- In the start screen of the **Found New Hardware Wizard**, answer the question **Can Windows connect to Windows Update…?** by selecting the **No, not this time** option.
- Click **Next** button.
- In the next screen, answer the question **What do you want the wizard to do?** by selecting **Install the software automatically** option.
- Click **Next**.
- Windows then copies the driver files to the Windows directories.
- In the **Completing the Found New Hardware Wizard** screen, click **Finish** button.

4. Configure netRAPID for DPM host interface mode.

➢ If you are using a **NRPEB 10-CCS**, **NRPEB 10-DPS** or **NRPEB 52-RE** Evaluation Board:
Use the **X5 Host Mode** pin strip on the board (see position ⑨ in the *netRAPID Evaluation Boards* section on page 24) to set the host interface mode to **Parallel Dual-Port Memory 16 bit mode**.
Set the following jumper positions:

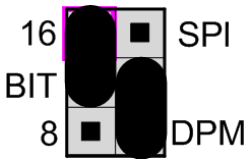
X5	Description
	16 bit mode: use jumper to connect pin 1 to pin 3 Parallel DPM mode: use jumper to connect pin 4 to pin 6

Table 24: Set jumpers on X5 for Dual-Port Memory

➢ If you are using the **NRPEB 51-RE** Evaluation Board:
Use the **S203**, **S204** and **S300** switches on the board (see positions ㉗, ㉖ and ㉕ in the *NRPEB 51-RE Evaluation Board* section on page 26) to set the host interface mode to **Parallel Dual-Port Memory 16 bit mode**. To do so, set the switches as follows:

S203 position (27)	S204 position (26)	S300 position (25)
		

Table 25: Set switches on NRPEB 51-RE for Dual-Port Memory

5. Start the netRAPID.

➢ Connect the netRAPID to the power supply.

↬ The Second Stage Bootloader is loaded from the flash memory and then runs in the internal RAM of the netRAPID, searching for firmware to boot. This is indicated by the **SYS** LED (see position ④ in the *netRAPID Evaluation Boards* section on page 24) alternating between yellow and green.

6. Enable/disable the NXPCA-PCI driver before firmware download.

Before you can download the firmware file, you have to acquaint the Windows driver on your configuration PC with the new system channel in the Dual-Port Memory of the netRAPID, which has been established by the Second Stage Bootloader.

This can be achieved by enabling/disabling the **NXPCA-PCI driver** in the **Device Manager** of the PC:

- Open the **Device Manager** on your PC.
  In Windows XP: **Start** menu > **Control Panel** > **System** > **Hardware** > **Device Manager**
  In Windows 7 and 8: **Start** menu > **Control Panel** > **Hardware and Sound** > **Device Manager**
- In the **Device Manager**, click on the **+** Symbol in front of the **CIFx Communication Interface** entry, then right-click **NX-PCA-PCI** entry to open the context menu.
- In the context menu, select **Disable**.

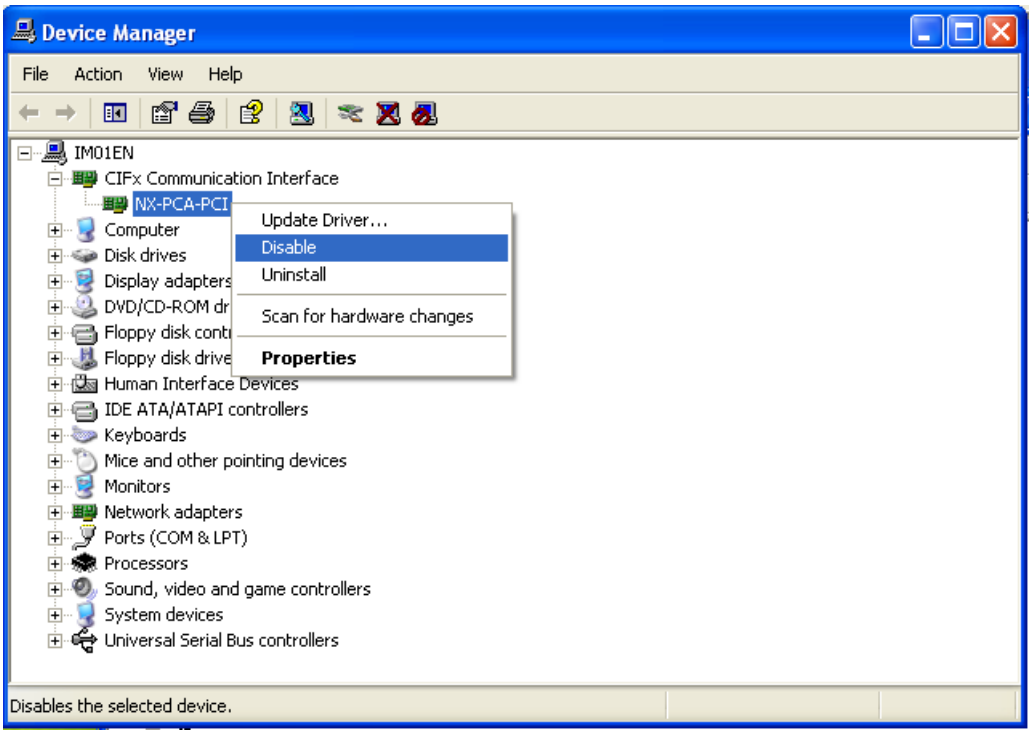


Figure 38: Disable NXPCA-PCI in Device Manager (Windows XP)

A warning message appears.

- Acknowledge the warning message with **Yes**.

➢ Wait for a few seconds, then open the context menu on the **NX-PCA-PCI** entry again and select **Enable**.

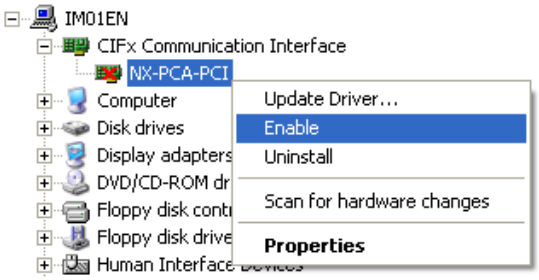


Figure 39: Enable NXPCA-PCI in Device Manager (Windows XP)

You can now proceed to download the firmware.

7. Open cifX Driver Setup Utility on your PC.

If you are using Windows XP:

➢ In the **Start** menu, choose **Control Panel**.

The **Control Panel** opens. Here you will see two cifX icons:

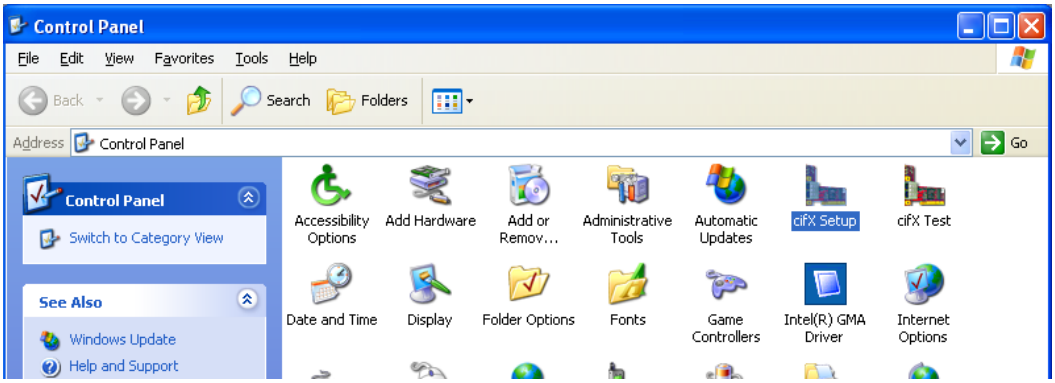


Figure 40: Control Panel in Windows XP

➢ Double-click **cifX Setup** icon.

If you are using Windows 7 or 8:

➢ In the **Start** menu, choose **Control Panel**.

↬ The **Control Panel** opens.

➢ In the navigation bar of the **Control Panel**, click on ▸ button and select **All Control Panel Items** entry.

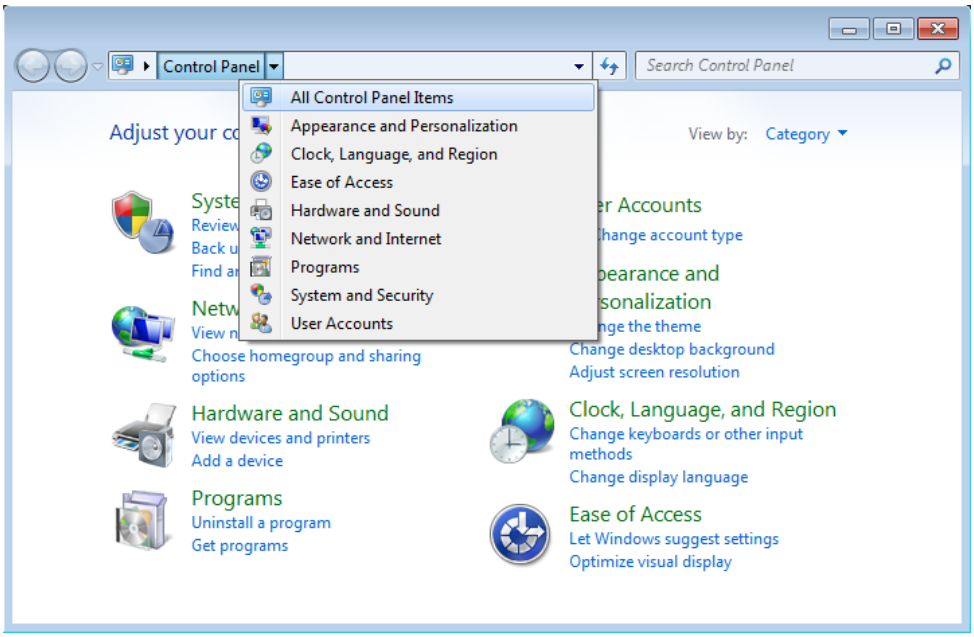


Figure 41: Control Panel in Windows 7

↬ The **All Control Panel Items** window opens:

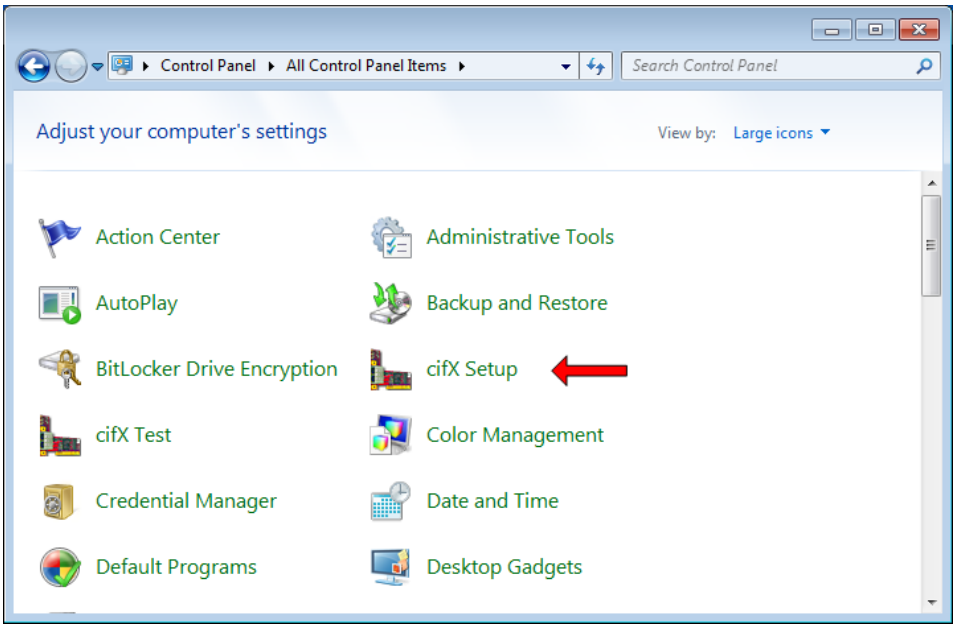


Figure 42: All Control Panel items in Windows 7

➢ Double-click **cifX Setup** icon.

➢ Answer the question **Do you want to allow the following program to make changes to this computer** with Yes.

➭ The cifX Driver Setup Utility window opens:

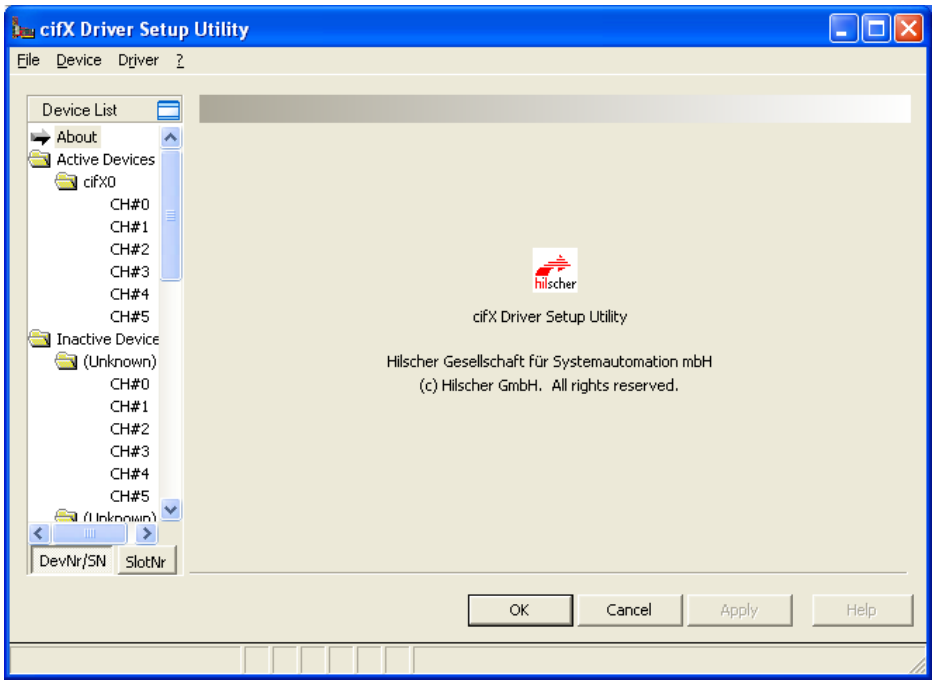


Figure 43: cifX Driver Setup Utility start screen

8. Select connected device.

➢ In the **Device List**, in the folder **Active Devices**, click on the **cifX** entries to display the device information parameters.

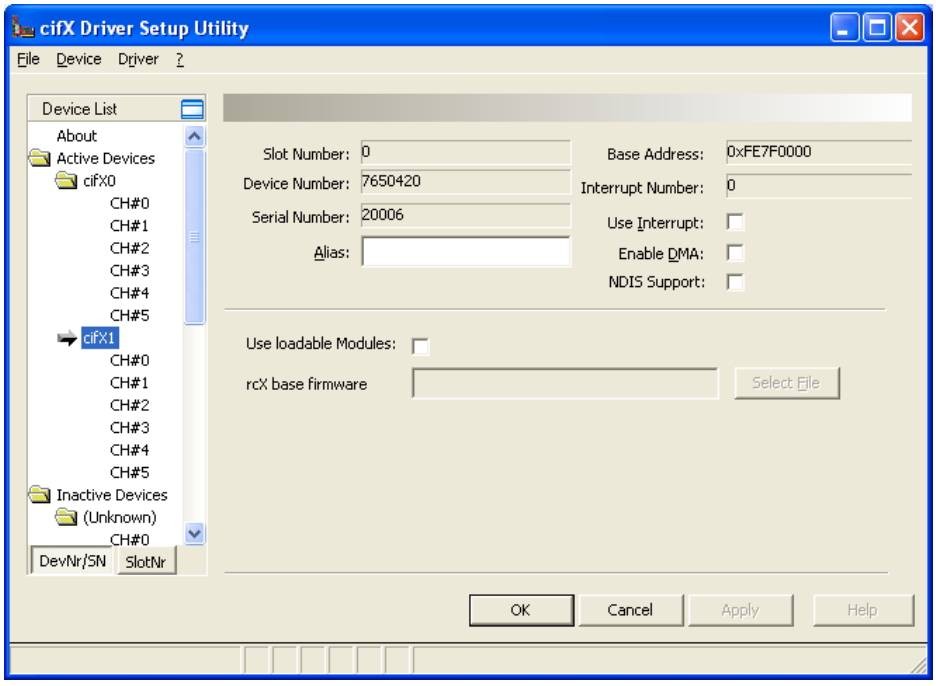


Figure 44: Check device number in cifX Driver Setup Utility

➢ Check, which of the connected devices is your netRAPID:
the **NRP 10-DPS** has the **Device Number** 7650420
the **NRP 10-CCS** has the **Device Number** 7650740
the **NRP 51-RE** has the **Device Number** 7660101
the **NRP 52-RE** has the **Device Number** 7670100

Note: This checking of the device number is only necessary if you have connected more than one Hilscher device to your development PC, e.g. the netRAPID and also a PC Card cifX.
If you have connected only the netRAPID, choose the first entry in the **Active Devices** folder.

9. Select communication channel.

➢ In the **Device List**, in the folder **Active Devices**, click **CH#0** entry of your netRAPID.

Note: A firmware and a configuration file can be assigned to each of the communication channels CH#0 to CH#5. By default, only channel CH#0 is used for firmware files in the `.nxf` format. The other channels are used for modular firmware files in the `.nxo` format.

➢ The following window is displayed:

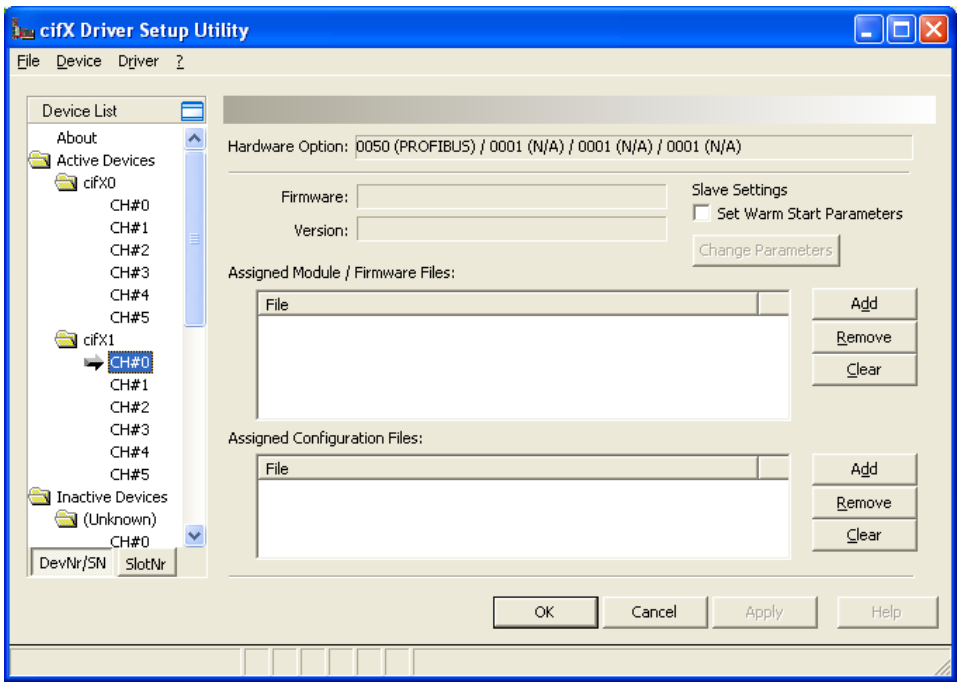


Figure 45: cifX Driver Setup Utility – channel selection

10. Select firmware file.

➢ In the **Assigned Module / Firmware Files** area, click **Add** button.

➢ A file selection dialog window opens:

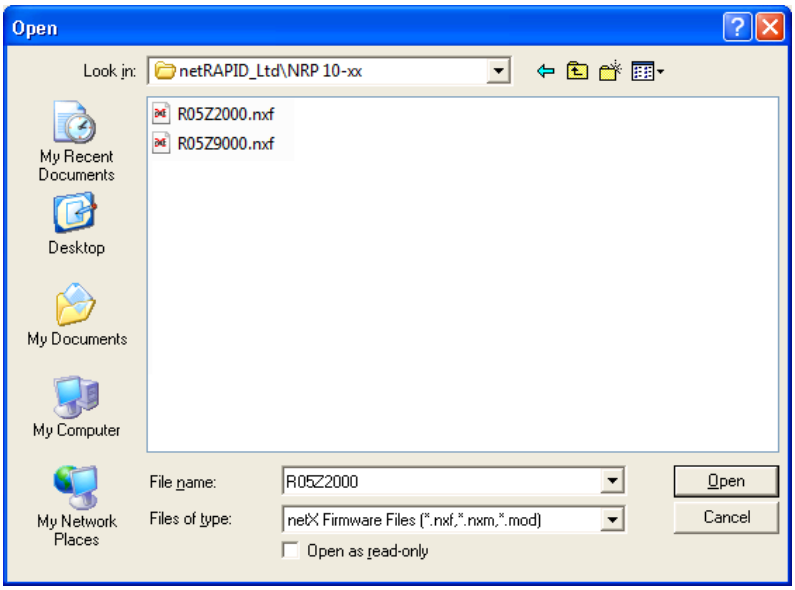


Figure 46: cifX Driver Setup Utility – open file dialog

➢ In the Windows file selection dialog, navigate to the `Firmware\netRAPID_LTD` directory, open the `NRP 10-xx`, `NRP 51-RE` or `NRP 52-RE` folder and select the firmware file which you want to download:
PROFIBUS DP Slave for NRP 10-DPS: R05Z2000.nxf
CC-Link Slave for NRP 10-CCS: R05Z9000.nxf
PROFINET IO Device for NRP 51-RE: R06ZD000.nxf
PROFINET IO Device for NRP 52-RE: R07ZD000.nxf
EtherCAT Slave for NRP 51-RE: R06ZF000.nxf
EtherCAT Slave for NRP 52-RE: R07ZF000.nxf
Sercos Slave for NRP 51-RE: R06ZJ000.nxf
Sercos Slave for NRP 52-RE: R07ZJ000.nxf
Open Modbus/TCP for NRP 51-RE: R06ZL000.nxf
Open Modbus/TCP for NRP 52-RE: R07ZL000.nxf
Ethernet/IP Adapter for NRP 51-RE: R06ZH000.nxf
Ethernet/IP Adapter for NRP 52-RE: R07ZH000.nxf
POWERLINK Controlled Node for NRP 51-RE: R06ZK000.nxf
POWERLINK Controlled Node for NRP 52-RE: R07ZK000.nxf
VARAN Client for NRP 51-RE: R06ZT000.nxf
VARAN Client for NRP 52-RE: R07ZT000.nxf

➢ Click **Open** button.

➧ The selected Firmware file is displayed in the **Assigned Module / Firmware Files** field:

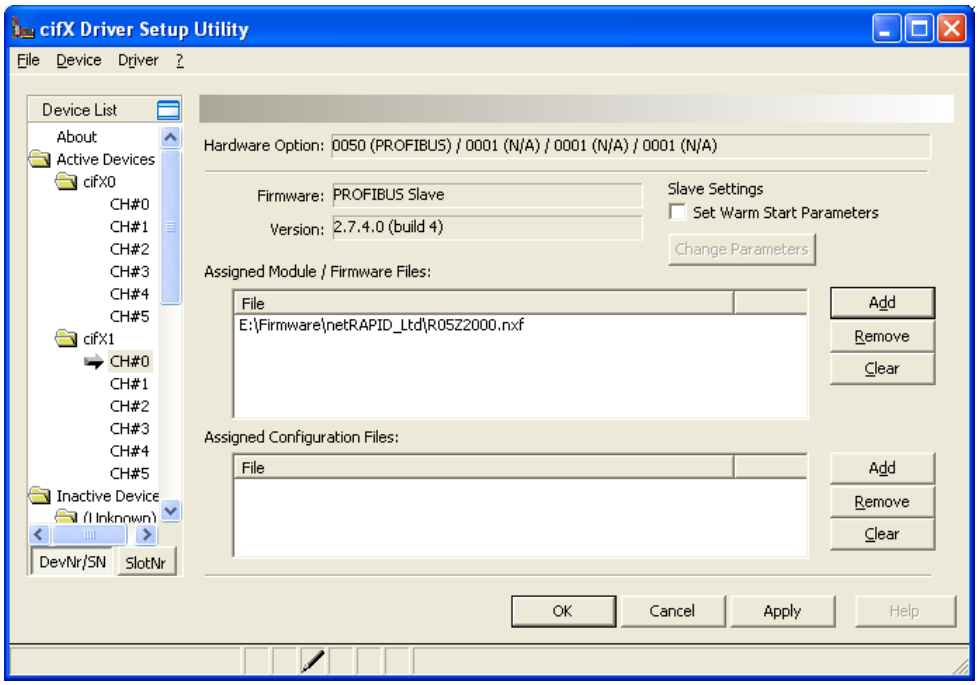


Figure 47: cifX Driver Setup Utility – selected firmware file

11. Download firmware file.

➢ Click **Apply** button to activate the file download (click **OK** button to download the file and to close the **cifX Driver Setup Utility**).

➧ A dialog box asking you to restart the netRAPID appears:

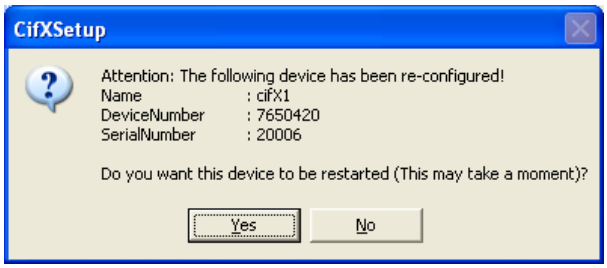


Figure 48: Device restart request

➢ Answer the request with **Yes**.

➧ The firmware file is downloaded to the netRAPID.

Note: The firmware file is also copied to the configuration directory on the PC, e. g. `[disk drive]:\Program Files\cifX Device Driver\1250 100_999\Channel0\`.
This function is needed for netX devices without flash memory, which are booted from the PC via PCI, like e.g. cifX PC Cards.

In case another program (e. g. SYCON.net) is accessing the netRAPID at the same time during download, the following warning is displayed:

Figure 49: Device still accessed warning

➢ In this case, close the other program and repeat steps 10 and 11.

On the Evaluation Board, the downloaded and running firmware is indicated by a steady green **SYS** LED (see position ④). If you have downloaded a PROFIBUS DP slave firmware, the **V12** (COM 0) LED (see position ③) is blinking red acyclically, indicating that the PROFIBUS configuration is missing.

Note: If you also want to download a configuration file, click **Add** button in the **Assigned Configuration Files** area to select the configuration file (`*.nxd`), then click **Apply** button to activate the download of the configuration file.

Enabling/disabling the NXPCA-PCI driver after firmware download

If you want to continue accessing the netRAPID from your PC via PCI interface after firmware download (i. e. for configuration or testing the IO data exchange), you again have to enable/disable the **NXPCA-PCI driver** in the **Device Manager** of your PC. This is because the Dual-Port Memory of the netRAPID has been changed by the firmware now running on the device.

For details on how to enable/disable the NXPCA-PCI driver, see step 6.

4.2.5 Downloading firmware to the NRPEB 51-RE via SPM USB interface

4.2.5.1 Overview

The **NRPEB 51-RE** Evaluation Board allows you to easily access its serial dual-port memory over USB interface (SPM-to-USB via FTDI chip).
This section describes how to download a Standard Loadable Firmware file from your configuration PC (which in this case serves as “host”) to the NRPEB 51-RE via SPM-to-USB connection.

The instructions in this section apply solely to the NRPEB 51-RE, because only this board is equipped with the necessary FTDI-based SPM-to-USB interface (see position ㉓ in the *NRPEB 51-RE Evaluation Board* section on page 26).

4.2.5.2 Prerequisites

- You have installed USB SPM Driver.
  (To do so, open the `Driver and Toolkit\USB SPM Driver` directory on the NRPEB product DVD, then double-click the `setup.exe` file. Follow the instructions of the **Device Driver Installation Wizard**.)
- You have downloaded the Second Stage Bootloader to the netRAPID NRPEB 51-RE (see section *Downloading executable binary image to NRP 51-RE or NRP 52-RE via USB* on page 46).
- The NRPEB 51-RE is connected to a voltage supply.
- You have a USB cable with a Type B plug ready.
- You have access to the firmware file which you want to download.
  (On the NRPEB product DVD, the firmware for the NRPEB 51-RE is stored in the `Firmware\netRAPID_Ltd\NRP 51-RE` folder.)

4.2.5.3 Step-by-step instructions

1. Configure netRAPID for **SPM USB** host interface mode.

➢ Use the **S204**, **S300** and **S301** switches on the board (see positions (26), (25) and (24) in the *NRPEB 51-RE Evaluation Board* section on page 26) to set the host interface mode to **Serial Dual-Port via USB** mode. To do so, set the switches as follows:

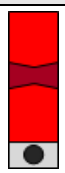
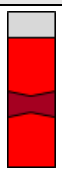
S204 position (26)	S300 position (25)	S301 position (24)
		

Table 26: Set switches on NRPEB 51-RE for SPM USB mode

2. Run the Second Stage Bootloader on the netRAPID.

➢ Push the **Reset** button (T1) on the Evaluation Board (see position (5) in the *NRPEB 51-RE Evaluation Board* section on page 26).

➢ The Second Stage Bootloader is loaded from flash memory and then runs in the internal RAM of the netX on the netRAPID, searching for firmware to boot. This is indicated by the **SYS** LED (see position (4)) alternating between yellow and green.

3. Establish USB connection.

➢ Plug a USB cable with Type B connector into the SPM USB socket on the Evaluation Board (see position (23)) and connect the other end of the USB cable to your PC.

4. Open the **netHOST Device Test Application** on your PC.

➢ Use the Windows Explorer to open the directory `Tools\netHost` on the DVD.

➢ Double-click **netHOST.exe**.

➭ The **netHOST Device Test Application** opens:

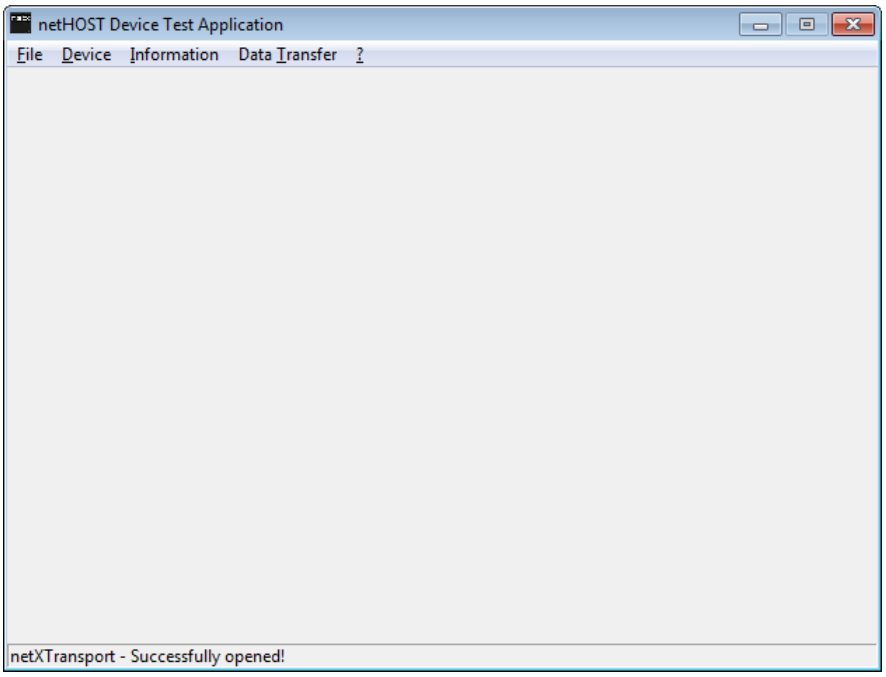


Figure 50: netHOST Device Test Application start screen

5. Open connection to the Serial Dual-Port memory of the netRAPID.

➢ In the menu, choose **Device** > **Select netX SPM USB Driver – (serial DPM via SPI)** and wait for a few seconds.

➢ Open **Device** menu again and select **Open**.

➭ The **Channel Selection** dialog box opens:

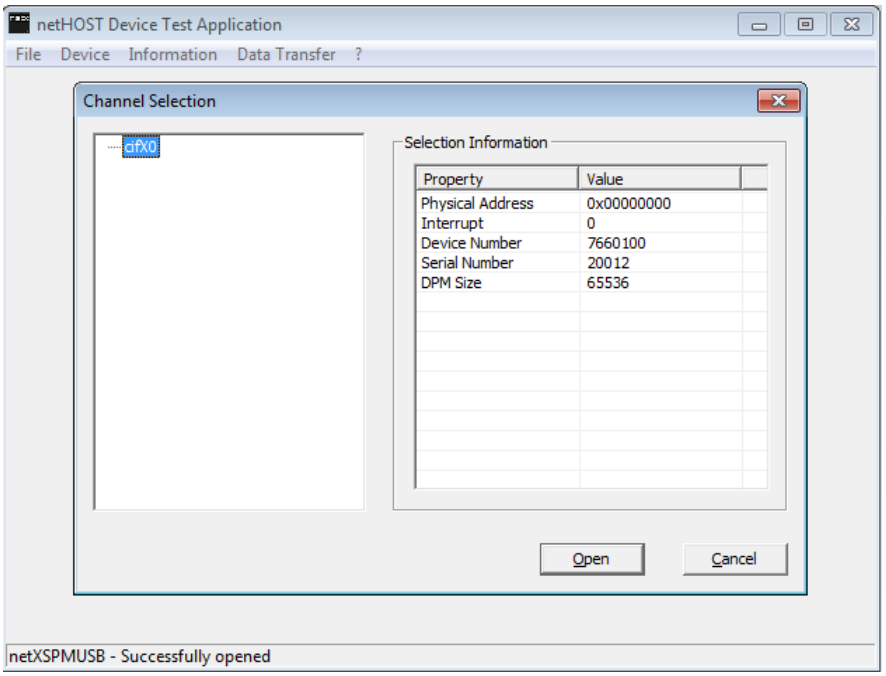


Figure 51: Channel selection dialog

➢ In the left part of the dialog box, select the **cifX0** entry, then click **Open** button.

➧ The **Channel Selection** dialog box closes, and back in the **netHOST Device Test Application** window, the header displays the selected channel:

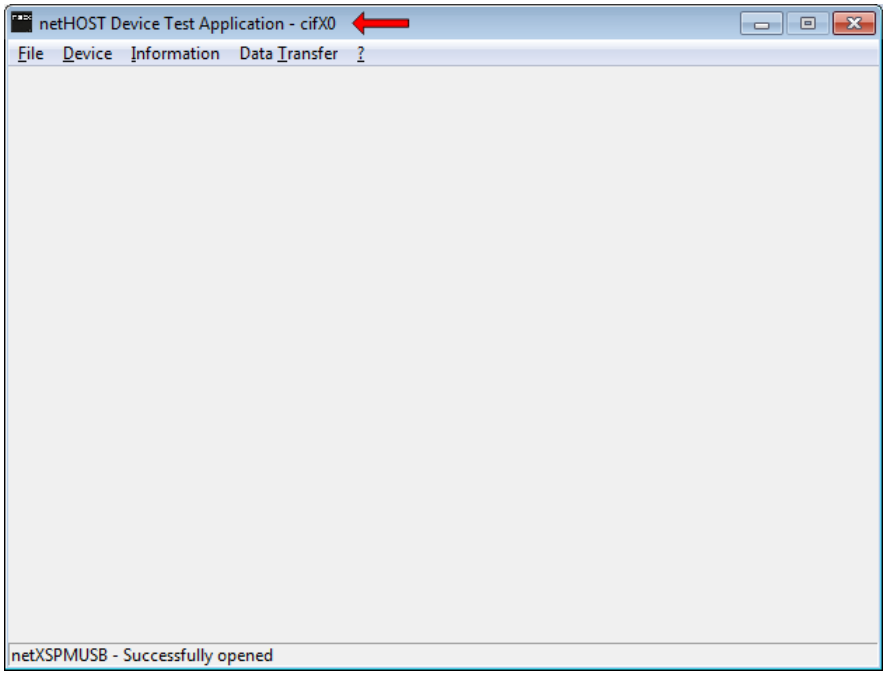


Figure 52: netHOST Device Test Application after channel selection

6. Select firmware file.

➢ In the menu, choose **Device** > **Download**.

➧ The **Download** window opens:

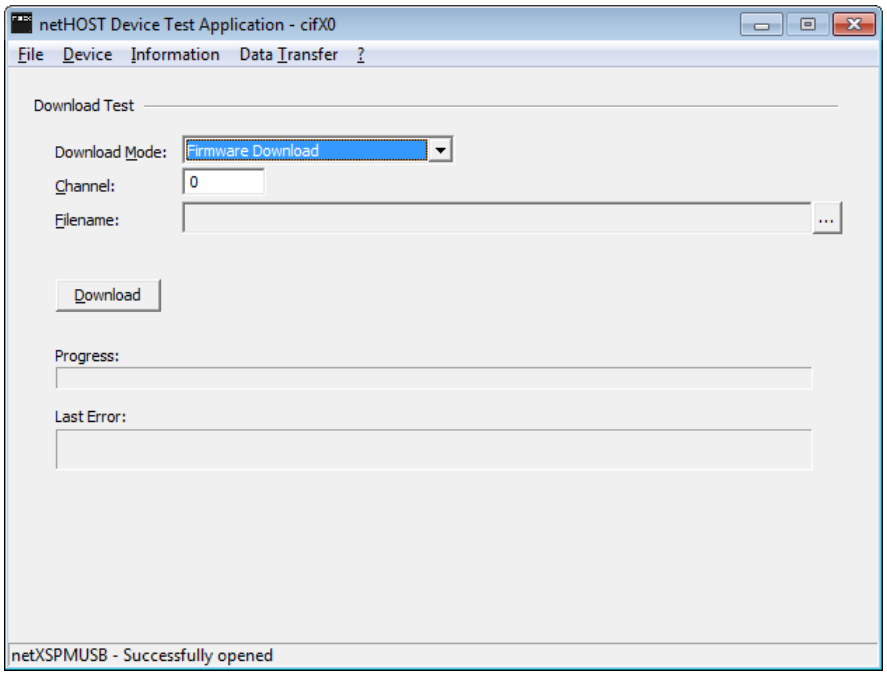


Figure 53: Download window

➢ In the **Download Mode** drop-down list, choose **Firmware Download**.

➢ Click ... button next to the **Filename** field.

The Windows file selection dialog opens:

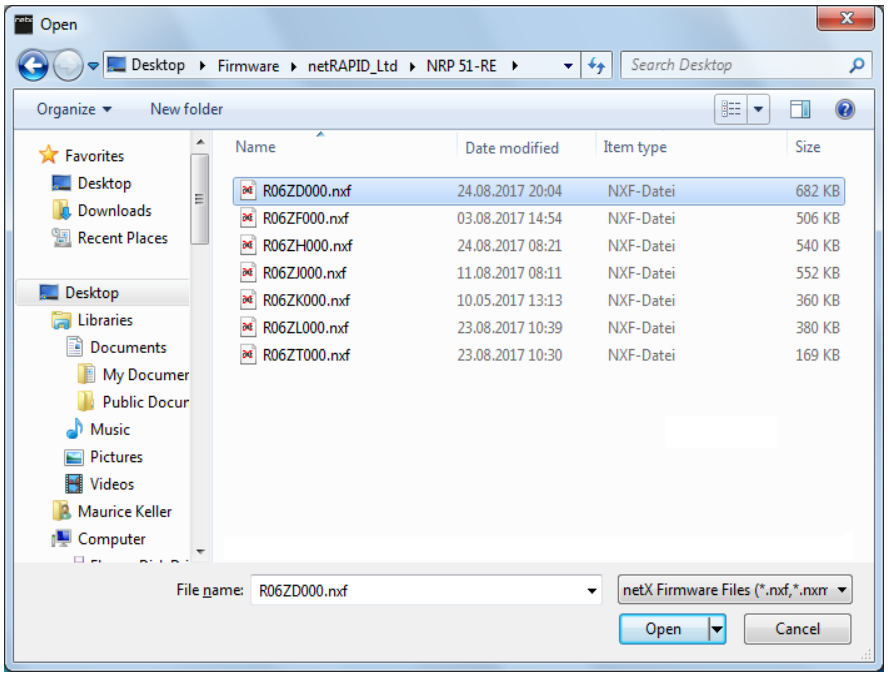


Figure 54: File selection

➢ In the Windows file selection dialog, navigate to the `Firmware\netRAPID_LTD` directory, open the `NRP 51-RE` folder and select the firmware file which you want to download:

PROFINET IO Device: R06ZD000.nxf
EtherCAT Slave: R06ZF000.nxf
Sercos Slave: R06ZJ000.nxf
Open Modbus/TCP: R06ZL000.nxf
Ethernet/IP Adapter: R06ZH000.nxf
POWERLINK Controlled Node: R06ZK000.nxf
VARAN Client: R06ZT000.nxf

➢ Click **Open** button.

The Windows file selection dialog closes, and back in the **Download** window, the selected Firmware file is displayed in the **Filename** field.

7. Download firmware file.

➢ Click **Download** button to start the file download.

➧ While the firmware file is being downloaded to the netRAPID, a progress bar is displayed:

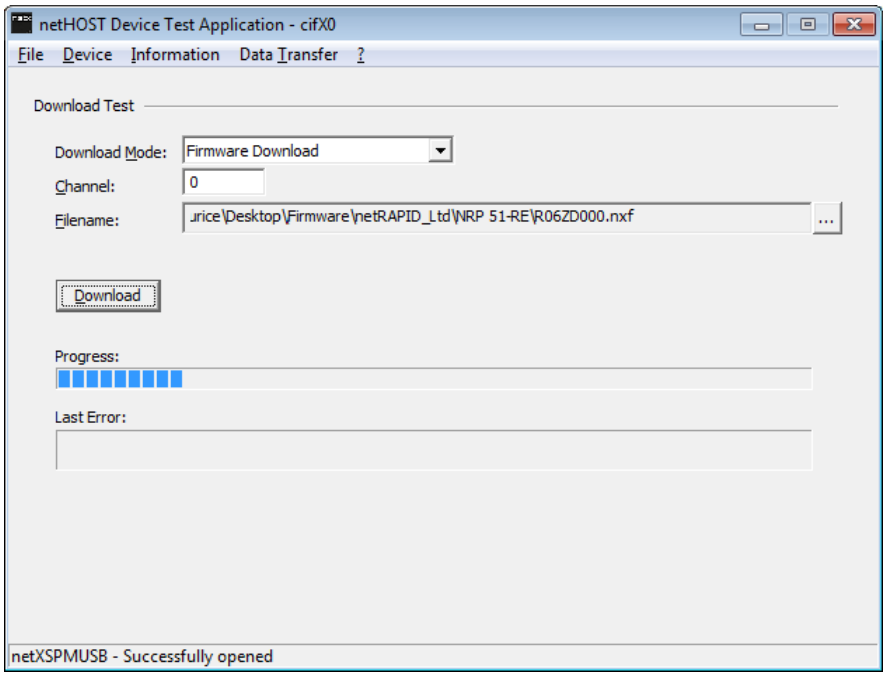


Figure 55: Firmware download in progress

Note: A completed download will be indicated only by a “full” progress bar; there will be no extra message box popping up in order to inform you about the completion of the download.

8. Reset netRAPID to start the firmware.

➢ Disconnect the USB cable from the netRAPID.

➢ Push the **Reset** button (**T1**) on the netRAPID (see position ⑤ in the *NRPEB 51-RE Evaluation Board* section on page 26).

➧ The firmware is loaded by the Second Stage Bootloader. The running firmware is indicated by a steady green **SYS** LED (see position ④).

➢ In the menu of the **netHOST Device Test Application**, choose **Device** > **Close**, then choose **File** > **Quit** to exit the application.

4.3 Configuration examples

4.3.1 Configuring NRP 10-DPS with SYCON.net

4.3.1.1 Overview

This section describes how to set up a small PROFIBUS DP network, how to configure the NRP 10-DPS with the **SYCON.net** configuration software and how to download the configuration from your configuration PC to the netRAPID via **Host Interface** and **NXPCA-PCI Adapter Board**. After configuration, you can test the I/O communication of the netRAPID within the PROFIBUS DP network.

Note: For effective configuration and testing of the NRP 10-DPS as PROFIBUS DP slave, you also need a PROFIBUS DP master device. In this example, a Hilscher PC Card **CIFX 50-DP** is used as PROFIBUS master.

4.3.1.2 Prerequisites

- You have downloaded the firmware to the netRAPID (see *Downloading firmware to the netRAPID via USB* section on page 56 or *Downloading Firmware to the netRAPID via PCI and Host Interface* section on page 62).
- The netRAPID (respectively the Evaluation Board) is connected to the configuration PC via **NXPCA-PCI Adapter Board** and **CAB-NXPCA-PCI** cable. This is described in steps 1 – 6 of the *Downloading Firmware to the netRAPID via PCI and Host Interface* section on page 62.
- You have installed the **SYCON.net** configuration software version 1.360 or higher on your PC (on the NRPEB product DVD, open the `Software\SYCON.net` directory, then double-click **SYCONnet netX setup.exe** file. Follow the instructions of the installation wizard).
- You have installed the cifX Device Driver on your PC (on the NRPEB product DVD, open the `Driver and Toolkit\Device Driver (NXDRV-WIN)\Installation` directory, then double-click **cifX Device Driver Setup.exe** file. Follow the instructions of the installation wizard).
- You have installed a PC Card **CIFX 50-DP** in your configuration PC. For details, please refer to the User Manual *PC Cards CIFX 50 50E 70E 100EH*, DOC120204UMxxEN.
- PROFIBUS DP master firmware for the PC Card CIFX 50-DP.
- The netRAPID/Evaluation Board is connected to a voltage supply.
- The netRAPID/Evaluation Board is connected to the PC Card CIFX 50-DP via PROFIBUS cable.

4.3.1.3 Step-by-step instructions

1. Start **SYCON.net** configuration software.

➢ In the Windows Start menu, select **All Programs** > **SYCON.net System Configurator** > **SYCON.net**.

➢ A login dialog appears:

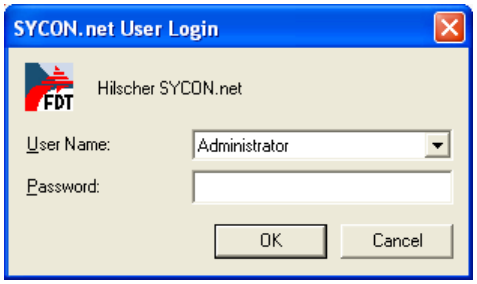


Figure 56: SYCON.net login

➢ Enter your password, then click **OK**.

➢ SYCON.net opens with a new empty project:

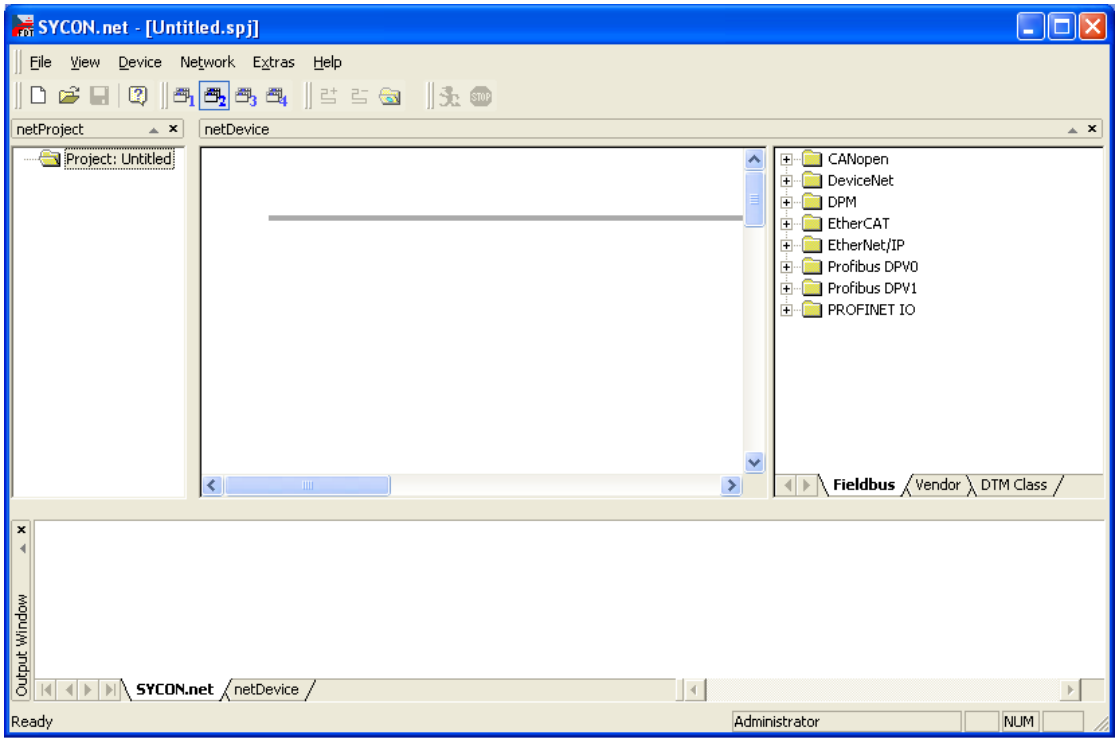


Figure 57: Empty project in SYCON.net

2. Add PC Card cifX as PROFIBUS master.

➢ In the **Fieldbus** tab of the **Device Catalog** (right window), open the **PROFIBUS DPV1** > **Master** folder. Then select **CIFX DP/DPM** device and drag & drop it onto the root line in the middle window.

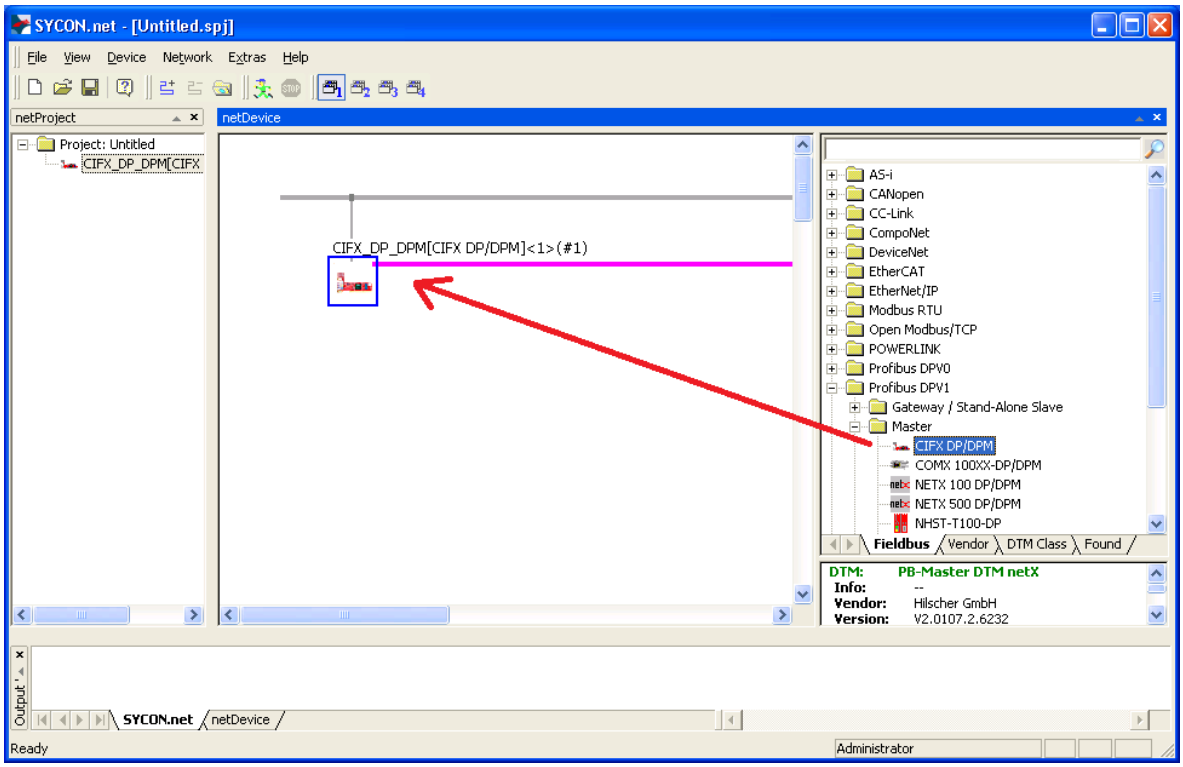


Figure 58: Define PC Card cifX as PROFIBUS Master in SYCON.net

➢ The PC Card cifX is displayed below the root line.

3. Add netRAPID as PROFIBUS DP slave.

➢ In the **Fieldbus** tab of the **Device Catalog** (right window), open the **PROFIBUS DPV1** > **Gateway / Stand-Alone Slave** folder. Then select the **NRP 10-DPS/DPS** item and drag & drop it onto the PROFIBUS network line next to the PC Card cifX.

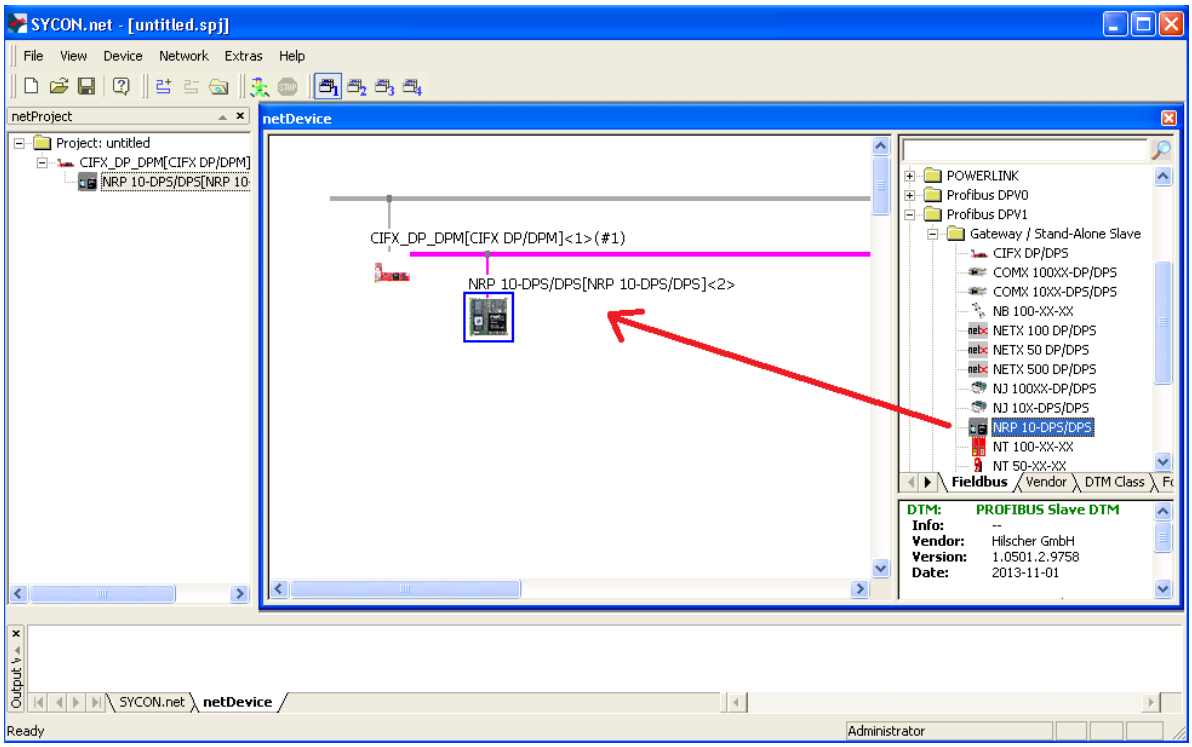


Figure 59: Add netRAPID as PROFIBUS Slave in SYCON.net

➧ You have added the netRAPID as PROFIBUS Slave in the PROFIBUS network.

4. Assign driver to PC Card cifX (PROFIBUS DP master).

➢ Double-click the **CIFX_DP_DPM** symbol in the bus configuration line or select the symbol and choose **Configuration…** entry from the context menu.

➧ The **Configuration** dialog window opens.

➢ In the **Navigation Area**, select **Settings** > **Driver**.

The **Driver** list opens:

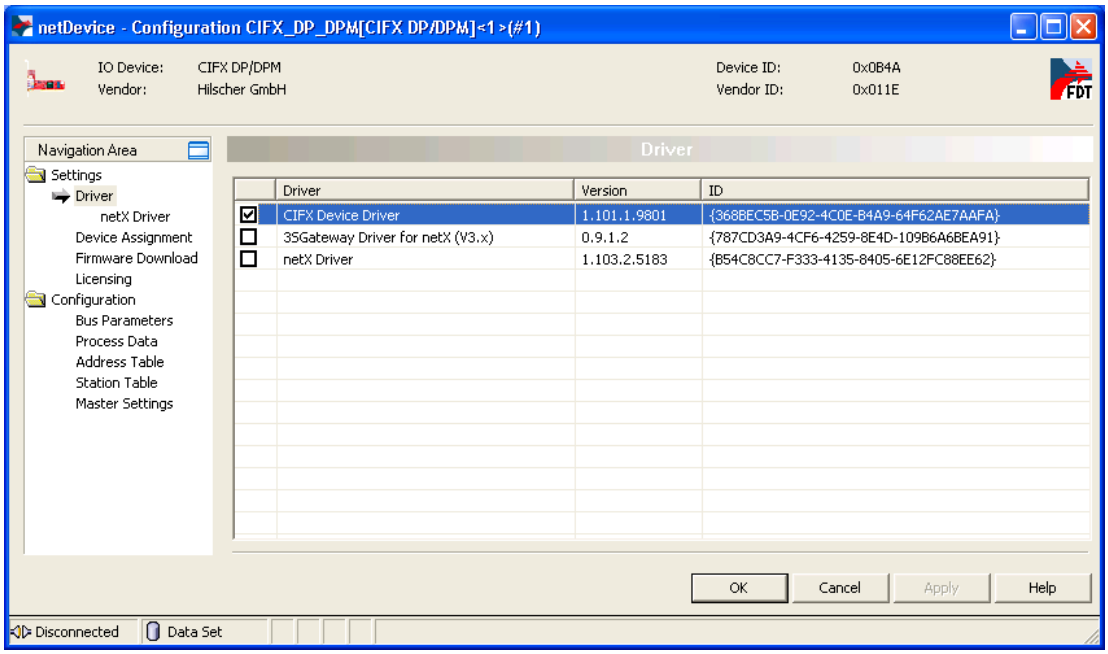


Figure 60: Choose driver for PC Card cifX

- Check the box in front of the **cifX Device Driver** entry and click **Apply** button.
- In the **Navigation Area**, select **Settings** > **Driver** > **Device Assignment**.

The **Device Assignment** window opens.

- Check the box in front of the **CIFX 50-DP** entry and click **Apply** button.

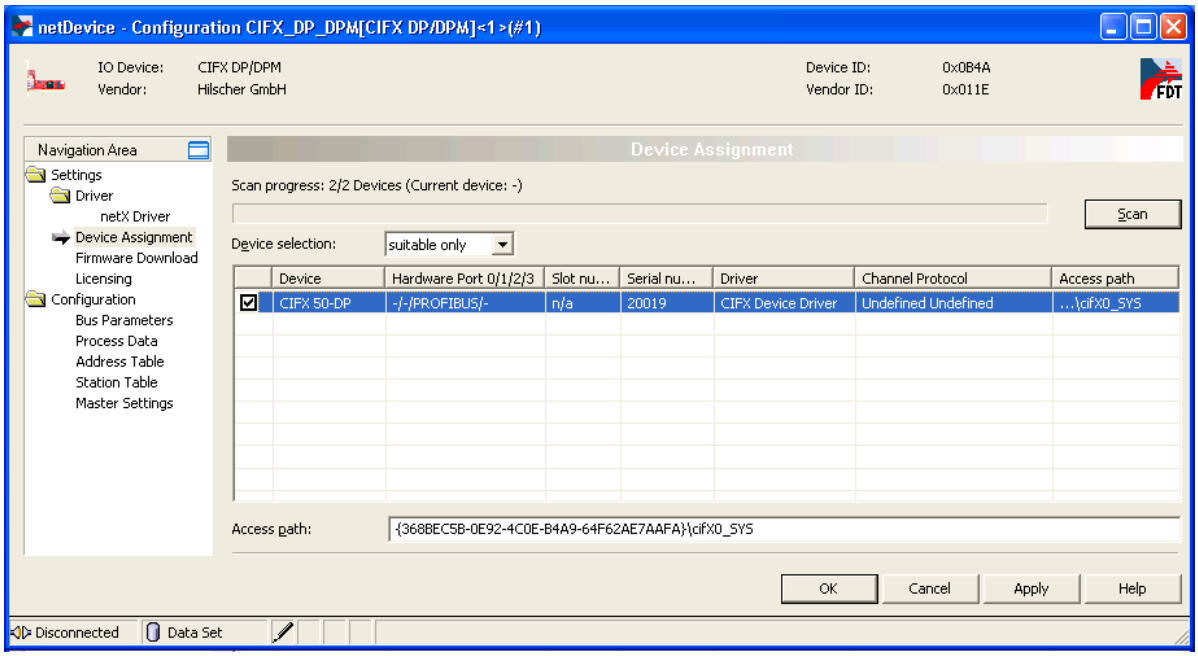


Figure 61: Assign driver to PC Card cifX

You have assigned the driver for the PC Card cifX.

5. Download PROFIBUS master firmware to PC Card cifX.

Note: This step has to be performed only if no PROFIBUS master firmware has yet been loaded to the PC Card cifX. If the PC Card cifX is already equipped with a PROFIBUS master firmware, you can skip this step and close the configuration dialog window for the PC Card cifX by clicking the **OK** button.

➢ In the **Navigation Area**, select **Settings** > **Driver** > **Firmware Download**.

➪ The **Firmware Download** window opens:

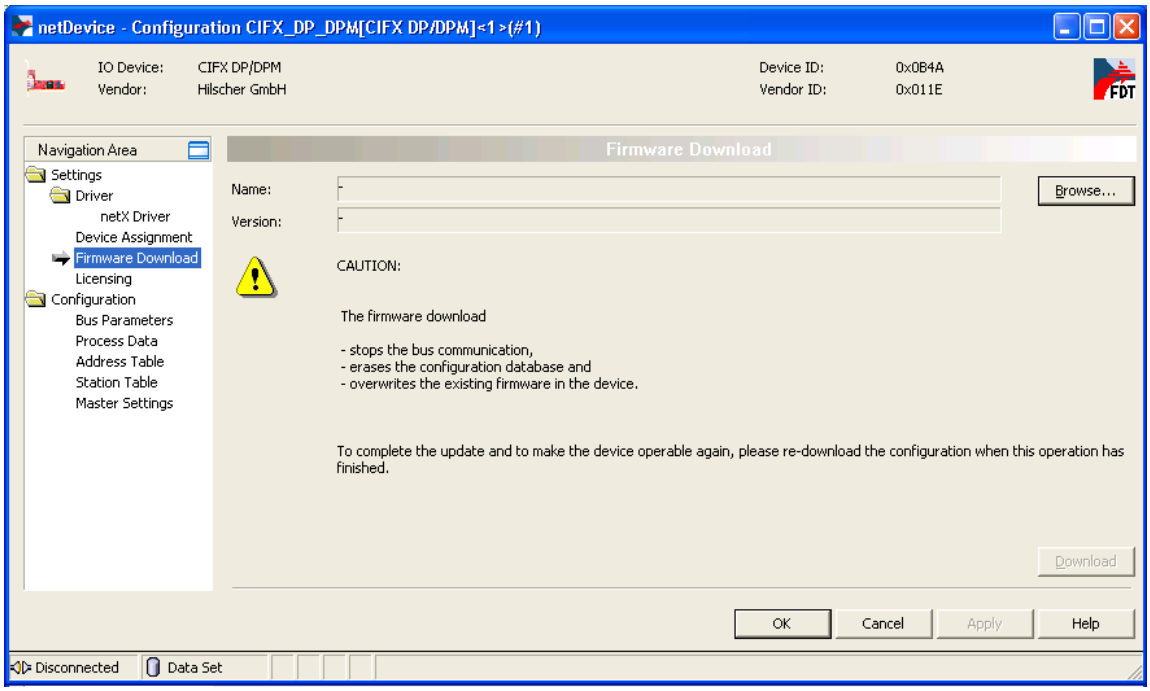


Figure 62: Firmware download dialog in SYCON.net

➢ Click **Browse…** button to choose the firmware which you want to load into the PC Card cifX.

➧ The **Select Firmware File** dialog opens:

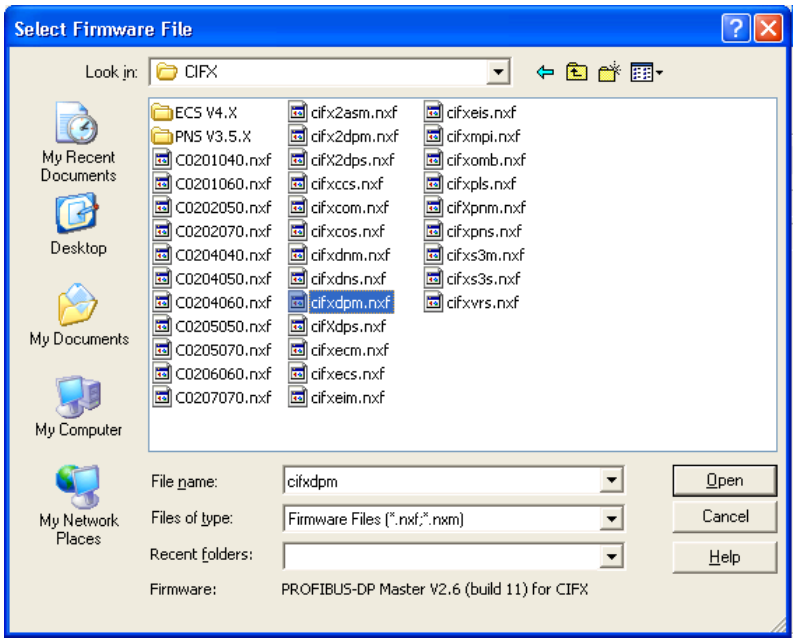


Figure 63: Select Firmware File dialog in SYCON.net

➢ Navigate to the directory where the PROFIBUS DP master firmware is stored. On the Communication Solutions DVD, this is the `Firmware\CIFX` folder.

➢ Select **cifXdpm.nxf** file, then click **Open** button.

➧ Name and version of the selected firmware are displayed in the **Firmware Download** window.

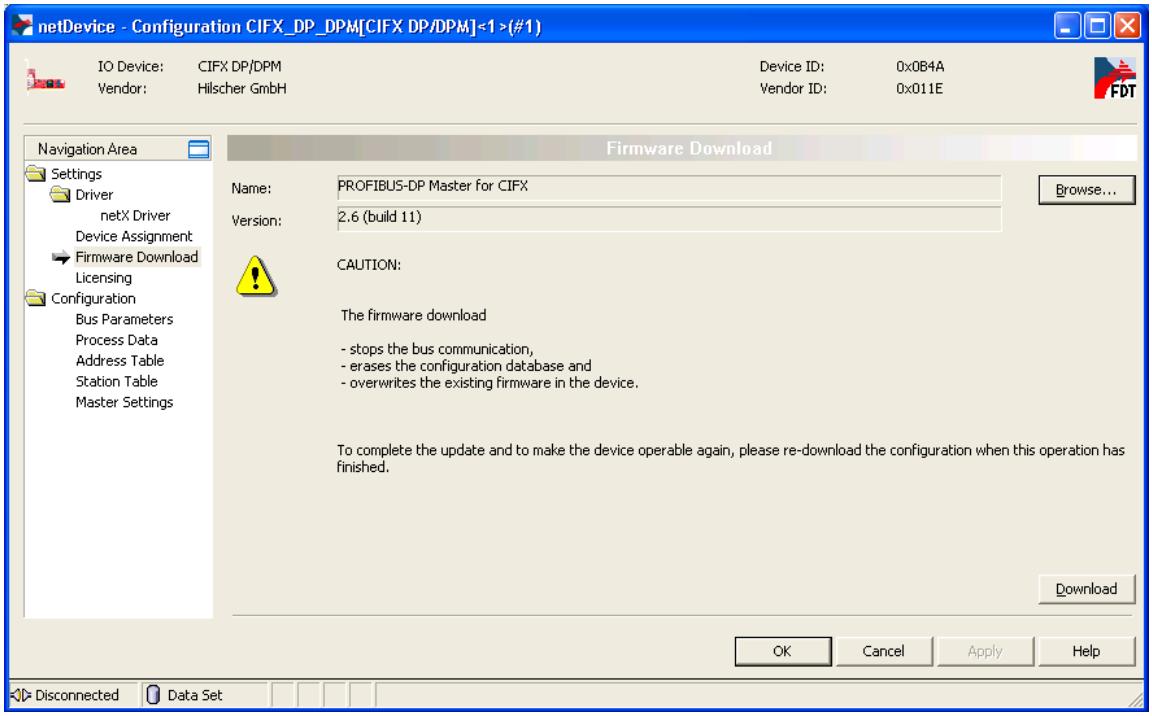


Figure 64: Downloading firmware to PC Card cifX

- Check, whether you have selected the right firmware, then click **Download** button to start the download. Answer the security question with **Yes**.
- The firmware is downloaded to the PC Card cifX.
- Click **OK** button to close the configuration window.

6. Assign driver to netRAPID.

- In SYCON.net, double-click the **NRP 10-DPS/DPS** symbol in the bus configuration line or select the symbol and choose **Configuration…** entry from the context menu.
- The **Configuration** dialog opens.
- In the **Navigation Area**, select **Settings** > **Driver**.
- The **Driver** list opens:

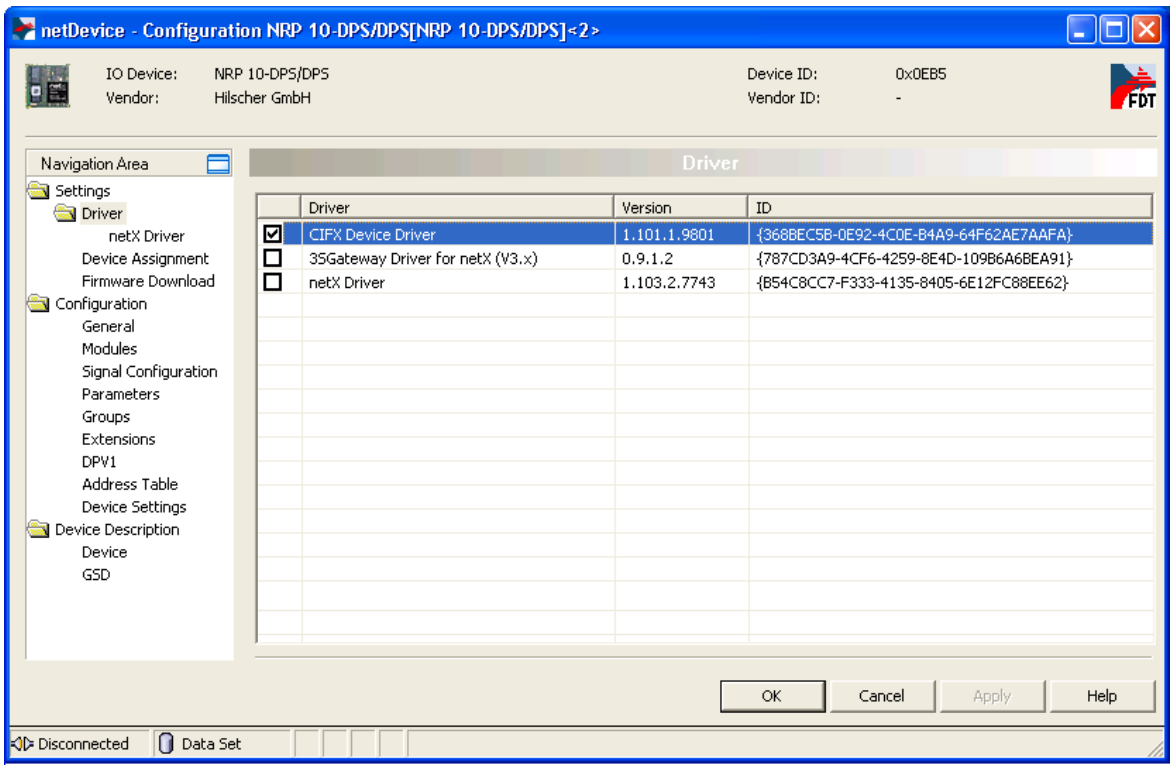


Figure 65: Choose driver for netRAPID

- Check the box in front of the **cifX Device Driver** entry and click **Apply** button.
- In the **Navigation Area**, select **Settings** > **Driver** > **Device Assignment**.
- The **Device Assignment** dialog window opens.
- In the **Device Assignment** dialog window, choose **all** in the **Device selection** drop-down list, then click **Scan** button.

➪ SYCON.net scans for connected devices. If the netRAPID/Evaluation Board has been properly connected to the configuration PC, the netRAPID will be found and displayed as NRP 10-DPS in the list.

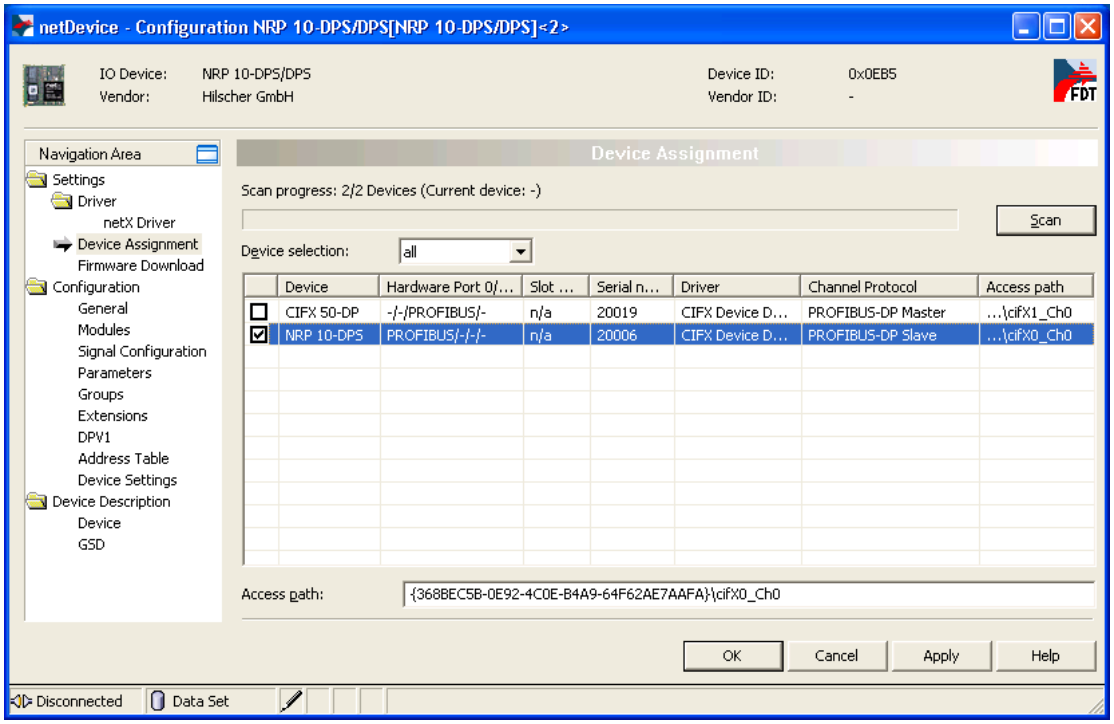


Figure 66: Assign driver to netRAPID

➢ Check the box in front of the **NRP 10-DPS** entry and click **Apply** button.

➪ You have assigned the driver for the netRAPID.

7. Configure PROFIBUS slave (i. e. netRAPID).

Note: In this simple configuration example, you only need to configure the I/O data and the station address of the PROFIBUS DP Slave manually; all other parameters can be left at their default settings. The I/O data (which in the limited firmware is restricted to 2 bytes output / 2 bytes input) needs to be set in the PROFIBUS Slave configuration dialog (i. e. in the NRP 10-DPS/DPS DTM), whereas the station address of the Slave (which in the limited firmware is fixed on the value 32) needs to be set in the **Station Table** window of the PROFIBUS master configuration dialog (i. e. in the CIFX DP/DPM DTM).

➢ In the **Navigation Area**, select **Configuration** > **Modules**.

➧ The **Modules** dialog window opens:

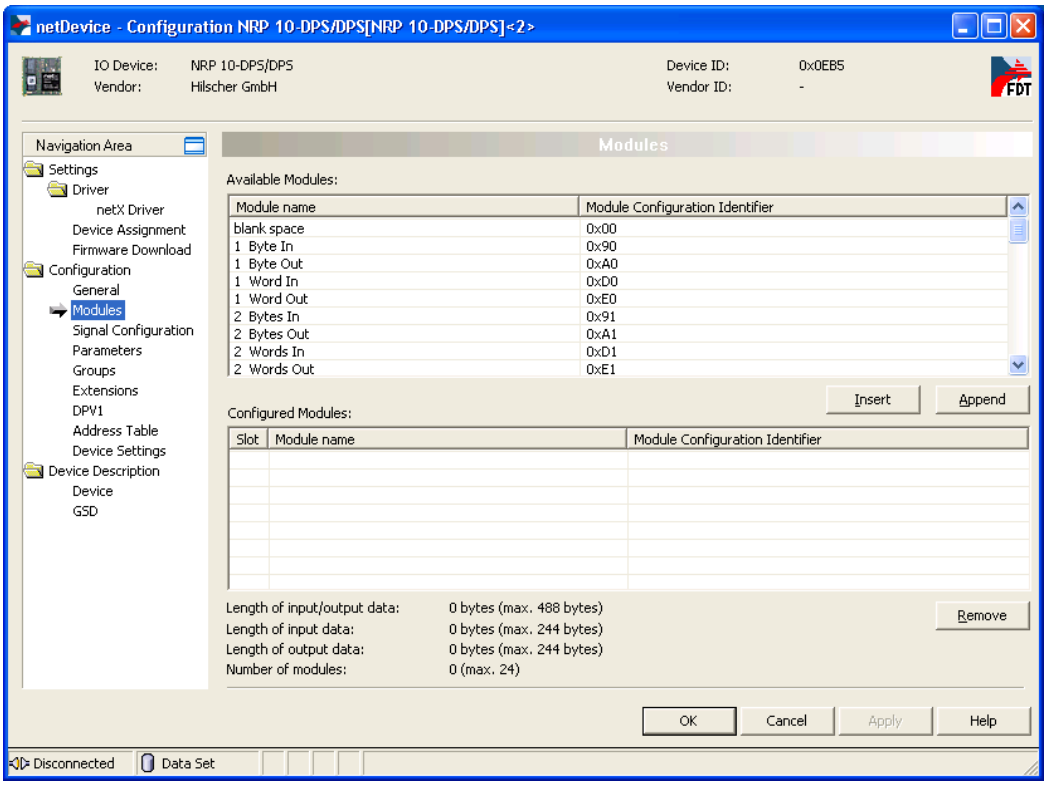


Figure 67: Modules dialog of netRAPID

➢ In the **Available Modules** area, select **2 Bytes In** module, then click **Insert** button.

➧ The chosen **2 Bytes In** module is displayed in the **Configured Modules** area.

➢ In the **Available Modules** area, select **2 Bytes Out** module, then click **Insert** button.

➧ The chosen **2 Bytes Out** module is also displayed in the **Configured Modules** area:

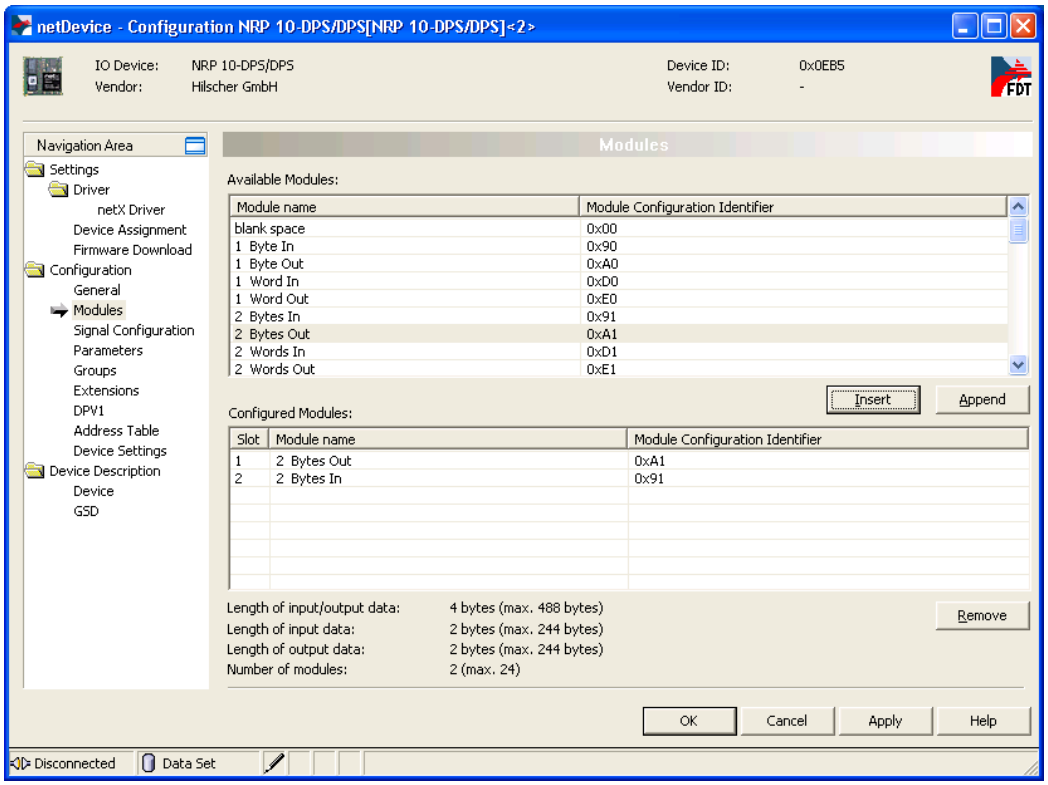


Figure 68: Configured modules of netRAPID

➢ Click **OK** to close the **Configuration** dialog.

➧ You have configured the I/O data of the netRAPID.

8. Configure PROFIBUS DP master (cifX PC Card).

Note: In the PROFIBUS DP master configuration dialog (i. e. in the CIFX DP/DPM DTM), you only need to edit the station address of the Slave in the **Station Table** window. The I/O data configuration is automatically taken over from the slave (i. e. from the NRP 10-DPS/DPS DTM); all other configuration parameters can be kept in their preset default settings.

➢ Double-click the **CIFX_DP_DPM** symbol in the bus configuration line or select the symbol and choose **Configuration…** entry from the context menu.

➧ The **Configuration** dialog window opens.

➢ In the **Navigation Area**, select **Configuration** > **Bus Parameters**.

➢ The **Bus Parameters** dialog window opens:

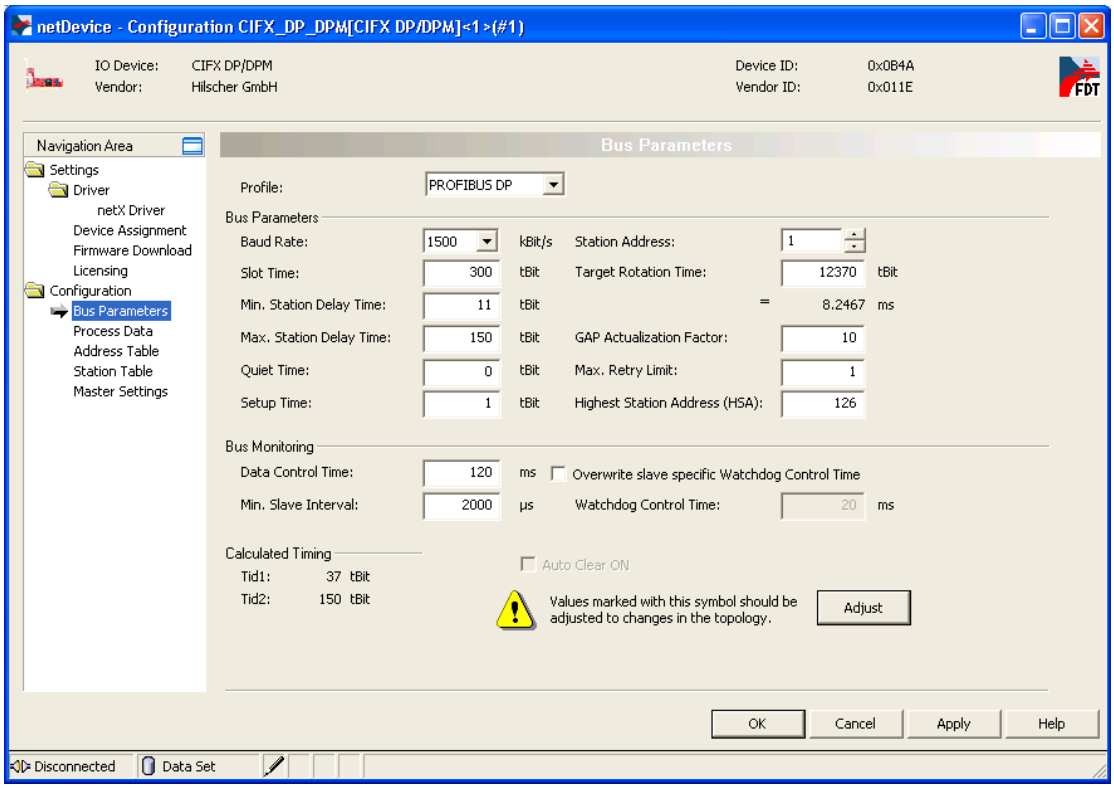


Figure 69: Bus parameters for PROFIBUS Master

➢ Check whether the preset default **Bus Parameters** are correct.

Note: You can also check the **Process Data**, **Address Table** and **Master Settings**.

➢ In the **Navigation Area**, select **Configuration** > **Station Table**.

➧ The **Station Table** dialog window opens:

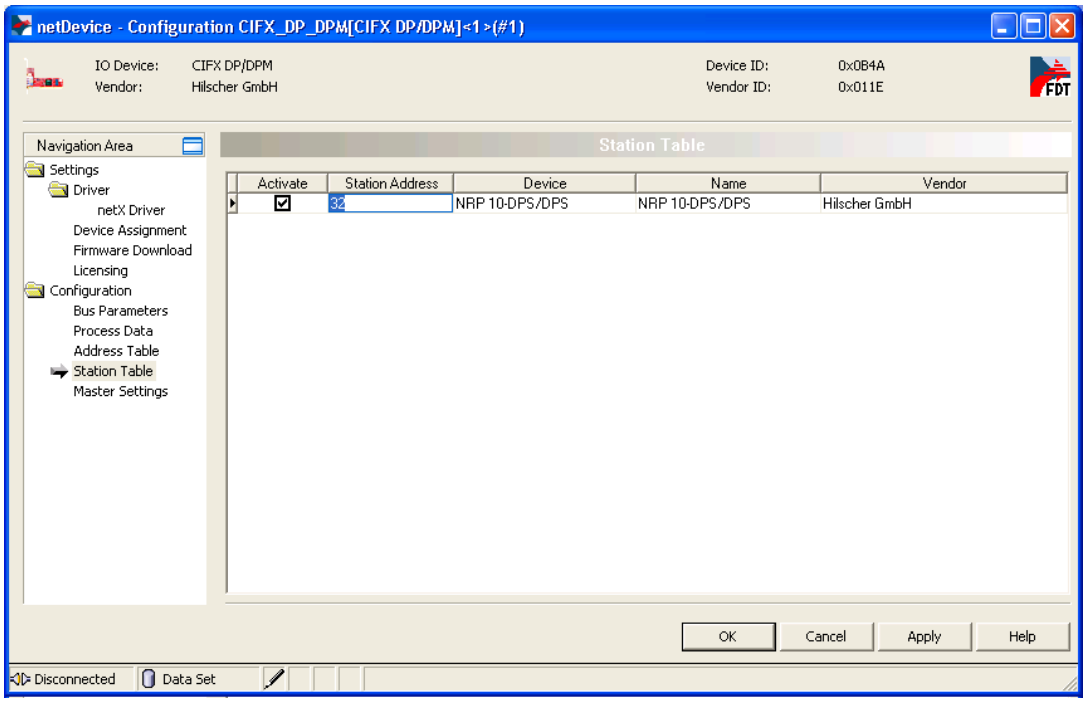
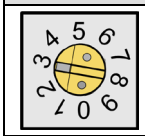
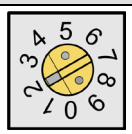


Figure 70: Set station address in PROFIBUS Master

➢ In the **Station Address** field, enter the station address of the slave, i. e. the netRAPID. If you are using the limited firmware, you must enter the value `32`. Make sure that the box in the **Activate** field is checked.

➢ Click **OK** to close the **Configuration** dialog.

Note: If you want to use the rotary switches on the Evaluation Board to set the station address of the slave, you have to configure the netRAPID in SYCON.net at the root line as Stand-Alone Slave and choose the **Enable Address Switch** option in the **General** window of the slave configuration dialog before you download the slave configuration to the netRAPID.
On the Evaluation Board, you can use the **S1** and **S2** rotary switches to set the station address (see positions ⑲ and ⑳ in the *NRPEB 10-CCS and NRPEB 10-DPS Evaluation Boards* section on page 24).
The **S2** switch multiplies times `10`. So, for example, if you want to configure station address `32` for the netRAPID, you need to set **S2** to `3` and **S1** to `2`.

S2	**S1**
	
Set to: `3`	Set to: `2`

You then of course have to enter the different station address of the slave in the **Station Table** window of the PROFIBUS master configuration dialog before you download the master configuration to the master device (i. e. the PC Card cifX).

9. Download PROFIBUS slave configuration to netRAPID.

➢ Select the **NRP 10-DPS/DPS** symbol in the bus configuration line, then use the right mouse button to open the context menu.

➢ In the context menu, select **Download**.

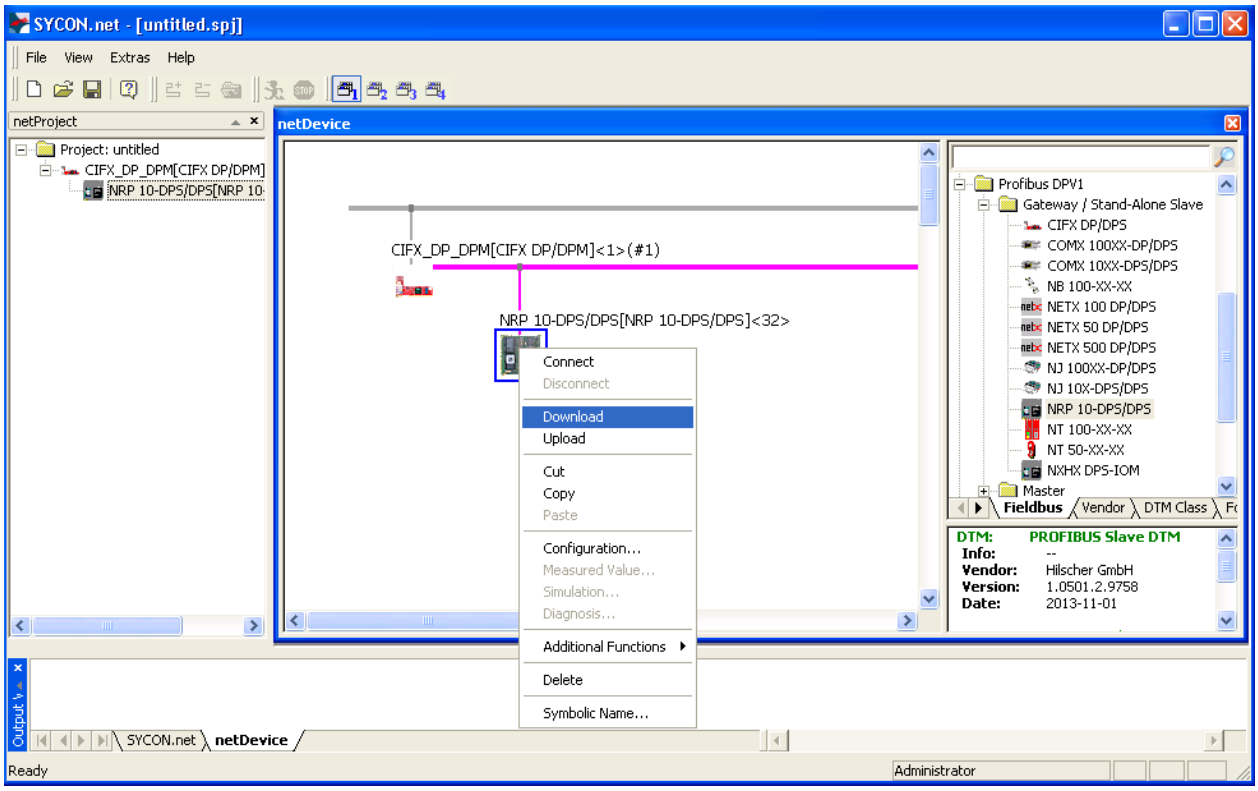


Figure 71: Download configuration to netRAPID

➢ Answer the configuration download confirmation request with **Yes**.

↯ The configuration is downloaded to the netRAPID.
SYCON.net automatically establishes an online connection for both netRAPID and the PC Card cifX.
The communication status **V12** (COM 0) LED on the Evaluation Board (see position ③ in the *NRPEB 10-CCS and NRPEB 10-DPS Evaluation Boards* section on page 24) is blinking cyclically red. This is because the configuration of the PROFIBUS master (i. e. the PC Card cifX) has not been downloaded yet, thus master and slave are not communicating yet.

10. Download configuration to PC Card cifX (PROFIBUS DP master).

➢ Select the **CIFX_DP_DPM** symbol, then use the right mouse button to open the context menu.

➢ In the context menu, select **Download**.

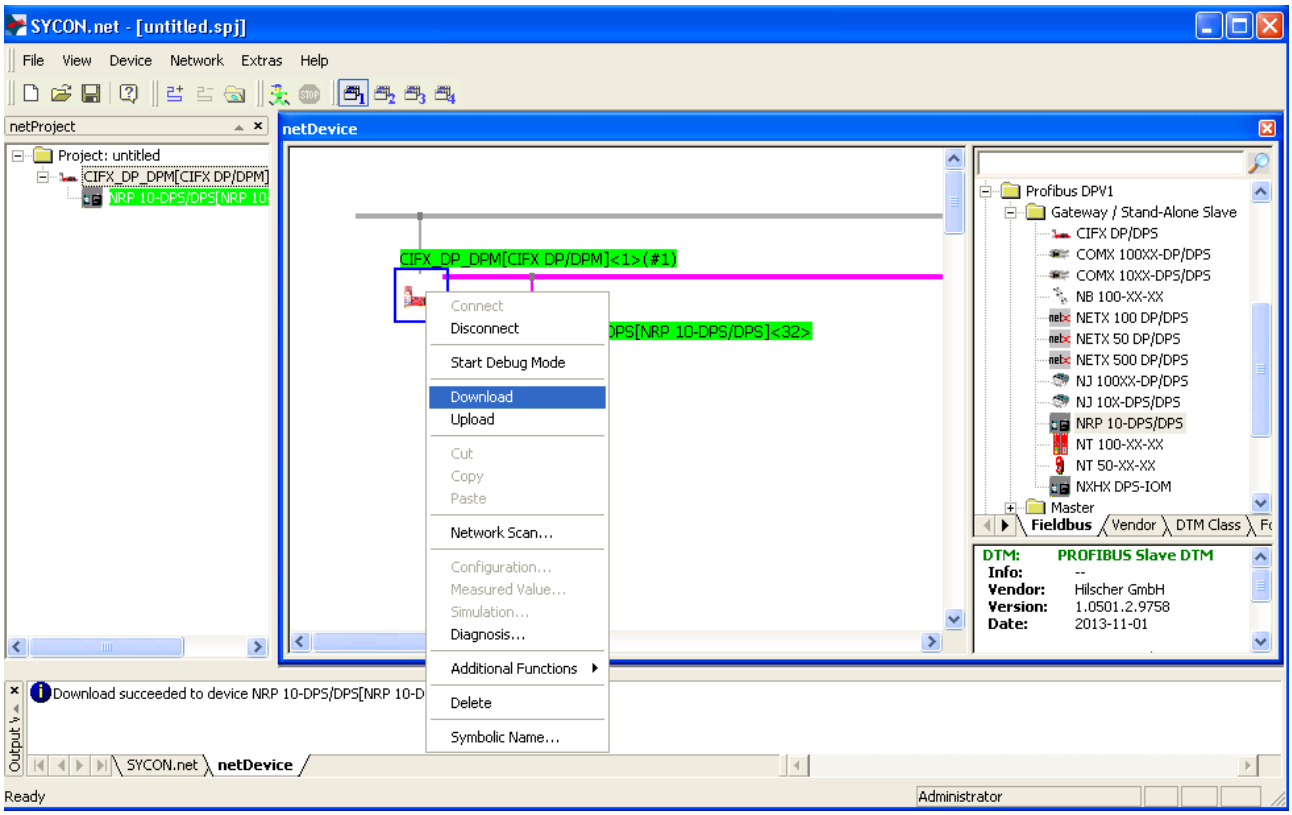


Figure 72: Download configuration to PC Card cifX

➢ Answer the configuration download confirmation request with **Yes**.

➢ The configuration is downloaded to the PC Card cifX.
SYCON.net automatically establishes an online connection for the PC Card cifX. Once the PC Card cifX has successfully established communication with the netRAPID, the communication status **V12** (COM 0) LED on the Evaluation Board (see position ③ in the *NRPEB 10-CCS and NRPEB 10-DPS Evaluation Boards* section on page 24) is showing steady green light.

4.3.2 Configuring NRP 51-RE/ECS or NRP 52-RE/ECS with SYCON.net

4.3.2.1 Overview

This section describes how to set up a small EtherCAT network, how to configure the NRP 52-RE/ECS with the **SYCON.net** configuration software and how to download the configuration from your configuration PC to the netRAPID via **Host Interface** and **NXPCA-PCI Adapter Board**. After configuration, you can test the I/O communication of the netRAPID within the EtherCAT network.
Although the NRP 52-RE is used as example in this section, these operational steps in principle also apply to the configuration of the NRP 51-RE.

Note: For effective configuration and testing of the NRP 51-RE or NRP 52-RE as EtherCAT slave, you also need an EtherCAT master. In this example, a Hilscher PC Card **CIFX 50 RE** is used as master.

4.3.2.2 Prerequisites

- You have downloaded the firmware to the netRAPID (see *Downloading firmware to the netRAPID via USB* section on page 56 or *Downloading Firmware to the netRAPID via PCI and Host Interface* section on page 62).
- The netRAPID (respectively the Evaluation Board) is connected to the configuration PC via **NXPCA-PCI Adapter Board** and **CAB-NXPCA-PCI** cable. This is described in steps 1 – 6 of the *Downloading Firmware to the netRAPID via PCI and Host Interface* section on page 62.
- You have installed the **SYCON.net** configuration software version 1.360 or higher on your PC (on the NRPEB product DVD, open the `Software\SYCON.net` directory then double-click **SYCONnet netX setup.exe** file. Follow the instructions of the installation wizard).
- You have installed the **cifX Device Driver** on your PC (on the NRPEB product DVD, open the `Driver and Toolkit\Device Driver (NXDRV-WIN)\Installation` directory, then double-click **cifX Device Driver Setup.exe** file. Follow the instructions of the installation wizard).
- You have installed a PC Card **CIFX 50-RE** in your configuration PC. For details, please refer to the User Manual *PC Cards CIFX 50 50E 70E 100EH*, DOC120204UMxxEN.
- EtherCAT master firmware for the PC Card CIFX 50-RE.
- The netRAPID/Evaluation Board is connected to a voltage supply.
- The netRAPID/Evaluation Board is connected to the PC Card CIFX 50-RE via Ethernet cable. Connect Ethernet Channel 0 of the PC Card CIFX 50-RE to Ethernet Channel 0 of the netRAPID/Evaluation Board (see position ⑰ in the *netRAPID Evaluation Boards* section on page 24).

4.3.2.3 Step-by-step instructions

1. Start **SYCON.net** configuration software.

➢ In the Windows Start menu, select **All Programs** > **SYCON.net System Configurator** > **SYCON.net**.

➧ A login dialog appears:

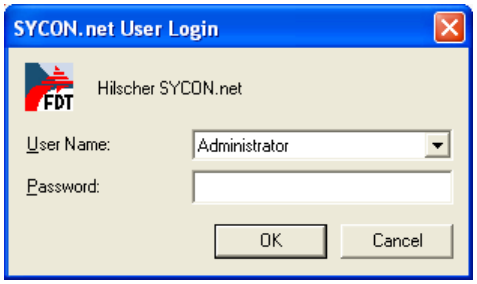


Figure 73: SYCON.net login

➢ Enter your password, then click **OK**.

➧ SYCON.net opens with a new empty project:

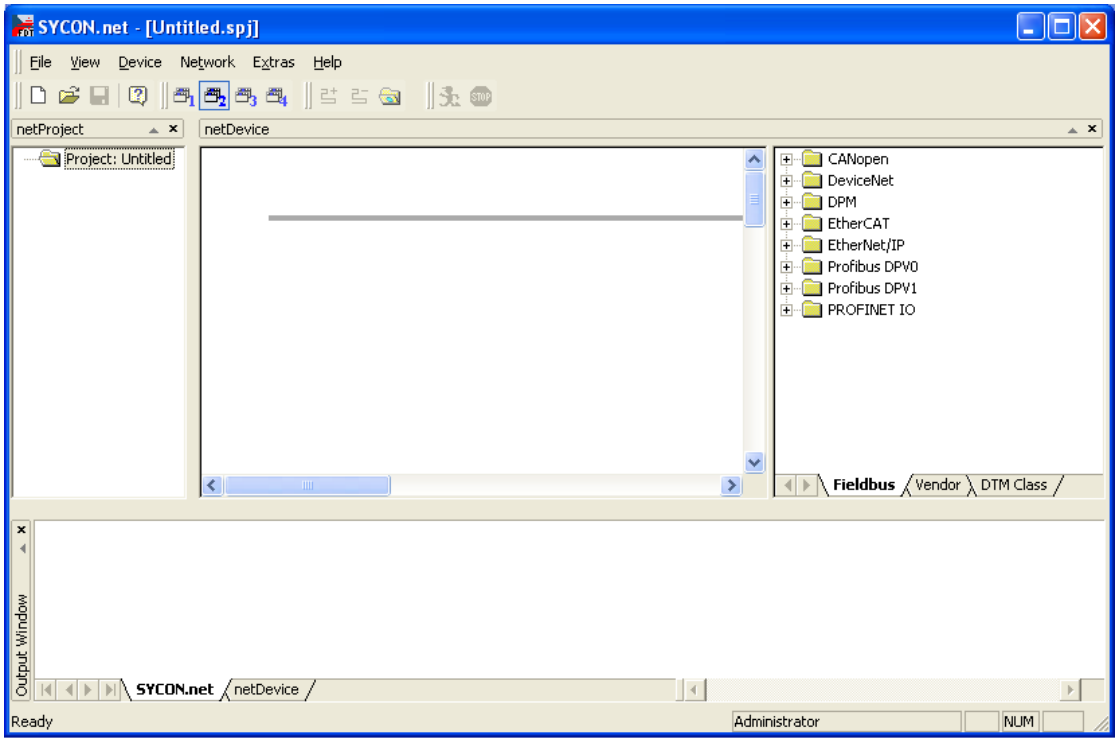


Figure 74: Empty project in SYCON.net

2. Add PC Card cifX as EtherCAT master.

➢ In the **Fieldbus** tab of the **Device Catalog** (right window), navigate to folder **EtherCAT** > **Master**. Then select **CIFX RE/ECM** device and drag & drop it onto the root line in the middle window.

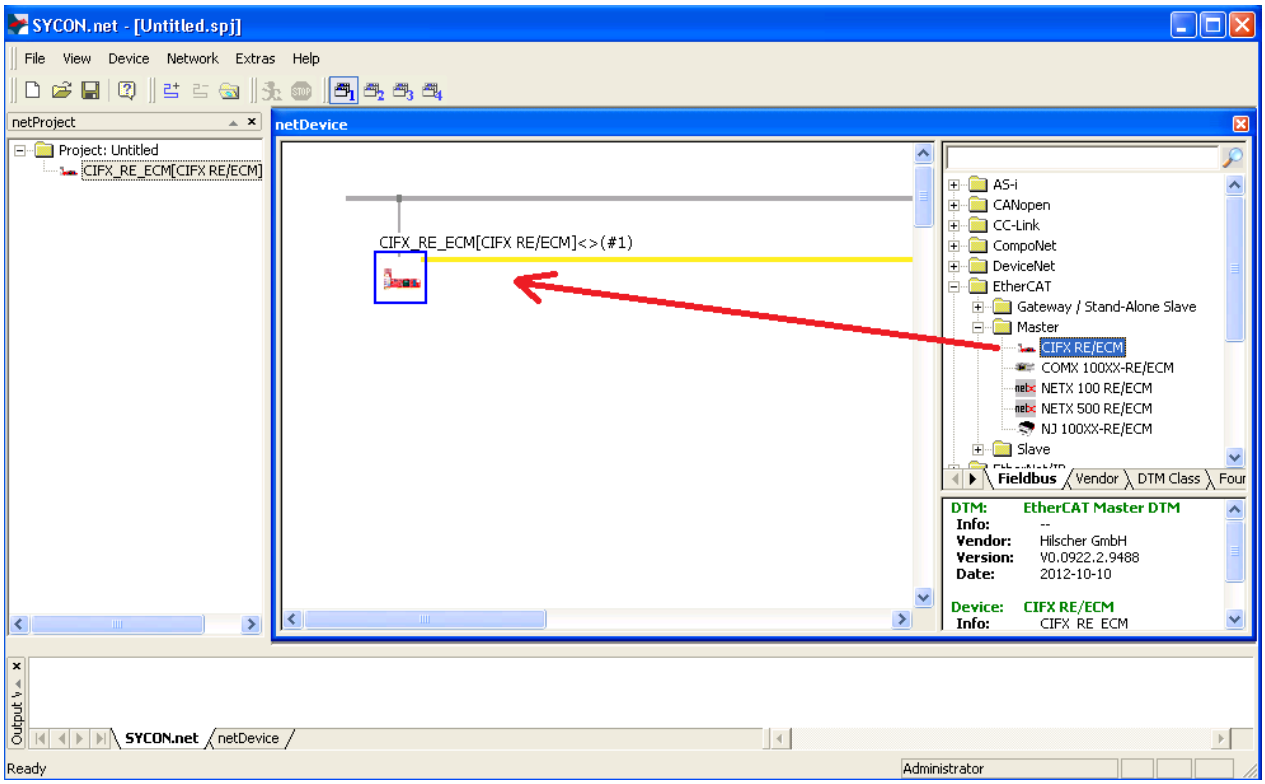


Figure 75: Define CIFX 50 as EtherCAT Master in SYCON.net

➢ The PC Card cifX is displayed below the root line.

3. Add netRAPID as EtherCAT slave.

➢ In the **Fieldbus** tab of the **Device Catalog** (right window), navigate to folder **EtherCAT** > **Gateway / Stand-Alone Slave**. Then select **NRP 52-RE/ECS V2.4** item and drag & drop it onto the EtherCAT network line next to the PC Card cifX.

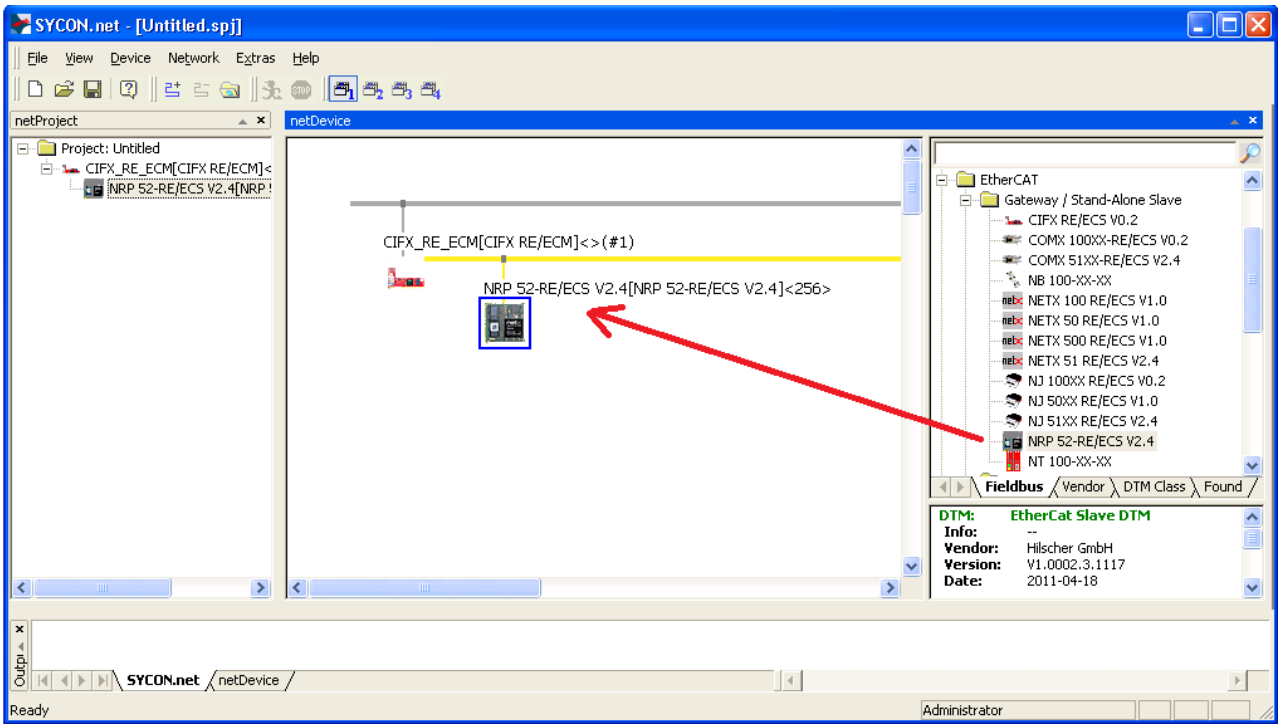


Figure 76: Add netRAPID as EtherCAT Slave in SYCON.net

➭ You have added the netRAPID as slave in the EtherCAT network.

4. Assign driver to PC Card cifX (EtherCAT master).

➢ Double-click the **CIFX_RE_ECM** symbol (i. e. the EtherCAT master) in the bus configuration line or select the symbol and choose **Configuration…** entry from the context menu.

➭ The **Configuration** dialog window opens.

➢ In the **Navigation Area**, select **Settings** > **Driver**.

➧ The **Driver** list opens:

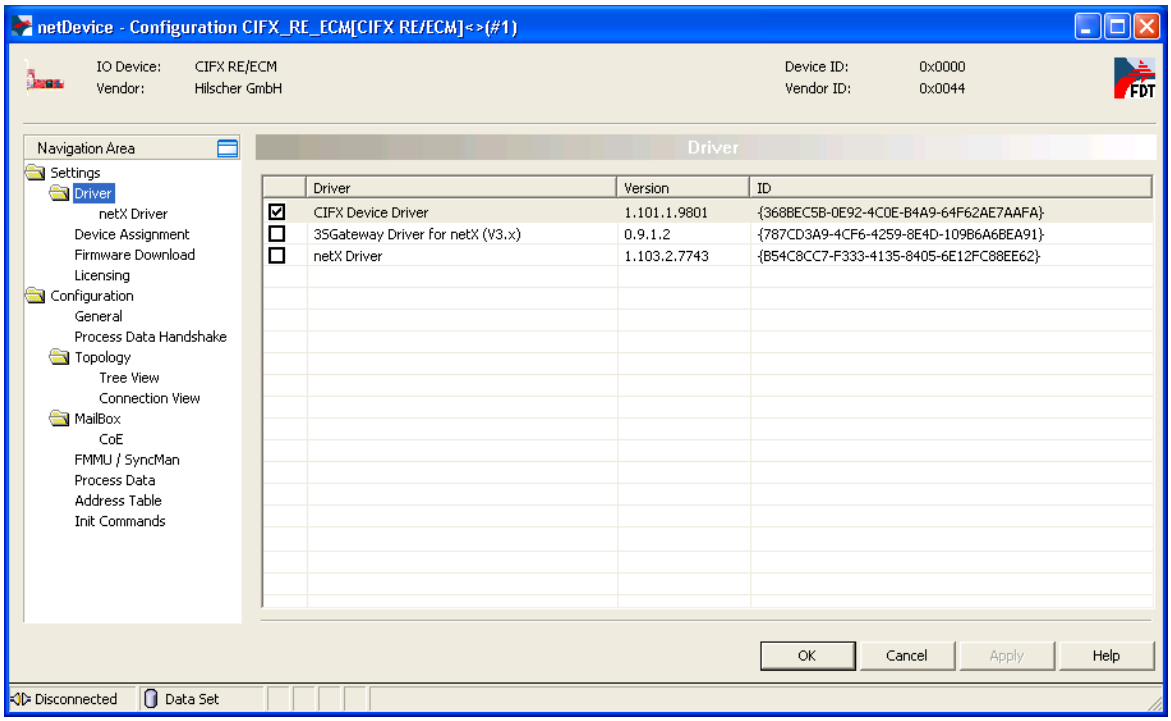


Figure 77: Choose driver for PC Card cifX

➢ Check the box in front of the **cifX Device Driver** entry and click **Apply** button.

➢ In the **Navigation Area**, select **Settings** > **Driver** > **Device Assignment**.

➧ The **Device Assignment** window opens.

➢ Check the box in front of the **CIFX 50-RE** entry and click **Apply** button.

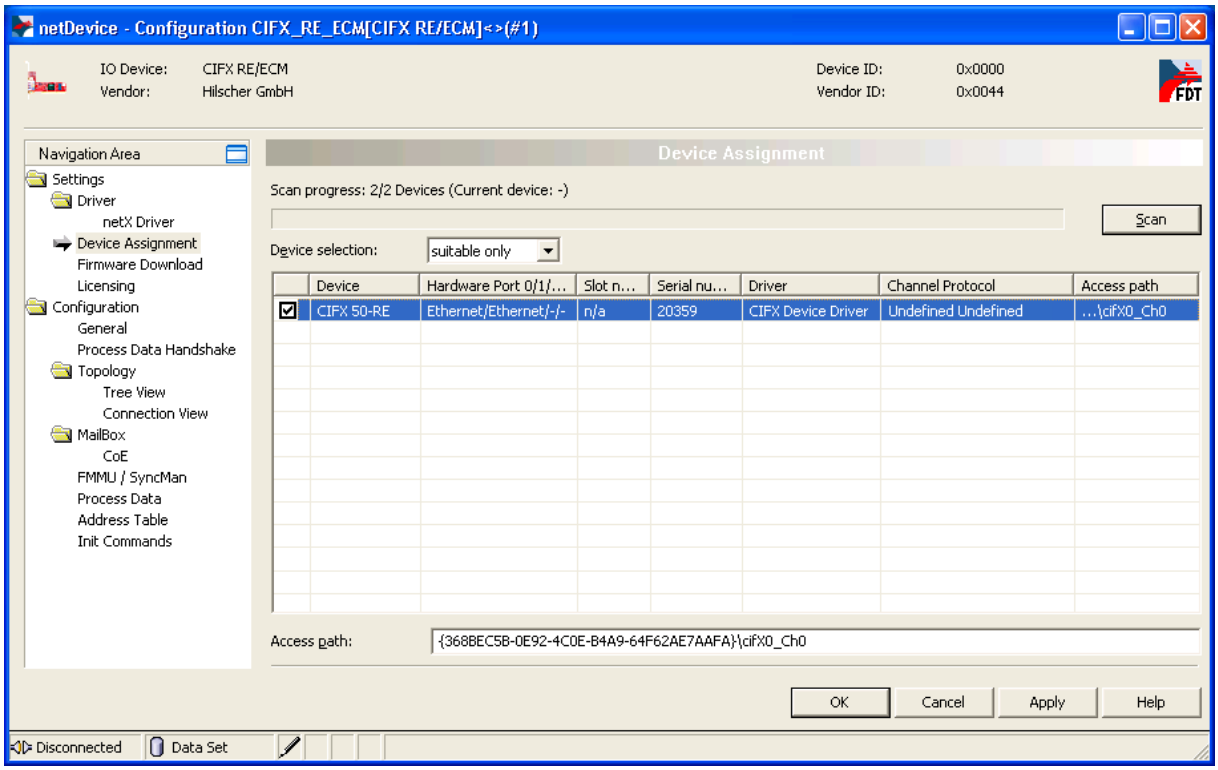


Figure 78: Assign driver to PC Card cifX

➧ You have assigned the driver for the PC Card cifX.

5. Download EtherCAT master firmware to PC Card cifX.

Note: This step has to be performed only if no EtherCAT master firmware has yet been loaded to the PC card cifX. If the PC Card cifX is already equipped with an EtherCAT master firmware, you can skip this step and close the configuration dialog window for the PC Card cifX by clicking the **OK** button.

➢ In the **Navigation Area**, select **Settings** > **Driver** > **Firmware Download**.

➧ The **Firmware Download** window opens:

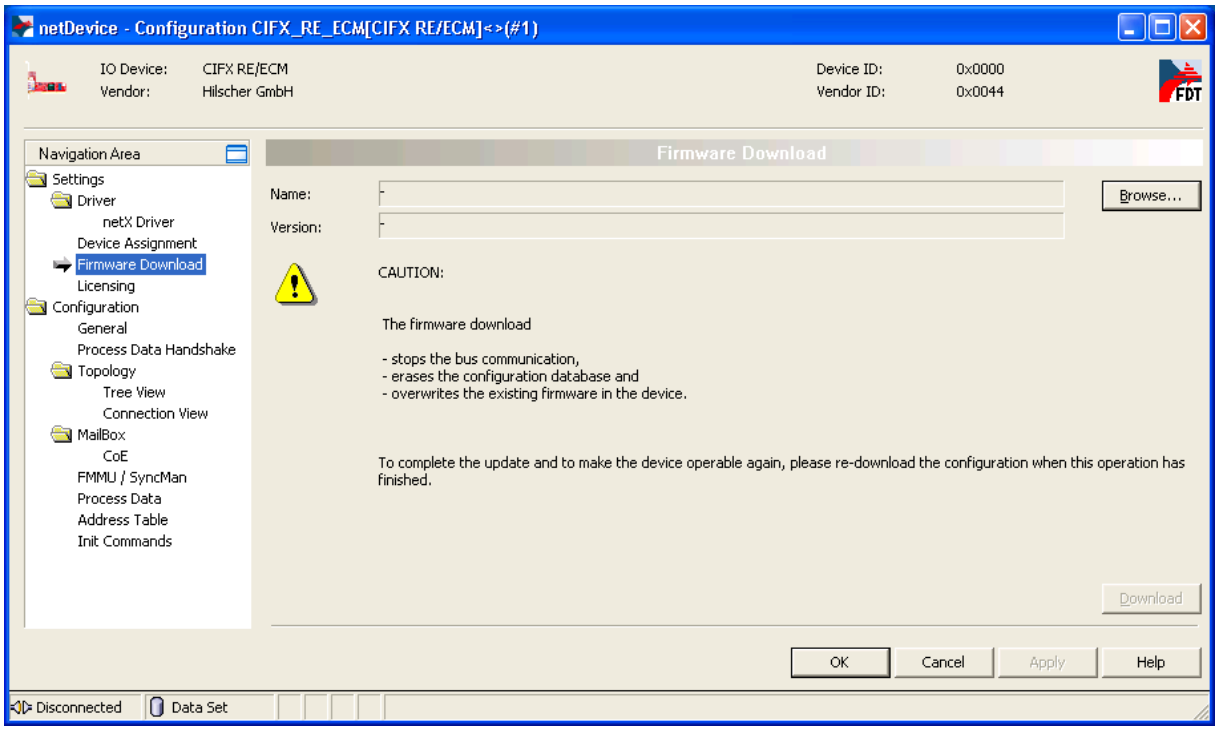


Figure 79: Firmware download dialog in SYCON.net

➢ Click **Browse…** button to choose the firmware which you want to load into the PC Card cifX.

➧ The **Select Firmware File** dialog opens:

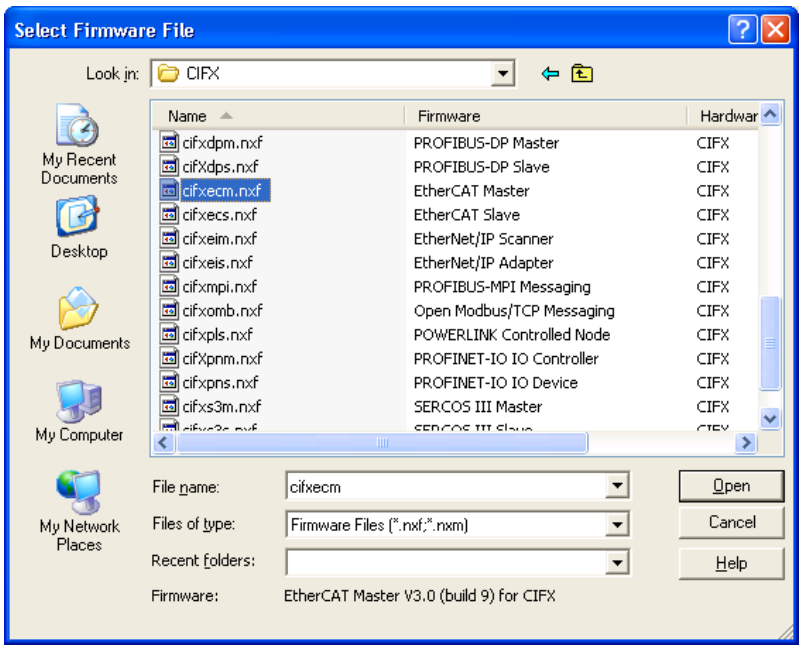


Figure 80: Select firmware file dialog in SYCON.net

➢ Navigate to the directory where the EtherCAT master firmware is stored. On the Communication Solutions DVD, this is the `Firmware\CIFX` folder.

➢ Select **cifXecm.nxf** file, then click **Open** button.

➧ Name and version of the selected firmware are displayed in the **Firmware Download** window.

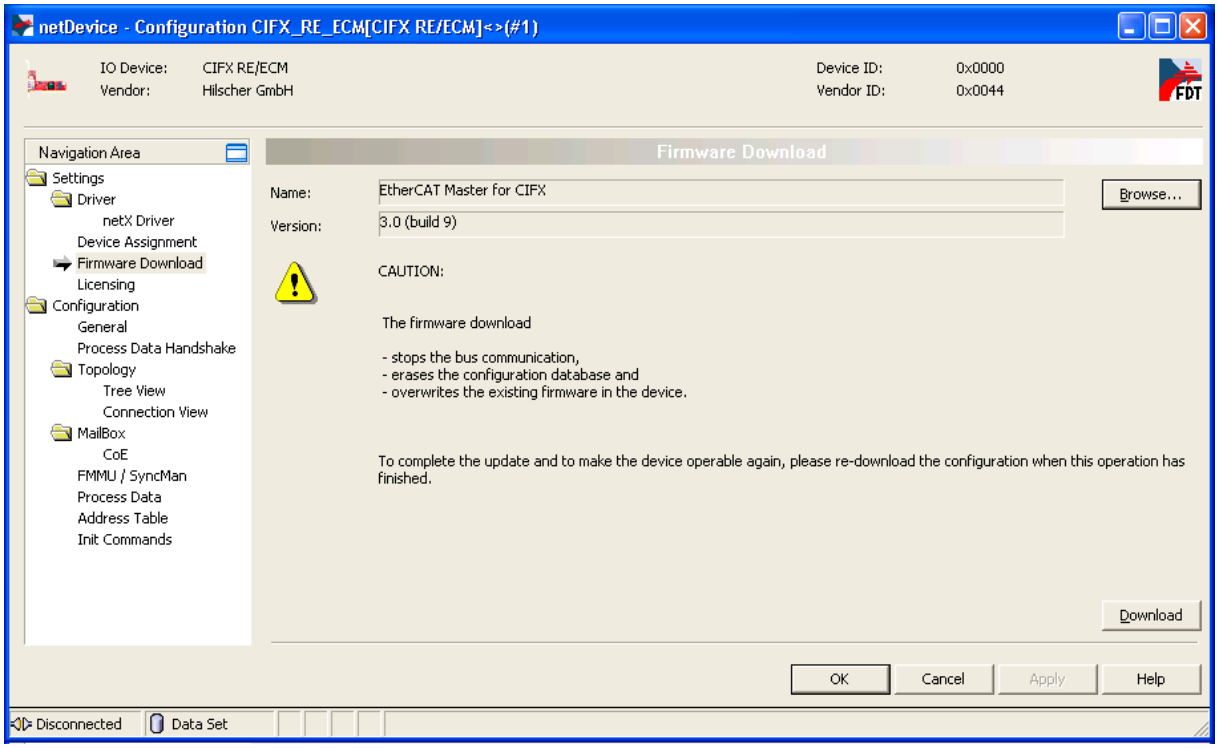


Figure 81: Downloading firmware to PC Card cifX

➢ Check, whether you have selected the right firmware, then click **Download** button to start the download. Answer the security question with **Yes**.

➧ The firmware is downloaded to the PC Card cifX.

➢ Click **OK** button to close the configuration window.

6. Assign driver to netRAPID (EtherCAT slave).

➢ Double-click the **NRP 52-RE/ECS V2.4** symbol in the bus configuration line or select the symbol and choose **Configuration…** entry from the context menu.

➧ The **Configuration** dialog opens.

➢ In the **Navigation Area**, select **Settings** > **Driver**.

➧ The **Driver** list opens:

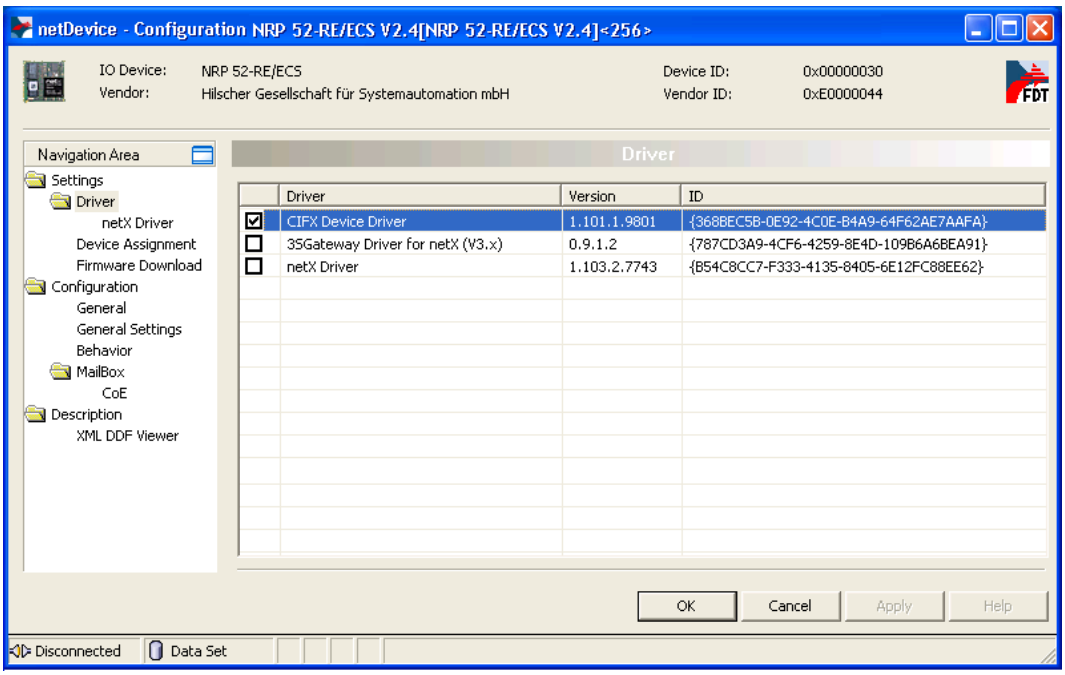


Figure 82: Choose driver for netRAPID

➢ Check the box in front of the **cifX Device Driver** entry and click **Apply** button.

➢ In the **Navigation Area**, select **Settings** > **Driver** > **Device Assignment**.

➢ The **Device Assignment** dialog window opens:

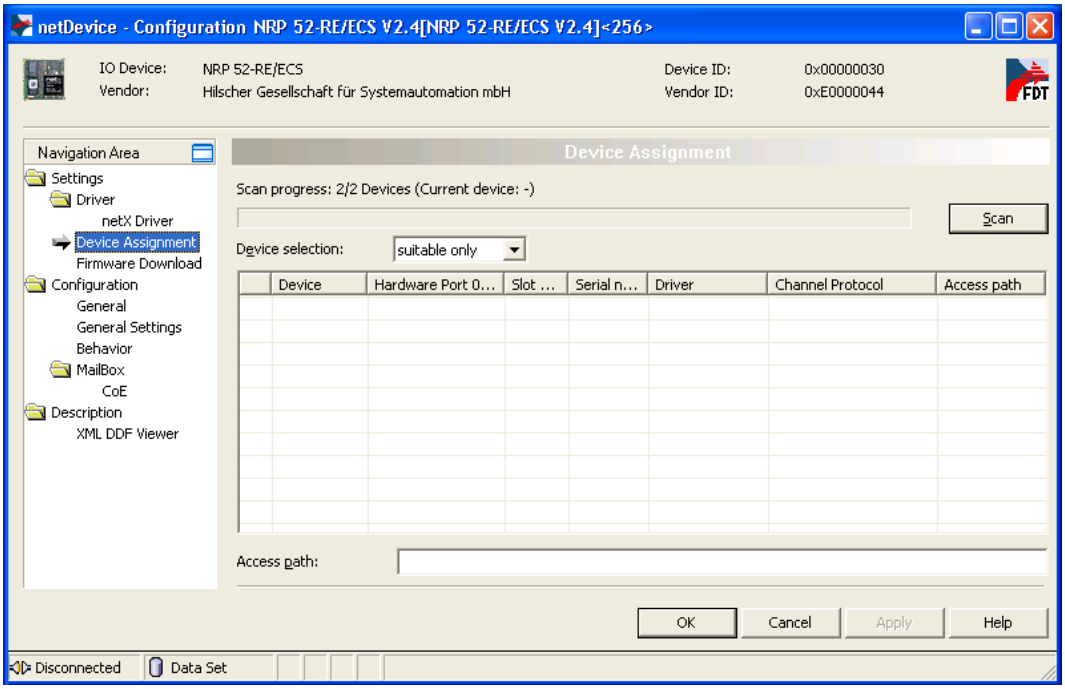


Figure 83: Device assignment dialog

➢ In the **Device Assignment** dialog window, choose **all** in the **Device selection** drop-down list, then click **Scan** button.

SYCON.net scans for connected devices. If the netRAPID, respectively the Evaluation Board has been properly connected to the configuration PC, the netRAPID will be found and displayed as NRP 52-RE in the list:

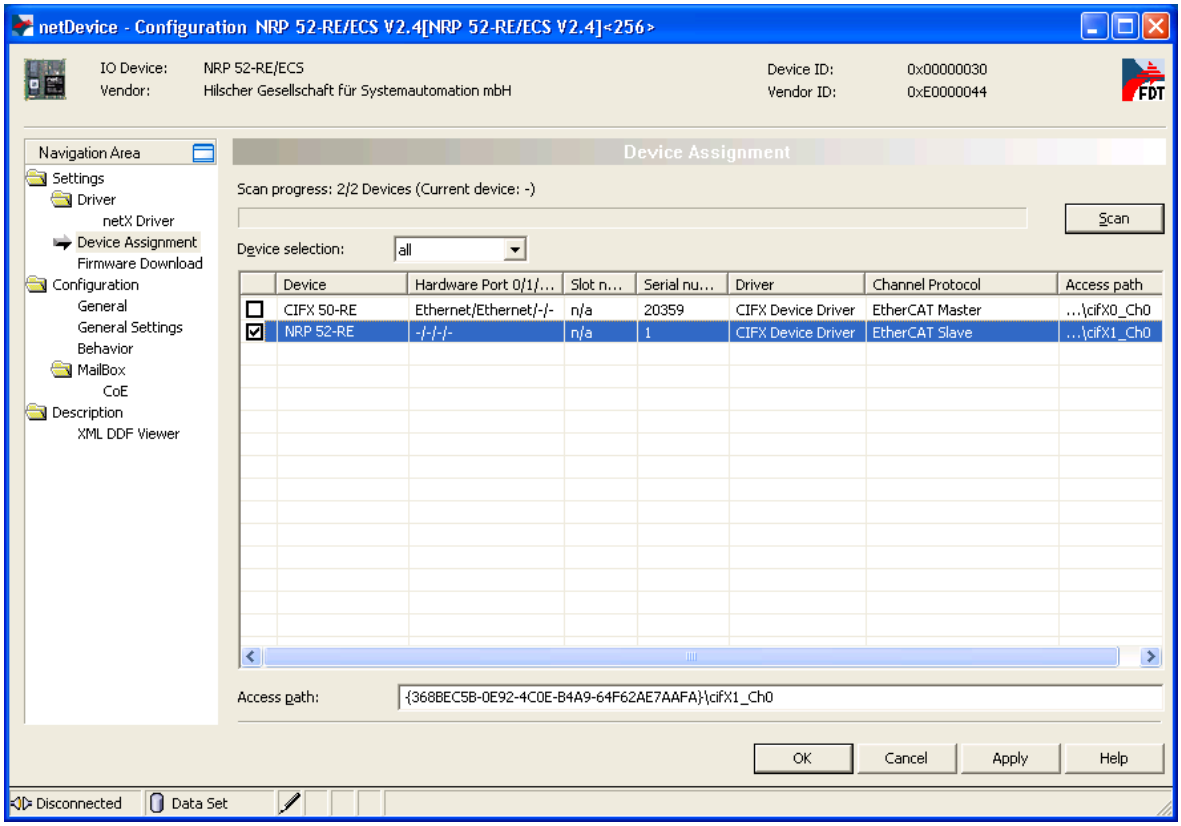


Figure 84: Assign driver to netRAPID

➢ Check the box in front of the NRP 52-RE entry and click **Apply** button.

You have assigned the driver for the netRAPID.

7. Configure EtherCAT slave (i. e. the netRAPID).

Note: In this simple configuration example, you only need to set the Input and Output Data Bytes of the EtherCAT slave manually. All other parameters can be left in their default settings.

➢ In the **Navigation Area**, select **Configuration** > **General Settings**.

➧ The **General Settings** dialog window opens:

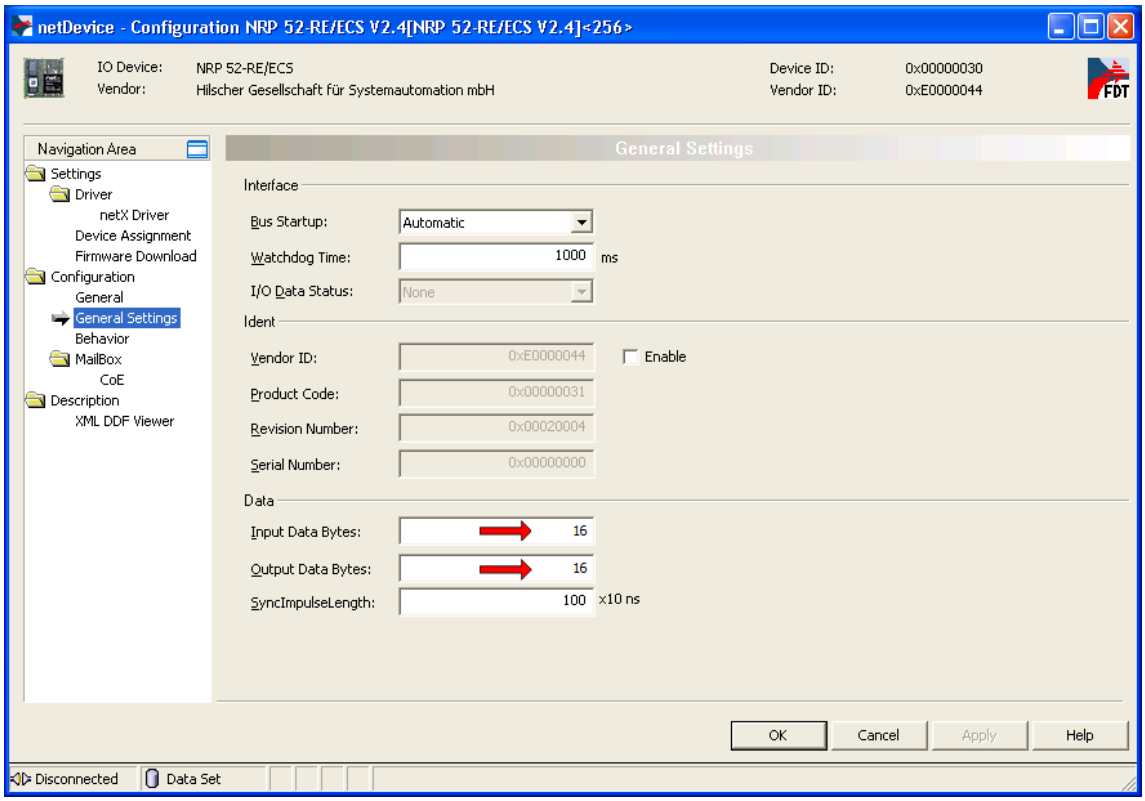


Figure 85: General settings dialog of netRAPID

➢ In the **Input Data Bytes** and **Output Data Bytes** fields, enter the appropriate value, e.g. `16`.

➢ Click **OK** button to close the configuration dialog.

➧ You have configured the I/O data of the netRAPID.

8. Download configuration to netRAPID.

➢ Select the **NRP 52-RE/ECS V2.4** symbol and use the right mouse button to open the context menu.

➢ In the context menu, select **Download**.

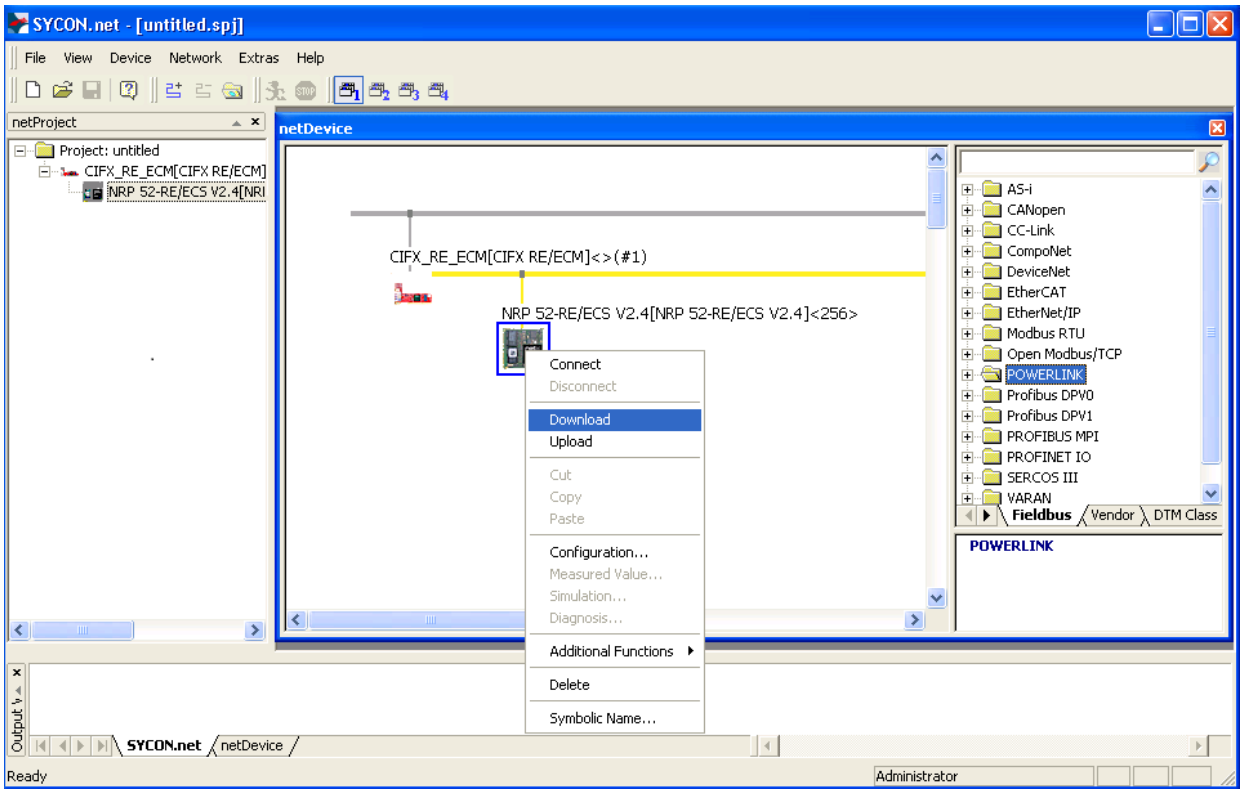


Figure 86: Download configuration to netRAPID

➢ Answer the configuration download confirmation request with **Yes**.

↬ The configuration is downloaded to the netRAPID.
SYCON.net automatically establishes an online connection for both netRAPID (EtherCAT slave) and the PC Card cifX (EtherCAT master).

Note: You don't need to configure the PC Card cifX (EtherCAT master), because this example can be used with the configuration parameters preset by SYCON.net, respectively with the data taken over from the slave.

9. Download configuration to PC Card cifX (EtherCAT master).

➢ Select the **CIFX_RE_PNM** symbol and use the right mouse button to open the context menu.

➢ In the context menu, select **Download**.

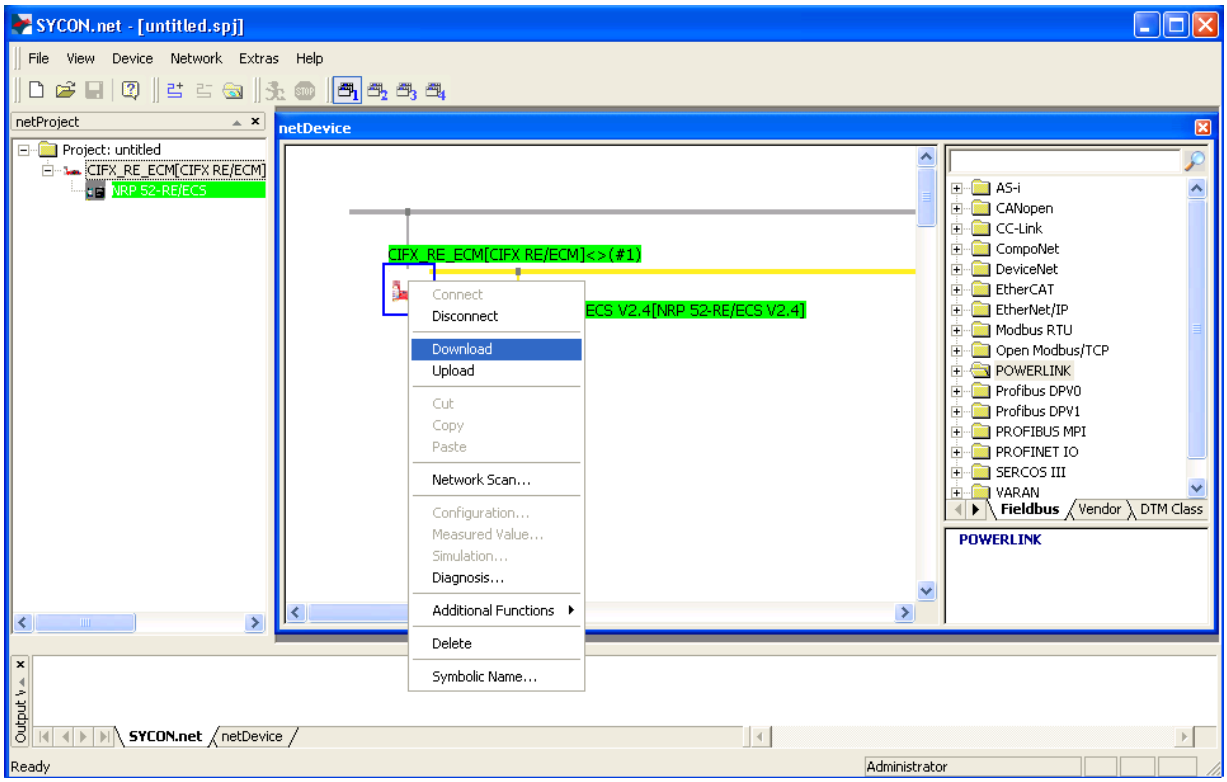


Figure 87: Download configuration to PC Card cifX

➢ Answer the configuration download confirmation request with **Yes**.

↬ The configuration is downloaded to the PC Card cifX.
Once the PC Card cifX has successfully established communication with the netRAPID, the green L/A LED of channel 0 of the RJ45 Ethernet connector on the Evaluation Board starts flickering (see position ⑰ in the *netRAPID Evaluation Boards* section on page 24).

4.4 Testing I/O communication

4.4.1 Overview

This section describes how to test the I/O data exchange between the NRP 10-DPS (PROFIBUS DP slave) and the PC card cifX (PROFIBUS DP master). In this test setup, the netRAPID/Evaluation Board is connected to the configuration PC via **Host Interface** and **NXPCA-PCI Adapter Board**. The configuration PC serves as host system for the netRAPID, the Hilscher **cifX Test Application** running on the PC simulates a host application for the netRAPID (i. e. the PROFIBUS slave) enabling you to exchange I/O data with the PROFIBUS master. The configuration PC is also the host system for the PC Card cifX, which is connected to the PCI interface of the PC. The **IO Monitor** feature of **SYCON.net** running on the configuration PC simulates a host application for the PC Card cifX (i. e. the PROFIBUS master), enabling you to exchange I/O data with the slave.

The testing of the PROFIBUS DP I/O data exchange between slave and master is used as general example of how to test the I/O communication of a netRAPID. The procedure for netRAPIDs with other network protocols follows the same principle.

4.4.2 Prerequisites

- The netRAPID (respectively the Evaluation Board) is connected to the configuration PC via **NXPCA-PCI Adapter Board** and **CAB-NXPCA-PCI** cable. This is described in steps 1 – 6 of the *Downloading Firmware to the netRAPID via PCI and Host Interface* section on page 62.
- You have installed the **SYCON.net** configuration software version 1.360 or higher on your PC (on the NRPEB product DVD, open the `Software\SYCON.net` directory, then double-click **SYCONnet netX setup.exe** file. Follow the instructions of the installation wizard).
- You have installed the **cifX Device Driver** on your PC (on the NRPEB product DVD, open the `Driver and Toolkit\Device Driver (NXDRV-WIN)\Installation` directory, then double-click **cifX Device Driver Setup.exe** file. Follow the instructions of the installation wizard).
  The cifX Device Driver installation contains the **cifX Test Application**, which can be used for testing the I/O data exchange of the netRAPID.
- You have installed a PC Card **CIFX 50-DP** in your configuration PC (or any other card PC Card cifX capable of serving as master in your network). For details, please refer to the User Manual *PC Cards CIFX 50 50E 70E 100EH*, DOC120204UMxxEN.
- You have configured the netRAPID and the PC Card cifX (see *Configuration examples* section on page 81).
- The netRAPID/Evaluation Board is connected to a voltage supply.
- The netRAPID/Evaluation Board is connected to the PC Card cifX via network cable (in this example via PROFIBUS cable).

4.4.3 Step-by-step instructions

1. Establish online connection between SYCON.net and the PC Card cifX.

➢ Open your configuration project in SYCON.net.

➢ Select the **CIFX_DP_DPM** symbol and use the right mouse button to open the context menu.

➢ In the context menu, select **Connect**.

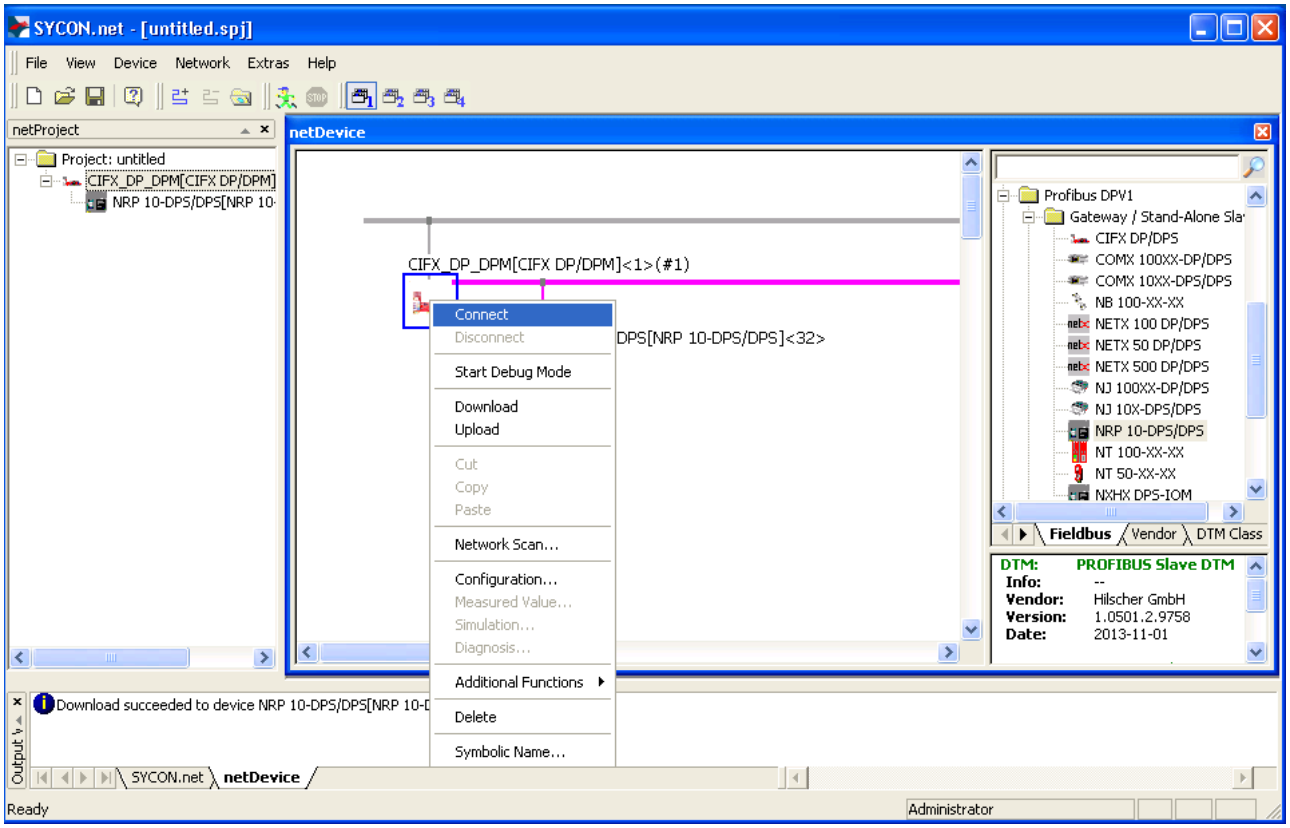


Figure 88: Establish online connection to PC Card cifX

➢ SYCON.net establishes an online connection with the PC Card cifX. This is indicated by a green label above the symbol of the PC Card cifX.

2. Open Diagnosis for PROFIBUS master (PC Card cifX) in SYCON.net.

➢ Select the **CIFX_DP_DPM** symbol and use the right mouse button to open the context menu.

➢ In the context menu, select **Diagnosis…**

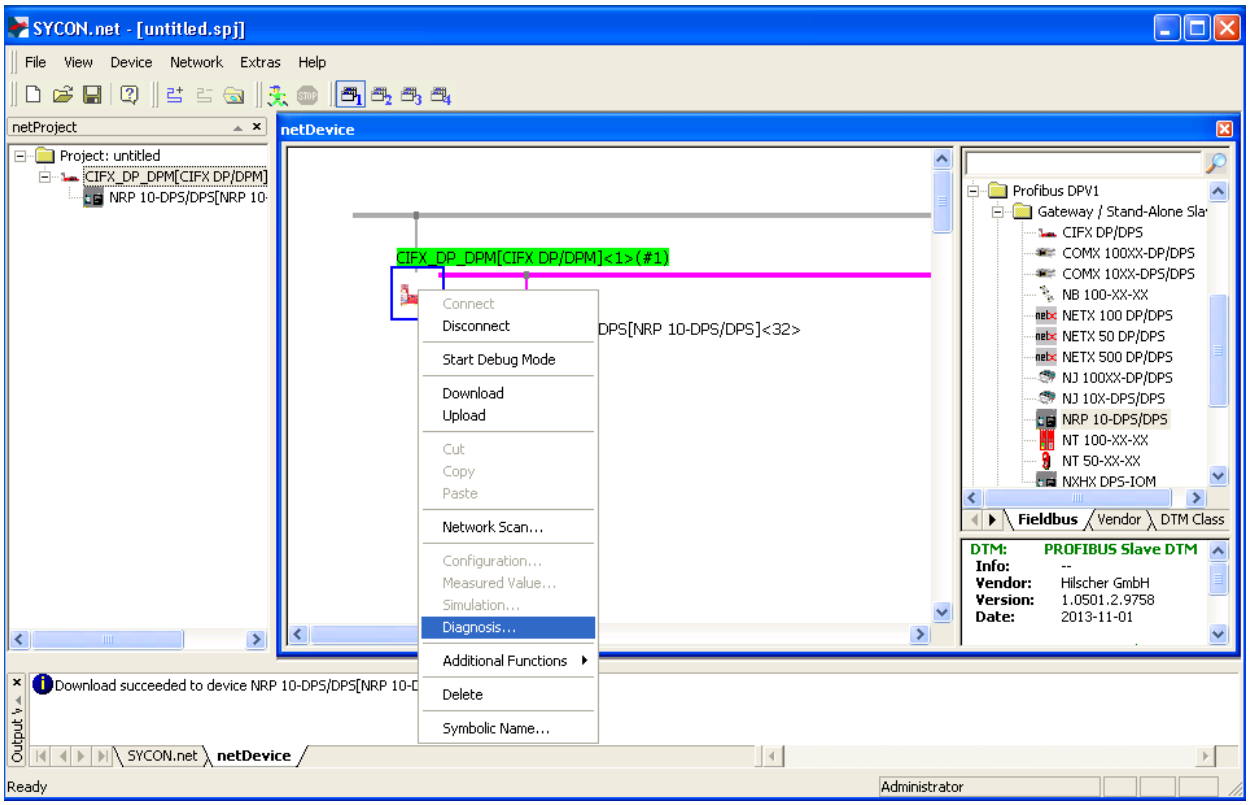


Figure 89: Open diagnosis dialog for PC Card cifX

➢ The **General Diagnosis** dialog window opens:

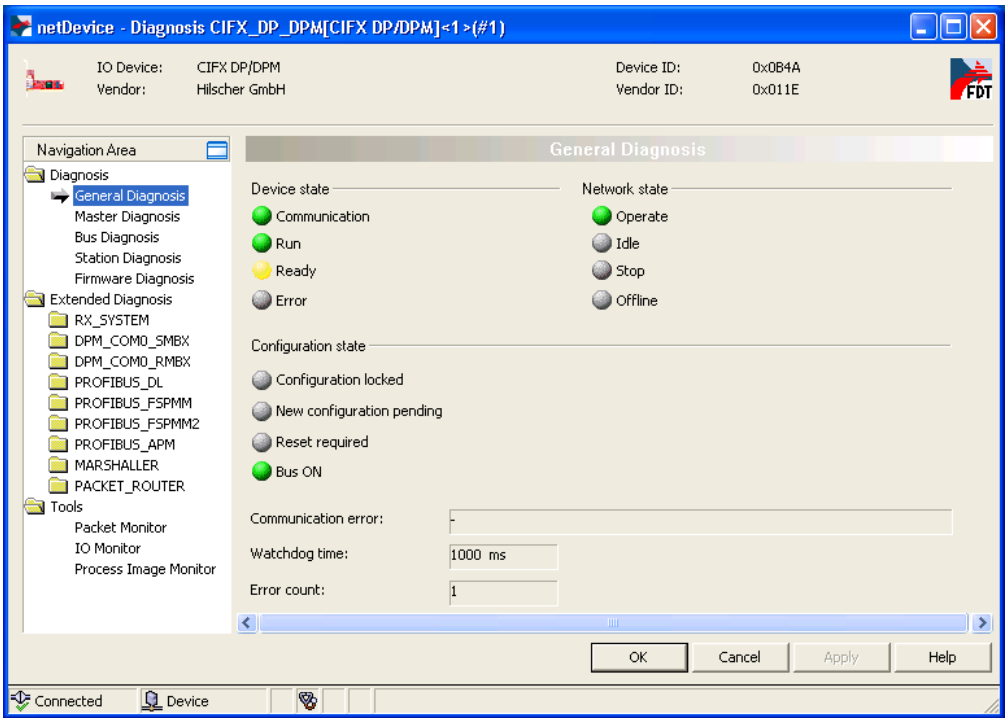


Figure 90: General diagnosis for PC Card cifX

➢ Check, whether the LEDs for **Communication**, **Operate**, **Run** and **Bus ON** are green. If this is the case, a functioning communication between the PC Card cifX and the netRAPID has been established.

3. Open IO Monitor.

➢ In the **Navigation Area**, choose **Tools** > **IO Monitor**.

➢ The **IO Monitor** dialog window opens:

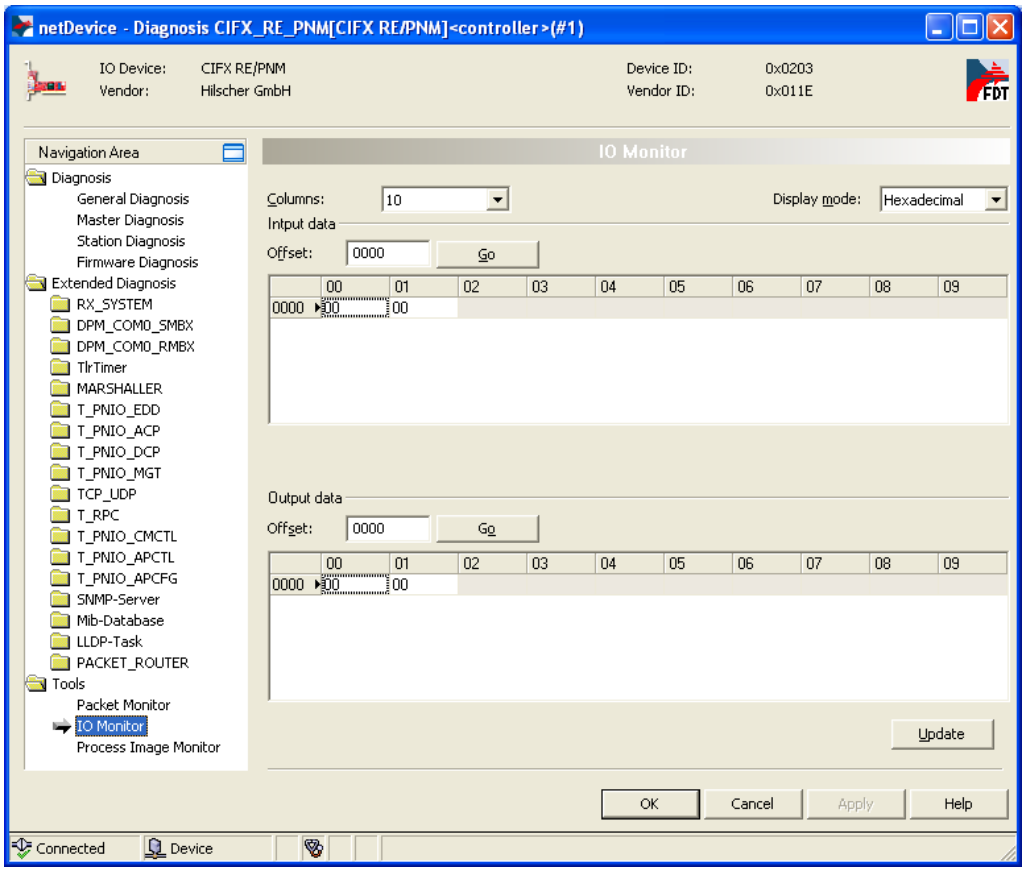


Figure 91: IO Monitor for PC Card cifX

➢ Leave the **IO Monitor** dialog window open while changing to the **cifX Test Application** in the next step.

4. Open the **cifX Test Application** on your PC.

➢ In the Windows **Start** menu, choose **Control Panel** > **cifX Test**.

➢ The **cifX Test Application** opens:

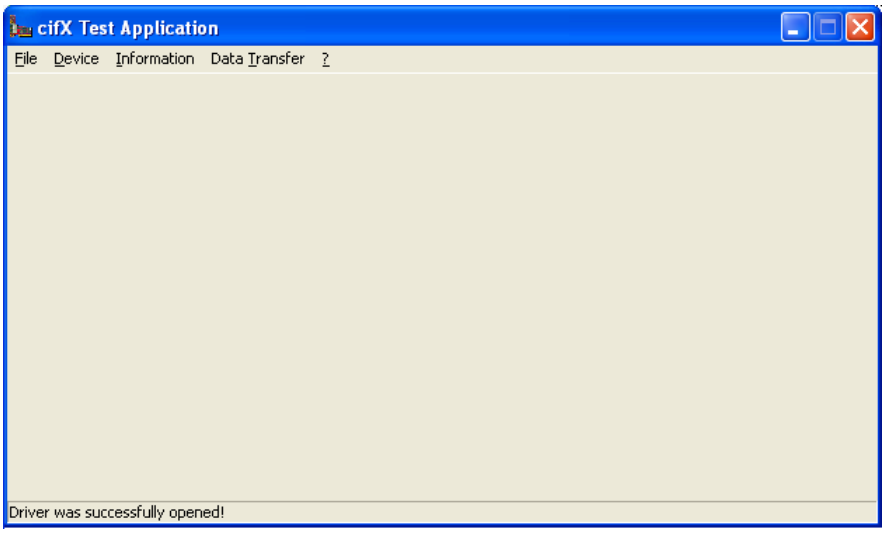


Figure 92: cifX Test Application start screen

5. Open connection to netRAPID.

➢ In the menu, choose **Device** > **Open** and wait for a few seconds.

➢ After a while, the **Channel Selection** dialog box opens:

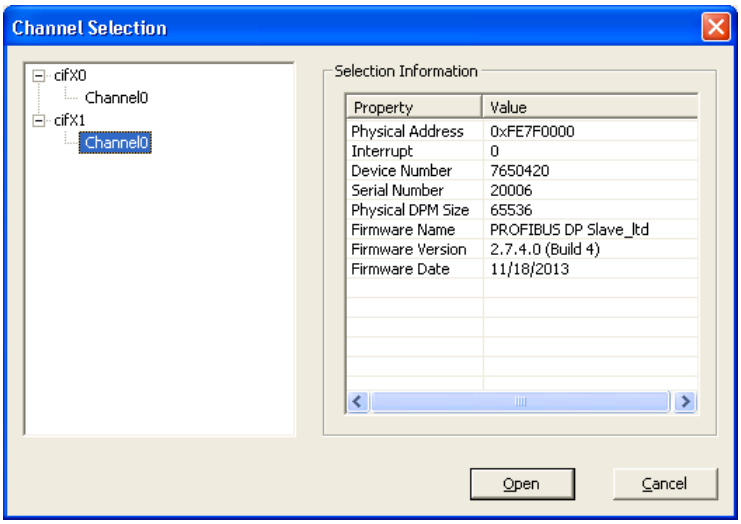


Figure 93: Channel selection dialog

➢ In the left part of the dialog box, select the channel of the cifX driver to which the netRAPID/Evaluation Board is connected via **Host Interface** and **NXPCA-PCI Adapter Board**. The PROFIBUS DP master (i. e. the PC Card cifX) is also connected to the cifX driver, therefore check in the **Selection Information** area on the right side, whether you have selected the correct channel (i. e. the channel of the slave).

➢ After having selected the channel of the PROFIBUS DP slave (i. e. the netRAPID), click **Open** button.

➧ The **Channel Selection** dialog box closes, and back in the **cifX Test Application** window, the header displays the selected channel:

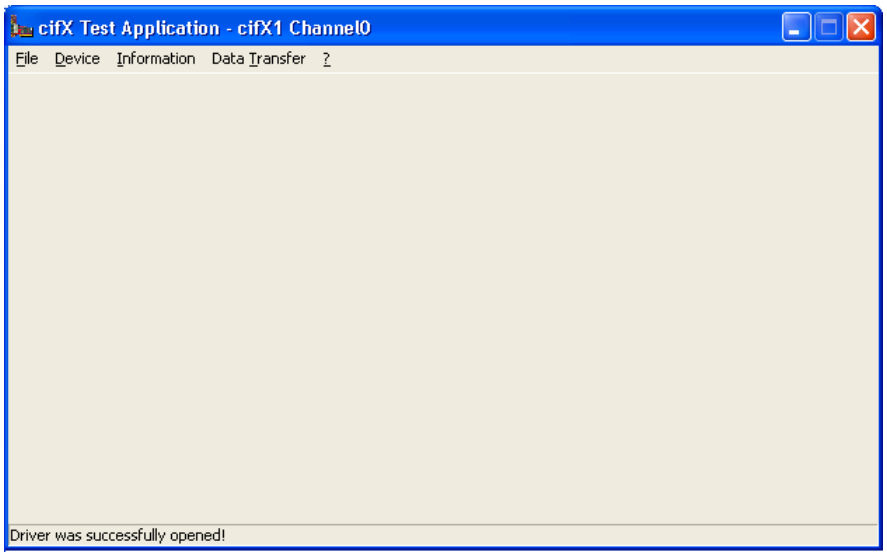


Figure 94: cifX Test Application after channel selection

6. Send I/O Output data from slave to master.

➢ In the menu, choose **Data Transfer** > **I/O Data**.

➧ The **Process Data I/O Image** dialog window opens.

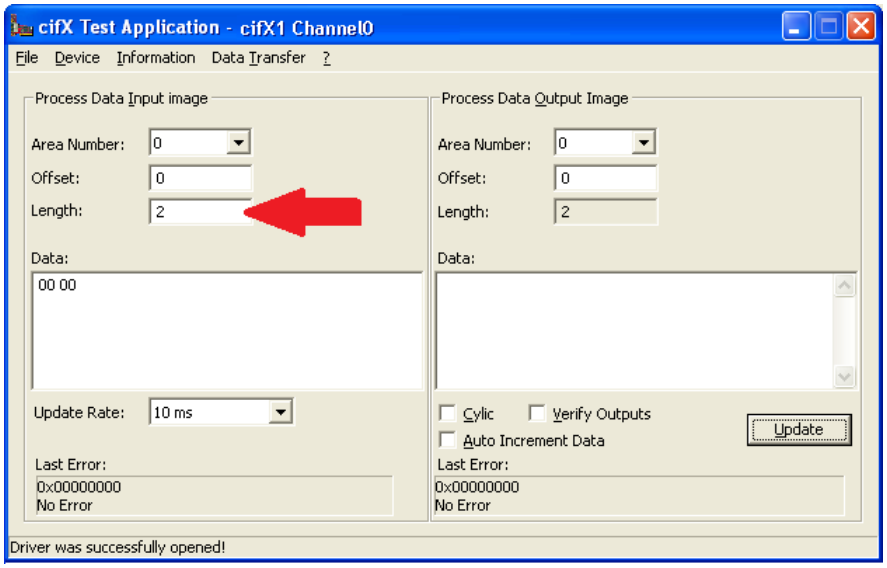


Figure 95: I/O data dialog in cifX Test Application

➢ In the **Length** field of the **Process Data Input Image** area, enter the value **2**. This is the number of Bytes which can be received if you are using the netRAPID with limited firmware.

➢ In the **Data** field of the **Process Data Output Image** area, enter output data that can be sent to the PROFIBUS DP master (i. e. the PC Card cifX). Keep in mind, that the PROFIBUS DP slave firmware for testing and evaluation purposes is limited to 2 bytes output / 2 bytes input data exchange. For instance, you can enter the values **01 02**.

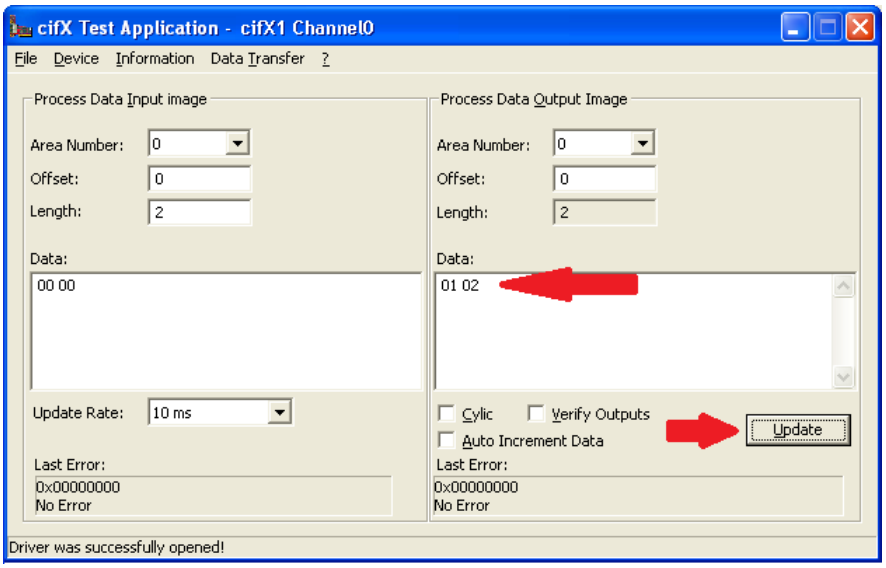


Figure 96: Enter output data in cifX Test Application

➢ After having entered the output data, click **Update**.

➪ The data is sent from the slave (i. e. the netRAPID) to the master (i. e. the PC Card cifX) via PROFIBUS cable.

7. Read I/O data from slave in SYCON.net IO Monitor.

➢ Change to the **IO Monitor** window in SYCON.net.

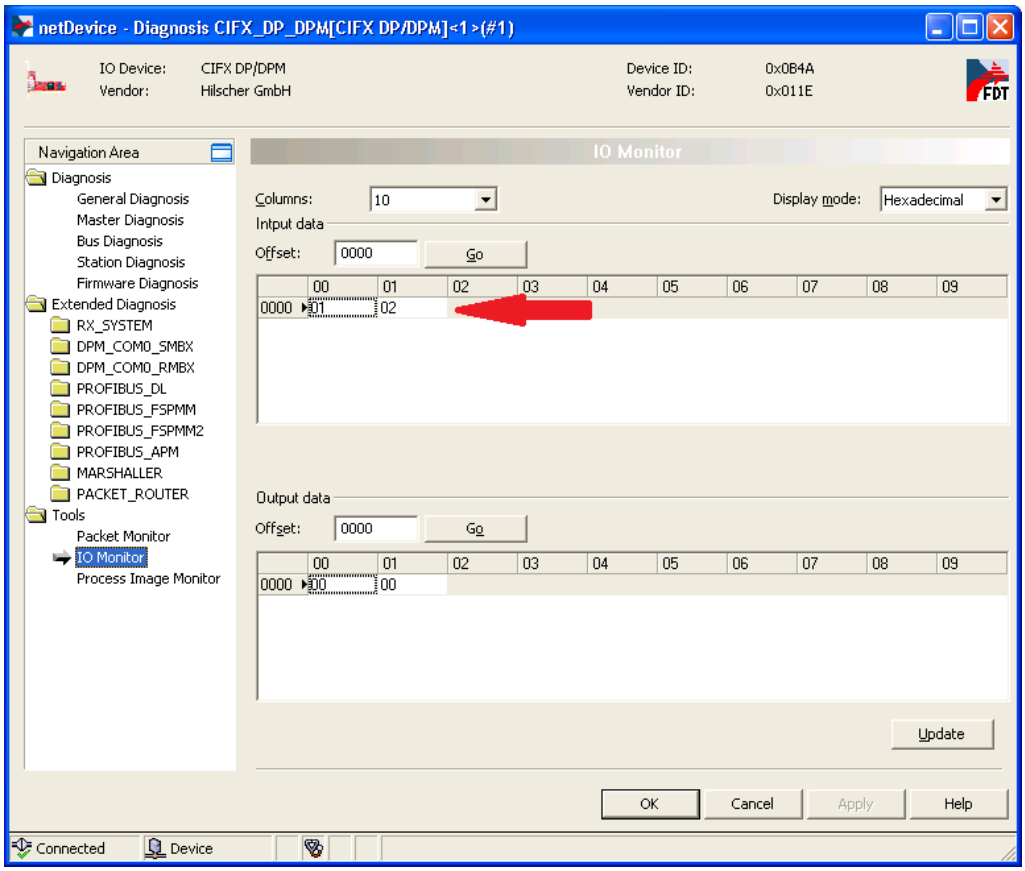


Figure 97: Incoming data in IO Monitor

➢ The data which has been sent from the PROFIBUS slave (i. e. the netRAPID) is displayed in the **Input data** area of the **IO Monitor**.

8. Send I/O Output data from master to slave.

➢ In the **Output data** area of the **IO Monitor**, enter output data that can be sent from the PROFIBUS master (i. e. the PC Card cifX) to the slave (i. e. the netRAPID). For instance, you can enter the values **03 04**.

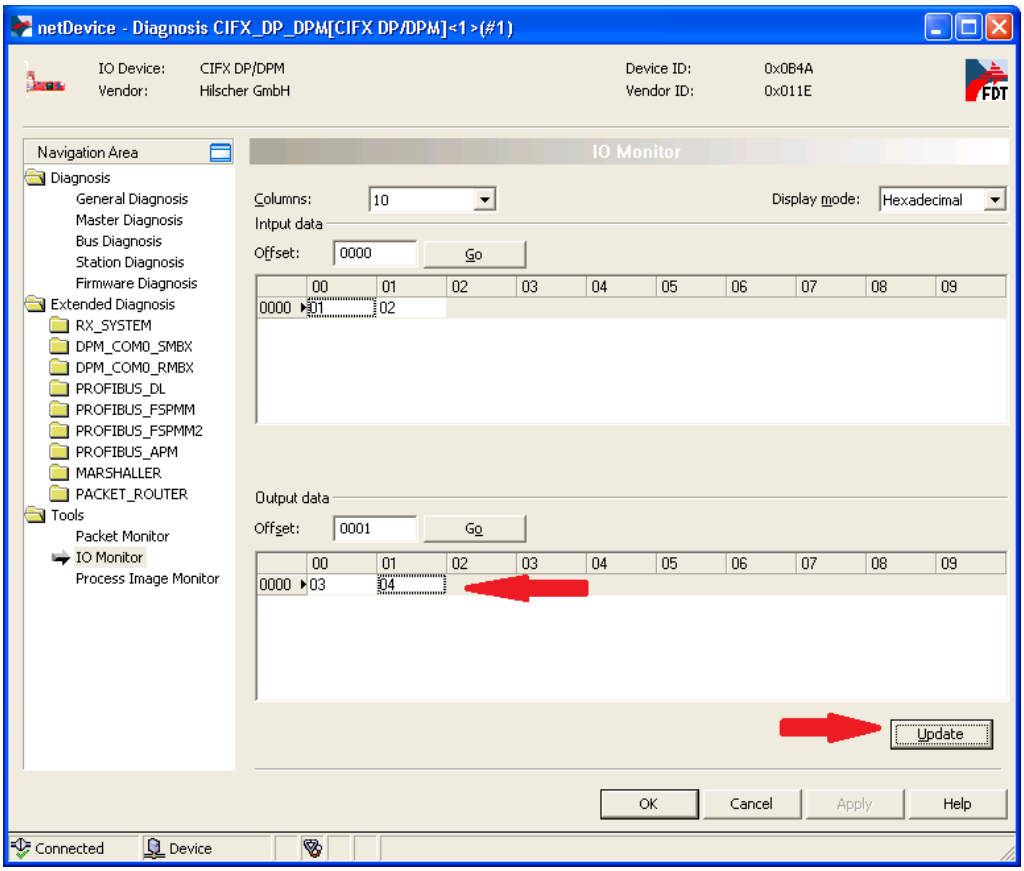


Figure 98: Output data in IO Monitor

➢ After having entered the output data, click **Update**.

➢ The data is being sent from the PROFIBUS master (i. e. the PC Card cifX) to the slave (i. e. the netRAPID) via PROFIBUS cable.

9. Read I/O data from master in cifX Test Application.

➢ Change to the cifX Test Application.

➧ The data which has been sent from the PROFIBUS master (i. e. the PC Card cifX) is displayed in the **Data** field of **Process Data Input Image** area of the cifX Test Application.

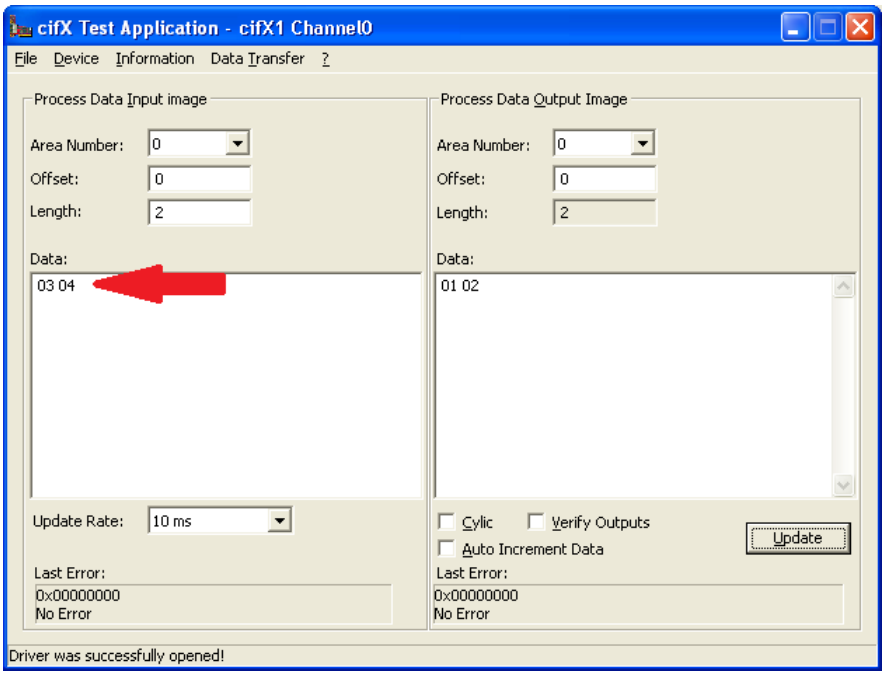


Figure 99: Incoming data in cifX Test Application

5 LED Descriptions

5.1 System LED

The subsequent table describes the signals of the **SYS** LED (V11) on the netRAPID Evaluation Boards. The signals of the **SYS** LED are identical for all types of Evaluation Boards.

LED	Color	State	Meaning
SYS Number in the device drawing: ④	**Duo LED yellow/green**		
	(green)	On	Operating System running
	(green/ yellow)	Blinking green/ yellow (alternating)	Second stage bootloader is waiting for firmware
	(yellow)	Static	Bootloader netX (= romloader) is waiting for second stage bootloader
	(off)	Off	Power supply for the device is missing or hardware defect

Table 27: System Status LED

5.2 LED GPIO

The standard firmware does NOT use the signals of the **GPIO** LED (V1) (position ① in the the *netRAPID Evaluation Boards* section on page 24).

5.3 PROFIBUS DP Slave LED on NRPEB 10-DPS

The subsequent table describes the signals of the PROFIBUS DP Slave communication status LED **COM**. The communication status LED is represented on the NRPEB 10-DPS Evaluation Board by the **COM0** (V12) LED.

Note: The **COM1** LED (V13) on the NRPEB 10-DPS Evaluation Board is not used by the PROFIBUS DP Slave firmware.

LED	Color	State	Meaning
COM Name in the device drawing: **COM0** (V12) Number in the device drawing: ③	**Duo LED red/green**		
	● **(green)**	On	RUN, cyclic communication
	✺ (green)	Flashing, cyclic (2 Hz)	Master is in CLEAR state.
	✺ (red)	Flashing, acyclic (1 Hz)	Device is not configured.
	✺ (red)	Flashing, cyclic (2 Hz)	STOP, no communication, connection error
	● (red)	On	Wrong configuration at PROFIBUS DP Slave.
	● (off)	Off	Device is not switched on or network power is missing.

Table 28: LED states for the PROFIBUS DP Slave protocol

LED State	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Flashing, acyclic (1 Hz)	The indicator turns on and off in irregular intervals, with a frequency of 1 Hz: “on” for 750 ms, followed by “off” for 250 ms.
Flashing, cyclic (2 Hz)	The indicator turns on and off with a frequency of 2 Hz: “on” for 250 ms, followed by “off” for 250 ms.

Table 29: LED state definitions for the PROFIBUS DP Slave protocol

5.4 CC-Link Slave LED on NRPEB 10-CCS

The subsequent table describes the signals of the CC-Link Slave **L RUN/L ERR** LEDs. These LEDs are represented on the NRPEB 10-CCS Evaluation Board by the **COM0** (V12) LED.

Note: The **COM1** LED (V13) on the NRPEB 10-CCS Evaluation Board is not used by the CC-Link Slave firmware.

LED	Color	State	Meaning
L RUN / L ERR Name in the device drawing: **COM0** (V12) Number in the device drawing: ③	**Duo LED red/green**		
	(off)	Off	1. Before participating in the network 2. Unable to detect carrier 3. Timeout 4. Resetting hardware
	(green)	On	Receive both refresh and polling signals or just the refresh signal normally, after participating in the network.
	(red)	Blinking	The switch setting has been changed from the setting at the reset cancellation (blinks for 0.4 sec.).
	(red)	On	1. CRC error 2. Address parameter error (0, 65 or greater is set including the number of occupied stations) 3. Baud rate switch setting error during cancellation of reset (5 or greater)

Table 30: LED states for the CC-Link Slave protocol

5.5 EtherCAT Slave LEDs NRPEB 51-RE and NRPEB 52-RE

The subsequent table describes the signals of the EtherCAT Slave **RUN** and **ERR** LEDs. These LEDs are represented on the Evaluation Boards by the **COM0** and **COM1** LEDs. The LEDs on the RJ45 sockets are also described.

LED	Color	State	Meaning
RUN Name in the device drawing: **COM0** Number in the device drawing: ③	**Duo LED red/green**		
	● (off)	Off	**INIT**: The device is in state INIT.
	✳ (green)	Blinking (2.5 Hz)	**PRE-OPERATIONAL**: The device is in PRE-OPERATIONAL state.
	✳ (green)	Single flash	**SAFE-OPERATIONAL**: The device is in SAFE-OPERATIONAL state.
	● (green)	On	**OPERATIONAL**: The device is in OPERATIONAL state.
ERR Name in the device drawing: **COM1** Number in the device drawing: ②	**Duo-LED red/green**		
	● (off)	Off	**No error:** The EtherCAT communication of the device is in working condition.
	✳ (red)	Blinking (2.5 Hz)	**Invalid configuration:** General Configuration Error Possible reason: State change commanded by master is impossible due to register or object settings.
	✳ (red)	Single Flash	**Local error:** Slave device application has changed the EtherCAT state autonomously. Possible reason 1: A host watchdog timeout has occurred. Possible reason 2: Synchronization Error, device enters Safe-Operational automatically.
	✳ (red)	Double Flash	**Application watchdog timeout:** An application watchdog timeout has occurred. Possible reason: Sync Manager Watchdog timeout.
L/A IN/ RJ45 Ch0 **L/A OUT**/ RJ45 Ch1 Number in the device drawing: ⑰	**LED green**		
	● (green)	On	**Link:** The device is linked to the Ethernet, but does not send/receive Ethernet frames.
	✳ (green)	Flickering (load dependent)	**Activity:** The device is linked to the Ethernet and sends/receives Ethernet frames.
	● (off)	Off	The device has no link to the Ethernet.
RJ45 Ch0 RJ45 Ch1	**LED yellow**		
	● (off)	Off	This LED is not used.

Table 31: LED states for the EtherCAT Slave protocol

LED State	Definition
Blinking (2.5 Hz)	The indicator turns on and off with a frequency of 25 Hz: “on” for 200 ms, followed by “off” for 200 ms.
Single flash	The indicator shows one short flash (200 ms) followed by a long “off“ phase (1,000 ms).
Double flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Flickering (load dependent)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: on for approximately 50 ms, followed by off for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity.

Table 32: LED state definitions for the EtherCAT Slave protocol

5.6 PROFINET IO Device LEDs on NRPEB 51-RE and NRPEB 52-RE

The subsequent table describes the signals of the PROFINET IO Device **SF** and **BF** LEDs. These LEDs are represented on the Evaluation Boards by the **COM0** and **COM1** LEDs.
The LEDs on the RJ45 sockets are also described.

LED	Color	State	Meaning
SF (System Failure) Name in the device drawing: **COM0** Number in the device drawing: ③	**Duo LED red/green**		
	(off)	Off	No error
	(red)	Flashing (1 Hz, 3 s)	DCP signal service is initiated via the bus.
	(red)	On	Watchdog timeout; channel, generic or extended diagnosis present; system error
BF (Bus Failure) Name in the device drawing: **COM1** Number in the device drawing: ②	**Duo LED red/green**		
	(off)	Off	No error
	(red)	Flashing (2 Hz)	No data exchange
	(red)	On	No configuration; or low speed physical link; or no physical link
LINK/RJ45 Ch0 & Ch1 Number in the device drawing: ⑰	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(off)	Off	The device has no link to the Ethernet.
RX/TX/RJ45 Ch0 & Ch1 Number in the device drawing: ⑰	**LED yellow**		
	(gelb)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(off)	Off	The device does not send/receive Ethernet frames.

Table 33: LED states for the PROFINET IO-Device protocol

LED state	Definition
Flashing (1 Hz, 3 s)	The indicator turns on and off for 3 seconds with a frequency of 1 Hz: “on” for 500 ms, followed by “off” for 500 ms.
Flashing (2 Hz)	The indicator turns on and off with a frequency of 2 Hz: “on” for 250 ms, followed by “off” for 250 ms.
Flickering (load dependent)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: on for approximately 50 ms, followed by off for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity.

Table 34: LED state definitions for the PROFINET IO-Device protocol

5.7 Sercos Slave LED on NRPEB 51-RE and NRPEB 52-RE

The subsequent table describes the signals of the Sercos Slave **S** LED. This LED is represented on the Evaluation Boards by the **COM0** LED. The LEDs on the RJ45 sockets are also described.

Note: The **COM1** LED on the Evaluation Boards is not used by the Sercos Slave firmware.

LED	Color	State	Meaning
S Name in the device drawing: **COM0** Number in the device drawing: ③	**Duo LED red/green** (orange = red/green simultaneously)		
	(green)	On	**CP4: Communication phase 4:**Normal operation, no error
	(green)	Blinking (2 Hz)	**Loopback:** The network state has changed from „fast-forward“ to „loopback“.
	(green/orange)	Flashing (3 x green/3s)	**CP3: Communication phase 3**
		(2 x green/3s)	**CP2: Communication phase 2**
		(1 x green/3s)	**CP1: Communication phase 1**
	(orange)	On	**CP0: Communication phase 0**
	(orange/green)	Blinking (2 Hz)	**HP0:** Hot-plug phase 0
		(1 x orange/3s)	**HP1:** Hot-plug phase 1
		(2 x orange/3s)	**HP2:** Hot-plug phase 2
	(orange)	Flashing (2 Hz)	**Identification:** Corresponds to C-DEV.Bit 15 in the Slave’s Device Control indicating remote address allocation or configuration errors between Master and Slaves (for details refer to sercos Slave V3 Protocol API Manual).
	(green/red)	Flashing (2 Hz, min. 2s)	**MST losses ≥ (S-0-1003/2):** Depends on IDN S-0-1003 (for details refer to sercos Slave Protocol API manual). Corresponds to S-DEV.Bit 15 in the Device Status indicating a communication warning (Master SYNC telegrams have not been received).
	(red/orange)	Flashing (2 Hz)	**Application error (C1D):** See GDP & FSP Status codes class error, (see sercos Slave V3 Protocol API Manual).
	(red)	Flashing (2 Hz)	**Watchdog error:** Application is not running
	(red)	On	**Communication Error (C1D):** Error detected according to sercos third generation Class 1 Diagnosis, see SCP Status codes class error (see sercos Slave V3 Protocol API Manual).
	(off)	Off	**NRT-Mode:** (Non Real-Time Mode) No sercos Communication
L/A/RJ45 Ch0 & Ch1 Number in the device drawing: ⑰	LED green		
	(green)	On	**Link:** The device is linked to the Ethernet, but does not send/receive Ethernet frames.
	(green)	Flickering (load dependant)	**Activity:** The device is linked to the Ethernet and sends/receives Ethernet frames.
	(off)	Off	The device has no link to the Ethernet.
RJ45 Ch0 & Ch1	LED yellow		
	(off)	Off	This LED is not used.

Table 35: LED states for the sercos Slave protocol

LED state	Definition
Flashing (2 Hz)	The indicator turns on and off with a frequency of 2 Hz: *one color:* On for appr. 250 ms, followed by off for appr. 250 ms. *two colors:* First color for appr. 250 ms, followed by the second color for appr. 250 ms.
Flashing (1 x green/3s)	Flashing green for 250 ms, then orange on for 2 second and 750 ms.
(2 x green/3s)	Flashing green / orange / green, each for 250 ms, then orange on for 2 seconds and 250 ms.
(3 x green/3s)	Flashing green / orange / green / orange / green, each for 250 ms, then orange on for 1 second and 750 ms.
(1 x orange/3s)	Flashing orange for 250 ms, then green on for 2 second an 750 ms.
(2 x orange/3s)	Flashing orange / green / orange, each for 250 ms, then green on for 2 seconds and 250 ms.
Flickering (load dependent)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "on" for approximately 50 ms, followed by "off" for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity.

Table 36: LED state definitions for the sercos Slave protocol

5.8 Open Modbus/TCP LEDs on NRPEB 51-RE and NRPEB 52-RE

The subsequent table describes the signals of the Open Modbus/TCP **RUN** and **ERR** LEDs. These LEDs are represented on the Evaluation Boards by the **COM0** and **COM1** LEDs. The LEDs on the RJ45 sockets are also described.

LED	Color	State	Meaning
RUN Name in the device drawing: **COM0** Number in the device drawing: ③	**Duo-LED red/green**		
	(green)	On	**Connected**: OMB task has communication. At least one TCP connection is established.
	(green)	Flashing (1 Hz)	**Ready, not yet configured:** OMB task is ready and not yet configured.
	(green)	Flashing (5 Hz)	**Waiting for Communication:** OMB task is configured.
	(off)	Off	**Not Ready**: OMB task is not ready.
ERR Name in the device drawing: **COM1** Number in the device drawing: ②	**Duo-LED red/green**		
	(off)	Off	No communication error
	(red)	Flashing (2 Hz, 25% on)	System error
	(red)	On	Communication error active
LINK/RJ45 Ch0 & Ch1 Number in the device drawing: ⑰	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(off)	Off	The device has no link to the Ethernet.
ACT/RJ45 Ch0 & Ch1 Number in the device drawing: ⑰	**LED yellow**		
	(yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(off)	Off	The device does not send/receive Ethernet frames.

Table 37: LED states for the OpenModbusTCP protocol

LED state	Definition
Flashing (1 Hz)	The indicator turns on and off with a frequency of 1 Hz: “on” for 500 ms, followed by “off” for 500 ms.
Flashing (2 Hz, 25% on)	The indicator turns on and off with a frequency of 2 Hz: “on” for 125 ms, followed by “off” for 375 ms.
Flashing (5 Hz)	The indicator turns on and off with a frequency of 5 Hz: “on” for 100 ms, followed by “off” for 100 ms.
Flickering (load dependent)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: on for approximately 50 ms, followed by off for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity.

Table 38: LED state definitions for the OpenModbusTCP protocol

5.9 Ethernet/IP Adapter LEDs on NRPEB 51-RE and NRPEB 52-RE

The subsequent table describes the signals of the Ethernet/IP Adapter **MS** and **NS** LEDs. These LEDs are represented on the Evaluation Boards by the **COM0** and **COM1** LEDs. The LEDs on the RJ45 sockets are also described.

LED	Color	State	Meaning
MS (Module status) Name in the device drawing: **COM0** Number in the device drawing: ③	**Duo-LED red/green**		
	(green)	On	**Device operational**: The device is operating correctly.
	(green)	Flashing (1 Hz)	**Standby**: The device has not been configured.
	(red/green)	Flashing (1 Hz)	**Self-test**: The device is performing its power up testing.
	(red)	Flashing (1 Hz)	**Minor fault**: The device has detected a recoverable minor fault. E. g. an incorrect or inconsistent configuration can be considered as a minor fault.
	(red)	On	**Major fault**: The device has detected a non-recoverable major fault.
	(Off)	Off	**No power**: The power supply to the device is missing.
NS (Network-status) Name in the device drawing: **COM1** Number in the device drawing: ②	**Duo-LED red/green**		
	(green)	On	**Connected**: The device has at least one established connection (even to the Message Router).
	(green)	Flashing (1 Hz)	**No connections**: The device has no established connections, but has obtained an IP address.
	(red/green)	Flashing (1 Hz)	**Self-test**: The device is performing its power up testing.
	(red)	Flashing (1 Hz)	**Connection timeout**: One or more of the connections in which this device is the target have timed out. This status will be finished only if all timed out connections are re-established or if the device is reset.
	(red)	On	**Duplicate IP**: The device has detected that its IP address is already in use.
	(Off)	Off	**Not powered, no IP address**: The device does not have an IP address (or is powered off).
LINK Ch0 & Ch1 Number in the device drawing: ⑰	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(Off)	Off	The device has no link to the Ethernet.
ACT Ch0 & Ch1 Number in the device drawing: ⑰	**LED yellow**		
	(yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(Off)	Off	The device does not send/receive Ethernet frames.

Table 39: LED states for the EtherNet/IP Adapter protocol

LED state	Definition
Flashing (1 Hz)	The indicator turns on and off with a frequency of 1 Hz: “on” for 500 ms, followed by “off” for 500 ms.
Flickering (load dependent)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: on for approximately 50 ms, followed by off for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity.

Table 40: LED state definitions for the EtherNet/IP Adapter protocol

5.10 POWERLINK Controlled Node LEDs on NRPEB 51-RE and NRPEB 52-RE

The subsequent table describes the signals of the POWERLINK **BS** and **BE** LEDs. These LEDs are represented on the Evaluation Boards by the **COM0** and **COM1** LEDs. The LEDs on the RJ45 sockets are also described.

LED	Color	State	Meaning
BS (Bus Status) Name in the device drawing: **COM0** Number in the device drawing: ③	**Duo LED red/green**		
	● (green)	On	Slave is in **'Operational'** state
	✺ (green)	Triple Flash	Slave is in **‚ReadyToOperate'** state
	✺ (green)	Double flash	Slave is in **‚Pre-Operational 2'** state
	✺ (green)	Single flash	Slave is in **‚Pre-Operational 1'** state
	✺ (green)	Flickering (10 Hz)	Slave is in **‚Basic Ethernet'** state
	✺ (green)	Blinking (2.5 Hz)	Slave is in **‚Stopped'** state
	● (off)	Off	Slave initializing
BE (Bus Error) Name in the device drawing: **COM1** Number in the device drawing: ②	**Duo LED red/green**		
	● (off)	Off	Slave has no error
	● (red)	On	Slave has detected an error
L/A IN/ RJ45 Ch0 **L/A OUT**/ RJ45 Ch1 Number in the device drawing: ⑰	**LED green**		
	● (green)	On	**Link:** The device is linked to the Ethernet, but does not send/receive Ethernet frames.
	✺ (green)	Flickering (load dependent)	**Activity:** The device is linked to the Ethernet and sends/receives Ethernet frames.
	● (off)	Off	The device has no link to the Ethernet.
RJ45 Ch0 RJ45 Ch1	**LED yellow**		
	● (off)	Off	This LED is not used.

Table 41: LED states for the POWERLINK Controlled Node protocol

LED state	Definition
Triple Flash	The indicator shows a sequence of three short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Double flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Single flash	The indicator shows one short flash (200 ms) followed by a long "off" phase (1,000 ms).
Flickering (10 Hz)	The indicator turns on and off with a frequency of approximately 10 Hz: on for approximately 50 ms, followed by off for 50 ms. Red and green LEDs shall be on alternately.
Blinking (2.5 Hz)	The indicator turns on and off with a frequency of approximately 2.5 Hz: on for approximately 200 ms, followed by off for 200 ms. Red and green LEDs shall be on alternately.
Flickering (load dependent)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: on for approximately 50 ms, followed by off for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity.

Table 42: LED state definitions for the POWERLINK Controlled Node protocol

5.11 VARAN Client LEDs on NRPEB 51-RE and NRPEB 52-RE

The subsequent table describes the signals of the VARAN **RUN** and **ERR** LEDs. These LEDs are represented on the Evaluation Boards by the **COM0** and **COM1** LEDs. The LEDs on the RJ45 sockets are also described.

LED	Color	State	Meaning
RUN Name in the device drawing: **COM0** Number in the device drawing: ③	**Duo-LED red/green**		
	(green)	On	Configured and communication is active.
	(green)	Blinking (5 Hz)	Configured and communication is inactive.
	(off)	Off	Not configured.
ERR Name in the device drawing: **COM1** Number in the device drawing: ②	**Duo-LED red/green**		
	(off)	Off	Configured.
	(red)	Blinking (5 Hz)	Not configured.
	(red)	On	Communication error occurred.
LINK Ch0 & Ch1 Number in the device drawing: ⑰	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(off)	Off	The device has no link to the Ethernet.
ACT Ch0 & Ch1 Number in the device drawing: ⑰	**LED yellow**		
	(yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(off)	Off	The device does not send/receive Ethernet frames.

Table 43: LED states for the VARAN-Client protocol

LED state	Definition
Blinking (5 Hz)	The indicator turns on and off with a frequency of 5 Hz: “on” for 100 ms, followed by “off” for 100 ms.
Flickering (load depend-ent)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: on for approximately 50 ms, followed by off for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity.

Table 44: LED state definitions for the VARAN-Client protocol

6 Technical Data

6.1 CC-Link Slave

6.1.1 netRAPID Chip Carrier NRP 10-CCS

NRP 10-CCS	Parameter	Value
Device identification	Part number	7650.740
Communication interface	Field bus	CC-Link Slave
CC-Link Interface	Transmission rate	156 kBit/s, 625 kBit/s, 2500 kBit/s, 5 MBit/s, 10 MBit/s
	Interface Type	RS-485
	Galvanic Isolation	optically isolated
Communication controller	Type	netX 10
Memory	FLASH	4 MB serial Flash EPROM
Host interface	Type	Parallel Dual-port memory or serial Dual-port memory (SPI)
	Dual-port memory size	16 KB (14 address lines), where 8 KB used by firmware (13 address lines, lowest 8 KB)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector Type	76-pin solder contacts 1 mm with 1.5 mm grid
Diagnostic Interface	USB	Signals at chip carrier (supported by standard firmware) Available only if integrated in host system
	UART	RXD, TXD signals at chip carrier (not supported by standard firmware)
Display	LED Display	Signals at chip carrier SYS System Status L RUN/L ERR Communication status
Power supply	Voltage	+3.3 V ± 5 % DC
	Current at 3.3 V (typ.)	360 mA
	Current at 3.3 V (max.)	710 mA
	Power Consumption (typ.)	1.2 W
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	0 … +70 °C
	Air flow	0.5 m/s
Dimensions	L x W x H	32 x 32 x 4 mm
Weight	Weight	approx. 4 g

Table 45: Technical data NRP 10-CCS

6.1.2 Evaluation Board NRPEB 10-CCS

NRPEB 10-CCS	Parameter	Value
Device identification	Part number	7600.740
Chip carrier	Type	NRP 10-CCS
Field bus	Interface	CC-Link
	Connector	Combicon 5-pin , male connector
Host interface	Type	Parallel dual-port memory or serial dual-port memory (SPI)
	Connector Type	68-pin (X1) or 40-pin (X2)
Diagnostic Interface	USB	Mini-B USB
	UART	Pin header
Display	LED	SYS System Status
		COM0, COM1 Communication status
		GPIO Status
Operating elements	Buttons	Reset push button Serial boot mode push button
	Switch	Baud rate switch Address switch (*1) Address switch (*10)
Power supply	Voltage	24 V ± 6 V DC
	Current at 24 V (typ.)	55 mA
	Power Consumption	1.3 W (at 24 V)
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	0 … +70 °C
	Air flow	0.5 m/s
Dimensions	(L x W x H)	100 x 65 x 12 mm
Weight	Weight	approx. 45 g

Table 46: Technical data NRPEB 10-CCS

6.2 PROFIBUS DP Slave

6.2.1 netRAPID Chip Carrier NRP 10-DPS

NRP 10-DPS	Parameter	Value
Device identification	Part number	7650.420
Communication controller	Type	netX 10
Memory	FLASH	4 MB serial Flash EPROM
Communication interface	Field bus	PROFIBUS DP Slave
PROFIBUS Interface	Transmission rate	9,6 kBit/s, 19,2 kBit/s, 31,25 kBit/s, 45,45 kBit/s, 93,75 kBit/s, 187,5 kBit/s, 500 kBit/s, 1,5 MBit/s, 3 MBit/s, 6 MBit/s, 12 MBit/s
	Interface Type	RS-485
	Galvanic Isolation	Isolated
Host interface	Type	Parallel Dual-port memory or serial Dual-port memory (SPI)
	Dual-port memory size	16 KB (14 address lines), where 8 KB used by firmware (13 address lines, lowest 8 KB)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI Slave, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector Type	76-pin solder contacts 1 mm with 1.5 mm grid
Diagnostic Interface	USB	Signals at chip carrier (supported by standard firmware) Available only if integrated in host system
	UART	RXD, TXD signals at chip carrier (not supported by standard firmware)
Display	LED Display	Signals at chip carrier SYS system status COM communication status
Power supply	Voltage	+3.3 V ± 5 % DC
	Current at 3.3 V (typ.)	290 mA
	Current at 3.3 V (max.)	790 mA
	Power Consumption	1 W
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	-20 … +70 °C
	Air flow	0.5 m/s
Dimensions	L x W x H	32 x 32 x 4 mm
Weight	Weight	approx. 3 g

Table 47: Technical data NRP 10-DPS

6.2.2 Evaluation Board NRPEB 10-DPS

NRPEB 10-DPS	Parameter	Value
Device identification	Part number	7600.420
Chip carrier	Type	NRP 10-DPS
Field bus	Interface	PROFIBUS DP Slave
	Connector	D-Sub 9-pin, female
Host interface	Type	Parallel dual-port memory or serial dual-port memory (SPI)
	Connector Type	68-pin (X1) or 40-pin (X2)
Diagnostic Interface	USB	Mini-B USB
	UART	Pin header
Display	LED	SYS system status
		COM0, COM1 communication status
		GPIO status
Operating elements	Buttons	Reset push button Serial boot mode push button
	Switch	Address switch (*1) Address switch (*10)
Power supply	Voltage	24 V ± 6 V DC
	Current at 24 V (typ.)	45 mA
	Power Consumption	1.1 W (at 24 V)
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	-20 … +70 °C
	Air flow	0.5 m/s
Dimensions	L x W x H	100 x 65 x 12 mm
Weight	Weight	approx. 45 g

Table 48: Technical data NRPEB DPS

6.3 Real-Time Ethernet

6.3.1 netRAPID Chip Carrier NRP 51-RE

NRP 51-RE\F8T	Parameter	Value
Device identification	Part number	7660.101
Communication controller	Type	netX 51
Integrated memory	SDRAM	8 MB
	FLASH	4 MB serial Flash EPROM
Ethernet interface	Transmission rate	100 MBit/s 10 MBit/s (depending on loaded firmware)
	Half duplex/Full duplex	supported (at 100 MBit/s)
	Auto-Negotiation	depending on loaded firmware
	Auto-Crossover	depending on loaded firmware
	Galvanic Isolation	Isolated
Host interface	Type	Parallel Dual-port memory or serial Dual-port memory (SPI)
	Dual-port memory size	16 KB (14 address lines)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI Slave, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector Type	76-pin solder contacts 1 mm with 1.5 mm grid
Diagnostic Interface	UART	RXD, TXD (depending on loaded firmware)
	USB	Yes
Display	LED Display	Signals at chip carrier SYS system status COM0, COM1 communication status Link0, Link1 Activity0, Activity1
Power supply	Voltage	+3.3 V ± 5 % DC
	Current at 3.3 V (typ.)	560 mA
	Current at 3.3 V (max.)	580 mA
	Power Consumption (typ.)	1.92 W
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	-20 … +70 °C
	Air flow	0.5 m/s
Dimensions (L x W x H)		32 x 32 x 3 mm
Weight	Weight	approx. 4 g

Table 49: Technical data NRP 51-RE

6.3.2 netRAPID Chip Carrier NRP 51-RE\F8T (planned)

Note: The netRAPID Chip Carrier NRP 51-RE\F8T is planned and not yet available in mass production. The technical data provided in the table below is preliminary.

NRP 51-RE\F8T	Parameter	Value
Device identification	Part number	7660.100
Communication controller	Type	netX 51
Integrated memory	SDRAM	8 MB
	FLASH	8 MB serial Flash EPROM
Ethernet interface	Transmission rate	100 MBit/s 10 MBit/s (depending on loaded firmware)
	Half duplex/Full duplex	supported (at 100 MBit/s)
	Auto-Negotiation	depending on loaded firmware
	Auto-Crossover	depending on loaded firmware
	Galvanic Isolation	Isolated
Host interface	Type	Parallel Dual-port memory or serial Dual-port memory (SPI)
	Dual-port memory size	16 KB (14 address lines)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI Slave, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector Type	76-pin solder contacts 1 mm with 1.5 mm grid
Diagnostic Interface	UART	RXD, TXD (depending on loaded firmware)
	USB	Yes
Security functions	Security module	TPM (Trusted platform module) V1.2
Display	LED Display	Signals at chip carrier SYS system status COM0, COM1 communication status Link0, Link1 Activity0, Activity1
Power supply	Voltage	+3.3 V ± 5 % DC
	Current at 3.3 V (typ.)	*tbd*
	Current at 3.3 V (max.)	*tbd*
	Power Consumption (typ.)	*tbd*
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	*tbd*
	Air flow	0.5 m/s
Dimensions (L x W x H)		32 x 32 x 4 mm
Weight	Weight	approx. 4 g

Table 50: Technical data NRP 51-RE\F8T (preliminary)

6.3.3 netRAPID Chip Carrier NRP 52-RE

NRP 52-RE	Parameter	Value
Device identification	Part number	7670.100
Communication controller	Type	netX 52
Integrated memory	FLASH	4 MB serial Flash EPROM
Ethernet interface	Transmission rate	100 MBit/s 10 MBit/s (depending on loaded firmware)
	Half duplex/Full duplex	supported (at 100 MBit/s)
	Auto-Negotiation	depending on loaded firmware
	Auto-Crossover	depending on loaded firmware
	Galvanic Isolation	Isolated
Host interface	Type	Parallel Dual-port memory or serial Dual-port memory (SPI)
	Dual-port memory size	16 KB (14 address lines)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector Type	76-pin solder contacts 1 mm with 1.5 mm grid
Diagnostic Interface	UART	RXD, TXD (depending on loaded firmware)
	USB	Yes
Display	LED Display	Signals at chip carrier SYS system status COM0, COM1 communication status Link0, Link1 Activity0, Activity1
Power supply	Voltage	+3.3 V ± 5 % DC
	Current at 3.3 V (typ.)	520 mA
	Current at 3.3 V (max.)	600 mA
	Power Consumption (typ.)	1.8 W
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	-20 … +70 °C
	Air flow	0.5 m/s
Dimensions (L x W x H)		32 x 32 x 4 mm
Weight	Weight	approx. 4 g

Table 51: Technical data NRP 52-RE

6.3.4 Evaluation Board NRPEB 51-RE

NRPEB 51-RE	Parameter	Value
Device identification	Part number	7600.100
Chip carrier	Type	NRP 51-RE\F8T
Ethernet interface	Connector	2x RJ45
Host interface	Type	Parallel dual-port memory or serial dual-port memory (SPI)
	Connector Type	68-pin (X1) or 40-pin (X2)
Diagnostic Interface	USB	Mini-B USB
	UART	Pin header
Display	LED Display	SYS System Status
		COM0, COM1 Communication status
		GPIO Status (not supported by standard firmware)
Operating elements	Buttons	Reset push button S-Boot push button
	Switch	Address switch (*1) Address switch (*10) (not supported by standard firmware)
Power supply	Voltage	24 V ± 6 V DC
	Current at 24 V (typ.)	*tbd*
	Power Consumption (typ.)	2.4 W
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	-20 … +70 °C
	Air flow	0.5 m/s
Dimensions	L x W x H	100 x 65 x 18 mm
Weight	Weight	approx. 45 g

Table 52: Technical data NRPEB 51-RE

6.3.5 Evaluation Board NRPEB 52-RE

NRPEB 52-RE	Parameter	Value
Device identification	Part number	7600.200
Chip carrier	Type	NRP 52-RE
Ethernet interface	Connector	2x RJ45
Host interface	Type	Parallel dual-port memory or serial dual-port memory (SPI)
	Connector Type	68-pin (X1) or 40-pin (X2)
Diagnostic Interface	USB	Mini-B USB
	UART	Pin header
Display	LED Display	SYS System Status
		COM0, COM1 Communication status
		GPIO Status (not supported by standard firmware)
Operating elements	Buttons	Reset push button S-Boot push button
	Switch	Address switch (*1) Address switch (*10) (not supported by standard firmware)
Power supply	Voltage	24 V ± 6 V DC
	Current at 24 V (typ.)	100 mA
	Power Consumption (typ.)	2.4 W
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	-20 … +70 °C
	Air flow	0.5 m/s
Dimensions	L x W x H	100 x 65 x 18 mm
Weight	Weight	approx. 45 g

Table 53: Technical Data NRPEB 52-RE

7 Appendix

7.1 List of figures

7.2 List of tables

7.3 Contacts

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