User Manual

netSWITCH SERCOS III

Installation, Configuration, Diagnosis and Operation

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DOC070701UM07EN | Revision 7 | English | 2017-09 | Released | Public

Table of Contents

1 Introduction

1.1 About the User Manual

This User Manual contains a short description about installation, configuration, diagnosis and operation of the netSWITCH SERCOS III devices.

1.1.1 List of Revisions

Index	Date	Hard / Software	Chapter	Revisions
6	2015-10-16	Firmware Version: V1.1.0.x	3.4.1	Section *netSWITCH SERCOS III and one Standard Ethernet Port*: APL LED added in Figure 2.
			5.1	Section *netSWITCH SERCOS III and one Ethernet Port*: APL LED has "NRT Channel Status" from firmware version 1.1.0.0.
			9.1	Section *Java Settings to access the netSWITCH SERCOS III* added.
7	2017-09-28	Firmware Version: V1.2	8	Section *Configuration File on MMC Card* added.
			9.2	Section *Java-Plug-in für web browser not supported* added.

Table 1: List of Revisions

1.1.2 Reference on Hardware

Device Type	Product	Device
NS-S3-1NRT	netSWITCH SERCOS III and one Ethernet Port	Revision 7

Table 2: Reference on Hardware

1.1.3 Reference on Firmware

Firmware	Protocol	Version
netx.rom	netSWITCH SERCOS III	V1.2

Table 3: Reference on Firmware

1.1.4 Conventions in this Manual

Operating Instructions, a result of an operation step or notes are marked as follows:

Operating Instructions:

➢ <instruction>

or

1. <instruction>
2. <instruction>

Results:

➪ <result>

Notes:

Note: <note>

1.2 Contents of the Product CD

The product CD contains:

- Documentation: User Manual (this document)
- Loadable Firmware

1.2.1 Directory Structure of the CD

All manuals on this CD are delivered in the Adobe Acrobat® Reader format (PDF).

Directory Name	Description
Documentation	Documentation in the Acrobat® Reader Format (PDF)
Firmware	Loadable Firmware

Table 4: Directory Structure of the CD

2 Safety

2.1 Intended Use

The **netSWITCH SERCOS III** devices described in this User Manual serve to couple SERCOS III network with standard Ethernet.

2.2 Personnel Qualification

The netSWITCH SERCOS III device must only be installed, configured and removed by qualified personnel.

2.3 Labeling of Safety Instructions

The safety instructions are pinpointed particularly. The instructions are highlighted with a specific safety symbol, a warning triangle and a signal word according to the degree of endangerment. Inside the note the danger is exactly named. Instructions to a property damage message do not contain a warning triangle.

Signal Word	Meaning (International)	Meaning (USA)
DANGER	Indicates a direct hazard with high risk, which will have a consequence of death or grievous bodily harm if it is not avoided.	Indicates a hazardous situation which if not avoided, will result in death or serious injury.
WARNING	Indicates a possible hazard with medium risk, which will have a consequence of death or (grievous) bodily harm if it is not avoided.	Indicates a hazardous situation which if not avoided, could result in death or serious injury.
CAUTION	Indicates a minor hazard with medium risk, which could have a consequence of minor or moderate bodily harm if it is not avoided.	Indicates a hazardous situation which if not avoided, may result in minor or moderate Injury.

Safety Sign	USA	Warning or Principle
		Warning of lethal electrical shock
		Principle: Disconnect the power plug

Table 5: Signal Words and Safety Signs in Safety Messages on Personal Injury

Signal Word	Meaning (International and USA)
NOTICE	Indicates a property damage message.
Safety Sign	**Warning or Principle**
	Warning on damages by electrostatic discharge
-	Example: Warning of device destruction due to exceedingly high supply voltage

Table 6: Signal Words and Safety Signs in Safety Messages on Property Damage

2.4 Safety Instructions

This manual contains instructions which must be observed to ensure your own personal safety and to avoid damage to devices.

3 Overview netSWITCH SERCOS III

3.1 Description

The netSWITCH SERCOS III devices couple a SERCOS III network with a standard Ethernet network.

The Real-Time Ethernet system SERCOS III provides a deterministic jitter-free data transmission for controlling and synchronizing drives. Parallel to this and based on a time-slot basis, standard Ethernet telegrams[1] can be transmitted via a NRT (None-Real-Time) channel. These NRT telegrams must be buffered for retransmission on a standard Ethernet network. The netSWITCH SERCOS III provides this buffer connection between the synchronized SERCOS III network and standard Ethernet.

The netSWITCH SERCOS III device provides two Real-Time Ethernet ports for SERCOS III. Furthermore a standard Ethernet port is available to connect a notebook or other standard Ethernet capable devices and to provide access to the internal Web server that is used for configuration.

The device firmware is loaded and executed from the inserted MMC card.

In the SERCOS III network, SERCOS III telegrams and standard Ethernet telegrams on the NRT channel are received by the netSWITCH SERCOS III. The standard Ethernet telegrams of the NRT channel are forwarded by the netSWITCH SERCOS III to the standard Ethernet port (NRT-port) making these messages available to users outside the SERCOS III ring. Likewise standard Ethernet telegrams that are received by the netSWITCH SERCOS III at the standard Ethernet port (NRT-port) are inserted into the NRT channel of the SERCOS III network for delivery to SERCOS III components.

The netSWITCH SERCOS III forwards the SERCOS III telegrams with a throughput of 600 ns. Non-SERCOS III Ethernet Frames are processed according to the Store-and-Forward principle.

The SERCOS III norm specifies the start time t_6 and the final time t_7 for the time slot of the NRT channel in the communication phases CP0..2 definitely. A SERCOS III master with the "NRT-plug support" functionality sends the time slot parameters of the SERCOS III NRT channel during start up for the communication phases CP3..4. The netSWITCH SERCOS III device detects and adjusts the time slot for the SERCOS III NRT channel after that automatically. Thereby the netSWITCH SERCOS III can be operated without a previous manual configuration in the SERCOS III network.

If the SERCOS III master does not support the "NRT-plug support" function, the user has the option of using the integrated Web browser to configure the netSWITCH SERCOS III device start time t_6 and end time t_7 for the time slot of all communications phases of the SERCOS III NRT channel manually and to save this data remanently to the device.

For the control of the communication and device state LED are integrated at the netSWITCH SERCOS III. Using the internal Web browser further status and diagnosis information can be read from the netSWITCH SERCOS III device.

[1] According to IEEE 802.3

3.2 Sample Application

The following figure shows a sample application for the netSWITCH SERCOS III device.

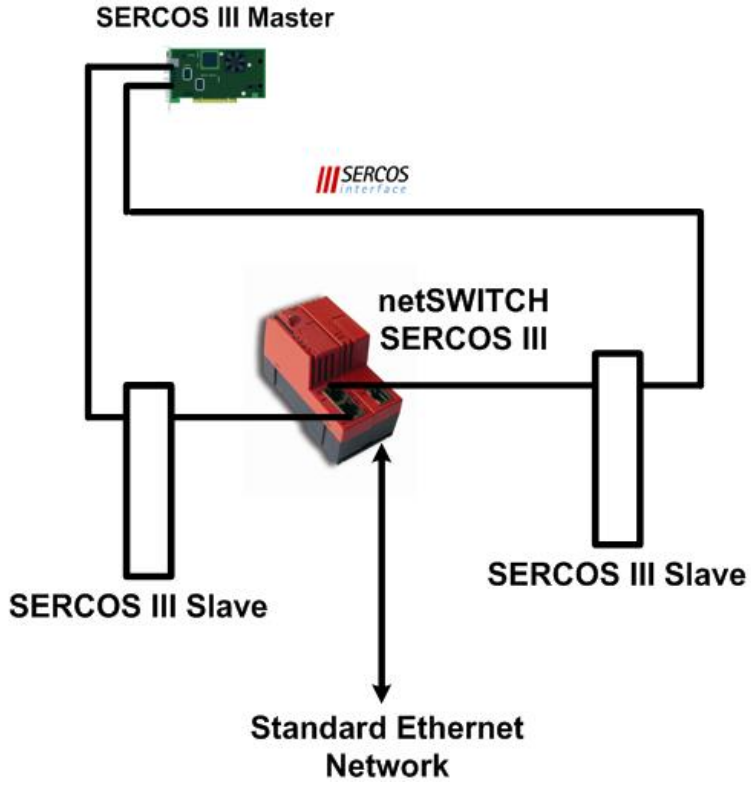


Figure 1: Sample Application

3.3 Requirements

- DC power supply with 24 V (18 - 30 V) output voltage
- SERCOS III Communication Master and at least one SERCOS III Slave
- Ethernet Cable
- PC with Ethernet connector for configuration and diagnosis
- Java capable Web browser
  (Java Runtime Environment (jre), Version 1.5 or higher)

3.4 Illustrations netSWITCH SERCOS III Devices

Device type	Article
NS-S3-1NRT	netSWITCH SERCOS III and one Ethernet port

Table 7: netSWITCH SERCOS III devices

3.4.1 netSWITCH SERCOS III and one Standard Ethernet Port

The following figure shows the netSWITCH device in front view.

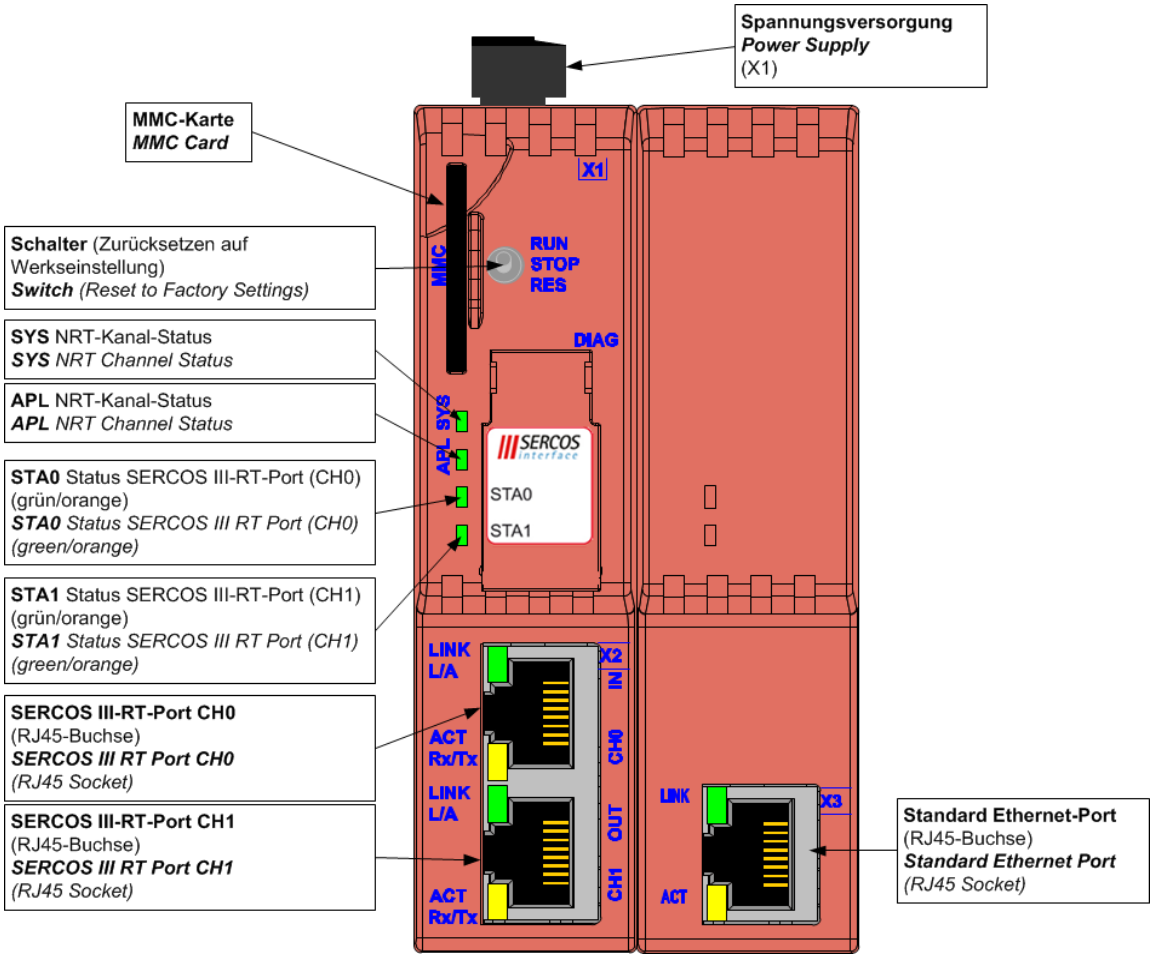


Figure 2: netSWITCH SERCOS III and one Standard Ethernet Port – Front view

Below the cover **DIAG** is a Mini USB connector available. This connector is without function.

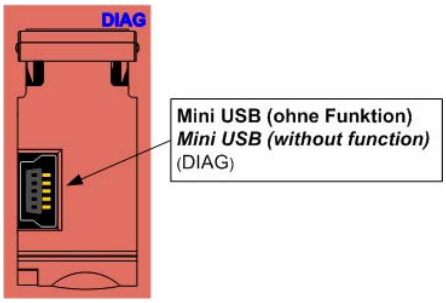


Figure 3: netSWITCH SERCOS III and one Standard Ethernet Port – DIAG

The following figure shows the netSWITCH device in side view (view from the right side).

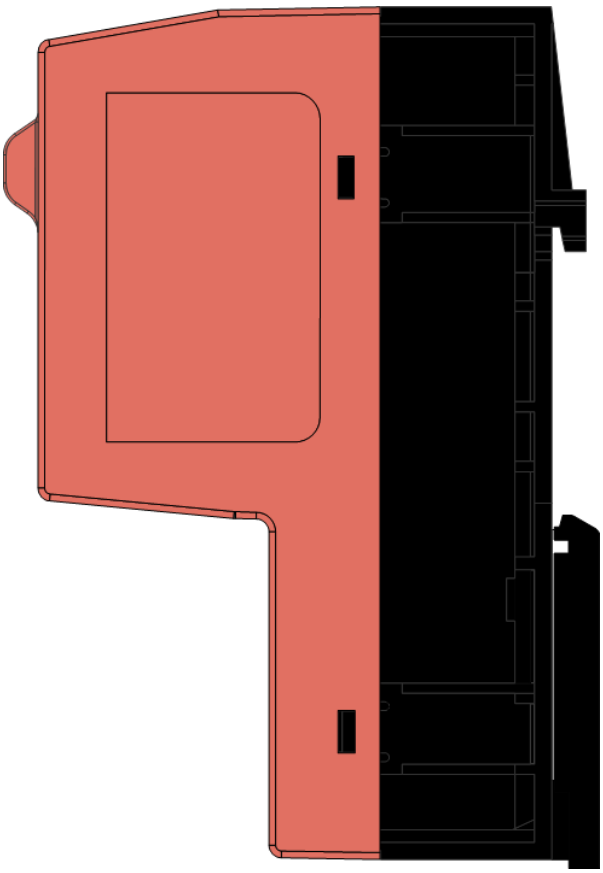


Figure 4: netSWITCH SERCOS III and one Standard Ethernet Port – Side view

4 Connectors

4.1 Power Supply

The netSWITCH SERCOS III device can be operated by a DC power supply from 24V (18V – 30V).

- Plug the DC power supply into the power jack X1 located at the top side of the device.

Pin	Description
1	Ground
2	24V (18 - 30 V DC)

Table 8: Power Supply, X1

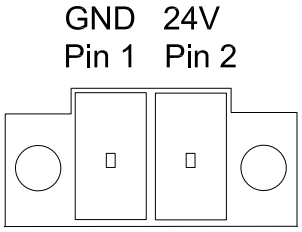


Figure 5: Power Supply, X1

4.2 Communication

4.2.1 Ethernet

The netSWITCH SERCOS III device provides two SERCOS III ports and one standard Ethernet port for the connection of a notebook or other Ethernet capable devices.

For the Ethernet interface use RJ45 plugs and twisted pair cable of category 5 (CAT5) which consists of 4 twisted cores and is usable for a transmission rate of 100 MBit/s (CAT5).

4.2.1.1 Ethernet Pinning at the RJ45 female Connector

Note: The SERCOS III RT-ports and the standard Ethernet port support the **Auto Crossover function**. Due to this fact RX and TX can be switched.

The following figure shows the RJ45 standard pinning.

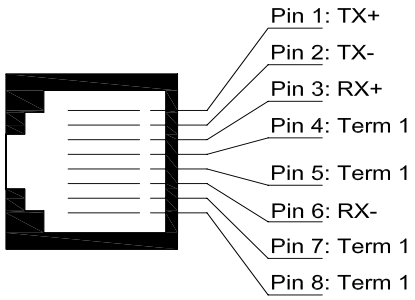


Figure 6: Ethernet Pinning at the RJ45 female Connector

Pin	Signal	Meaning
1	TX+	Transmit Data +
2	TX–	Transmit Data –
3	RX+	Receive Data +
4	Term 1	Connected to each other and terminated to PE through RC circuit*
5	Term 1	
6	RX–	Receive Data –
7	Term 2	Connected to each other and terminated to PE through RC circuit*
8	Term 2	
		* Bob Smith Termination

Table 9: Ethernet Pinning at the RJ45 female Connector

4.2.1.2 Ethernet Connection Data

Medium	2 x 2 Twisted-Pair cupric cable, CAT5 (100 MBit/s)	
Length of cable	max. 100 m	
Transmission rate	SERCOS III RT-port	100 MBit/s full-duplex
	Standard Ethernet	10 MBit/s / 100 MBit/s full-duplex/half-duplex

Table 10: Ethernet Connection Data

4.2.1.3 Use of Hubs and Switches

The following table shows the use of hubs and switches by SERCOS III port:

netSWITCH SERCOS III Port	Hub	Switch
Standard Ethernet	applicable	applicable
SERCOS III	forbidden	forbidden

Table 11: Use of Hubs and Switches

4.2.2 Mini USB Connector (5 Pin)

(without function)

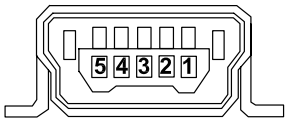


Figure 7: Mini USB Connector (5 Pin)

Pin	Name	Description
1	USB_EXT	USB Bus Power (+5V, supplied externally)
2	D-	Data -
3	D+	Data +
4	ID	Not connected
5	GND	Ground

Table 12: Pin out

5 LED

For the control of the communication and device state the netSWITCH SERCOS III is equipped with LED.

5.1 netSWITCH SERCOS III and one Ethernet Port

LED netSWITCH SERCOS III and one Ethernet Port (NS-S3-1NRT):

Labeling and Color		Function
SYS yellow / green		System status
APL green/red		NRT Channel Status
STA0 green/red/orange		Status SERCOS III RT-port (CH0)
STA1 green/red/orange		Status SERCOS III RT-Port (CH1)
RJ45 CH0 (X2)	green	LINK
	yellow	ACT
RJ45 CH1 (X2)	green	LINK
	yellow	ACT

Labeling and Color		Function
RJ45 (X3)	green	LINK
	yellow	ACT

Table 13: LED netSWITCH SERCOS III and one Ethernet Port

LED	Color	State	Meaning
SYS	green	On	Operating System running
	green	Flashing cyclic at 5 Hz	Devices indicates 'Reset to Factory Settings'
	yellow	Flashing cyclic at 1 Hz	Device indicates boot error. No firmware was found.
	yellow	Static	Bootloader is waiting for booting procedure
	-	Off	Power supply for the device is missing or hardware defect
APL	green	Static	NRT channel established
	red	Static	Wrong configuration for NRT channel, i.e. time is configured smaller than 125 µs
STA0 **STA1**	green	Static	SERCOS III RT-port is in communication phase CP4
	orange (red/green at the same time)	Static	SERCOS III RT-port is in communication phase CP0, CP1, CP2 or CP3
	red/green	Cyclic changing between red and green	SERCOS III RT-port is in NRT Modus
LINK	green	On	A connection to the Ethernet exists
	-	Off	The device has no connection to the Ethernet
ACT	yellow	Flashing	The device sends/receives Ethernet frames

Table 14: LED netSWITCH SERCOS III and one Ethernet Port – Meaning of the States

6 Starting up netSWITCH SERCOS III

6.1 Installation

How to proceed:

1. Install the DIN rail for the netSWITCH SERCOS III at the designated mounting place.
2. **[A]** Insert the netSWITCH SERCOS III with the upper side of the mounting plate into the DIN rail.
3. **[B]** Then press the netSWITCH SERCOS III at its lower side towards the mounting plate until it engages at the DIN rail.

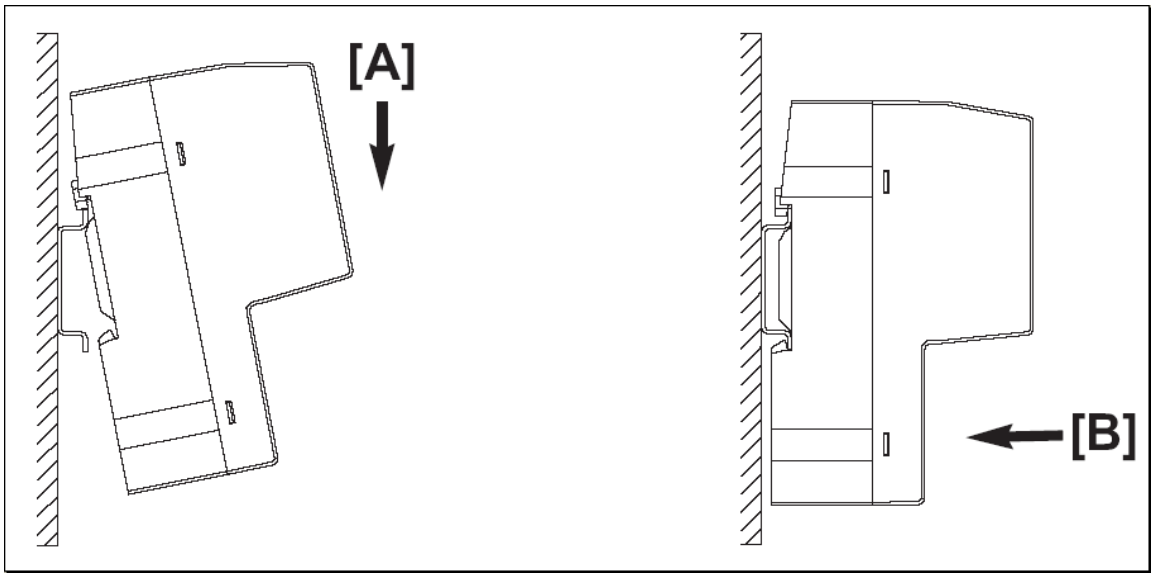


Figure 8: Mounting netSWITCH SERCOS III

4. Afterwards connect the 24 V power supply to the netSWITCH SERCOS III device.

The grounding of the netSWITCH SERCOS III is made by the earth terminal to the DIN rail at the back of the device.

6.2 Unistalling Device

Tools:

- Screwdriver

How to proceed:

1. Remove the power supply of the device.
2. Remove the Ethernet cable.
3. Remove the device from the DIN rail.

➢ Apply the screw driver in the mounting link at the lower side of the device.

➢ Open the interlock by use of the screwdriver.

4. Remove device from DIN rail.

6.3 Installing MMC Card

Requirements:

- MMC card with the firmware for the netSWITCH SERCOS III (file name netX.rom)
- MMC card formatted in FAT 16
- MMC card with max. 2 GByte memory

How to proceed:

1. Disconnect power supply from the netSWITCH SERCOS III device.
2. Slot the MMC card into the SD / MMC card connector until it engages.
3. Connect the 24-V power supply to the device.

➪ The device loads the firmware and is in operation state then.

6.4 Set Device back to Factory Settings

How to proceed:

1. Disconnect power supply from the netSWITCH SERCOS III device.
2. Push the switch to position RES (downwards) and hold it in this position.
3. Connect the 24-V power supply to the device.
4. Hold the switch for 3 seconds until the SYS LED changes to static green.

➪ The device indicates 'Reset to Factory Settings' by a green flashing SYS LED.

6.5 Access about Web Browser by NetBIOS Protocol

The netSWITCH SERCOS III device can be accessed about Web browsers by means of the NetBIOS protocol. Therefore in the Web browser „**http://ns-s3-xxxxx**“ must be entered (xxxxx .. serial number indicated at the device).

Example: **http://ns-s3-20003**

Note: Under Microsoft Windows® the NetBIOS protocol is installed via the Internet protocol by default.

6.6 Access about Web Browser using IP-Address

If the NetBIOS protocol is not supported by the Web browser, the netSWITCH SERCOS III device needs an IP-address to be configured via a Web browser. The device tries to obtain an IP-address from a DHCP server.

6.6.1 Obtaining IP-Address from DHCP Server

The IP-address of the netSWITCH SERCOS III device can be obtained from the DHCP server.

How to proceed:

1. At the DHCP server assign the IP-address of the device to the MAC-address of the device.

↬ After system start the netSWITCH SERCOS III device tries to auto configure itself via DHCP. If 8 trials (approx. 1 minute) fail, the DHCP configuration is stopped.

6.6.2 Specify IP-Address via Web Browser

The IP-address of the netSWITCH SERCOS III device is preset. The IP-address can be changed via the configuration dialog of the internal Web browser of the netSWITCH SERCOS III. (See section *"Configuration Network Settings" Page* on page *29*.)

Settings netSWITCH SERCOS III	
0002AXXXXXX	Range of the MAC-Address
192.168.0.158	Standard IP-Address
255.255.255.0	Subnet Mask
Example IP-Address PC	
192.168.0.150	IP-Address network card PC (possible range 192.168.0.001 to 192.168.0.254, but not 192.168.0.158)

Table 15: Settings netSWITCH SERCOS III and Example IP-Address PC

1. Enter the IP-address of the PC within the network range of the preset IP-address of the device.

Change IP-address of the device:

1. Change the IP-address of the netSWITCH SERCOS III device via the Web browser. (See section *Starting Web Pages netSWITCH SERCOS III* on page 24.)
2. Change the subnet mask of the netSWITCH SERCOS III device via the Web browser.
3. Select the **submit** button.

↪ The netSWITCH SERCOS III device applies the specified IP-address.

Note: If the device is switched current-free, the record of the IP-address in the device is erased. If subsequently the device is restarted, the device uses the original preset IP-address. The IP-address and the subnet mask can be changed and saved remanently on the netSWITCH SERCOS III device using the "Configuration Network Settings" page.

6.7 Configuring Timing parameters

Depending from the SERCOS III communication, each SERCOS III RT-port of the netSWITCH SERCOS III device can go to the operating phases described in the table below:

Phases (CP)	Meaning
-1	NRT (Non-Real-time), no SERCOS III communication
0/1/2	SERCOS III communication in CP0/1/2 The timing parameters t_6/t_7 must comply with the standard values according to SERCOS III specification [1].
3/4	SERCOS III communication in CP3/4 The timing parameters t_6/t_7 must comply with the values, which have been written from the SERCOS III Master to the IDN S-0-1017. That means the timing pattern is determined by the SERCOS III Master.

Table 16: Operating Phases netSWITCH SERCOS III

6.7.1 Configuring Timing Parameters automatically

If the SERCOS III Master supports the "NRT-Plug support" function, the netSWITCH SERCOS III device detects the time slot parameters for all communication phases automatically and reports them under **Parameters**.

Note: Make sure that under **Parameters** the option **Set timings manually** is deactivated. This is also the factory setting.

Further, the time for the NRT channel has to be at least 125 µs or more in order to transfer an Ethernet frame of maximum length.

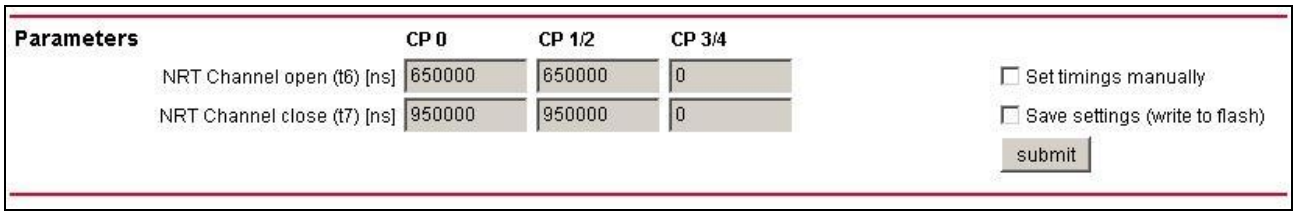


Figure 9: Timing Parameter Setting for automatic Configuration

6.7.2 Configuring Timing Parameters manually

Note: If the timing parameter sets for the NRT channel of all communication phases are known for the operator from the start, he can adjust them during the NRT phase all at once completely and store them remanently to the device when required. Then at the next system start the values are set automatically in the device.

Important: Make sure that under **Parameters** the option **Set timings manually** is activated. Furthermore for the transportation of Ethernet frames of maximum length, the **size of the NRT channel** must represent **at least 125 µ seconds**.

For the Communication Phases CP0:

Important: The timing parameters t_6/t_7 for the communication phase CP0 must be configured before the SERCOS III ring with the netSWITCH SERCOS III device has reached the communication phase CP0.

How to proceed:

1. Start netSWITCH SERCOS III Web server. (See section *Starting Web Pages netSWITCH SERCOS III* on page 24.)
2. Stop the SERCOS III Master communication.

↬ In **Status** > **SERCOS III side** > **CP** the value -1 is displayed.

↬ The SERCOS III ring is in NRT-mode.

3. Enter the values for the timing parameters t_6/t_7 for the communication phase CP0 to **Parameters** > **CP0**.
4. Then select the **submit** button, to transmit the values to the netSWITCH SERCOS III device.

Parameter	Description	Value / Range of Values
CP0		
NRT Channel open (t_6) [ns]	650000 (Default value according to SERCOS III specification [1])	0 … < SERCOS III cycle time
NRT Channel close (t_7) [ns]	950000 (Default value according to SERCOS III specification [1])	0 … < SERCOS III cycle time

Table 17: Timing parameters for the Phases CP0

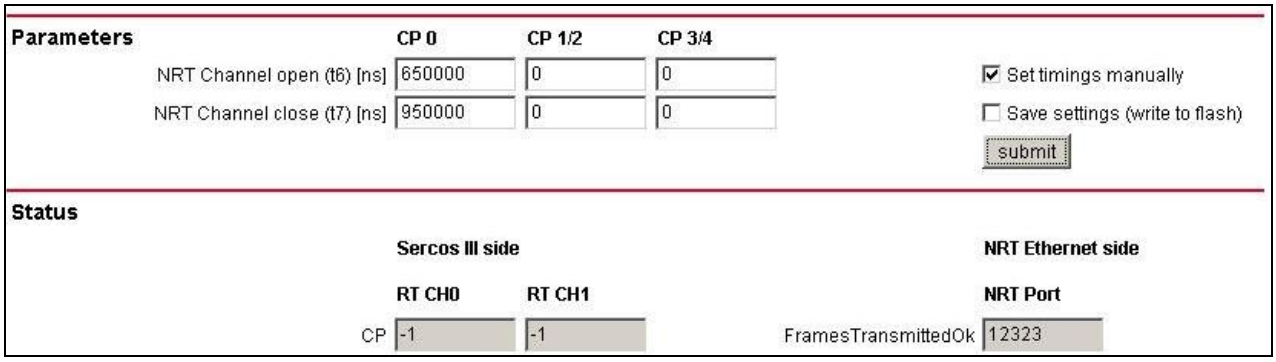


Figure 10: Timing Parameter Setting for manual Configuration CP0

For the Communication Phases CP1/2:

Important: The timing parameters t_6/t_7 for the communication phases CP1/2 must be configured before the SERCOS III ring with the netSWITCH SERCOS III device has reached the phases CP1/2.

How to proceed:

1. Start the netSWITCH SERCOS III Web server (if closed). (See section *Starting Web Pages netSWITCH SERCOS III* on page 24.)
2. Bring the SERCOS III Master communication to the phase CP0.

↬ In **Status** > **SERCOS III side** > **CP** the value 0 is displayed.

3. Enter the values for the timing parameters t_6/t_7 for the phases CP1/2 to **Parameters** > **CP1/2**.
4. Then select the **submit** button, to transmit the values to the netSWITCH SERCOS III device.

Note: According to the SERCOS III specification [1] there are two different timing parameter sets for the communication phases CP1/2. They depend on the number of MDT/AT telegrams in CP1/2. The information how many MDTs/ATs the SERCOS III master sends out is displayed in the communication phase CP0 under **Number of MDTs/ATs in CP1/2**.

Parameter	Description	Value / Range of Values
CP1/2		
NRT Channel open (t_6) [ns]	650000 (2 MDTs/ATs) 1050000 (4 MDTs/ATs) (Default value according to SERCOS III specification [1])	0 … < SERCOS III cycle time
NRT Channel close (t_7) [ns]	950000 (2 MDTs/ATs) 1950000 (4 MDTs/ATs) (Default value according to SERCOS III specification [1])	0 … < SERCOS III cycle time

Table 18: Timing parameters for the Phases CP1/2

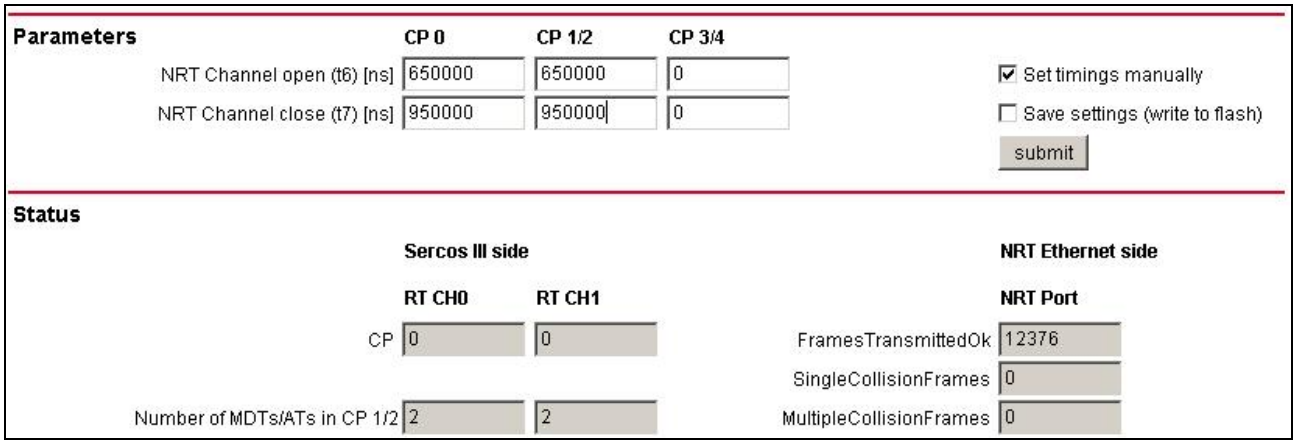


Figure 11: Timing Parameter Setting for manual Configuration CP1/2

For the Communication Phases CP3/4:

NOTICE

Communication Failure

- If wrong values have been configured for the timing parameter t_6/t_7 for phase CP3 and phase CP4, the system communication or the plant operation is disrupted. By consequence property damage at systems and plants can happen.
- Make sure, that the entering values for t_6/t_7 for phase CP3 and CP4 are correctly in any case. The correct values must be entered before phase CP3 has started!

Important:

- The timing parameters t_6/t_7 for the communication phases CP3/4 must be configured before the netSWITCH SERCOS III device has reached the communication phases CP3.
- For the netSWITCH SERCOS III device always the values for the timing parameters t_6/t_7 for the phases CP 3/4 must be used, which are preset in the SERCOS III Master and which this one writes to the IDN S-0-1017.

How to proceed:

1. Start the netSWITCH SERCOS III Web server. (See section *Starting Web Pages netSWITCH SERCOS III* on page 24.)
2. Bring the SERCOS III Master communication to the phase CP2.

   In **Status** > **SERCOS III side** > **CP** the value 2 is displayed.
3. Enter the values for the timing parameters t_6/t_7 for the phases CP3/4 to **Parameters** > **CP3/4**.
4. Then select the **submit** button, to transmit the values to the netSWITCH SERCOS III device.

Parameter	Description	Value / Range of Values
CP3/4		
NRT Channel open (t_6) [ns]	Parameter value according to S IDN S-0-1017. (The user must configure this value.)	0 … < SERCOS III cycle time
NRT Channel close (t_7) [ns]	Parameter value according to S IDN S-0-1017. (The user must configure this value.)	0 … < SERCOS III cycle time

Table 19: Timing parameters for the Phases CP3/4

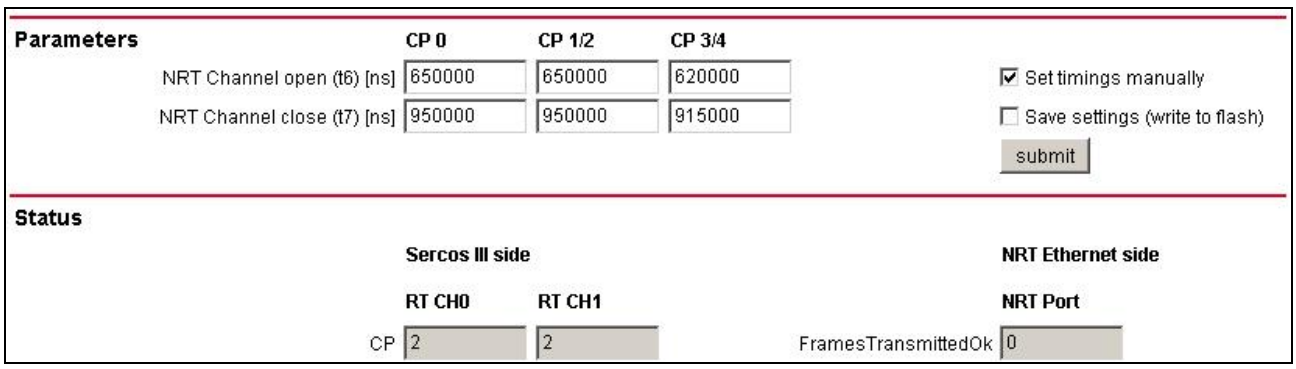


Figure 12: Timing Parameter Setting for manual Configuration CP3/4

7 Web Pages for Configuration and Diagnosis

A standard Web browser is used for configuration settings and to obtain status/diagnosis information from the netSWITCH SERCOS III device.

7.1 Starting Web Pages netSWITCH SERCOS III

How to proceed:

1. For configuration and diagnosis purposes connect the netSWITCH SERCOS III device to a pc via standard Ethernet.

➢ Therefore connect the standard Ethernet port of the netSWITCH SERCOS III device with the standard Ethernet port of the pc using an Ethernet cable.

2. Start the Web browser at the pc.
3. Enter the IP-address of the netSWITCH SERCOS III device in the address bar of the Web browser and press the enter button.

   Example: **http://192.168.0.158**

↬ The starting page netSWITCH SERCOS III status and diagnosis is displayed.

4. Enter the name of the designated web page in the address bar of the Web browser after the device IP-address and press the Enter button.

   Example: **http://192.168.0.158/ipconfig.html**

↬ The designated web page is displayed.

The internal Web server of netSWITCH SERCOS III provides the following pages:

Page	Web Page Name	Explanation
Status and Diagnosis	index.html	Starting page with diagnosis and status information. See section *"Status and Diagnosis" Page* on page 25.
Configuration Network Settings	ipconfig.html	Page to configure the device IP address. See section *"Configuration Network Settings" Page* on page 29.
Resetting Device to Factory Settings	reset.html	Page to reset all parameters and network settings to factory settings. See section *"Resetting to Factory Settings" Page* on page 31.

Table 20: Web Pages of netSWITCH SERCOS III

The starting page "index.html" contains a Java Applet. As the browser can open the applet, the java environment (Java Runtime-Environment (jre)) Version 1.5 or higher must be installed.

7.2 “Status and Diagnosis” Page

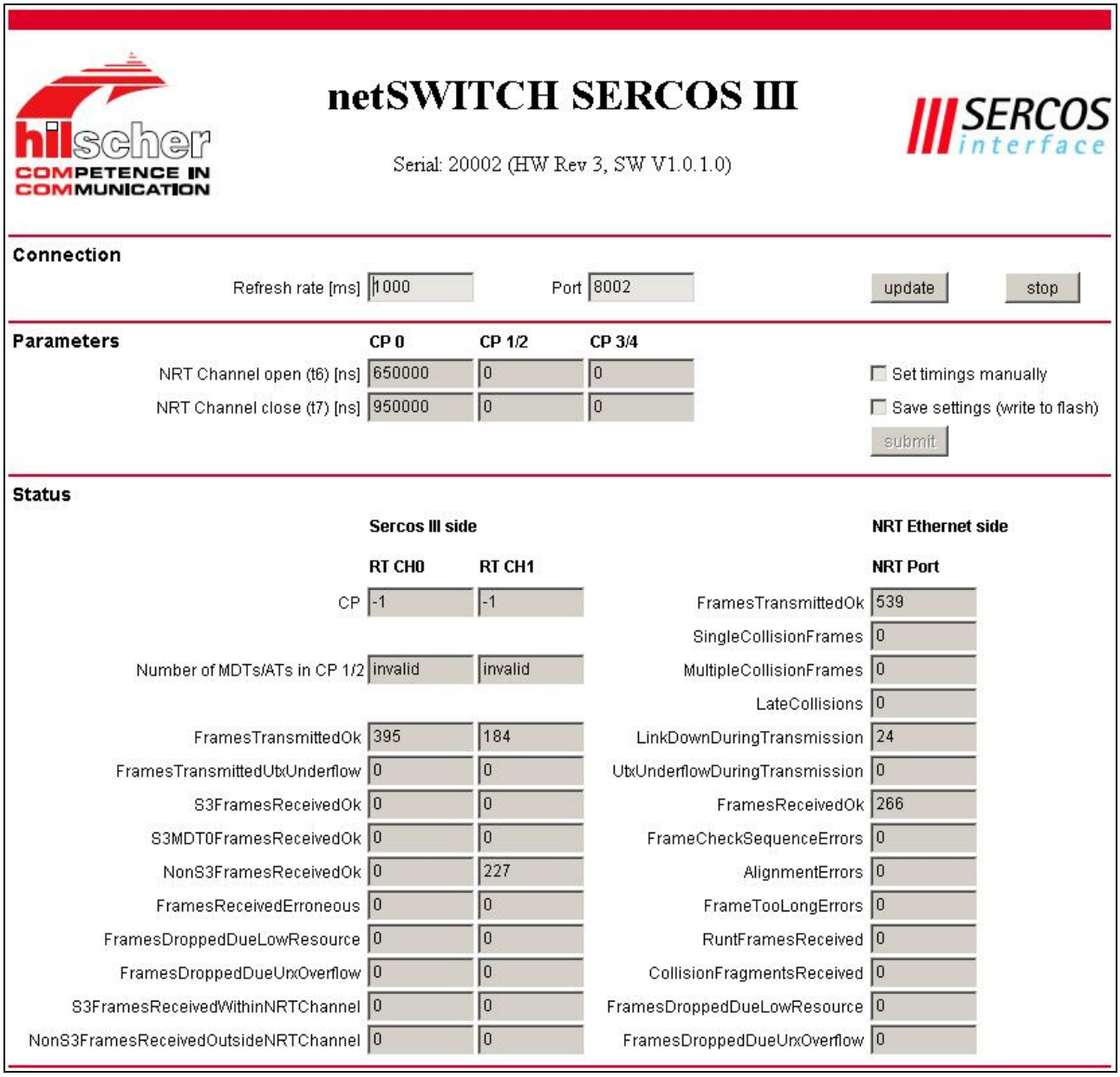


Figure 13: “Status and Diagnosis” Page

7.2.1 Connection

Parameter	Description	Value / Range of Values
refresh rate [ms]	Indicates the period in milliseconds between two updates of the diagnosis values.	10..4294967295
Port	UDP destination port on the PC	8000 + Serial No.[31..0]
Controls		
update	Starts the periodic update of the diagnosis values.	
stop	Stops the update.	

Table 21: "Status and Diagnosis" Page – Connection

7.2.2 Parameters

Parameters	Description	Value / Range of Values
CP0		
NRT Channel open (t6) [ns]	Start time NRT channel in CP0	10..4294967295
NRT Channel close (t7) [ns]	End time NRT channel in CP0	10..4294967295
CP 1/2		
NRT Channel open (t6) [ns]	Start time NRT channel in CP1/2	10..4294967295
NRT Channel close (t7) [ns]	End time NRT channel in CP1/2	10..4294967295
CP 3/4		
NRT Channel open (t6) [ns]	Start time NRT channel in CP3/4	10..4294967295
NRT Channel close (t7) [ns]	End time NRT channel in CP3/4	10..4294967295
Controls		
Set timings manually	Checkbox: The timing parameters are detected automatically or manually.	on/off
Save settings (write to flash)	Checkbox: The timing parameters are saved on the netSWITCH SERCOS III device remanently in the flash memory, including the **Set timings manually** information.	on/off
submit	The timing parameters are submitted to the device and the parameters are respectively saved remanently.	

Table 22: Status and Diagnosis" Page – Parameters

7.2.3 Status SERCOS III side

Status-Parameter	Description	Value / Range of Values
RT 0 / RT 1		
CP	SERCOS III communication phase	-1, 0, 1, 2, 3, 4
Number of MDTs/ATs in CP1/2	Number of the SERCOS III MDT/AT telegrams sent by the Master in CP1/2	Invalid, 2, 4
FramesTransmittedOk	Number of the successfully sent frames	0..4294967295
UtxUnderflowDuringTransmission	Number of faulty sent frames because of buffer underflow	0..4294967295
S3FramesReceivedOk	Number of the correctly received SERCOS III frames	0..4294967295
NonS3FramesReceivedOk	Number of the correctly received non SERCOS III frames	0..4294967295
FramesReceivedErroneous	Number of the corruptly received frames (FCS incorrect)	0..4294967295
FramesDroppedDueLowResource	Number of lost frames because of memory deficiency	0..4294967295
FramesDroppedDueUrxOverflow	Number of faulty received frames because of buffer overflow	0..4294967295
S3FramesReceivedWithin NRTChannel	Number of the SERCOS III frames received within the NRT channel	0..4294967295
NonS3FramesReceivedOutside NRTChannel	Number of the non SERCOS III frames received outside of the NRT channel	0..4294967295

Table 23: “Status and Diagnosis” Page – Status SERCOS III side

7.2.4 Status NRT Ethernet side

Status-Parameter	Description	Value / Range of Values
Port 2		
FramesTransmittedOk	Number of the correctly received Ethernet frames	0..4294967295
SingleCollisionFrames	Number of the frames involved in a collision	0..4294967295
MultipleCollisionFrames	Number of frames involved in several collisions	0..4294967295
LateCollisions	Number of clashed frames after at least 512bit of the frame have been transmitted	0..4294967295
LinkDownDuringTransmission	Number of frames sent during a broken connection	0..4294967295
UtxUnderflowDuringTransmission	Number of frames sent erroneously because of buffer underflow	0..4294967295
FramesReceivedOk	Number of correctly received frames	0..4294967295
FrameCheckSequenceErrors	Number of corruptly received frames (FCS incorrect)	0..4294967295
AlignmentErrors	Number of frames received in which its length is not an even number of Bytes	0..4294967295
FrameTooLongErrors	Number of frames received in which its length exceeds the maximum permitted frame length	0..4294967295
RuntFramesReceived	Number of frames received undamaged with a length of 42..63 Bytes. (Under run of the minimum permitted frame length)	0..4294967295
CollisionFragmentsReceived	Number of frames received corruptly with a length of 42..63 Bytes. (FCS check failed)	0..4294967295
FramesDroppedDueLowResource	Number of frames lost because of memory deficiency	0..4294967295
FramesDroppedDueUrxOverflow	Number of frames sent because of buffer underflow	0..4294967295

Table 24: “Status and Diagnosis” Page – Status NRT Ethernet side

7.3 “Configuration Network Settings” Page

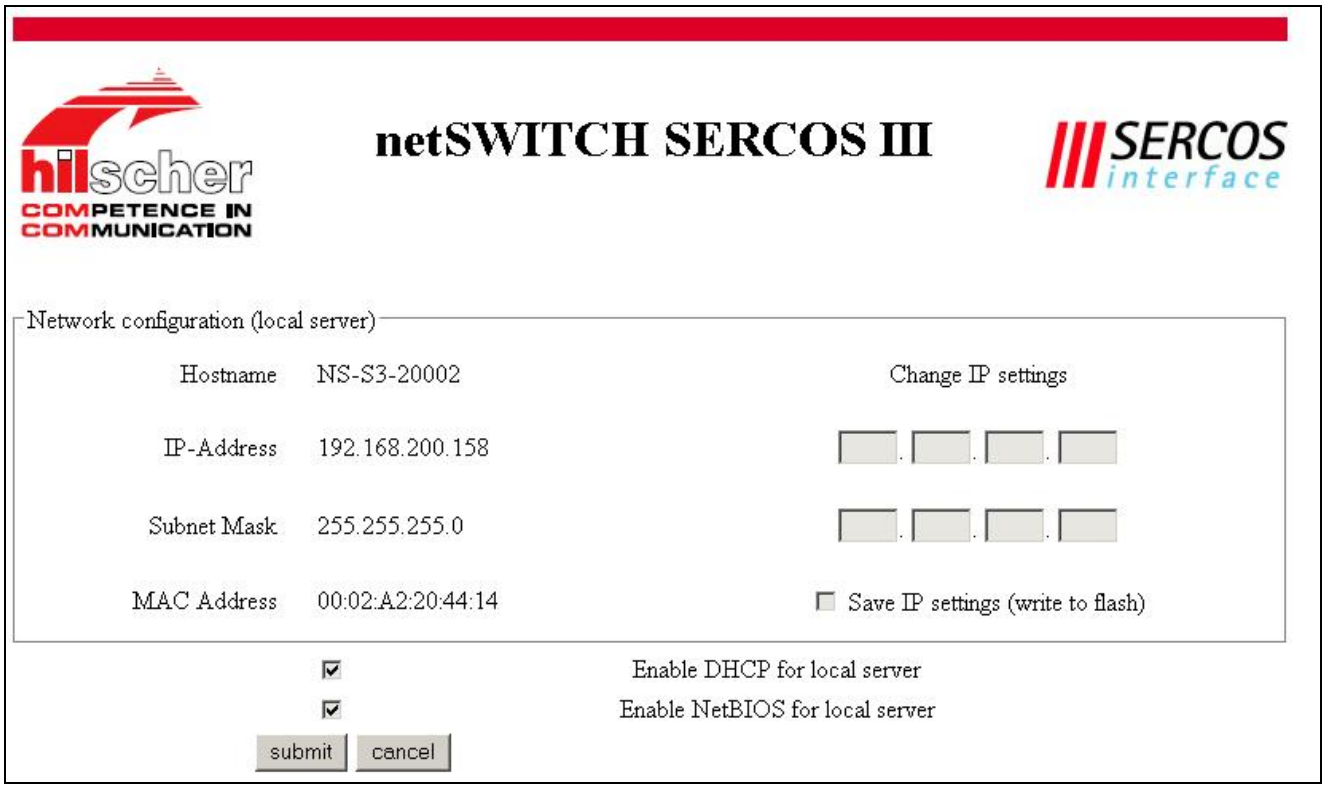


Figure 14: “Configuration Network Settings” Page

Parameter	Description	Value / Range of Values
Hostname	NetBIOS name of the device The NetBIOS name is only displayed and is not editable.	NS-S3-xxxxx (xxxxx .. Serial No. of the device)
IP-Address	In the fields under **IP-Address / Change IP settings** enter the IP address of the device. An IP address consists of 32 Bits (4 byte) and in each field 1 byte of the address must be entered.	0.0.0.0 .. 255.255.255.255
Subnet Mask	In the fields under **Subnet Mask / Change IP settings** enter the Subnet mask. A subnet mask consists of 32 Bits (4 byte) and in each field 1 byte of the address must be entered.	0.0.0.0 .. 255.255.255.255
MAC Address	For its identification in the network each device must have its unique MAC-ID. The MAC-address is only displayed and is not editable here.	0 … FF (per field)
Enable DHCP for local server	Put the DHCP functionality of the netSWITCH SERCOS III device on or off. (The setting is saved remanently and gets operative only after restart of the device.)	on/off
Enable NetBIOS for local server	Put the NetBIOS functionality of the netSWITCH SERCOS III device on or off. (The setting is saved remanently and gets operative only after restart of the device.)	on/off
Save IP settings (write to flash)	The IP settings are stored in the flash memory non-volatile.	
Controls		
submit	Configured parameter data are submitted to the device.	
cancel	The last entries are not applied.	

Table 25: "Configuration Network Settings" Page

7.4 “Resetting to Factory Settings” Page

Figure 15: “Resetting to Factory Settings” Page

Parameter	Description	Value / Range of Values
Reset device	Resetting to factory settings	on/off
Controls		
submit	Configured parameter data are submitted to the device.	
cancel	The last entries are not applied.	

Table 26: “Resetting to Factory Settings” Page

8 Configuration File on MMC Card

By default, the netSWITCH SERCOS III device stores the configuration parameters in the remanent Flash memory. The device offers also the possiblility to read the configuration parameters from a configuration file named `config.txt` from the MMC card, **instead of** reading parameters from the Flash memory.

Use the function **configuration file on MMC card**, when you replace a device without re-configuration. Use the MMC card from the "old" netSWITCH SERCOS III device in the "new" device or prepare an MMC card for case of replacing a device. Store the file `config.txt` in the root folder of the MMC card.

If you don't intent to use the the function "configuration file on MMC card" e.g. the device uses the parameters stored in the Flash memory, then verify that no configuration file `config.txt` is stored on the MMC card or if applicable delete the existing configuration file.

8.1 Configuration file format

The configuration file has following format:

```
keyword_a       value # comment
# comment
keyword_b       value # comment
...
```

The name of the configuration file is `config.txt` and the file content must be coded in ASCII format. The configuration file has the following keywords:

Parameters	keyword	Value / Range of Values
Network Settings		
IP-Address	ip_addr	0.0.0.0 .. 255.255.255.255
Subnet Mask	subnet_mask	0.0.0.0 .. 255.255.255.255
Gateway Address	gateway_addr	0.0.0.0 .. 255.255.255.255
Enable DHCP client	dhcp_en	1: on, 0: off
Enable NetBIOS service	netbios_en	1: on, 0: off
Timing parameters		
Configuring Timing Parameters manually	set_timings_man	1: on, 0: off
Start time NRT channel in CP0	t6_cp0	0 … < SERCOS III cycle time
End time NRT channel in CP0	t7_cp0	0 … < SERCOS III cycle time
Start time NRT channel in CP1/2	t6_cp12	0 … < SERCOS III cycle time
End time NRT channel in CP1/2	t7_cp12	0 … < SERCOS III cycle time
Start time NRT channel in CP3/4	t6_cp34	0 … < SERCOS III cycle time
End time NRT channel in CP3/4	t7_cp34	0 … < SERCOS III cycle time

Tabelle 1: Keywords in configuration file

Important:

The start time and end time NRT channel in CP0 to CP4 are only used by netSWITCH SERCOS III device if the option "Configuring Timing Parameters manually" is enabled:

```
set_timings_man    1
```

Important:

In case of configration file contains an error, e.g. unknown keyword or invalid value format, then the device ignores the whole file content and the device uses the parameters from the Flash memory.

Note:

Make sure that you use only parameters in the configuration file shall applied, as exemplary documented in section *Example 2: With IP Address, Subnet mask and without DHCP* on page 34.

8.2 Configuration file examples

8.2.1 Example 1: All Parameters

Example of configuration file with all applicable parameters:

```
# network configuration
ip_addr      192.168.0.158 # IP address
subnet_mask  255.255.255.0 # subnet mask
gateway_addr 0.0.0.0       # no gateway
dhcp_en      1             # 1/0 .. enable/disable DHCP client
netbios_en   1             # 1/0 .. enable/disable netBIOS service

# timing parameters
set_timings_man      1 # 1: t6/t7 for CP0..4 set manually
t6_cp0          650000 # apply only if set_timings_man is 1
t7_cp0          950000 # apply only if set_timings_man is 1
t6_cp12              0 # apply only if set_timings_man is 1
t7_cp12              0 # apply only if set_timings_man is 1
t6_cp34              0 # apply only if set_timings_man is 1
t7_cp34              0 # apply only if set_timings_man is 1
```

8.2.2 Example 2: With IP Address, Subnet mask and without DHCP

Example of configuration file with IP address and Subnet mask configured and DHCP client functionality disabled.

```
# fixed IP configuration
ip_addr      192.168.0.101 # IP address
subnet_mask  255.255.255.0 # subnet mask
dhcp_en      0             # disable DHCP client
```

9 Troubleshooting

How to proceed:

- Check, if the requirements for operation of the netSWITCH SERCOS III device are served:

- DC power supply with 24 V (18 - 30 V) output voltage
- Firmware on MMC card and MMC card plugged into the device
- SERCOS III Communication Master and at least one SERCOS III Slave
- Ethernet Cable
- PC with Ethernet connector for configuration and diagnosis
- Java capable Web browser
  (Java Runtime Environment (jre), Version 1.5 or higher)

Status LINK LED:

- Check using the LINK LED status, if a connection to the Ethernet is established.

For further information refer to chapter *LED* on page 15.

Configuration:

- Check the configuration.

9.1 Java Settings to access the netSWITCH SERCOS III

Java Runtime Environment:

Newer versions of the Java Runtime Environment block the default Applet support due to security reasons.

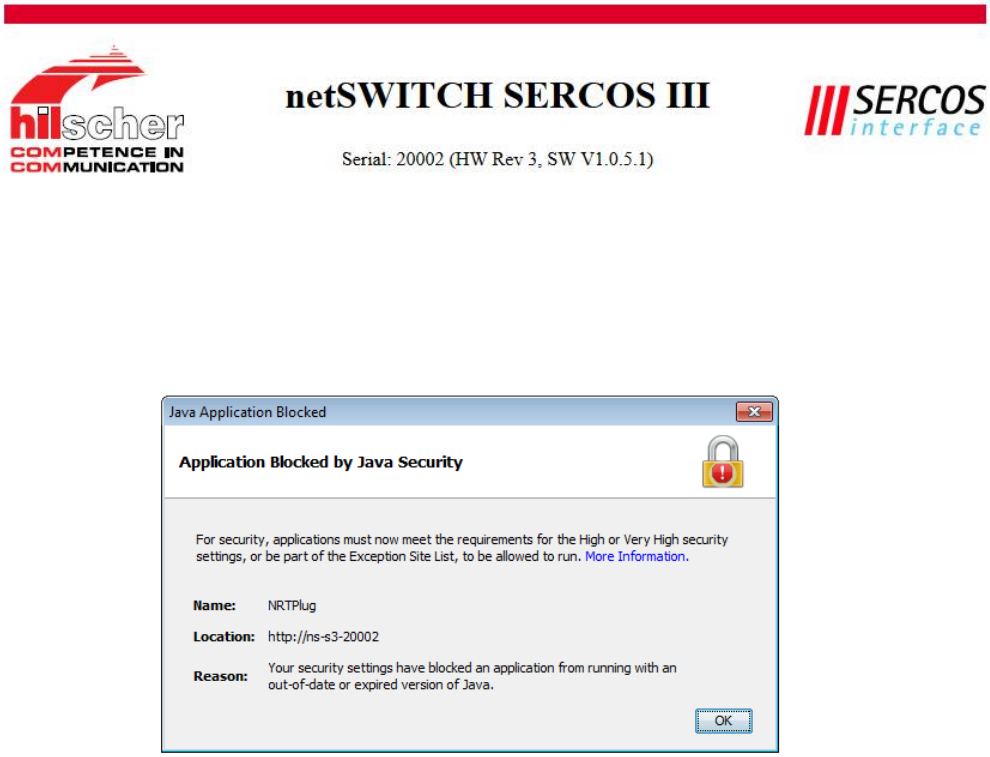


Figure 16: Blocked Java Application

The security policy file must be updated in order to execute the Applet.

- Open the `java.policy` file using a text editor. The path is (example) `C:\Program Files (x86)\Java\jre1.8.0_60\lib\security\` and contains the version number of the used Java.
- Add the following lines:

```
// Allow UDP communication of netSWITCH SERCOS III Applet
// Note: Please change IP address to match your netSWITCH
grant codeBase "http://192.168.0.158"
{
  permission java.security.AllPermission;
};
```

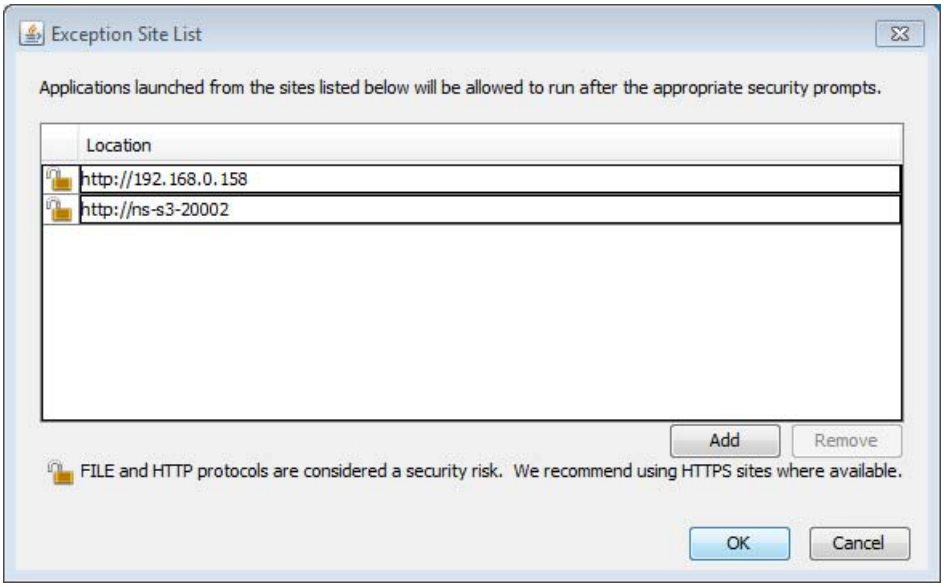
Additionaly, the server has to be added to the Java Exception Site List to allow explicitely the execution of applets from any web server like the NS-S3-1NRT.

- Open the **Java Control Panel**.
  Windows: Click **Start** > **Control Panel** > **Java**.
  Macintosh: Go to Systems Preferences and click on the Java button.
- Click the **Security** tab.
- Click **Edit Site List**.

↬ The **Exception Site List** windows opens.

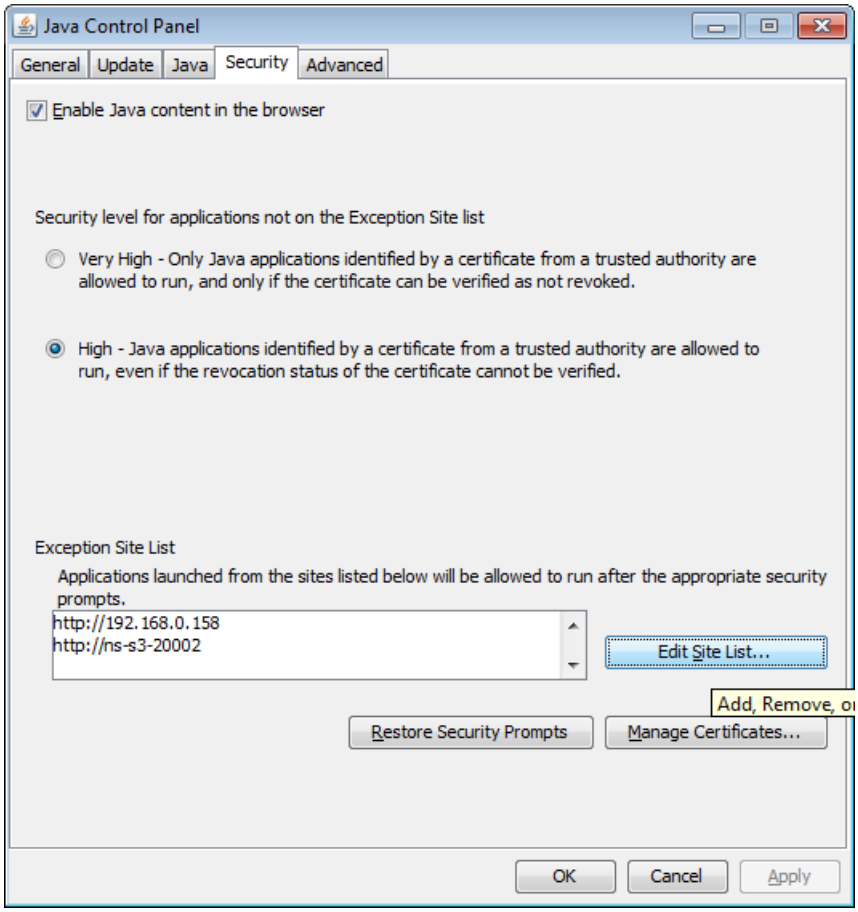
- Click **Add**.
- Enter the URL with the IP address of the NS-S3-1NRT into the empty location field, e.g. `http://192.168.0.158`
- Repeat this procedure and enter another URL with the NetBIOS name in the form `http://ns-s3-xxxxx`. Replace xxxxx with the serial number of your NS-S3-1NRT device, e.g. `http://ns-s3-20002`

↬ The Exception Site List contains two new URL entries.



- Click **OK**.

➪ The Exception Site List contains two new URL entries.



9.2 Java-Plug-in für web browser not supported

The Java plug-in for web browsers relies on the cross platform plugin architecture NPAPI, which has been supported by all major web browsers for over a decade. New versions of web browsers drop support for NPAPI e.g.

- Microsoft Internet Explorer Version 11 and higher
- Mozilla Firefox Version 52 and higher
- Google Chrome Version 45 and higher

If you use a web browser that does not support NPAPI then the following message is displayed when accessing the netSWITCH SERCOS III device:

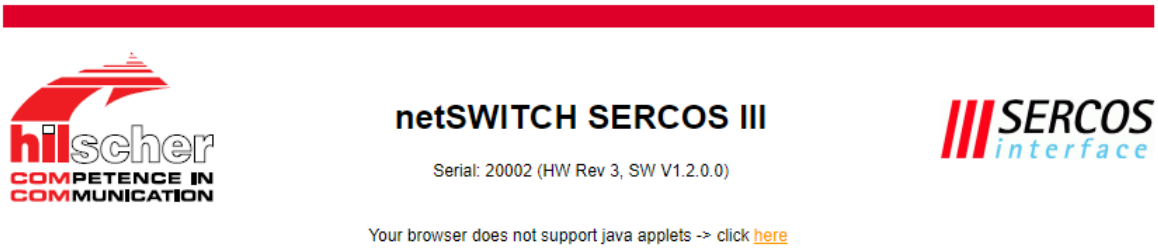


Figure 17: Web page "Browser does not support java applets"

➢ Click **here**.

➢ Following webpage appears:

Figure 18: "Status and Diagnosis" Page without Java support

➢ Click **refresh** to update status information.

Note:

This web page does not support automatical cyclic status information update.

10 Technical Data

Parameter	Value	
Item	NS-S3-1NRT, netSWITCH SERCOS III and one Ethernet port	
Function	Connects SERCOS III network with standard Ethernet network	
Communication	Throughput; SERCOS III Telegrams: Throughput time 600 ns Standard Ethernet Telegrams: Store-and-Foreword principle	
SERCOS III Interface	Controller	netX 500
	Transmission rate	100 MBit/s
	Interface	100BASE-TX full-duplex
	Connector	2x RJ45
Ethernet Interface	Controller	external PHY
	Transmission rate	10/100 MBit/s
	Interface	10BASE-T / 100BASE-TX full/half-duplex
	Connector	1x RJ45
Diagnostic Interface	via Ethernet	
LED	NS-S3-1NRT: SYS, APL, STA0, STA1, LINK, ACT	
Frame Memory	90 KByte	
Configuration, Diagnosis	via Web browser	
Power Supply	18 ... 30 V / 120 mA @ 24 V	
Connector	Mini COMBICON 2-pin	
Operating Temperature	0°C ... 50°C	
Dimensions (L x W x D)	100 x 52 x 70 mm	
Weight approx.	150 g	
CE Label	yes	
Emission	CISPR 11 Class A	
Interference Resistance	EN 61131-2: 2003	

Table 27: Technical Data netSWITCH SERCOS III

11 Glossary

AT

Drive Telegram

CP

SERCOS Communication Phase

DHCP

Dynamic Host Configuration Protocol

MAC Address

The MAC Address (MAC-ID) is the network address of the device.

MDT

Master Data Telegram

NetBIOS

Network Basic Input/Output System. The NetBIOS API allows applications on separate computers to communicate over a local area network.

netX

networX on chip, next generation of communication controllers

NRT

None Real Time

RT

Real Time

SERCOS

Serial Real-time Communication System

Store and forward

Communication technique. Telegrams are stored in a buffer and then are sent (forwarded).

t_6

Begin of NRT channel

t_7

End of NRT channel

UDP

User Datagram Protocol connectionless, verbindungsloses, ungesichertes Datenübertragungsprotokoll für Broad- und Multicast-Kommunikation

12 Appendix

12.1 List of Figures

12.2 List of Tables

12.3 References

[1] SERCOS III Communication V1.1.1.5

12.4 Legal Notes

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