

# Getting Started netRAPID Chip Carrier



# Hilscher Gesellschaft für Systemautomation mbH

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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 <b>V3.6</b> in section <i>Reference to hardware, firmware,</i> <i>software and drivers</i> added
		1.2	Section netRAPID products with pictures added
		3.2	Description of time restriction in limited RTE firmware in section <i>Choosing the right firmware</i> added
		4.3.2	Section <i>Configuring NRP 51-RE/ECS or NRP 52-RE/ECS</i> with SYCON.net updated (1 Byte I/O data restriction in limited EtherCAT has been replaced by one hour time restriction)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 <i>NRP 51-RE</i> and <i>NRPEB 51-RE</i> (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

U	

Important: <important note>



Note: <note>



<note, where to find further information>

#### **Operation instructions**

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

#### Results

- Sector Secto
- ⇒ <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
	Device: 7650 420				R0502000.nxf	
NRP 10-DPS	Tray: 7652.420	Slave	NRPLFW-DPS	7601.420	Limited version: R05Z2000.nxf	2.9
	Device:	CC-Link Slave	NRPLFW-CCS	7601.740	R0509000.nxf	2.11
NRP 10-CCS	Tray: 7652.740				Limited version: R05Z9000.nxf	
		EtherCAT Slave	NRPLFW-ECS	7601.120	R060F000.nxf	4.7
					Limited version: R06ZF000.nxf	
		PROFINET IO	NRPLFW-PNS	7601.850	R060D000.nxf	3.12
		Device			Limited version: R06ZD000.nxf	
		Sercos Slave	NRPLFW-S3S	7601.160	R060J000.nxf	3.5
					Limited version: R06ZJ000.nxf	
	Device: 7660.101	Open	NRPLFW-OMB	7601.860	R060L000.nxf	2.6
NRP 51-RE	Tray: 7662 101	Modbus/TCP			Limited version: R06ZL000.nxf	
	1002.101	EtherNet/IP	NRPLFW-EIS	7601.830	R060H000.nxf	2.13
		Adapter			Limited version: R06ZH000.nxf	
		POWERLINK	NRPLFW-PLS	7601.180	R060K000.nxf	3.3
		Controlled Node			Limited version: R06ZK000.nxf	
		VARAN Client	NRPLFW-VRS	7601.810	R060T000.nxf	1.1
					Limited version: R06ZT000.nxf	

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

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

 Table 3: Reference to Chip Carriers and firmware (2)
 (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	tion Board Part no. For network protocol hardware		Equipped with netRAPID	
NRPEB 10-DPS	7600.420	PROFIBUS DP Slave	NRP 10-DPS	
NRPEB 10-CCS	NRPEB 10-CCS 7600.740 CC-Link Slave		NRP 10-CCS	
		EtherCAT Slave		
		PROFINET IO Device		
		Sercos Slave		
NRPEB 51-RE	7600.100	Open Modbus/TCP	NRP 51-RF/F8T	
		EtherNet/IP Adapter		
		POWERLINK Controlled Node		
		VARAN Client		
		EtherCAT Slave		
		PROFINET IO Device		
		Sercos Slave		
NRPEB 52-RE	7600 200	Open Modbus/TCP	NRP 52-RF	
	1000.200	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 cify Device Drive	- loctallation
cifX Driver Setup Utility	1.2.x.x	- Included in citX Device Driver Installation	

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 solderedon 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: Add	ditional docume	ntation for N	RP 51/52	-RE/PNS
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#### 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	DOC0808010IxxEN	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

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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  $\geq 1.3.15xxx.x$  (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.

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 <sup>(1)</sup>) and the *S0* rotary switch for setting the baud rate (position <sup>(13)</sup>), 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		
2	V13	LED COM1		
3	V12	LED COM0	See also chapter LED Descriptions on page 120	
4	V11	LED SYS		
5	T1	Reset button		
6	T2	Button for serial b	oot mode	
7	X6	USB interface (Mi	ini-USB)	
8	X4	SYNC and GPIO	measuring points	
9	X5	Host interface mo	de setting	
		(for more information, see section <i>Host interface mode NRPEB 10-CCS, NRPEB 10-DPS, and NRPEB 52-RE (X5)</i> in the Design Guide <i>netRAPID Chip Carrier</i> , DOC111004DGxxEN)		
(1)	X100	Connector for power supply		
(1)	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		
<b>A7</b>	X30	PROFIBUS DP connector (NRPEB 10-DPS)		
0	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		
2	P202	LED COM1		
3	P201	LED COM0	LED COM0 See also chapter LED Descriptions on page	
4	P200	LED SYS		
5	S100	Reset button		
6	S200	Button for serial b	oot mode	
7	X200	USB interface (Mi	ini-USB)	
8	X202	SYNC and GPIO	measuring points	
-	-	-		
10	X511	Connector for pov	ver supply	
1	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 s via pin header	SPM via USB /	For more information, see section <i>Host interface mode</i>
25	S300	Switch between I	DPM/SPM	NRPEB 51-RE (S203, S204, S300, S301) in the Design
26	S204	Host interface mo	ode setting	Guide <i>netRAPID Chip Carrier</i> , DOC111004DGxxFN
27	S203	8/16 bit mode se	8/16 bit mode setting in parallel	

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		
2	V13	LED COM1	See also abanton / ED Descriptions on none 120	
3	V12	LED COM0	See also chapter LED Descriptions on page 120	
4	V11	LED SYS		
5	T1	Reset button		
6	T2	Button for serial b	poot mode	
0	X6	USB interface (M	ini-USB)	
8	X4	SYNC and GPIO	measuring points	
9	X5	Host interface mode setting		
		(for more information, see section <i>Host interface mode NRPEB 10-CCS, NRPEB 10-DPS, and NRPEB 52-RE (X5)</i> in the Design Guide <i>netRAPID Chip Carrier</i> , DOC111004DGxxEN)		
10	X100	Connector for power supply		
(1)	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 <u>https://www.hilscher.com/support/downloads</u>, 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
	EtherCAT Slave	7601 120	NRP 51-RE	R060F000.nxf
NRFLFW-ECS		7001.120	NRP 52-RE	R070F000.nxf
		7601 850	NRP 51-RE	R060D000.nxf
		7001.000	NRP 52-RE	R070D000.nxf
NRPLEW-S3S	Sercos Slave	7601 160	NRP 51-RE	R060J000.nxf
		1001.100	NRP 52-RE	R070J000.nxf
	Open Modbus/TCP	7601 860	NRP 51-RE	R060L000.nxf
		7001.000	NRP 52-RE	R070L000.nxf
	EtherNet/IP Adapter	7601 830	NRP 51-RE	R060H000.nxf
		7001.000	NRP 52-RE	R070H000.nxf
		7601 190	NRP 51-RE	R060K000.nxf
NKFLFVV-FL3	POWERLINK Controlled Node	7001.180	NRP 52-RE	R070K000.nxf
	VARAN Client	7601 810	NRP 51-RE	R060T000.nxf
		1001.010	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.BSI 1 / 17 1 usb id NPP10 disable uart bin	Firmware\2nd Stage	
NRP 10-CCS		Bootloader\NRP 10	
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 Toolkit\Driver Driver and Toolkit (NXDRV-TKIT) \cifXToolkit directory, to develop а enabling driver 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).



- 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  $\geq$  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.

- 1. Start the Bootwizard application on your PC.
- In the Windows Start menu, choose All Programs > Hilscher GmbH > Bootwizard > Bootwizard.
- ✤ The Bootwizard opens:

🕰 Bootwizard							
<u>File V</u> iew							
Select task: Images Build image Modify image Check image Flashing Write to flash Verify flash Read from flash	Input Toolchain Input file Chip type netX Bootblock par Addresses User Data	500 rameters Load Addres	0 100	) 50 Point	51/52	Reload	Load ELF/binary Detect
Erase flash	Source device			×			~
Quickstart Actions	Dest. device			×			¥
Config Quit	Output Output file Generate boo	bt image A	dd this as a qui	ickstart action			Save as
Message Log							х
13:37:46: function: 01	826158						~ ~
				Test 'Bootwiza	rd' in progress	Lua uses 163	33 kilobytes

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:

🛗 netX Bootwiza	ar d						
<u>F</u> ile ⊻iew							
Select task: Images Build image Modify image Check image Flashing Write to flash	Input Input file Chip type netX	<b>5</b> 500	0 100	0 50	51/52	Reload	f File to flash
Verify flash	-Hasher para	Offset	Size				
Read from flash	Area	0					
Erase flash	Flash type						~
Quickstart Actions	Buffer						~
Config	Flash	Add this as	s a quickstart ac	tion			
Quit	<b>j</b>						
Message Log							×
2:39:50 PM: Linux gco 2:39:50 PM: function:	:-arm-elf : 017FF078						
				Test 'Bootwia	zard' in progress.	Lua uses 1671	l kilobytes

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:

Informa	tion 🛛
٩	The netX chip type and the source/destination devices could not be identified or there are multiple matches. Please select the correct chip type and Flash device.
	ОК

Figure 10: Bootwizard message

- Click **OK**.
- 4. Select Chip type.
- > In the **Chip type** area, select **10**.
- ✤ The GUI should now look like this:

🖀 netX Bootwizar	rd						
<u>F</u> ile ⊻iew							
	Input						
- Select task:	Input file	Firmware\2nd Sta	ge Bootloader I	VRP 10 WETX 10-B	SL_1_4_17_1_usb_id	_NRP Reloa	d File to flash
Images	Chip type						
Build image	netX	0 500	O 100	0 50	◯ 51/52	<ul><li>● 10</li></ul>	Detect
Modify image	-Bootblock par	ameters					
Check image Flashing	Addresses	Load Address 0x00020040	Entry Point	c			
Write to flash	User Data	0×00000000					
Verify flash	Source device		_	~			<b>~</b>
Read from flash	Dest. device			~			
Erase flash	⊂Flasher param	neters					
Quickstart Actions	Aug	Offset	Size				
Config	Area	0	55108				
	Flash type	Serial flash on SPI	bus				~
	Buffer	Internal RAM					~
	Flash	Add this as a qui	ckstart action				
Message Log							×
4:59:40 PM: Informatio Please select the corre	on: The netX chij ct chip type and	o type and the sou Flash device.	rce/destination	devices could no	t be identified or ther	e are multiple match	nes. 🔼
							~
				Test 'Bootwi	zard' in progressLu	a uses 1485 kilobyt	es

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 <sup>(6)</sup> 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 <sup>(5)</sup>).
- ✤ 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.
- $\Rightarrow$  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.
- <sup>™</sup> The **Control Panel** window opens.
- > In the **Control Panel**, double-click on **System** entry.
- Դ 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).

🚇 Device Manager	
<u>File A</u> ction <u>V</u> iew <u>H</u> elp	
CIFX Communication Interface  CIFX Communication Interface  CIFX Communication Interface  Disk drives  Display adapters  DVD/CD-ROM drives  Floppy disk controllers  Floppy disk controllers  Floppy disk drives  DIDE ATA/ATAPI controllers  Keyboards  Mice and other pointing devices  Mice and other pointing devices  Ports (COM & LPT)  Processors  Ports (COM & LPT)  System devices  Universal Serial Bus controllers  Universal Serial Bus devices  Communication Interface  Communication Interface  Computer  Communication Interface  CIFX Communication  CIFX Communicat	

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).
- 🖌 🍵 Universal Serial Bus devices
  - 🔲 🖶 netX10 USB Bootmonitor (ROM)
- 🖕 🌡 USB-Controller

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

9. Download image file.

🞬 netX Bootwiza	rd		
<u>F</u> ile ⊻iew			
Select task: Images Build image Check image Flashing Write to flash Verify flash Read from flash Erase flash Quickstart Actions	Input Input file Chip type netX Bootblock par Addresses User Data Source device Dest, device Flasher paran Area	Firmware\2nd Stage Bootloader NRP 10\NETX 10-BSL_1_4_17_1_usb_id_NRP       Reload         \$500       100       50       \$51/52       III         ameters       IIII       IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	File to flash Detect
	Flash type	Serial flash on SPI bus	*
Quit	Buffer	Internal RAM	¥
$\rightarrow$	Flash	Add this as a quickstart action	
Message Log			x
4:59:40 PM: Informatic Please select the corre	on: The netX chij ct chip type and	) type and the source/destination devices could not be identified or there are multiple matches. Flash device.	
		Test 'Bootwizard' in progressLua uses 1485 kilobytes	

> In the Bootwizard, click Flash button.

Figure 14: Write to flash screen

 $\Rightarrow$  The plugin selector opens:

Select the plugin					×
Name	Тур		Comment		- [
✓romloader_uart_COM1	romloader_uart		free		
romloader_uart_COM3	romloader_uart		free		
romloader_usb_05_01	romloader_usb		free		
Ok		Rescan		Cancel	
UK		Rescan			

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:

Executing function 🛛
Transferring data
Cancel
Cancer

Figure 16: Progress window

<sup>™</sup> Finally, a success or an error message is shown:

Success	
(į)	Image flashed.
	ОК

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*, DOC070502OlxxEN, 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

 $\rightarrow$ 

**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  $\ge 1.3.15xxx.x$ , 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  $\geq$  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.
- Դ The Bootwizard opens:

🚰 Bootwizard			
<u>F</u> ile ⊻iew			
Select task: Images Build image Modify image Check image Flashing	Input Toolchain [ Input file [ Chip type netX	Reload     500 0 100 0 50 0 51/52 0 10 meters	Load ELF/binary
Write to flash Verify flash Read from flash	Addresses	oad Address Entry Point	
Erase flash	Source device	~	~
Quickstart Actions	Dest. device		►
	Output Output file		Save as
	Generate boot	image Add this as a quickstart action	
Message Log			×
13:37:46: function: 01	826158		~
		Test 'Bootwizard' in progressLua uses 163	3 kilobytes

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:

🛗 netX Bootwiza	ar d						
<u>F</u> ile <u>V</u> iew							
Select task: Images Build image Modify image Check image Flashing Write to flash	Input Input file Chip type netX	0 500	O 100	○ 50	051/52	C 10	d File to flash
Verify flash Read from flash	Flasher paran Area	offset	Size				
Erase flash	Flash type						~
Quickstart Actions	Buffer						◄
Config	Flash	Add this as	a quickstart ar	tion.			
Quit							
Message Log							×
2:39:50 PM: Linux gcc 2:39:50 PM: function:	:-arm-elf : 017FF078						
				Test 'Bootwi:	zard' in progress.	Lua uses 1671	1 kilobytes

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:

Informa	tion 🛛 🔀
(į)	The netX chip type and the source/destination devices could not be identified or there are multiple matches. Please select the correct chip type and Flash device.
	ок

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:

🞬 netX Bootwiza	rd						
<u>F</u> ile ⊻iew							
	Input file	2nd Stage Bootloa	ader\NRP 52\NETX	52-BSL_V1_4	_17_1_usb_id_NRP52_(	Relo	ad File to flash
- Select task:	Chip type —						
Build image	netX	0500	O 100	0 50	⊙ 51/52	<b>O</b> 10	Detect
Modify image	C Bootblock par	ameters					
Check image Flashing	Addresses	Load Address 0x080000c0	Entry Point 0x0800041c				
Write to flash	User Data	0×00000000					
Verify flash	Source device						·
Read from flash	Dest. device		~				
Erase riash	Flasher param	neters					
Quickstart Actions	Area	Offset	Size				
	Flash type	Serial flash on SP1	Thus				
Quit	Buffer	Internal RAM					
	Elach	Add this as a qui	ekstart action				
		Auu u iis as a yui	LKStart action				
Message Log							×
11:10:37 AM: Informat Please select the corre	tion: The netX ch ct chip type and	nip type and the so I Flash device.	ource/destination (	devices could i	not be identified or there	e are multiple ma	tches.
				Test 'Booty	vizard' in progress…Lua	uses 1486 kiloby	tes

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 <sup>6</sup>) 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 <sup>5</sup>).
- ✤ 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.
- <sup>₽</sup> 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.
- <sup>™</sup> The **Control Panel** window opens.
- > In the **Control Panel**, double-click on **System** entry.
- P→ 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):

🖳 Device Manager	
<u>File Action View H</u> elp	
<ul> <li>CIFx Communication Interface</li> <li>Computer</li> <li>Display adapters</li> <li>DVD/CD-ROM drives</li> <li>Floppy disk controllers</li> <li>Floppy disk controllers</li> <li>Floppy disk controllers</li> <li>Floppy disk drives</li> <li>IDE ATA/ATAPI controllers</li> <li>Keyboards</li> <li>Monitors</li> <li>Monitors</li> <li>Network adapters</li> <li>COMmunications Port (COM1)</li> <li>ECP Printer Port (LPT1)</li> <li>Intel(R) Active Management Technology - SOL (COM3)</li> <li>Processors</li> <li>Sound, video and game controllers</li> <li>System devices</li> <li>Universal Serial Bus controllers</li> </ul>	

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

- <sup>™</sup> 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):

a 🖤 Ports (CON	1 & LPT)
	ter Port (LPT1)
Commu	nications Port (COM1)
	Bootmonitor (CDC) (COM28) 🔶

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.

<b>Tie <u>v</u>iew</b>	rd						
Select task:	Input Input file	2nd Stage Boot	loader\NRP 52\NE	TX52-BSL_V1_4_	17_1_usb_id_NRP52_	Reloa	ad File to flash
Images Build image	Chip type netX	○ 500	◯ 100	050	⊙ 51/52	<b>O</b> 10	Detect
Check image	-Bootblock par Addresses	ameters Load Address 0x080000c0	Entry Point 0x0800041	c			
Write to flash Verify flash Read from flash	User Data Source device	0×00000000					~
Erase flash Quickstart Actions	Dest. device	neters Offset	Size	×			×
Config	Area Flash type	0 Serial flash on S	57864 5PI bus				~
	Buffer Flash	Internal RAM Add this as a c	quickstart action	]			~
Message Log							
11:10:37 AM: Informal Please select the corre	tion: The netX d xt chip type and	hip type and the I Flash device.	source/destinatio	on devices could n	ot be identified or the	re are multiple mai	ches.
				Test 'Bootwi	zard' in progressLua	a uses 1486 kiloby	tes

Figure 25: Write to flash screen

<sup>™</sup> The plugin selector opens:

Select the plugin				
Name	Тур	Comment		
romloader_uart_COM1	romloader_uart	free		
✓ romloader_uart_COM3	romloader_uart	free		
✓romloader_uart_COM28	romloader_uart	free		
Ok	Rescan		Cancel	

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:

Executing function 🔀
Transferring data
Cancel

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 <sup>5</sup>) 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.
- 🗄 🝠 Ports (COM & LPT) 🛛
  - 🥑 Communications Port (COM1)
  - ECP Printer Port (LPT1)
  - 涅 Hilscher netRAPID 10 (COM32) <del>4</del>

Intel(R) Active Management Technology - SOL (COM3)

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.

```
    Ports (COM & LPT)
    Communications Port (COM1)
    ECP Printer Port (LPT1)
    Hilscher netRAPID 10 (COM32)
```

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:

Channel Selection				
COM32_cifX0	-Selection Information -			
	Property	Value		
	Physical Address	0×00000000		
	Interrupt	0		
	Device Number	7650420		
	Serial Number	20006		
	DPM Size	8192		
1				
		Open Cancel		

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:

rate	netHOS	T Device Te	est Applicatio	n - COM32_cifX0		
Eile	<u>D</u> evice	Information	Data <u>T</u> ransfer	2		
netX'	Transport	- Remote driv	er was successfu	Illy opened!		

Figure 33: netHOST Device Test Application after channel selection

- 6. Select firmware file.
- In the menu, choose Device > Download.
- Դ The **Download** window opens:

🞬 netHOST Device Test Application - COM32_cifX0	
<u>File D</u> evice Information Data Iransfer <u>?</u>	
Download Test	
Download Mode: Firmware Download	
Channel: 0	
Eilename:	
Download Progress:	-
Last Error:	_
netXTransport - Remote driver was successfully opened!	

Figure 34: Download window

- > In the **Download Mode** drop-down list, choose **Firmware Download**.
- > Click ---- button next to the **Filename** field.
- <sup>™</sup> 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 OF 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:

📫 netHOST Device	Test Application - COM32_cifX0	
<u>File D</u> evice <u>I</u> nformati	ion Data <u>T</u> ransfer <u>?</u>	
Download Test		
Download <u>M</u> ode:	Firmware Download	
<u>⊂</u> hannel:	0	
<u>F</u> ilename:	Firmware\netRAPID_Ltd\R05Z2000.nxf	
[ Download ]		
Progress:		_
		_
Last Error:		
netXTransport - Remote	driver was successfully opened!	

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 <sup>(5)</sup>) 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 your PC on • NRPEB product DVD, (on the 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 !





- 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 1) 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.
- <sup>™</sup> 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 <sup>(9)</sup>) 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 SPI BIT SPI 8 SPI	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 2), and 2 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:



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**.

📕 Device Manager				
File Action View Help				
← → 📧 🖆 👙 😫 🗮 🛪 🗷 👧				
Image: Second system devices         Image: System devices				
Disables the selected device.				

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)

- <sup>№</sup> 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:

🕑 Control Panel								
<u>File E</u> dit <u>V</u> iew F <u>a</u> vorites <u>T</u> ools	<u>H</u> elp							<b>1</b>
Ġ Back 👻 🕥 👻 🏂	Search 🛛 🍺 Fol	ders 🛄 🕶						
Address 📴 Control Panel							*	🔁 Go
Control Panel 🛞	Accessibility Options	Rdd Hardware	Add or Remov	Administrative Tools	Automatic Updates	cifX Setup	cifX Test	
See Also 🛞	Date and Time	isplay	Folder Options	Fonts	Game Controllers	Intel(R) GMA Driver	Internet Options	
<ul> <li>Help and Support</li> </ul>	هـ	9		1	e 🔍			

- 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.
- <sup>▶</sup> 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:

🌆 cifX Driver Setu	p Utility	
<u>File D</u> evice D <u>r</u> iver 3		
Device List → About Active Devices CH#0 CH#0 CH#1 CH#2 CH#3 CH#4 CH#4 CH#5 Inactive Device (Unknown) CH#0 CH#4 CH#5 CH#4 CH#4 CH#5 CH#4 CH#5 CH#4 CH#4 CH#5 CH#4 CH#5 CH#4 CH#5 CH#4 CH#5 CH#4 CH#5 CH#0 CH#0 CH#0 CH#0 CH#0 CH#0 CH#1 CH#5 Sitter Sevices Sitter Sevices CH#0 CH#4 CH#5 CH#0 CH#0 CH#0 CH#0 CH#1 CH#5 Sitter Sevices Sitter Sevices CH#4 CH#5 CH#0 CH#0 CH#0 CH#0 CH#4 CH#5 CH#0 CH#0 CH#0 CH#0 CH#4 CH#5 CH#0 CH#0 CH#0 CH#0 CH#0 CH#0 CH#0 CH#0 CH#1 CH#5 CH#0 CH#1 CH#2 CH#3 CH#4 CH#5 CH#4 CH#5 CH#4 CH#5 CH#4 CH#5 CH#0 CH#1 CH#2 CH#4 CH#5 CH#4 CH#5 CH#4 CH#5 CH#4 CH#5 CH#4 CH#5 CH#4 CH#5 Sitter Sources Sitter Sources CH#0 CH#0 CH#0 CH#1 CH#2 CH#4 CH#5 Sitter Sources Sitter So	cifX Driver Setup Utility Hilscher Gesellschaft für Systemautomation mbH (c) Hilscher GmbH. All rights reserved.	
	OK Cancel Apply	Help

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.

🏣 cifX Driver Setup l	Jtility			
<u> E</u> ile <u>D</u> evice D <u>r</u> iver <u>?</u>				
Device List 📃				
About 🔨				0.55750000
Active Devices	Slot Number:	P	Base Address:	UXFE/FUUUU
🔄 cifX0	Device Number:	7650420	Interrupt Number:	0
CH#0	Serial Number:	20006	Lice Interrupti	
			Use Interrupt.	-
CH#2	<u>A</u> lias:	I	Enable <u>D</u> MA:	
CH#4			NDIS Support:	
CH#5				
📫 cifX1	Use loadable Mo	dules: 🗔		
CH#0				
CH#1	rcX base firmwar	re		Select <u>Fi</u> le
CH#2				
CH#3				
CH#9 CH#5				
Inactive Devices				
(Unknown)				
СН#0́ 🚬	·			
DevNr/SN SlotNr				
			_	
		ОК	Cancel	Apply Help

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 <code>.nxf</code> format. The other channels are used for modular firmware files in the <code>.nxo</code> format.

 $\Rightarrow$  The following window is displayed:

b cifX Driver Setup U	Itility	
<u>File D</u> evice D <u>r</u> iver <u>?</u>		
Device List 📃		
About 🔨	Hardware Option: [0050 (PROFIBUS) / 0001 (N/A) / 0001 (N/A) / 0001 (N/A)	
CH#0	Firmware: Slave Settings	ramaters
CH#1 CH#2	Version: Change Parameters	rameters
CH#3	Assigned Module / Firmware Files:	
CH#4 CH#5	File	Add
🔄 cifX1	<u>E</u>	<u>temove</u>
CH#1	_	⊆lear
CH#2		
CH#3 CH#4	Assigned Configuration Files:	
CH#5	File	Add
(Unknown)	E	<u>l</u> emove
СН#0 💌		⊆lear
Devivryon SlotNr		
	OK Cancel Apply	Help

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:

Open	?	$\mathbf{X}$
Look jn: My Recent Documents Desktop My Documents	<ul> <li>PotRAPID_Ltd\NRP 10-xx</li> <li>✓ € € № Ⅲ•</li> <li>R05Z2000.nxf</li> <li>R05Z9000.nxf</li> </ul>	
My Network Places	File name:     R0522000     ①pen       Files of type:     netX Firmware Files (*.nxf,*.nxm,*.mod)     Cancel       © Open as read-only     Cancel	

Figure 46: cifX Driver Setup Utility - open file dialog

 $\triangleright$ In Windows file selection the 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:

🏣 cifX Driver Setup	) Utility	
<u>File D</u> evice D <u>r</u> iver <u>?</u>		
Device List 📃		
_ About 🛛 🔼	Hardware Option: 0050 (PROFIBUS) / 0001 (N/A) / 0001 (N/A) / 0001 (N/A)	
Active Devices		
CH#0	Firmware: PROFIBUS Slave Slave Slave Settings	
CH#0	Version 2 7 4 0 (build 4)	arameters
CH#2	Change Parameters	1
CH#3	Assigned Module / Firmware Files:	1
CH#4 📃	File	Add
CH#5	E:\Firmware\netRAPID_Ltd\R05Z2000.nxf	
CifX1		Remove
CH#U		⊆lear
CH#1		
CH#3	Assisted Configuration Files:	
CH#4	Assigned Contriguration Piles:	(
CH#5		Add
Inactive Device		<u>R</u> emove
		Clear
DevNr/SN SlotNr		
	OK Cancel Apply	Help

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:

CifXSetu	p 🛛 🔀
2	Attention: The following device has been re-configured! Name : cifX1 DeviceNumber : 7650420 SerialNumber : 20006 Do you want this device to be restarted (This may take a moment)? <u>Yes</u> <u>No</u>

Figure 48: Device restart request

- > Answer the request with **Yes**.
- ✤ The firmware file is downloaded to the netRAPID.

 $\rightarrow$ 

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 <sup>23</sup>) 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 29, 23 and 29 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:



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 <sup>5</sup> 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 2) 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**.

Դ 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:

File Device Information Data Transfer ?	
File Device Information Data Transfer ?         Channel Selection         Image: selection Information         Image: selection Information <td< th=""><th></th></td<>	
netXSPMUSB - Successfully opened	

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:

🔛 ne	etHOST D	evice Test App	lication - cifX0	<b>—</b>	- • •
<u>F</u> ile	<u>D</u> evice	<u>Information</u>	Data <u>T</u> ransfer	?	
netXS	PMUSB -	Successfully of	pened		

Figure 52: netHOST Device Test Application after channel selection

- 6. Select firmware file.
- > In the menu, choose **Device** > **Download**.
- <sup>™</sup> The **Download** window opens:

metHOST Device Test Application - cifX0	- • •
<u>File Device Information Data Transfer ?</u>	
Download Test	
Download Mode: Firmware Download	
Channel: 0	
Eilename:	
Download	
Progress:	
Last Error:	
,	
netXSPMUSB - Successfully opened	

Figure 53: Download window

- > In the **Download Mode** drop-down list, choose **Firmware Download**.
- Click button next to the Filename field.

Դ The Windows file selection dialog opens:

Open				×
🔾 🗢 💻 Desktop	Firmware → netRAPID_Ltd →	NRP 51-RE 🕨 👻	<ul> <li>✓</li> <li>Search Desktop</li> </ul>	٩
Organize 🔻 New fo	older		3	I • I 0
🚖 Favorites	^ Name	Date modified	Item type	Size
ktop 📃 Desktop	= R06ZD000.nxf	24.08.2017 20:04	NXF-Datei	682 KB
🗼 Downloads	R06ZF000.nxf	03.08.2017 14:54	NXF-Datei	506 KB
🖳 Recent Places	R06ZH000.nxf	24.08.2017 08:21	NXF-Datei	540 KB
	R06ZJ000.nxf	11.08.2017 08:11	NXF-Datei	552 KB
🧮 Desktop	R06ZK000.nxf	10.05.2017 13:13	NXF-Datei	360 KB
🥽 Libraries	M R06ZL000.nxf	23.08.2017 10:39	NXF-Datei	380 KB
Documents	₩ R06ZT000.nxf	23.08.2017 10:30	NXF-Datei	169 KB
📗 My Documer				
🌗 Public Docur				
🁌 Music				
Pictures				
🛃 Videos				
🚺 Maurice Keller				
👰 Computer				
Fil	le <u>n</u> ame: R06ZD000.nxf		<ul> <li>netX Firmware F</li> </ul>	iles (*.nxf,*.nxm 🔻
			Open	Cancel

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:

netHOST Device Test Application - cifX0	
<u>File D</u> evice Information Data <u>Transfer</u>	
Download Test	
Download Mode: Firmware Download	
Channel: 0	
Eilename:	
[]	
Progress:	
Last Error:	
- AVERAULER Commented	
netASPINIOSB - Successfully opened	

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 <sup>5</sup>) 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 vour PC NRPEB DVD, (on the product open the Driver and Toolkit\Device Driver (NXDRV-WIN)\Installation directory, double-click cifX Device Driver Setup.exe file. then 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.
- Դ A login dialog appears:

SYCON.net User Login							
Hilscher SYC	CON.net						
<u>U</u> ser Name:	Administrator						
<u>P</u> assword:							
	OK Cancel						

Figure 56: SYCON.net login

- > Enter your password, then click **OK**.
- <sup>№</sup> SYCON.net opens with a new empty project:

m srcow.net - [ontitied.sp]]	
Eile <u>V</u> iew <u>D</u> evice Network Extras <u>H</u> elp	
D 🖆 🔲   Q    <b>41 (55, 65, 65, 65, 65)</b>	
netProject 🔺 🗙 netDevice	 <u>⊾ ×</u>
	355 /
x monormal sycon.net (netDevice /	

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.

😽 SYCON.net - [untitled.spj]		
File View Device Network Extra	: Help	
🗅 🚅 🔚   🕄    😫 🖆 📾    🕄	x 💿 🖪 a, a,	
netProject 🔺 🗙	netDevice	
	CIFX_DP_DPM[CIFX DP/DPM]<1>(#1)	POWERLINK     Profibus DPV0     Profibus DPV1     Gateway / Stand-Alone Slave     CIFX DP/DP5     COMX 100X-DP/DP5     COMX 100X-DP/DP5     COMX 100X-DP/DP5     NB 100-XX-XX     NK TIO XX-XX     NK TIO XX-
Ready	e / 🔣	nistrator

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:

netDevice - Configuration CIFX_DP_DPM[CIFX DP/DPM]<1>(#1)								
IO Device: CIFX DP/[ Vendor: Hilscher G	DPM GmbH		Device ID: Vendor ID:	0x0B4A 0x011E	FDT			
Navigation Area 📃								
Settings	Deitor	Version	ID					
Driver	Driver	version						
netX Driver	CIFX Device Driver	1.101.1.9801	{368BEC5B-0E92-4C	0E-B4A9-64F62AE7AAFA}				
Device Assignment	35Gateway Driver for netX (V3.x)	0.9.1.2	{787CD3A9-4CF6-42	259-8E4D-109B6A6BEA91}				
Firmware Download	netX Driver	1.103.2.5183	{B54C8CC7-F333-41	35-8405-6E12FC88EE62}				
Licensing								
Configuration								
Bus Parameters								
Process Data								
Address Table								
Station Table								
Master Settings								
		[	OK Car	ncel Apply	Help			
🗘 Disconnected 🚺 Data Set								

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.

😽 netDevice - Configurati	ion CIF	X_DP_DPM[C	IFX DP/DPM]<1>(#1)					
IO Device: CIF	X DP/DP cher Gmb	M bH				Device Vendor	ID: 0x0B4A ID: 0x011E	FÓT
Navigation Area 📃								
Settings Driver netX Driver Device Assignment Eirmware Download	Scan p D <u>e</u> vice	rogress: 2/2 Dev selection:	vices (Current device: -)					<u>S</u> can
Licensing		Device	Hardware Port 0/1/2/3	Slot nu	Serial nu	Driver	Channel Protocol	Access path
Configuration Bus Parameters Process Data Address Table Station Table Master Settings	Access	CIFX 50-DP	-/-/PROFIBUS/-	n/a 84A9-64F62	20019 2467AAFA}\cif	CIFX Device Driver	Undefined Undefined	\afX0_SY5
OK Cancel Apply Help								
🗘 Disconnected 🚺 Data Sel	t							

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.
- netDevice - Configuration CIFX\_DP\_DPM[CIFX DP/DPM]<1>(#1) IO Device: CIFX DP/DPM Device ID: 0x0B4A FOT Vendor: Hilscher GmbH Vendor ID: 0×011E Navigation Area 1 🔄 Settings Name: Browse... 🔄 Driver netX Driver Version: Device Assignment CAUTION: Licensing <u>/!</u>\ 🗟 Configuration The firmware download Bus Parameters Process Data stops the bus communication,
   erases the configuration database and
   overwrites the existing firmware in the device. Address Table Station Table Master Settings To complete the update and to make the device operable again, please re-download the configuration when this operation has finished. ΟК Cancel Help 🗘 Disconnected 🛛 🚺 Data Set
- ✤ 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.

Select Firmwar	e File					? 🛛
Look <u>i</u> n:	CIFX		•	🔶 🔁	💣 🎟 •	
My Recent Documents Desktop My Documents	ECS V4.X     PNS V3.5.X     C0201040.nxf     C0202050.nxf     C0202070.nxf     C020204060.nxf     C0204060.nxf     C0204060.nxf     C0204060.nxf     C0204060.nxf     C0205050.nxf     C0205	cifx2asm.nxf cifx2dpm.nxf cifx2dpm.nxf cifx2dps.nxf cifxcos.nxf cifxcos.nxf cifxcos.nxf cifxdns.nxf cifxdns.nxf cifxdps.nxf cifxdps.nxf cifxdps.nxf cifxdps.nxf cifxcos.nxf cifxecs.nxf cifxecs.nxf cifxecs.nxf	cifxeis.nxf cifxmpi.nxf cifxomb.nxf cifxpls.nxf cifxpls.nxf cifxpnm.nxf cifxpns.nxf cifxs3m.nxf cifxs3s.nxf cifxvrs.nxf			
My Network Places	File <u>n</u> ame: Files of <u>type:</u> Recent <u>f</u> olders: Firmware:	cifxdpm Firmware Files (*.nx PROFIBUS-DP Mast	f;*.nxm) er V2.6 (build 11)	for CIFX	•	Open Cancel Help

♣ 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.

😽 netDevice - Configurat	tion CIFX_DP	_DPM[CIFX DP/DPM]<1>(#1)	
IO Device: CII Vendor: Hil:	FX DP/DPM scher GmbH	Device ID: 0x0B4A Vendor ID: 0x011E	FDT
Navigation Area 📃		Firmware Download	
<ul> <li>Settings</li> <li>Driver netX Driver</li> <li>Device Assignment</li> <li>Firmware Download</li> <li>Licensing</li> <li>Configuration</li> <li>Bus Parameters</li> <li>Process Data</li> <li>Address Table</li> </ul>	Name: Version:	PROFIBUS-DP Master for CIFX 2.6 (build 11) CAUTION: The firmware download - stops the bus communication, - erases the configuration database and	Browse
Station Table Master Settings		<ul> <li>overwrites the existing firmware in the device.</li> <li>To complete the update and to make the device operable again, please re-download the configuration when this op finished.</li> </ul>	eration has
			Download
		OK Cancel Apply	Help
🖘 Disconnected 🛛 🚺 Data Se	et		11

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.
- <sup>™</sup> 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.
- Դ The Driver list opens:

PretDevice - Configuration	n NRF 0-DPS	<mark>? 10-dps/dps[NRP 10-dps/dps]</mark> < /dps	2>	Device ID: 0x0EB5		
Navigation Area			Driver		FDT	
Settings		Driver	Version	ID		
			1 101 1 0001		0	
netx Driver	Here and the second sec	CIPX Device Driver	1.101.1.9601	(3000EC30-0E92-4C0E-04A9-04F62AE7AAFA	4) <sup>2</sup>	
Device Assignment	8	35Gateway Driver for hetx (V3.x)	0.9.1.2	{787CD3A9-4CF6-4259-8E4D-10986A68EA9.	1}	
	ш	neck briver	1.105.2.7745	{B34C0CC7-F333-4133-0403-0E12FC00EE02	j;	
General						
Modules						
Signal Configuration						
Parameters						
Groups						
Extensions						
DPV1						
Address Table						
Device Settings						
Device Description						
Device						
GSD						
OK Cancel Apply Help						
0⊅ Disconnected 🚺 Data Set						

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.

😽 netDevice - Configuratio	on NR	p 10-dps/dp	s[NRP 10-DPS/DP	S]<2>				
IO Device: NRP Vendor: Hilsc	10-DP: her Gm	5/DPS IbH				Device ID: Vendor ID:	0×0EB5 -	FDT
Navigation Area 📃								
Settings	Scan	progress: 2/2 D	evices (Current device	: -)				
netX Driver Device Assignment Firmware Download	D <u>e</u> vic	e selection:	al	·				<u>S</u> can
Configuration		Device	Hardware Port 0/	Slot	Serial n	Driver	Channel Protocol	Access path
General		CIFX 50-DP	-/-/PROFIBUS/-	n/a	20019	CIFX Device D	PROFIBUS-DP Master	\cifX1_Ch0
Modules		NRP 10-DPS	PROFIBUS/-/-/-	n/a	20006	CIFX Device D	PROFIBUS-DP Slave	\cifX0_Ch0
Signal Configuration								
Parameters								
Extensions								
DPV1								
Address Table								
Device Settings								
Device Description								
Device								
GSD								
	,			1				
	Acces	ss <u>p</u> ath:	{368BEC5B-0E92	-4C0E-B4A	9-64F62AE7	AAFA}\cifX0_Ch0		
OK Cancel Apply Help								
🗘 Disconnected 🚺 Data Set	Disconnected 🚺 Data Set 🖌							

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:

א netDevice - Configurati	on NRP 10-DPS/DPS[NRP 10	-DPS/DPS]<2>			
IO Device: NRP Vendor: Hilso	P 10-DPS/DPS cher GmbH		Device ID: Vendor ID:	0x0EB5 -	FDT
Navigation Area	Available Modules: Module name blank space	Mo Module 0x00	dules e Configuration Identifi	ier	
Firmware Download Configuration General Modules Signal Configuration Parameters	1 Byte In 1 Byte Out 1 Word In 1 Word Out 2 Bytes In 2 Bytes Out 2 Words In 2 Words Out	0x90 0xA0 0xD0 0xE0 0x91 0xA1 0xD1 0xC1			
Extensions DPV1 Address Table Device Settings Device Description Device GSD	Configured Modules:	UALI	Module Configuration	Insert	Append
	Length of input/output data: Length of input data: Length of output data: Number of modules:	0 bytes (max. 488 bytes) 0 bytes (max. 244 bytes) 0 bytes (max. 244 bytes) 0 (max. 24)			Remove
이다 Disconnected 🚺 Data Set			OK	Cancel Apply	Help

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:

retDevice - Configurati	ion NRP 10-DPS/DPS[NRP 10	D-DPS/DPS]<2>			
IO Device: NRF Vendor: Hils	9 10-DPS/DPS cher GmbH		Device ID: Vendor ID:	0×0EB5 -	FDT
Navigation Area 📃					
Settings	Available Modules:				
netX Driver	Module name	Modul	e Configuration Identifi	ier	~
Device Assignment	blank space	0×00			
Firmware Download	1 Byte In	0×90			
Configuration	1 Byte Out	0×A0			
General	1 Word In	UXDU			
🛶 Modules	2 Bytes In	0xE0			
Signal Configuration	2 Bytes Out	0×A1			
Parameters	2 Words In	0×D1			_
Groups	2 Words Out	0×E1			<u> </u>
Extensions DPV1	Configured Modules:			[Insert]	Append
Address Table			Land L. C. C	*.1	
Device Settings				1 Identifier	
Device Description	1 2 Bytes Out		UXA1		
Device	2 Z Dytes In		0.771		
GSD					
	Length of input/output data:	4 bytes (max. 488 bytes)			<u>R</u> emove
	Length of input data:	2 bytes (max. 244 bytes)			
	Length of output data:	2 bytes (max, 244 bytes)			
	Number or modules:	2 (max, 24)			
			ОК	Cancel Apply	Help
					·
🗘 Disconnected 🛛 🚺 Data Sel	t 🥒 🗌				//

Figure 68: Configured modules of netRAPID

- > Click **OK** to close the **Configuration** dialog.
- <sup>™</sup> You have configured the I/O data of the netRAPID.
- 8. Configure PROFIBUS DP master (cifX PC Card).

Note: In the PROFIBUS DP master config	uration 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 co	onfiguration is automatically
taken over from the slave (i. e. from the NI	RP 10-DPS/DPS DTM); all
other configuration parameters can be kep	ot 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.

netDevice - Configurat	tion CIFX_DP_DPM[CIFX DI	2/DPM]≈1>(#1) Device ID: Dx084A	
Vendor: Hil	scher GmbH	Vendor ID: 0x011E	FÓT
Navigation Area 📃			
Settings	Profile:	PROFIBUS DP -	
Device Assignment Firmware Download	Bus Parameters Baud Rate:	1500 V kBit/s Station Address:	
Licensing	Slot Time:	300 tBit Target Rotation Time: 12370 tBit	
Bus Parameters	Min. Station Delay Time:	11 tBit = 8.2467 ms	
Address Table	Max. Station Delay Time:	150 tBit GAP Actualization Factor: 10	
Station Table	Quiet Time:	0 tBit Max. Retry Limit: 1	
Master Settings	Setup Time:	1 tBit Highest Station Address (HSA): 126	
	Bus Monitoring		
	Data Control Time:	120 ms 🗍 Overwrite slave specific Watchdog Control Time	
	Min. Slave Interval:	2000 µs Watchdog Control Time: 20 ms	
	Calculated Timing Tid1: 37 tBit Tid2: 150 tBit	Auto Clear ON     Values marked with this symbol should be     Adjust     Adjusted to changes in the topology.	
		OK Cancel Apply	Help
Disconnected 🚺 Data Se	et 🖌		

→ 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:

RetDevice - Configuration CIFX_DP_DPM[CIFX DP/DPM]<1>(#1)							
IO Device: CIF Vendor: Hils	X DP/D cher Gr	PM nbH			Device ID: Vendor ID:	0x0B4A 0x011E	Fót
Navigation Area							
Settings		Activate	Station Address	Device	Name		Vendor
Driver	Þ		32	NRP 10-DPS/DPS	NRP 10-DPS/DPS	Hilscher GmbH	
Device Assignment Firmware Download Licensing Configuration Bus Parameters Process Data Address Table → Station Table Master Settings							
					ОК	Cancel A	pply Help
🕸 Disconnected 🛛 🚺 Data Set	:	/					

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 <sup>19</sup> and <sup>20</sup> 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		
50°00 5	5 5 6 1 8 0 0 0		
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**.

😽 SYCON.net - [untitled.spj]				
File View Extras Help				
🗅 🚅 🔚   🕄    🗄 🗉 📾    3	: 💿 🖪 3, 3, 3, 4			
netProject	netDevice			X
		X DP/DPM]<1>(#1) P 10-DPS/DPS[NRP 10-DP Connect Disconnect Disconnect Upload Cut Copy Paste Configuration Measured Value Simulation Diagnosis	S/DPS]<32>	Profibus DPV1 Gateway / Stand-Alone Slave CHX DP/DPS COMX 100XX-DP/DPS COMX 100XX-DP/DPS COMX 100XX-DP/DPS NB 100-XX-XX NEX S00 DP/DPS NX 100X-DP/DPS NX 100-XDP/DPS NX 100-XDP/DPS NX 100-XDP/DPS NX 100-XDP/DPS NX 100-XDP/DPS NX 100-XX-XX <p< th=""></p<>
		Delete		
	e /	Symbolic Name	1	
Ready	¢/		Adm	inistrator

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.

SYCON not . Funtitled spil			
File View Device Network Extrac Help			
	<b>.</b>		
	<u></u> dt		
			×
CIFX_DP_DPM[CIFX_DP/DPM]	DP_DPM[CIFX DP/DPM] Connect Disconnect Start Debug Mode Download Upload Cut Copy Paste Network Scan Configuration	<pre></pre>	
	Measured Value		Vendor: Hilscher GmbH
	Simulation		Date: 2013-11-01
	Additional Europtions	<u> </u>	. 💌
Download succeeded to device NRP 10-DPS/DPS[NRP 10-D			
	Delete		
	Symbolic Name		
o I III IIII SYCON.net \ netDevice /		4	
Ready		Admir	nistrator //

> 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).
- PC • You have installed the cifX Device Driver on your product DVD, open the (on Driver the NRPEB 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 1) in the *netRAPID Evaluation Boards* section on page 24).

- 1. Start **SYCON.net** configuration software.
- In the Windows Start menu, select All Programs > SYCON.net System Configurator > SYCON.net.
- A login dialog appears:

SYCON.net User Login									
Hilscher SYCON.net									
<u>U</u> ser Name:	Administrator								
<u>P</u> assword:									
	OK Cancel								

Figure 73: SYCON.net login

- > Enter your password, then click **OK**.
- ⇒ SYCON.net opens with a new empty project:

🕌 SYCON. net - [Untitled.spj]		
Eile <u>V</u> iew <u>D</u> evice Network Extras <u>H</u> elp		
] D 🖆 🖬   Q    4, 4, 4, 4, 4, 1 H H H 🕤 🕤		
netProject 🔺 🗙 netDevice		×
Project: Unktled	CANopen DeviceNet DPM Fieldbus (Vendor ), DTM Class	
SYCON.net / netDevice /	Administrator NUM	

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

<sup>№</sup> 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.

😽 SYCON.net - [Untitled.spj]	
Eile <u>V</u> iew <u>D</u> evice Ne <u>t</u> work E <u>x</u> tras	Help
🗅 🖨 🔚   🍳    😫 🖆 🕲    3:	
netProject 🔺 🗙	netDevice 🔺 🗙
Project: Untitled	
CIFX_RE_ECM[CIFX RE/ECM]<	EtherCAT
CE NAV SE REVECT VELIDIAN -	Gateway / Stand-Alone Slave
	CIEX RE FCMICTEX RE/FCMIC>(#1)
	COMX 51XX-RE/ECS V2.4
	NRP 52-RE/ECS V2.4[NRP 52-RE/ECS V2.4]<256>
	MEX 500 RE/ECS V1.0
	- S NJ 51XX RE/ECS V2.4
	TIE NRP 52-RE/ECS V2.4
	Tideline (Vacety DM Clear) Engl
	Predous Avenue Av
	Vendor: Hilscher GmbH
< >	Version Viologian Viologian
× ₹	
SYCON.net / netDevice	
Ready	Administrator

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.
- Դ The **Driver** list opens:

▶ netDevice - Configuration CIF	FX_RE_ECM[CIFX RE/ECM]<>(#1)				
IO Device: CIFX RE/EC	CM mbH		Device ID: Vendor ID:	0x0000 0x0044	FDT
Navigation Area					
Driver	Driver	Version	ID		
netX Driver	CIFX Device Driver	1.101.1.9801	{368BEC5B-0E92-4C0	E-B4A9-64F62AE7AAFA}	
Device Assignment	35Gateway Driver for netX (V3.x)	0.9.1.2	{787CD3A9-4CF6-425	9-8E4D-109B6A6BEA91}	
Firmware Download	netX Driver	1.103.2.7743	{B54C8CC7-F333-413	5-8405-6E12FC88EE62}	
Configuration					
Process Data Handshake					
S Topology					
Tree View					
Connection View					
MailBox					
EMMLI ( SvocMap					
Process Data					
Address Table					
Init Commands					
1					
			ок	Lancel Apply	Help
⊲⊳ Disconnected 🚺 Data Set					

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.

Not Device - Configuration C	IFX_R	E_ECM[CIFX	RE/ECM]<>(#1)					
IO Device: CIFX RE/ Vendor: Hilscher (	ECM GmbH					Device ID Vendor II	0×000 0: 0×004	оо 💦 👬
Navigation Area 📃								
Settings	Scan p	rogress: 2/2 De	evices (Current device: -)					
netX Driver Device Assignment Firmware Download	D <u>e</u> vice	selection:	suitable only					Scan
Licensing		Device	Hardware Port 0/1/	Slot n	Serial nu	Driver	Channel Protoco	Access path
Licensing General General Process Data Handshake Topology Tree View Connection View MailBox CoE FMMU / SyncMan Process Data Address Table Init Commands		CIFX 50-RE	Ethernet/Ethernet/-/-	n/a	20359	CIFX Device Driver		fined\afX0_Ch0
	Access	; path:	{368BEC5B-0E92-4C	)E-B4A9-64	F62AE7AAFA}	\cifX0_Ch0		
						ОК	Cancel	Apply Help
🗘 Disconnected 🛛 🗍 Data Set	1							

Figure 78: Assign driver to PC Card cifX

- <sup>™</sup> 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.

ha

→ The **Firmware Download** window opens:

Not Device - Configuration	CIFX_RE_EC	:M[CIFX RE/ECM]<>(#1)			
IO Device: CIFX RE Vendor: Hilscher	E/ECM · GmbH		Device ID: Vendor ID:	0x0000 0x0044	FOT
Navigation Area 🚍		Firmware Do			
<ul> <li>Settings</li> <li>Driver netX Driver</li> <li>Device Assignment</li> <li>Firmware Download</li> <li>Licensing</li> <li>Configuration</li> <li>General</li> <li>Process Data Handshake</li> <li>Topology</li> <li>Tree View</li> <li>Connection View</li> <li>MailBox</li> <li>CoE</li> <li>FMMU / SyncMan</li> <li>Process Data</li> <li>Address Table</li> <li>Init Commands</li> </ul>	Name: Version:	CAUTION: CAUTION: The firmware download - stops the bus communication, - erases the configuration database and - overwrites the existing firmware in the device. To complete the update and to make the device operable ag finished.	iain, please re-download t	he configuration when	Browse
			OK	Cancel Apply	Help
∜D Disconnected 🚺 Data Set					

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.

Select Firmwa	re File			?	>
Look <u>i</u> n	: 🔁 CIFX		▼ 🗢 🔁		
	Name 🔺		Firmware	Hardwar	^
	🚾 cifxdpm.nxf		PROFIBUS-DP Master	CIFX	
My Recent	🔂 cifXdps.nxf		PROFIBUS-DP Slave	CIFX	
Documents	cifxecm.nxf		EtherCAT Master	CIFX	
	cifxecs.nxf		EtherCAT Slave	CIFX	
	🚾 cifxeim.nxf		EtherNet/IP Scanner	CIFX	
Desktop	🚾 cifxeis.nxf		EtherNet/IP Adapter	CIFX	
~	🚾 cifxmpi.nxf		PROFIBUS-MPI Messaging	CIFX	
	🖬 cifxomb.nxf		Open Modbus/TCP Messaging	CIFX	
Mu Decumente	🖬 cifxpls.nxf		POWERLINK Controlled Node	CIFX	
My Documents	🚾 cifXpnm.n×f		PROFINET-IO IO Controller	CIFX	
	🔂 cifxpns.nxf		PROFINET-IO IO Device	CIFX	
	🖬 cifxs3m.nxf		SERCOS III Master	CIFX	
My Computer	🔜 situata sut		SERCOS III Slava	CTEV	~
	<			>	_
<b>S</b>	File <u>n</u> ame:	cifxecm	•	<u>O</u> pen	
My Network	Files of <u>t</u> ype:	Firmware Files (*.	nxf;*.nxm) 🗨	Cancel	
Places	Recent <u>f</u> olders:		•	<u>H</u> elp	
	Firmware:	EtherCAT Master	V3.0 (build 9) for 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.

F netDevice - Configuration	CIFX_RE_	ECM[CIFX RE/ECM]<>(#1)	
IO Device: CIFX RE Vendor: Hilscher	/ECM GmbH	Device ID: 0x0000 Vendor ID: 0x0044	FDT
Navigation Area         Settings         Driver         netX Driver         Device Assignment         Firmware Download         Licensing         Configuration         General         Process Data Handshake         Tree View         Cornection View         MailBox         CoE         FMMU / SyncMan         Process Data         Address Table         Init Commands	Name: Version:	EtherCAT Master for CIFX         3.0 (build 9)         CAUTION:         The firmware download         - stops the bus communication,         - erases the configuration database and         - overwrites the existing firmware in the device.         To complete the update and to make the device operable again, please re-download the configuration when this of finished.	Browse peration has
		OK Cancel Apply	Help
🕸 Disconnected 🚺 Data Set			

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.
- <sup>№</sup> 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.
- Դ The Configuration dialog opens.
- > In the **Navigation Area**, select **Settings** > **Driver**.
- Դ The **Driver** list opens:

RetDevice - Configuration NRP 52-RE/ECS V2.4[NRP 52-RE/ECS V2.4]<256>									
IO Device: NRP 52-6 Vendor: Hilscher	RE/ECS Gesellschaft für Systemautomation mbH	D	FDT						
Navigation Area 🗖									
🔁 Settings 📃	-								
🔄 Driver	Driver	Version	ID						
netX Driver	CIFX Device Driver	1.101.1.9801	368BEC5B-0E92-4C0E-B4A9-64F62AE7A	AFA}					
Device Assignment	35Gateway Driver for netX (V3.x)	0.9.1.2	{787CD3A9-4CF6-4259-8E4D-109B6A6BE	A91}					
Firmware Download	netX Driver	1.103.2.7743	{B54C8CC7-F333-4135-8405-6E12FC88E	E62}					
General Canaval Sattinga									
Bebavior									
COE									
C Description									
XML DDF Viewer									
OK Cancel Apply Help									
∜l> Disconnected 🚺 Data Set									

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:

😽 netDevice - Configuratio	netDevice - Configuration NRP 52-RE/ECS V2.4[NRP 52-RE/ECS V2.4]<256>								
IO Device: NRP Vendor: Hilso	>52-RE/ECS cher Gesellschaft für S	iystemautomation mb	Н		Device ID: Vendor ID:	0x00000030 0xE0000044	FDT		
Navigation Area 🗖				Device As					
Settings	Scan progress: 2/2 D Device selection:	evices (Current devi suitable only	te: -)				Scan		
Firmware Download	Device	Hardware Port 0	Slot	Serial n	Driver	Channel Protocol	Access path		
<ul> <li>Configuration</li> <li>General</li> <li>General Settings</li> <li>Behavior</li> <li>MailBox</li> <li>CoE</li> <li>Description</li> <li>XML DDF Viewer</li> </ul>	Access gath:								
					ок	Cancel Apply	Help		
∜Disconnected 🚺 Data Set									

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:

א netDevice - Configuratio	on NRP 52	-RE/ECS V2	.4[NRP 52-RE/ECS \	2.4]<25	6>			
IO Device: NRP Vendor: Hilso	IO Device: NRP 52-RE/ECS Vendor: Hilscher Gesellschaft für Systemautomation mbH					Device ID: Vendor ID:	0×00000030 0×E0000044	FDT
Navigation Area 📃								
Settings	Scan progres	ss: 2/2 Devices	s (Current device: -)					
netX Driver Device Assignment Firmware Download	D <u>e</u> vice select	tion: al						<u>S</u> can
	Devic	e	Hardware Port 0/1/	Slot n	Serial nu	Driver	Channel Protocol	Access path
General General Settings		50-RE	Ethernet/Ethernet/-/-	n/a p/a	20359	CIFX Device Driver	EtherCAT Master	\cifX0_Ch0
Behavior		JZ-RE	-1-1-1-	ηγa	1	CIFX Device Driver	EtherCAT Slave	(dix1_ch0
CoE								
Description								
XML DDF Viewer								
	<							>
	Access path:	F	{368BEC5B-0E92-4C0E-E	34A9-64F62	AE7AAFA}\cif	K1_Ch0		
OK Cancel Apply Help								
\$⊅ Disconnected 🚺 Data Set	/							

Figure 84: Assign driver to netRAPID

- > Check the box in front of the NRP 52-RE entry and click **Apply** button.
- $\Rightarrow$  You have assigned the driver for the netRAPID.

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

 $\rightarrow$ 

**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:

א netDevice - Configurati	ion NRP 52-RE/ECS V2.	4[NRP 52-RE/ECS V2.4]<	256>			
IO Device: NRF Vendor: Hils	9 52-RE/ECS cher Gesellschaft für System	automation mbH		Device ID: Vendor ID:	0x00000030 0xE0000044	Fot
Navigation Area → Settings → Driver netX Driver Device Assignment Firmware Download → Configuration General → General Settings Behavior → MailBox CoE → Description XML DDF Viewer	Interface Bus Startup: Watchdog Time: I/O Data Status: Ident Vendor ID: Product Code: Revision Number: Serial Number: Data Input Data Bytes: Qutput Data Bytes: SyncImpulseLength:	Automatic	General Settings			
				OK Car	Apply	Help
🕸 Disconnected 🛛 🚺 Data Sel	:					1

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**.

😽 SYCON. net - [untitled. spj]			
File View Device Network Extras Help			
D 🚅 🔲   Q    😆 🖆 📾    3. 🚳    📇 5. 5. 5.			
netProject			X
Project: untitled Image: CIFX_RE_ECM[CIFX_RE/ECM] Image: CIFX_RE_ECM[CIFX_RE/ECS_V2.4[NR] Image: CIFX_RE_ECM[CIFX_RE_ECM]_RAX_RAX_RAX_RAX_RAX_RAX_RAX_RAX_RAX_RAX	( RE/ECM] <> (#1) P 52-RE/ECS V2.4[NRP 52 Connect Disconnect Disconnect Upload Cut Copy Paste Configuration Measured Value Simulation Diagnosis Additional Functions	2-RE/ECS V2.4]<256>	AS-I  CANopen  CC-Link  CC-DeviceNet  CompoNet  CompoNet CompoNe
14 A =	Sumbolic Namo		
SYCON net / netDevice /	Sympolic Name		
Ready Administrator			

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.

≽ SYCON. net - [untitled.spj]			
File View Device Network Extras Help			
□ ☞ 및   ②   ≝ ≝ 😪   3: ∞   🖪 5:	3, <b>2</b> ,		
netProject			
Project: untitled			
			2
I MRP 52-RE/ECS			-
	FX_RE_ECM[CIFX RE/ECM]<>(#1)	E CompoNet	
a	Connect	€ EtherCAT	
	Disconnect ECS V2.4[NRP 52-RE;	/ECS V2.4]  EtherNet/IP	
	Dowpload	⊡ Modbus RTU     □ Open Modbus/TCP	
	Upload		
	Cut	🕀 🧰 Profibus DPV0	
	Сору	Profibus DPV1     Profibus DPV1     Profibus DPV1	
	Paste		
	Network Scan		~
	Configuration		lass
	Measured Value	POWERLINK	—
	Simulation		
	Diagnosis	<b>v</b>	
	Additional Functions		
	Delete		
×	Symbolic Name		
out v			
SYCON.net / netDevice /		T	Þ
Desdu		Administrator	5

> 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 1) 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 vour PC (on NRPEB product DVD, open the 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**.

😽 SYCON.net - [untitled.spj]			
File View Device Network Extras Help			
D 🖨 🔲   Q    🗄 🗉 📾    🏃 🍩 📑 🖷 . 🖷	<b>2</b> 4		
netProject  A X			×
	Connect Disconnect Start Debug Mode Download Upload Cut Copy Paste Network Scan Configuration Measured Value Simulation Diagnosis Additional Functions Delete	]<1>(#1) DPS[NRP 10-DPS/DPS]<32>	Profibus DPV1 Gateway / Stand-Alone Slar CIPX DP/DP5 COMX 100X-DP/DP5 COMX 100X-DP/DP5 COMX 100X-DP/DP5 NB 100-XX-XX NETX 50 DP/DP5 NJ 100X-DP/DP5 NJ 100X-DP/DP5 NJ 100X-DP/DP5 NT 100-XX-XX NT 50-XX-XX NT 50-XX-XX NT 100-XX-XX NT 100-XX-
B SYCON pet \ petDevice	Symbolic Name		
Ready		A	dministrator

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.

₩ SYCON.net - [untitled.spj]			
File View Device Network Extras Help			
D 📽 🔛   Q    😫 🖆 🕲    🕵 🚳 📑 🖷 🦉	<b>2</b> 4		
netProject 🔺 🗙 netDevice			6
Project: untitled	Connect Disconnect Start Debug Mode Download Upload Cut Copy Paste Network Scan Configuration Measured Value Simulation Diagnosis	A]<1>(#1) DPS[NRP 10-DPS/DPS]<32>	Profibus DPV1     Gateway / Stand-Alone Slar     CIFX DP/DPS     COMX 100Xx-DP/DPS     COMX 100Xx-DP/DPS     WETX 50 DP/DPS     WETX 50 DP/DPS     WETX 50 DP/DPS     WIX NO DY-DPS     WIX NO DY-DY-DPS     WIX NO DY-DPS     WIX NO DY-DY-DPS     WIX NO DY-DY-DY-DY-DY-DY-DY-DY-DY-DY-DY-DY-DY-D
	Additional Functions		
Download succeeded to device NRP 10-DPS/DPS[NRP 10-D	Delete	-	
	Symbolic Name		
SYCON.net netDevice		4	
Ready			Administrator

> In the context menu, select **Diagnosis...** 

Figure 89: Open diagnosis dialog for PC Card cifX

#### ✤ The General Diagnosis dialog window opens:

😽 netDevice - Diagnosis Clf	FX_DP_DPM[CIFX DP/DP	M]<1>(#1)			
IO Device: CIFX Vendor: Hilsch	DP/DPM er GmbH		Device ID: Vendor ID:	0x0B4A 0x011E	FDT
Navigation Area 📃		Ge			
<ul> <li>Diagnosis</li> <li>General Diagnosis</li> <li>Master Diagnosis</li> <li>Bus Diagnosis</li> <li>Station Diagnosis</li> <li>Firmware Diagnosis</li> <li>Extended Diagnosis</li> <li>RX_SYSTEM</li> <li>DPM_COM0_SMBX</li> <li>DPM_COM0_RMBX</li> <li>PROFIBUS_DL</li> <li>PROFIBUS_FSPMM1</li> <li>PROFIBUS_FSPMM2</li> <li>PROFIBUS_FSPMM2</li> <li>PROFIBUS_SPMM1</li> <li>PROFIBUS_SPMM1</li> <li>PROFIBUS_APM</li> <li>MARSHALLER</li> <li>PACKET_ROUTER</li> <li>Tools</li> <li>Packet Monitor</li> <li>IO Monitor</li> <li>Process Image Monitor</li> </ul>	Device state Communication Run Ready Error Configuration state Configuration locked New configuration perce Reset required Bus ON Communication error: Watchdog time: Error count:	ling 	Network state Operate Idle Stop Offline		
	<				>
			ОК	Cancel	pply Help
🍄 Connected 🛛 🗕 Device	8				

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:

א netDevice - Diagnosis CIFX	_RE_PNM[CIFX RE/PNM] <controller>(#1)</controller>			
IO Device: CIFX RE Vendor: Hilscher	/PNM GmbH	Device ID: Vendor ID:	0x0203 0x011E	FDT
Navigation Area 📄 Can Diagnosis General Diagnosis	Columns: 10		Display <u>m</u> ode:	Hexadecimal 💌
Master Diagnosis Station Diagnosis Firmware Diagnosis Extended Diagnosis	Intput data Offset: 0000 <u>G</u> o 00 00 01 02 03	04 05	06 07	08 09
RX_SYSTEM     DPM_COM0_SMBX     DPM_COM0_RMBX     ThrTimer     MARSHALLER     T_PNID_EDD     T_ PNID_ACD	<u>0000 ▶<u>00</u>00</u>			
T_PNIO_DCP T_PNIO_DCP T_PNIO_MGT TCP_UDP T_RPC	Output data			
T_PNIO_CMCTL T_PNIO_APCTL T_PNIO_APCFG SNMP-Server	00 01 02 03 0000 \$00	04 05	06 07	08 09
Mib-Database  LLDP-Task  PACKET_ROUTER  Tools				
Packet Monitor IO Monitor Process Image Monitor				Update
		ОК	Cancel Appl	y Help
😍 Connected 🗕 Device				li

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.
- Դ The cifX Test Application opens:

bes o	ifX Tes	t Applicatio	n		
Eile	<u>D</u> evice	Information	Data <u>T</u> ransfer	2	
Drive	r was suc	cessfully open	ed!		

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:

Channel0 Cha	Channel Selection		$\mathbf{X}$
Property       Value         Property       Value         Physical Address       0xFE7F0000         Interrupt       0         Device Number       7650420         Serial Number       20006         Physical DPM Size       65536         Firmware Name       PROFIBUS DP Slave_ltd         Firmware Version       2.7.4.0 (Build 4)         Firmware Date       11/18/2013	⊡ cifX0	- Selection Information	
Physical Address 0xFE7F0000 Interrupt 0 Device Number 7650420 Serial Number 20006 Physical DPM Size 65536 Firmware Name PROFIBUS DP Slave_Itd Firmware Version 2.7.4.0 (Build 4) Firmware Date 11/18/2013		Property	Value
Interrupt 0 Device Number 7650420 Serial Number 20006 Physical DPM Size 65536 Firmware Name PROFIBUS DP Slave_Itd Firmware Version 2.7.4.0 (Build 4) Firmware Date 11/18/2013		Physical Address	0×FE7F0000
Device Number       7650420         Serial Number       20006         Physical DPM Size       65536         Firmware Name       PROFIBUS DP Slave_ltd         Firmware Version       2.7.4.0 (Build 4)         Firmware Date       11/18/2013		Interrupt	0
Serial Number 20006 Physical DPM Size 65536 Firmware Name PROFIBUS DP Slave_ltd Firmware Version 2.7.4.0 (Build 4) Firmware Date 11/18/2013		Device Number	7650420
Physical DPM Size 65536 Firmware Name PROFIBUS DP Slave_ltd Firmware Version 2.7.4.0 (Build 4) Firmware Date 11/18/2013		Serial Number	20006
Firmware Name PROFIBUS DP Slave_ltd Firmware Version 2.7.4.0 (Build 4) Firmware Date 11/18/2013		Physical DPM Size	65536
Firmware Version 2.7.4.0 (Build 4) Firmware Date 11/18/2013		Firmware Name	PROFIBUS DP Slave_ltd
Firmware Date 11/18/2013		Firmware Version	2.7.4.0 (Build 4)
		Firmware Date	11/18/2013
		<u> </u>	
Open Const		Г	Open Cancel

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:

bes (	cifX Tes	t Applicatio	on - cifX1 Ch	annel0	
Eile	<u>D</u> evice	Information	Data <u>T</u> ransfer	2	
Drive	er was suc	cessfully open	ed!		

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.

🚾 cifX Test Application - cifX1 Channel0	
<u>File D</u> evice Information Data Iransfer ?	
Process Data Input image	Process Data Output Image
Area Number: 0	Area Number: 0
Offset: 0	Offset: 0
Length: 2	Length: 2
Data:	Data:
00 00	
	~
Update Rate: 10 ms	Cylic Verify Outputs
	Auto Increment Data
Last Error:	Last Error:
No Error	No Error
Driver was successfully opened!	

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.

be cifX Test Application - cifX1 Channel0	
<u>File D</u> evice Information Data <u>T</u> ransfer <u>?</u>	
Process Data Input image	Process Data Output Image
Area Number: 0	Area Number: 0
Offset: 0	Offset: 0
Length: 2	Length: 2
Data:	Data:
00 00	01 02
Update Rate: 10 ms 🗨	Cylic     Verify Outputs     Auto Increment Data
Last Error:	Last Error:
0x0000000 No Error	0x0000000 No Error
Driver was successfully opened!	

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.

😽 netDevice - Diagnosis CIF	X_DP_DPM[CIFX DP/DPM]<1>(#1)		
IO Device: CIFX I	DP/DPM er GmbH	Device ID: Vendor ID:	0x084A Provide A ProvideA ProvideA ProvideA Provide A Provide A Provide A Provide A Pr
Navigation Area	Columns: 10		Display mode: Hexadecimal
Bus Diagnosis Station Diagnosis Firmware Diagnosis	Offset: 0000 Go	3 04 05 06	07 08 09
RX_SYSTEM     DPM_COM0_SMBX     DPM_COM0_SMBX     DPM_COM0_RMBX     PROFIBUS_DL     PROFIBUS_FSPMM	0000 <b>P<u>al</u></b>		
PROFIBUS_FSPMM2     PROFIBUS_APM     MARSHALLER     PACKET_ROUTER	Output data		
Tools Packet Monitor Process Image Monitor	Offget: 0000 Go	3 04 05 06	07 08 09
	Shifummund		
			Update
		OK Ca	ncel Apply Help
😌 Connected 📃 Device			

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.

א netDevice - Diagnosis CIF	X_DP_DPM[CIFX DP/DPM]<1>(#1)		
IO Device: CIFX   Vendor: Hilsch	DP/DPM er GmbH	Device ID: Vendor ID:	0x084A 0x011E
Navigation Area Diagnosis General Diagnosis Master Diagnosis Bus Diagnosis Station Diagnosis Firmware Diagnosis Extended Diagnosis RX_SYSTEM DPM_COM0_SMBX DPM_COM0_SMBX PROFIBUS_PSPMM2 PROFIBUS_FSPMM2 PROFIBUS_FSPMM2 PROFIBUS_FSPMM2 PROFIBUS_FSPMM2 PROFIBUS_APM MARSHALLER PACKET_ROUTER Tools Packet Monitor Process Image Monitor	Columns:       10         Intput data	10 Monitor 04 05 06 04 05 06	Display mode: Hexadecimal
Decomposited	(m)	OK Car	icel Apply Help
Seconnected			10

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.

🐜 cifX Test Application - cifX1 Channel0	
<u>File Device Information Data Transfer ?</u>	
Process Data Input image	Process Data Output Image
Area Number: 0	Area Number: 0
Offset: 0	Offset: 0
Length: 2	Length: 2
Data:	Data:
03 04	01 02
Update Rate: 10 ms	<u>Cylic</u> <u>V</u> erify Outputs <u>Update</u>
Last Error:	Last Error:
0×00000000 No Error	0x0000000 No Error
Driver was successfully opened!	

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	Duo LED yellow/green		
Number in the device	📍 (green)	On	Operating System running
drawing:	¥ ¥ (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
СОМ	Duo LED red/green		
Name in the device drawing: <b>COM0</b> (V12) Number in the device drawing: 3	e (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 /	Duo LED red/green				
L ERR Name in the device drawing: COM0 (V12) Number in the device drawing: 3	• (off)	Off	<ol> <li>Before participating in the network</li> <li>Unable to detect carrier</li> <li>Timeout</li> <li>Resetting hardware</li> </ol>		
	(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	<ol> <li>CRC error</li> <li>Address parameter error (0, 65 or greater is set including the number of occupied stations)</li> <li>Baud rate switch setting error during cancellation of reset (5 or greater)</li> </ol>		

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	Duo LED red/green		
Name in the device drawing: <b>COM0</b>	(off)	Off	<b>INIT</b> : The device is in state INIT.
	(green)	Blinking (2.5 Hz)	<b>PRE-OPERATIONAL</b> : The device is in PRE-OPERATIONAL state.
device drawing:	∰ (green)	Single flash	<b>SAFE-OPERATIONAL</b> : The device is in SAFE-OPERATIONAL state.
	(green)	On	<b>OPERATIONAL</b> : The device is in OPERATIONAL state.
ERR	Duo-LED re	d/green	
Name in the device drawing:	• (off)	Off	<b>No error:</b> The EtherCAT communication of the device is in working condition.
COM1	ored)	Blinking	Invalid configuration: General Configuration Error
Number in the device drawing:		(2.5 Hz)	Possible reason: State change commanded by master is impossible due to register or object settings.
	🌞 (red)	Single Flash	<b>Local error:</b> 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.
	ored)	Double Flash	<b>Application watchdog timeout:</b> An application watchdog timeout has occurred.
			Possible reason: Sync Manager Watchdog timeout.
L/A IN/	LED green		
RJ45 Ch0 L/A OUT/ RJ45 Ch1 Number in the device drawing:	• (green)	On	<b>Link:</b> The device is linked to the Ethernet, but does not send/receive Ethernet frames.
	🌞 (green)	Flickering (load dependent)	<b>Activity:</b> The device is linked to the Ethernet and sends/receives Ethernet frames.
	• (off)	Off	The device has no link to the Ethernet.
RJ45 Ch0	LED yellow		
RJ45 Ch1	• (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.

LED	Color	State	Meaning	
SF (System	Duo LED red/green			
Failure)	• (off)	Off	No error	
device drawing:	<b>i</b> (red)	Flashing (1 Hz, 3 s)	DCP signal service is initiated via the bus.	
Number in the device drawing:	• (red)	On	Watchdog timeout; channel, generic or extended diagnosis present; system error	
BF	Duo LED re	d/green		
(Bus Failure) Name in the device drawing: <b>COM1</b>	• (off)	Off	No error	
	ired)	Flashing (2 Hz)	No data exchange	
Number in the device drawing:	• (red)	On	No configuration; or low speed physical link; or no physical link	
LINK/RJ45	LED green			
Ch0 & Ch1 Number in the	📍 (green)	On	The device is linked to the Ethernet.	
device drawing:	• (off)	Off	The device has no link to the Ethernet.	
RX/TX/RJ45 Ch0 & Ch1 Number in the device drawing:	LED yellow			
	🄆 (gelb)	Flickering (load dependent)	The device sends/receives Ethernet frames.	
	• (off)	Off	The device does not send/receive Ethernet frames.	

The LEDs on the RJ45 sockets are also described.

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	Duo LED red/green (orange = red/green simultaneously)				
Name in the	(green)	On	CP4: Communication phase 4:Normal operation, no error		
device drawing: COM0	(green)	Blinking (2 Hz)	<b>Loopback:</b> The network state has changed from "fast- forward" to "loopback".		
Number in the device	<b>і́∰ ∰</b> (green/orange)	Flashing (3 x green/3s)	CP3: Communication phase 3		
drawing:		(2 x green/3s)	CP2: Communication phase 2		
		(1 x green/3s)	CP1: Communication phase 1		
	(orange)	On	CP0: Communication phase 0		
	**	Blinking (2 Hz)	HP0: Hot-plug phase 0		
	(orange/green)	(1 x orange/3s)	HP1: Hot-plug phase 1		
		(2 x orange/3s)	HP2: Hot-plug phase 2		
	<b>₩</b> (orange)	Flashing (2 Hz)	<b>Identification:</b> 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).		
	<b>i ∰ ₩</b> (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	<b>Communication Error (C1D):</b> 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	<b>NRT-Mode:</b> (Non Real-Time Mode) No sercos Communication		
<b>L/A/</b> RJ45	LED green	LED green			
Ch0 & Ch1 Number in the device drawing:	• (green)	On	Link: The device is linked to the Ethernet, but does not send/receive Ethernet frames.		
	🔆 (green)	Flickering (load dependant)	<b>Activity:</b> The device is linked to the Ethernet and sends/receives Ethernet frames.		
	• (off)	Off	The device has no link to the Ethernet.		
RJ45	LED yellow				
Ch0 & Ch1	(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. <i>two colors:</i> 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	Duo-LED red/green		
Name in the device drawing:	e (green)	On	<b>Connected</b> : OMB task has communication. At least one TCP connection is established.
COM0 Number in the	🌞 (green)	Flashing (1 Hz)	Ready, not yet configured: OMB task is ready and not yet configured.
device drawing:	🌞 (green)	Flashing (5 Hz)	Waiting for Communication: OMB task is configured.
	• (off)	Off	Not Ready: OMB task is not ready.
ERR	Duo-LED re	d/green	
Name in the device drawing: <b>COM1</b> Number in the device drawing: 2	• (off)	Off	No communication error
	🌞 (red)	Flashing (2 Hz, 25% on)	System error
	(red)	On	Communication error active
LINK/RJ45 LED green			
Ch0 & Ch1 Number in the	🌞 (green)	On	The device is linked to the Ethernet.
device drawing:	• (off)	Off	The device has no link to the Ethernet.
ACT/RJ45	LED yellow		
Ch0 & Ch1	🔆 (vellow)	Flickering	The device sends/receives Ethernet frames.
Number in the device drawing:	(Jonew)	(load dependent)	
(17)	• (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	Duo-LED red/green			
(Module status)	e (green)	On	Device operational: The device is operating correctly.	
Name in the device	🌞 (green)	Flashing (1 Hz)	Standby: The device has not been configured.	
drawing: COM0	(red/green)	Flashing (1 Hz)	Self-test: The device is performing its power up testing.	
Number in the device drawing: 3	🌞 (red)	Flashing (1 Hz)	<b>Minor fault</b> : 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	Duo-LED red/	green		
(Network- status) Name in the device drawing: <b>COM1</b> Number in the device drawing: 2	• (green)	On	<b>Connected</b> : The device has at least one established connection (even to the Message Router).	
	🌞 (green)	Flashing (1 Hz)	<b>No connections</b> : 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)	<b>Connection timeout</b> : 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	<b>Duplicate IP</b> : The device has detected that its IP address is already in use.	
	• (Off)	Off	<b>Not powered, no IP address</b> : The device does not have an IP address (or is powered off).	
LINK	LED green			
Ch0 & Ch1 Number in	e (green)	On	The device is linked to the Ethernet.	
the device drawing: 1	<ul><li>(Off)</li></ul>	Off	The device has no link to the Ethernet.	
ACT	LED yellow			
Ch0 & Ch1 Number in the device drawing: 1	orgen (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	Duo LED red/green			
(Bus Status)	e (green)	On	Slave is in 'Operational' state	
drawing: COM0	🌞 (green)	Triple Flash	Slave is in ,ReadyToOperate' state	
Number in the de-	🌞 (green)	Double flash	Slave is in , <b>Pre-Operational 2'</b> state	
	🌞 (green)	Single flash	Slave is in , <b>Pre-Operational 1</b> ' state	
	🌞 (green)	Flickering (10 Hz)	Slave is in ,Basic Ethernet' state	
	🔆 (green)	Blinking (2.5 Hz)	Slave is in <b>,Stopped</b> ' state	
	• (off)	Off	Slave initializing	
BE	Duo LED re	d/green		
(Bus Error)	(off)	Off	Slave has no error	
drawing: <b>COM1</b>	(red)	On	Slave has detected an error	
Number in the de-				
vice drawing: 2				
L/A IN/	LED green			
RJ45 Ch0 L/A OUT/ RJ45 Ch1 Number in the <u>d</u> e-	e (green)	On	Link: The device is linked to the Ethernet, but does not send/receive Ethernet frames.	
	🔆 (green)	Flickering (load de- pendent)	Activity: The device is linked to the Ethernet and sends/receives Ethernet frames.	
vice drawing: 1	• (off)	Off	The device has no link to the Ethernet.	
RJ45 Ch0	LED yellow			
RJ45 Ch1	• (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 approxi- mately 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 de- pendent)	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	Duo-LED red/green			
Name in the	• (green)	On	Configured and communication is active.	
COM0	🌞 (green)	Blinking (5 Hz)	Configured and communication is inactive.	
Number in the device drawing:	• (off)	Off	Not configured.	
ERR	Duo-LED red	Duo-LED red/green		
Name in the	• (off)	Off	Configured.	
COM1	🌞 (red)	Blinking (5 Hz)	Not configured.	
Number in the device drawing:	• (red)	On	Communication error occurred.	
LINK	LED green			
Ch0 & Ch1 Number in the	📍 (green)	On	The device is linked to the Ethernet.	
device drawing:	• (off)	Off	The device has no link to the Ethernet.	
ACT Ch0 & Ch1 Number in the	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

## 6.1 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	Туре	netX 10
Memory	FLASH	4 MB serial Flash EPROM
Host interface	Туре	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	Туре	NRP 10-CCS
Field bus	Interface	CC-Link
	Connector	Combicon 5-pin , male connector
Host interface	Туре	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	Туре	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	Туре	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	LxWxH	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	Туре	NRP 10-DPS
Field bus	Interface	PROFIBUS DP Slave
	Connector	D-Sub 9-pin, female
Host interface	Туре	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	LxWxH	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	Туре	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	Туре	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	Туре	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	Туре	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	Туре	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	Туре	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	Туре	NRP 51-RE\F8T	
Ethernet interface	Connector	2x RJ45	
Host interface	Туре	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	LxWxH	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	Туре	NRP 52-RE	
Ethernet interface	Connector	2x RJ45	
Host interface	Туре	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	LxWxH	100 x 65 x 18 mm	
Weight	Weight	approx. 45 g	

Table 53: Technical Data NRPEB 52-RE

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## 7.3 Contacts

#### Headquarters

#### Germany

Hilscher Gesellschaft für Systemautomation mbH Rheinstrasse 15 65795 Hattersheim Phone: +49 (0) 6190 9907-0 Fax: +49 (0) 6190 9907-50 E-Mail: info@hilscher.com

Support Phone: +49 (0) 6190 9907-99 E-Mail: de.support@hilscher.com

#### **Subsidiaries**

#### China

Hilscher Systemautomation (Shanghai) Co. Ltd. 200010 Shanghai Phone: +86 (0) 21-6355-5161 E-Mail: info@hilscher.cn

#### Support

Phone: +86 (0) 21-6355-5161 E-Mail: <u>cn.support@hilscher.com</u>

#### France

Hilscher France S.a.r.l. 69500 Bron Phone: +33 (0) 4 72 37 98 40 E-Mail: <u>info@hilscher.fr</u>

#### Support

Phone: +33 (0) 4 72 37 98 40 E-Mail: <u>fr.support@hilscher.com</u>

#### India

Hilscher India Pvt. Ltd. Pune, Delhi, Mumbai Phone: +91 8888 750 777 E-Mail: info@hilscher.in

#### Italy

Hilscher Italia S.r.I. 20090 Vimodrone (MI) Phone: +39 02 25007068 E-Mail: <u>info@hilscher.it</u>

#### Support Phone: +39 02 25007068 E-Mail: <u>it.support@hilscher.com</u>

#### Japan

Hilscher Japan KK Tokyo, 160-0022 Phone: +81 (0) 3-5362-0521 E-Mail: info@hilscher.jp

#### Support

Phone: +81 (0) 3-5362-0521 E-Mail: jp.support@hilscher.com

#### Korea

Hilscher Korea Inc. Seongnam, Gyeonggi, 463-400 Phone: +82 (0) 31-789-3715 E-Mail: <u>info@hilscher.kr</u>

#### Switzerland

Hilscher Swiss GmbH 4500 Solothurn Phone: +41 (0) 32 623 6633 E-Mail: info@hilscher.ch

#### **Support** Phone: +49 (0) 6190 9907-99 E-Mail: <u>ch.support@hilscher.com</u>

#### USA

Hilscher North America, Inc. Lisle, IL 60532 Phone: +1 630-505-5301 E-Mail: info@hilscher.us

#### Support

Phone: +1 630-505-5301 E-Mail: <u>us.support@hilscher.com</u>

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