ETH1000-SW-COM and ETH1000-SW-COM-PB User Manual

Revision: H

2020-12-01

ETH1000-SW-COM is a true IP networking card featuring encapsulation of multiple RS422/RS485/RS232 and GPI over IP together with a multi-port GbE switch with optical uplink.

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Contents

1 Nevion Support

Nevion Norway	**Nevion UK**
Lysaker Torg 5	Unit 11 Brewery Court, High Street,
1366 Lysaker, Norway	Theale Reading, Berkshire,
Support phone 1: +47 33 48 99 97	RG7 5AJ, United Kingdom
Support phone 2: +47 22 88 97 70	Support phone: +44 147 361 7379
Nevion USA	**Nevion APAC**
400 West Ventura Boulevard, Suite 155,	600 North Bridge Road,
Camarillo, CA 93010, USA	Singapore 188778
Support phone: +1 (805) 247-8560	Support phone: +65 31 63 54 93

E-mail: support@nevion.com

See http://www.nevion.com/support/ for service hours for customer support globally.

2 Revision History

Revision	Replace	Date	Sign	Change description
H	G	2020-12-01	AAA	**Chapter 1: Nevion Support** updated. Connector module ETH1000-SW-COM-C3 documented in **Section 5.3**. **Section 6.8** updated with multiple serial port matrix behaviors. **Section 6.9** updated with boot-up timing diagram. **Section 6.14** added to describe how to change used connector module. **Section 7.1** updated with new usage of LEDs. **Section A.2** added with a new quick guide. **Appendix C** Added to explain how to use ETH1000-SW-COM-C3.
G	F	2017-10-23	AAA	**Section 4.4** updated. Information about hw 2.0 added. Appendix about ETH1000-SW-COM-PB added.
F	E	2016-05-12	AAA	**Chapter 1**, **Section 3.1**, **Chapter 4** and **Table A.2** updated. **Section 6.10** added.
E	D	2015-06-29	AAA	**Chapter 4**, **Section 5.4**, **Section 6.5** and **Section 6.7** updated. **Appendix A** added.
D	C	2015-05-05	AAA	**Chapter 4**, **Table 5.1**, **Table 5.4**, **Chapter 6**, **Section 7.2** and **Chapter 8** updated.
C	B	2015-04-08	AAA	**Chapter 6** updated.
B	A	2015-02-25	AAA	**Table 5.4**, **Section 6.1** and **Section 6.6** updated.
A	-	2015-02-17	AAA	First release.

3 Product overview

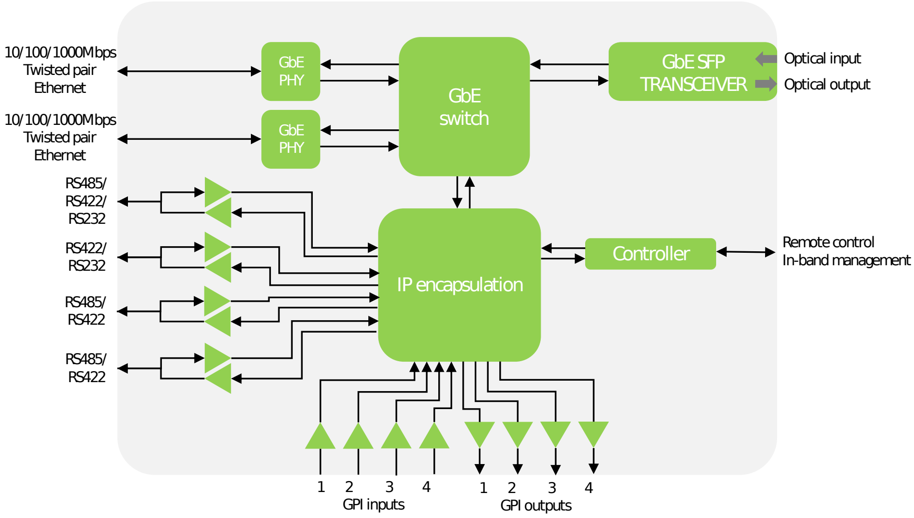

Figure 3.1 ETH1000-SW-COM block diagram

ETH1000-SW-COM provides a compact and powerful solution for transport of device control data for live productions. The IP protocol allows for remote control of multiple devices at different locations, such as cameras located in different arenas. The card can also be used for point-to-point transport of data over dark fiber networks.

The integration with Nevions extensive broadcast centric control surfaces covering configurable hardware panels and web panels makes the product easy to operate in live production applications.

ETH1000-SW-COM comes in two hardware variants, hw 1.0 and hw 2.0. Most of the functionality is the same for both of them, if not it will be specified in this manual. Hardware variants are reported to Multicon GYDA.

3.1 Key features

- 1x optical GbE uplink port
- 2x GbE port
- 4x serial ports for device control
- 4x GPI input and 4x GPI output ports for tally and joystick
- Supports optical and electrical IP network topology
- Built-in GbE switch

4 Specifications

Warning: When using a CWDM SFP, ETH1000-SW-COM need to be mounted in a frame with adequate airflow to avoid damage. On 11107 FR-2RU-10-2, external airflow support like 11131/11132 FR-FAN-1RU is recommended.

4.1 Engineering drawings

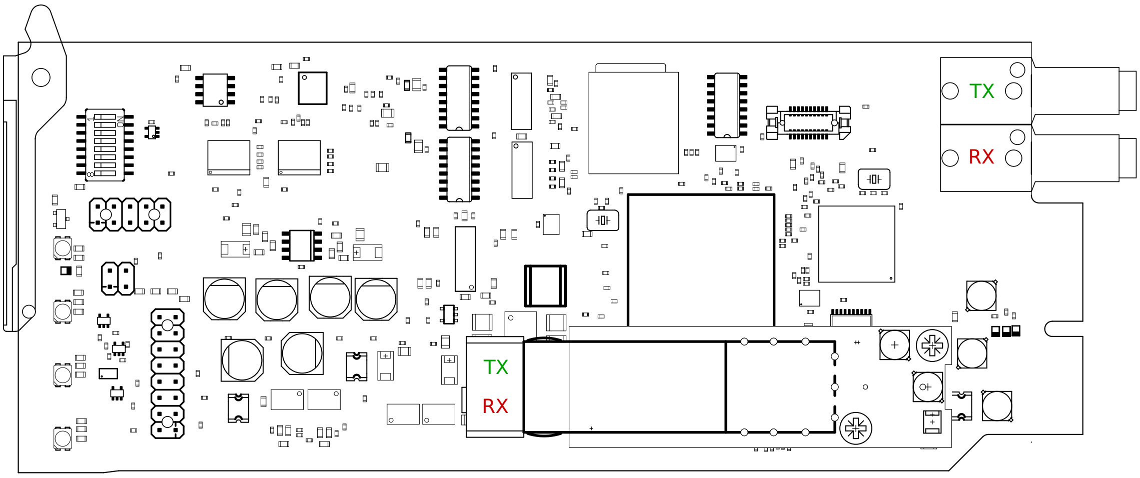

Figure 4.1 Top view of the hardware

4.2 General

User interface	Status LED, Status GPI, configuration DIP switches Web interface and SNMP thru Multicon controller
Temperature range	0°C to +40°C
Supported standards	IEEE802.3i, IEEE802.3u, IEEE802.3ab, IEEE802.3z
Ethernet switch bandwidth on hw 1.0	400 Mbits/sec
Ethernet switch bandwidth on hw 2.0	1 Gbits/sec

4.3 Power

	ETH1000-SW-COM no SFP	ETH1000-SW-COM single SFP	ETH1000-SW-COM-PB single SFP	ETH1000-SW-COM-PB double SFP
+15V	0.5W	0.5W	0.5W	0.5W
-15V	0.5W	0.5W	0.5W	0.5W
+5V	4.0W	5.0W	6.0W	7.0W

4.4 Optical Ethernet port

No of ports	1
Signal type	1000BASE-X
Connector	Dual SC/UPC
Optical system	Nevion's optical GbE tranceiver SFP range

4.5 Electrical Ethernet port

No of ports	2
Signal type	10BASE-T, 100BASE-TX, 1000BASE-T
Connector	8P8C modular jack (RJ45)

4.6 Serial data port

No of ports	4
Signal type	See **Table 6.5**
Connector	Molex KK 254 5pin
Supported bit rates	4800bps, 9600bps, 19200bps, 38400bps, 57600bps, 115200bps

4.7 GPI inputs

No of inputs	4
Signal type	Internal pull-up to 3.3V
Connector	Molex KK 254 5pin

4.8 GPI outupts

No of outputs	4
Signal type	Open collector transistor
Maximum voltage	30V
Maximum current	100mA
Connector	Molex KK 254 5pin

5 Connector modules

5.1 ETH1000-SW-COM-C1

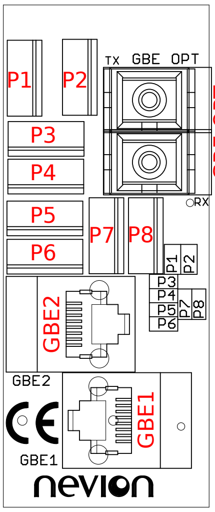

Figure 5.1 ETH1000-SW-COM-C1 connector module

Table 5.1 Connectors on ETH1000-SW-COM-C1

Label	Connector	Function	Notes
P1	Molex KK 254 5pin	GPI1	See **Table 5.5** for pinout.
P2	Molex KK 254 5pin		
P3	Molex KK 254 5pin	GPI2	See **Table 5.5** for pinout.
P4	Molex KK 254 5pin	Serial port 1	See **Table 6.5** for supported port modes and **Table 5.4** for pinout.
P5	Molex KK 254 5pin		
P6	Molex KK 254 5pin	Serial port 2	See **Table 6.5** for supported port modes and **Table 5.4** for pinout.
P7	Molex KK 254 5pin	Serial port 3	See **Table 6.5** for supported port modes and **Table 5.4** for pinout.
P8	Molex KK 254 5pin	Serial port 4	See **Table 6.5** for supported port modes and **Table 5.4** for pinout.
GBE1	8P8C modular jack (RJ45)	Electrical gigabit ethernet	
GBE2	8P8C modular jack (RJ45)	Electrical gigabit ethernet	
GBE OPT	Dual SC/UPC	Optical gigabit ethernet	

5.2 ETH1000-SW-COM-C2

ETH1000-SW-COM-C2 is a connector module with a relay between the electric ethernet ports. This is used for passive bypass, see **Appendix B** for more information.

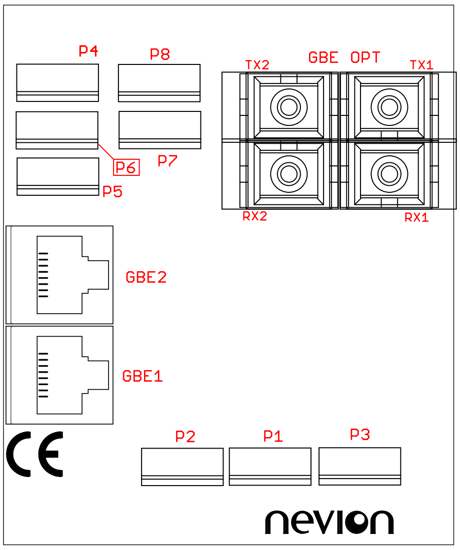

Figure 5.2 ETH1000-SW-COM-C2 connector module

Table 5.2.a Connectors on ETH1000-SW-COM-C2

Label	Connector	Function	Notes
P1	Molex KK 254 5pin	GPI1	See **Table 5.5** for pinout.
P2	Molex KK 254 5pin		
P3	Molex KK 254 5pin	GPI2	See **Table 5.5** for pinout.
P4	Molex KK 254 5pin	Serial port 1	See **Table 6.5** for supported port modes and **Table 5.4** for pinout.
P5	Molex KK 254 5pin		
P6	Molex KK 254 5pin	Serial port 2	See **Table 6.5** for supported port modes and **Table 5.4** for pinout.
P7	Molex KK 254 5pin	Serial port 3	See **Table 6.5** for supported port modes and **Table 5.4** for pinout.
P8	Molex KK 254 5pin	Serial port 4	See **Table 6.5** for supported port modes and **Table 5.4** for pinout.
GBE1	8P8C modular jack (RJ45)	Electrical gigabit ethernet	
GBE2	8P8C modular jack (RJ45)	Electrical gigabit ethernet	
GBE OPT TX1	SC/UPC	TX for optical gigabit ethernet	
GBE OPT RX1	SC/UPC	RX for optical gigabit ethernet	
GBE OPT TX2	SC/UPC	TX for optical gigabit ethernet	

Table 5.2.b Connectors on ETH1000-SW-COM-C2

Label	Connector	Function	Notes
GBE OPT RX2	SC/UPC	RX for optical gigabit ethernet	

5.3 ETH1000-SW-COM-C3

ETH1000-SW-COM-C3 is a connector module with relays on two serial ports and on the GPIO outputs. More about this in **Appendix C**.

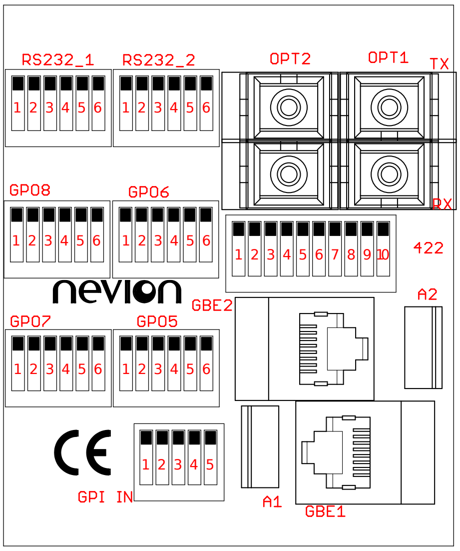

Figure 5.3 ETH1000-SW-COM-C3 connector module

Table 5.3.a Connectors on ETH1000-SW-COM-C3

Label	Connector	Function	Notes
RS232_1	PHOENIX CONTACT PTSA0,5/ 6-2,5-Z	Serial port 2	See **Figure 5.5** for pinout.
RS232_2	PHOENIX CONTACT PTSA0,5/ 6-2,5-Z	Serial port 1	See **Figure 5.5** for pinout.
422	PHOENIX CONTACT PTSA0,5/ 10-2,5-Z	Serial port 3 and 4	See **Table 5.6** for pinout.
GPI IN	PHOENIX CONTACT PTSA0,5/ 5-2,5-Z	GPI input 1-4	See **Table 5.7** for pinout.
GPO5	PHOENIX CONTACT PTSA0,5/ 6-2,5-Z	GPI output 1	See **Figure 5.6** for pinout.
GPO6	PHOENIX CONTACT PTSA0,5/ 6-2,5-Z	GPI output 2	See **Figure 5.6** for pinout.
GPO7	PHOENIX CONTACT PTSA0,5/ 6-2,5-Z	GPI output 4	See **Figure 5.6** for pinout.
GPO8	PHOENIX CONTACT PTSA0,5/ 6-2,5-Z	GPI output 3	See **Figure 5.6** for pinout.
A1	Molex KK 254 5pin		
A2	Molex KK 254 5pin		
GBE1	8P8C modular jack (RJ45)	Electrical gigabit ethernet	

Table 5.3.b Connectors on ETH1000-SW-COM-C3

Label	Connector	Function	Notes
GBE2	8P8C modular jack (RJ45)	Electrical gigabit ethernet	
OPT1 TX	SC/UPC	TX for optical gigabit ethernet	
OPT1 RX	SC/UPC	RX for optical gigabit ethernet	
OPT2 TX	SC/UPC	TX for optical gigabit ethernet	
OPT2 RX	SC/UPC	RX for optical gigabit ethernet	

5.4 Connector pin description.

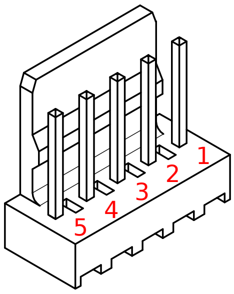

Figure 5.4 Molex KK 254 5pin connector pin numbering

Table 5.4 Serial port pinout

Pin number	Serial port mode			
	RS-422	4-wire RS-485	2-wire RS-485	RS-232
1	RX+	RX+	NC	RX
2	RX-	RX-	NC	NC
3	TX+	TX+	Data+	NC
4	TX-	TX-	Data-	TX
5	GND	GND	GND	GND

Table 5.5 GPI pinout

Pin number	Function	
	GPI1	GPI2
1	GPI output 2	GPI output 4
2	GPI output 1	GPI output 3
3	GPI input 2	GPI input 4
4	GPI input 1	GPI input 3
5	GND	GND

Table 5.6 Pinout on Serial port 3 and 4 when using ETH1000-SW-COM-C3.

Pin number	Function
1	GND
2	Serial port 3 - RX+
3	Serial port 3 - RX-
4	Serial port 3 - TX+
5	Serial port 3 - TX-
6	GND
7	Serial port 4 - RX+
8	Serial port 4 - RX-
9	Serial port 4 - TX+
10	Serial port 4 - TX-

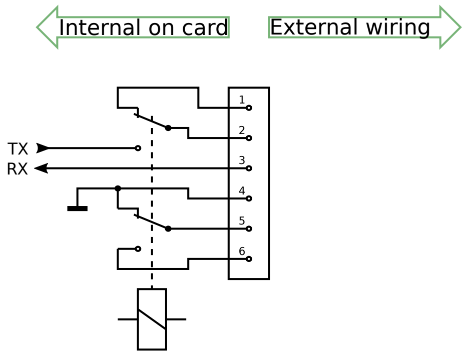

Figure 5.5 Pinout on RS232_1 and RS232_2 when using ETH1000-SW-COM-C3.

Table 5.7 Pinout on GPI inputs when using ETH1000-SW-COM-C3.

Pin number	Function
1	GPI input 1
2	GPI input 2
3	GPI input 3
4	GPI input 4
5	GND

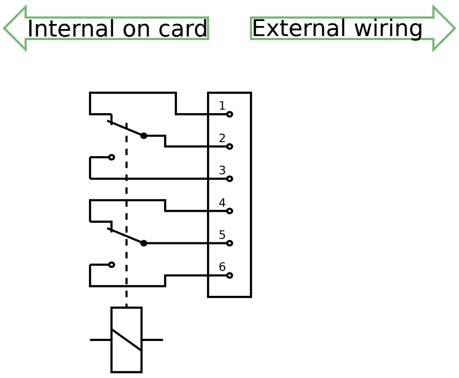

Figure 5.6 Pinout on GPI outputs when using ETH1000-SW-COM-C3.

6 Configuration

Note: Appendix A has some quick start guides that might be used when configuring typical systems.

The preferred way to configure ETH1000-SW-COM is by using Multicon GYDA. It is fully supported from Multicon GYDA release 5.0.1 and later. It is possible to configure using only DIP switches as well, but this will limit the functionality.

6.1 DIP switches

The DIP switches are located on the upper left corner of the board, see **Figure 6.1**. Please note that the rotation is different between hw 1.0 and hw 2.0. This results in different numbering and that the ON/OFF direction is swapped. This manual is using the name of the DIP switches instead of numbers when describing them. **Table 6.1** shows these names and an overview of what they are used for.

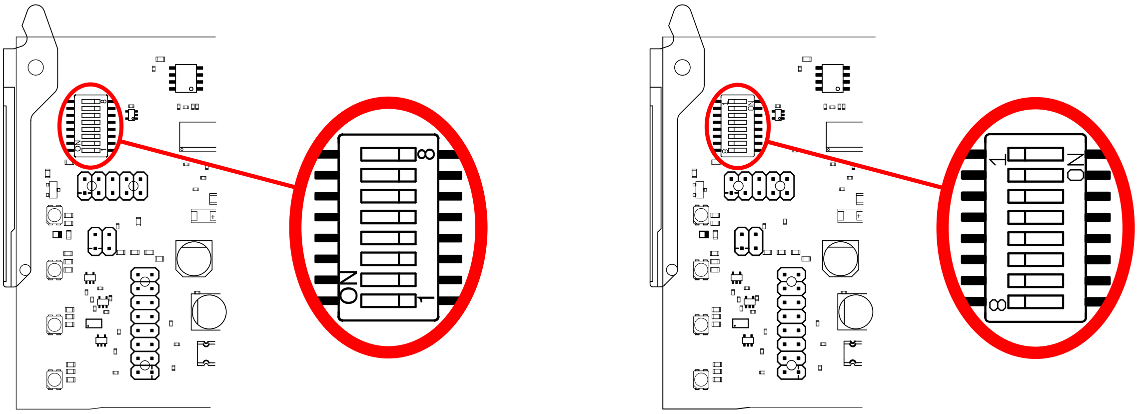

Figure 6.1 DIP switches on hw 1.0 (left image) and hw 2.0 (right image).

Table 6.1 Overview of DIP switches

DIP switch		Name	Function	ON	OFF (default)
hw 1.0	hw 2.0				
8	1	*bus_mode*	In-band management control bus mode	Master/controller	Slave/card
5-7	2-4	*group*	Position in card group, see Table 6.3. Only used if *override* DIP switch is ON.		
4	5				
3	6	*cfg_recovery*	Configuration recovery	Delete all configuration and use factory default.	Use last stored configuration.
2	7	*img_recovery*	Image recovery	Boot from factory default image.	Boot from latest image.
1	8	*override*	Multicon GYDA override	Configuration with DIP switches only.	Configuration with GYDA.

6.2 Example with multiple ETH1000-SW-COM cards

Multiple ETH1000-SW-COM cards can be configured to communicate with each other. Figure 6.2 is showing an example with three locations, each having at least one ETH1000-SW-COM card. The example will be used when explaining different configuration options in this chapter.

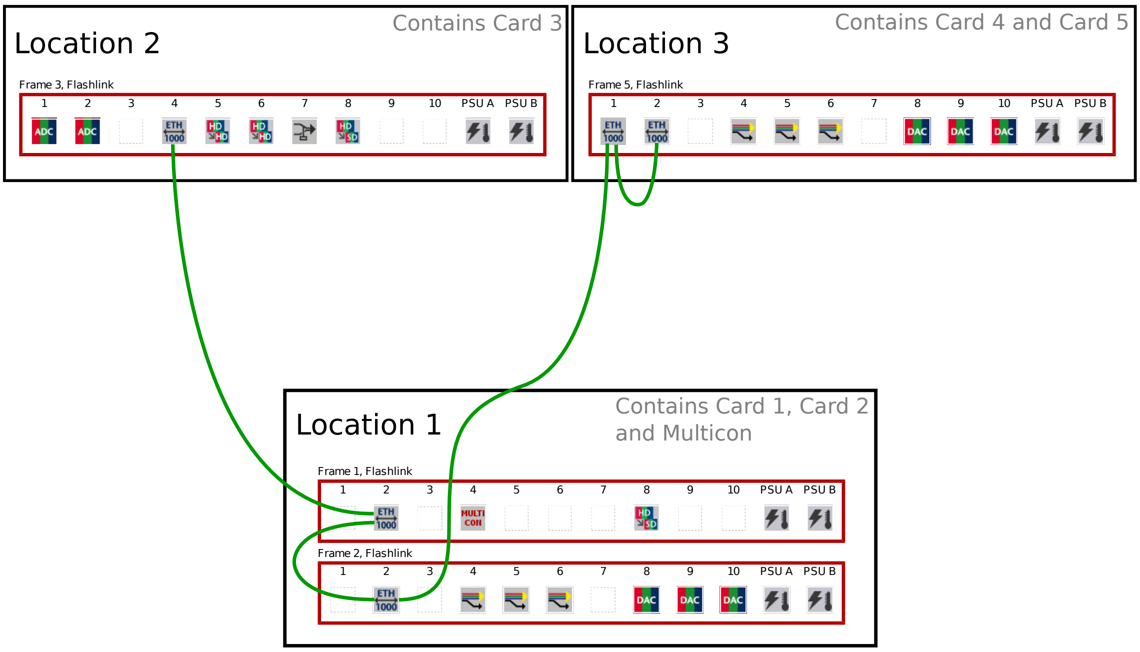

Figure 6.2 Example with multiple ETH1000-SW-COM cards in three locations.

6.3 Multicon GYDA override

"Multicon GYDA override" is controlled by *override* DIP switch. When activated (ON), it is not possible to use Multicon GYDA for configuration. Instead most configuration is fixed, and some can be changed by using DIP switches. The result is that two and two cards will be paired making a "link" between the ports on the connector module, P1 to P1, P2 to P2 and so on. Card 1 and card 2 will be paired, card 3 and card 4 will be paired, and so on. Up to eight cards can be used this way on the same network.

The different configuration settings is listed in **Table 6.2**. They will be explained in details later in this chapter.

Table 6.2 Configuration used when "Multicon GYDA override" is activated.

GBE1-2	**Speed**: Auto **Duplex**: Auto
Serial port 1-4	**Speed**: 115200 bps **Format**: 8 Data, No Parity, 1 Stop **Mode**: RS422
Local IP address	**Mode**: Static **IP address**: Same as IP address for the card specified by "position in card group". **Mask**: 24 **Gateway**: 192.168.1.254
Position in card group	Configured by *group* DIP switches, see **Table 6.3**.
Card 1 IP address	**Mode**: Static **IP address**: 192.168.1.1
Card 2 IP address	**Mode**: Static **IP address**: 192.168.1.2
Card 3 IP address	**Mode**: Static **IP address**: 192.168.1.3
Card 4 IP address	**Mode**: Static **IP address**: 192.168.1.4
Card 5 IP address	**Mode**: Static **IP address**: 192.168.1.5
Card 6 IP address	**Mode**: Static **IP address**: 192.168.1.6
Card 7 IP address	**Mode**: Static **IP address**: 192.168.1.7
Card 8 IP address	**Mode**: Static **IP address**: 192.168.1.8
In-band management	Disabled
Serial port matrix	Configured to make a "link" to the same ports on the card forming the same "pair".
GPI matrix	Configured to make a "link" to the same ports on the card forming the same "pair".

Table 6.3 Set position in card group with DIP switches.

hw 1.0			hw 2.0			Position in card group
SW7	SW6	SW5	SW2	SW3	SW4	
0	0	0	0	0	0	Card 1
0	0	1	0	0	1	Card 2
0	1	0	0	1	0	Card 3
0	1	1	0	1	1	Card 4
1	0	0	1	0	0	Card 5
1	0	1	1	0	1	Card 6
1	1	0	1	1	0	Card 7
1	1	1	1	1	1	Card 8

6.4 Factory default configuration

Default local IP configuration is:
Address: **192.168.1.1**
Netmask: **255.255.255.0**
Gateway: **192.168.1.254**

6.5 Group of cards

For ETH1000-SW-COM to create IP connections it must know the IP addresses of the other cards. A list of up to eight cards can be configured, including its own local IP address. These cards will form a group of cards.

Figure 6.3 shows a screenshot of how one of the cards in the example in Figure 6.2 is configured. The first line is used to set IP settings of the card. The IP address and netmask are using CIDR notation. The second line is telling where the card should be located in the group, in this case "Card 2". The rest of the lines are IP addresses to the other cards in the group. "Local IP address" is automatically copied to the correct line – depending on the current "Position in card group" setting. In this example it is copied to "Card 2 IP address".

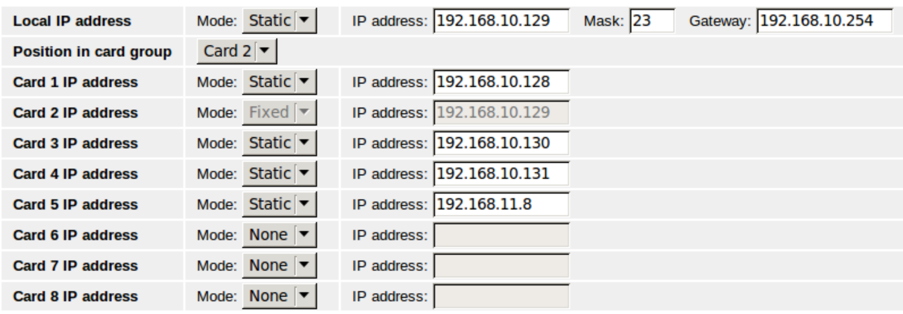

Figure 6.3 Screenshot showing "group of card" configuration.

The group of cards is used when setting up data links between the cards. **Figure 6.4** shows a screenshot of the GPI matrix on "Card 2". The inputs of the matrix consists of all the GPI inputs on all cards in the group. "GPI output 1" is switched to "Card 4 - 2". This will make the output follow "GPI input 2" on the card with IP address 192.168.10.131. "GPI output 2" is switched to "Card 2 - 4". As the screenshot is taken from "Card 2" this will make the output follow "GPI input 4" on the same card.

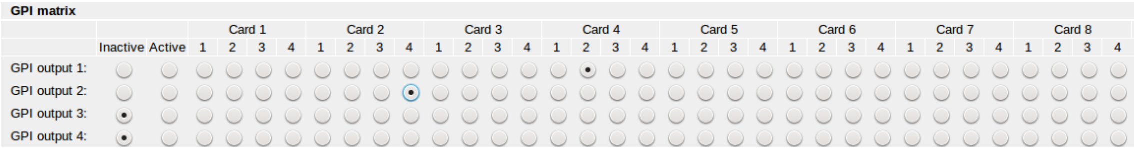

Figure 6.4 Screenshot of the GPI matrix

It is recommended to make the group of card list identical on all the cards. This will make the inputs on the matrices identical which makes it much easier to control.

6.6 In-band management

A Multicon GYDA can monitor & control up to 8 local frames via the RS-485 based Flashlink-bus. This means you normally need one Multicon GYDA for each location. With In-band management it is possible to extend the Flashlink-bus over IP. A single Multicon GYDA can then manage both local and remote frames.

In the example in **Figure 6.2**, location 1 has two ETH1000-SW-COM cards and one Multicon GYDA. Location 2 and 3 has one and two ETH1000-SW-COM cards, but no Multicon GYDA. In-band management can be configured to make all the cards on all the locations visible from Multicon GYDA in location 1.

The internal control bus in the frame can only have one master. In location 1 Multicon GYDA must be the master, and all ETH1000-SW-COM cards must be configured as slaves using *bus_mode* DIP switch. The frames in location 2 and 3 doesn't have a Multicon GYDA and will instead be controlled by Multicon GYDA in location 1. For this to happen, one ETH1000-SW-COM on each location must be configured as master using *bus_mode* DIP switch. In addition, one of the ETH1000-SW-COM cards in location 1 must be configured to connect to location 2 and 3. This is done on the Multicon GYDA web interface. **Figure 6.5** is showing the In-band management setup on one of the cards in location 1. The other cards in location 1 must have all set to "No". **Table 6.4** gives a summery of how the cards in the example can be configured.

Table 6.4 Configuration summary for the example

Card	Location	Local bus master	In-band management
Card 1	Location 1	No (*bus_mode* DIP switch OFF)	Configure as in **Figure 6.5**.
Card 2	Location 1	No (*bus_mode* DIP switch OFF)	Configure all to "No".
Card 3	Location 2	Yes (*bus_mode* DIP switch ON)	Not available.
Card 4	Location 3	Yes (*bus_mode* DIP switch ON)	Not available.
Card 5	Location 3	No (*bus_mode* DIP switch OFF)	Configure all to "No".

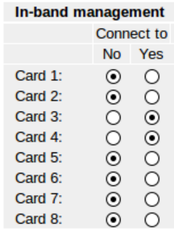

Figure 6.5 Screenshot showing In-band management configuration.

Warning: ETH1000-SW-COM doesn't do any address translation. All sub-racks must be configured with a unique frame address even if they are on different locations! See Multicon GYDA manual for more about setting frame address.

6.6.1 In-band management alarms

In-band management alarms will be activated if the card is configured to connect to another card, but is unable to establish the connection.

6.6.2 Setting local IP configuration on remote card.

Once in-band management is configured and working, the IP settings of both local and remote cards can be changed via the Multicon GYDA web interface.

Note: Changing the IP settings may break the in-band management. To avoid this, update the remote cards first, then the cards in the local frame.

When in-band management isn't configured, we have different possibilities. These are described in the sub-chapters below.

6.6.2.1 Temporary move card to local frame.

Make sure *bus_mode* DIP switch is set to slave/card and insert the card in the same frame as Multicon GYDA. Wait for the card to be detected and update local IP configuration. Then remove the card, update *bus_mode* DIP switch and insert it in the remote location.

6.6.2.2 Use ETH1000-SW-COM web page

ETH1000-SW-COM has a web server which can be used to configure IP settings using the following steps:

1. Use a computer configured with IP on the same range as the card and start a web browser.
2. Type the IP address of the card in the browsers URL, see **Section 6.4** for default IP address.
3. Choose "Network" from the first drop-down menu, see **Figure 6.6** for a screenshot.
4. Set the new IP settings and press "Update".

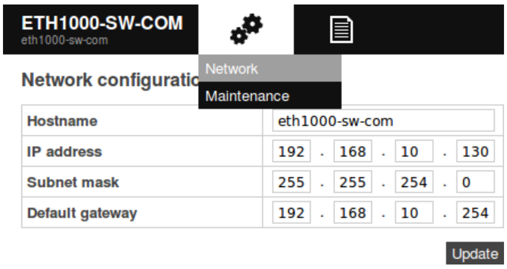

Figure 6.6 Screenshot showing how to configure local IP settings on own web page.

6.6.2.3 Use Multicon GYDA web page

Set the card in remote location and do the following steps:

1. Set IP address of ETH1000-SW-COM in local frame so it can reach the remote card. See **Section 6.4** for default IP settings.
2. Add current IP address of remote card to "group of cards" on local card.
3. Configure in-band management on local card to connect to remote card.
4. Wait until Multicon GYDA has detected the remote card.
5. Update local IP configuration on the remote card. This will break in-band management and the frame will then be lost in Multicon GYDA.
6. Reset IP address of local card back to original settings.
7. Update "group of cards" with the new IP address of the remote card.

Remote frame will now be detected again.

6.6.3 Multicon GYDA hot-swap procedure

Multicon GYDA will remember the settings on all cards it is controlling. If a card fails, it can be replaced and Multicon GYDA will automatically configure it with the same settings as the old card had.

When replacing ETH1000-SW-COM in a remote location, and new card has a different IP address then the old, the local card will not be able to reach it for in-band management. The IP configuration must be fixed manually as described in **Section 6.6.2**. If you choose to use the method described in **Section 6.6.2.3** please note that step 5 will be done by the hot-swap functionality in Multicon GYDA. You just have to wait for at least two minutes before continuing on step 6.

6.7 Serial port mode configuration

The serial ports can be configured to different modes as listed in **Table 6.5**. This configuration is done from Multicon GYDAs web interface.

Table 6.5 Supported modes for the serial ports.

Label	Function	Supported modes			
		RS-422	4-wire RS-485	2-wire RS-485	RS-232
P4	Serial port 1	yes	yes	yes	yes
P6	Serial port 2	yes	no	no	yes
P7	Serial port 3	yes	yes	yes	no
P8	Serial port 4	yes	yes	yes	no

6.8 Serial port matrix

The serial port matrix can behave in different ways. This can be configured by setting "Serial port matrix behavior".

> **Note:** When multiple ETH1000-SW-COM cards are configured to send serial data to each other, they must all be using the same serial port matrix behavior!

6.8.1 Serial port matrix behavior: Bidirectional one-to-one

Serial port matrix behavior [Bidirectional one-to-one ▼]

Figure 6.7 Setting serial port matrix behavior to bidirectional one-to-one.

Selecting different serial port matrix behaviors was introduced in firmware release 1.5.0. Earlier releases are always using bidirectional one-to-one behavior.

Figure 6.8 shows a block diagram showing this matrix behavior with two cards. Each card has four serial ports. Each serial port has a serial to IP bridge. The IP settings are configured in the serial matrix. If a serial port is configured as "Listen", the IP bridge for that serial port will be set to listen mode, waiting for other IP bridges to connect. Each IP bridge accepts one connection. If a serial port is configured to another card's serial port, the IP configuration will be set to connection mode and do a connection to that port.

The data between two connected serial to IP bridges is bidirectional, data will flow in both directions. As a listening serial to IP bridge will only accept one connection, it is not possible to send data from one port to multiple other ports.

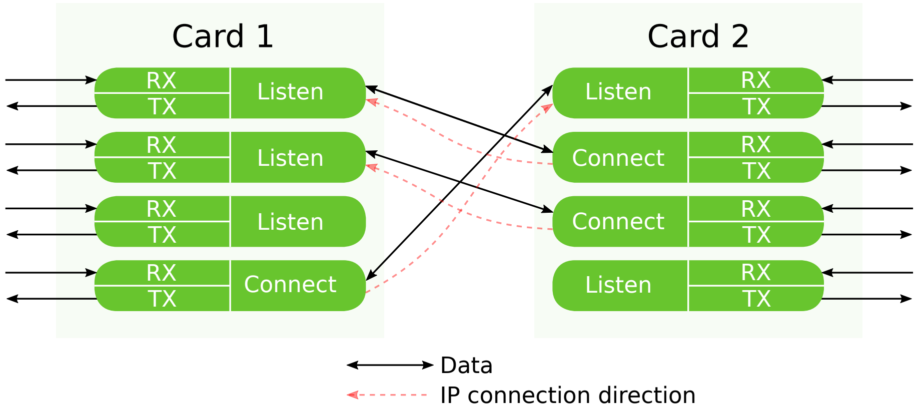

Figure 6.8 Block diagram of bidirectional one-to-one behavior.

Each card has its own serial port matrix. Many cards will give many matrices, but if configured smart by making the group of cards in the same order on all cards, it is possible to create a single virtual routing table to control them all. For more information on virtual routing tables, see Multicon User Manual and Nevion Configurator.

Figure 6.9 shows the serial port matrix for card 1 and **Figure 6.10** for card 2 to get the connections in example in **Figure 6.8**. The following connections are made:

- Serial port 1 on card 1 and serial port 2 on card 2 are connected:
  - Data in on serial port 1 on card 1 will be sent to serial port 2 on card 2.
  - Data in on serial port 2 on card 2 will be sent to serial port 1 on card 1.
- Serial port 2 on card 1 and serial port 3 on card 2 are connected:
  - Data in on serial port 2 on card 1 will be sent to serial port 3 on card 2.
  - Data in on serial port 3 on card 2 will be sent to serial port 2 on card 1.
- Serial port 4 on card 1 and serial port 1 on card 2 are connected:
  - Data in on serial port 4 on card 1 will be sent to serial port 1 on card 2.
  - Data in on serial port 1 on card 2 will be sent to serial port 4 on card 1.

Serial port matrix

		Card 1				Card 2				Card 3				Card 4				Card 5			
	Listen	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Serial port 1:	●	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 2:	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 3:	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 4:	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Figure 6.9 Serial port matrix for Card 1.

Serial port matrix

		Card 1				Card 2				Card 3				Card 4				Card 5			
	Listen	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Serial port 1:	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 2:	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 3:	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 4:	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Figure 6.10 Serial port matrix for Card 2.

6.8.2 Serial port matrix behavior: Unidirectional many-to-many

Figure 6.11 Setting serial port matrix behavior to unidirectional many-to-many.

When the serial matrix is configured to this behavior, the serial port is divided between RX and TX and the IP part is divided as one listener and one that connects. An IP listener is creating a bridge with RX. TX is creating a bridge with an IP block which might connect to another card. Figure 6.12 shows a block diagram showing this matrix behavior with two cards, each with four serial ports.

The data between two connected serial to IP bridges is unidirectional, data will flow in only one direction. To get a bidirectional path, two routes must be created, one for each direction. The IP listener accept multiple connections. This makes it possible to distribute serial data to multiple serial ports, end select which of these ports that should send return data.

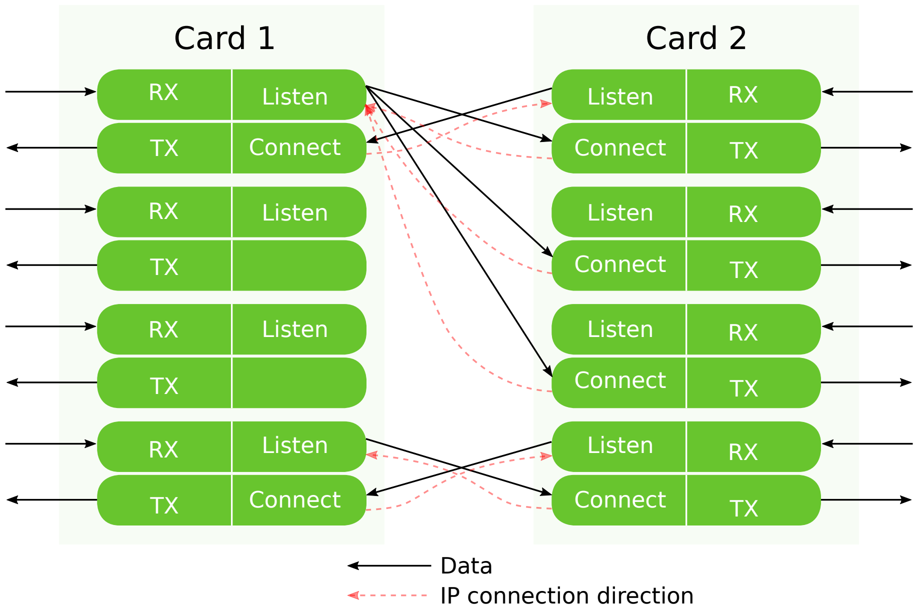

Figure 6.12 Block diagram of unidirectional many-to-many behavior.

The RX part of the serial to IP bridge will always listen for incoming connections, independent on the serial port matrix status. The "Listen" input is used when the TX part should not connect to anyone. It becomes like a "Disconnect" for the TX.

Figure 6.13 shows the serial port matrix for card 1 and Figure 6.14 for card 2 to get the connections in the example in Figure 6.12. The following connections are made:

- Serial port 1 on card 1 will be distributed to multiple ports on card 2. Return data comes from serial port 1:
  - Data in on serial port 1 on card 1 will be sent to serial port 1, 2 and 3 on card 2.
  - Data in on serial port 1 on card 2 will be sent to serial port 1 on card 1.

- Serial port 4 on card 1 and serial port 4 on card 2 are connected:
  - Data in on serial port 4 on card 1 will be sent to serial port 4 on card 2.
  - Data in on serial port 4 on card 2 will be sent on serial port 4 on card 1.

Serial port matrix

		Card 1				Card 2				Card 3				Card 4				Card 5			
	Listen	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Serial port 1:	○	○	○	○	○	◉	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 2:	◉	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 3:	◉	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 4:	○	○	○	○	○	○	○	○	◉	○	○	○	○	○	○	○	○	○	○	○	○

Figure 6.13 Serial port matrix for Card 1.

Serial port matrix

		Card 1				Card 2				Card 3				Card 4				Card 5			
	Listen	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Serial port 1:	○	◉	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 2:	○	◉	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 3:	○	◉	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 4:	○	○	○	○	◉	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Figure 6.14 Serial port matrix for Card 2.

6.9 GPI matrix

The GPI matrix acts like a traditional audio/video matrix where the GPI inputs are used as matrix input and GPI outputs are used as matrix output. An input can be routed to multiple outputs.

GPI outputs are open-collector. It requires an external pull-up resistor to archive a high level. The GPI matrix has two extra inputs where the GPI output can be set inactive (Level will be high if external pull-up is added) or active (Level will be low / GND).

When ETH1000-SW-COM is booting, GPI output 1 and 2 will be active for a period, see Figure 6.15. This occurs 1 - 1.5 seconds after the card starts booting. GPI output 3 and 4 will be inactive during the hole boot process.

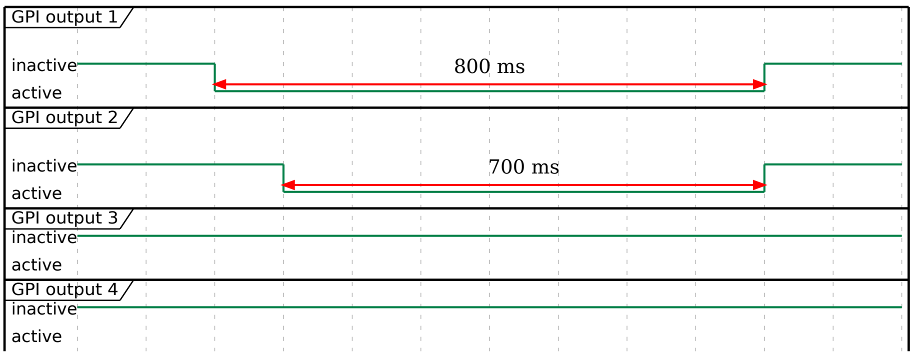

Figure 6.15 Timing diagram for GPI outputs during boot.

6.10 Ethernet interface

The electrical Ethernet interfaces are using auto-negotiation to establish link. Which link modes that will be advertised can be configured, see Table 6.6.

Note: Ethernet interface configuration is only available when using Multicon 5.1.1 or later.

Table 6.6 Ethernet interface auto-negotiation modes

Configuration		**— Advertised auto-negotiation**				
Speed	**Duplex**	**10baseT/Half**	**10baseT/Full**	**100baseT/Half**	**100baseT/Full**	**1000baseT/Full**
Auto	Auto	X	X	X	X	X
Auto	Half	X		X		
Auto	Full		X		X	X
10 Mbps	Auto	X	X			
10 Mbps	Half	X				
10 Mbps	Full		X			
100 Mbps	Auto			X	X	
100 Mbps	Half			X		
100 Mbps	Full				X	
1 Gbps	Auto					X
1 Gbps	Half					
1 Gbps	Full					X

6.11 Network configurations

If you want communication between ETH1000-SW-COM cards on different LANs, the firewall needs to be configured. Table 6.7 shows an overview of the IP ports used by ETH1000-SW-COM. You only needs to open the ports for the services in use.

Table 6.7 IP ports in use

Port	**Protocol**	**Direction**	**Description**
80	TCP	From PC to card	Web server
5010	TCP	From slave on control bus to master	In-band management
5500	TCP	Both directions	GPI
5511	TCP	Depends on serial port matrix	Serial port 1
5512	TCP	Depends on serial port matrix	Serial port 2
5513	TCP	Depends on serial port matrix	Serial port 3
5514	TCP	Depends on serial port matrix	Serial port 4
8080	TCP	From PC to card	WebSocket

6.12 Set configuration to factory default

Follow the steps below to erase all configuration and go back to factory default:

1. Pull out the card and activate *cfg_recovery* DIP switch.
2. Insert the card.
3. Wait until lower LED (D4, see **Figure 7.1**) is yellow and the other leds are off.
4. Pull out the card and disable *cfg_recovery* DIP switch.
5. Insert the card.

6.13 Restore to factory default image

If firmware upgrade fails, it is possible to go back to a factory default image. For this, do the following steps:

1. Pull out the card and activate *img_recovery* DIP switch.
2. Insert the card.
3. Wait until lower LED (D4, see **Figure 7.1**) is yellow and the other leds are off.
4. Pull out the card and disable *img_recovery* DIP switch.
5. Insert the card.

Note: Activating both "Configuration recovery" and "Image recovery" will reset the card to the state it had when shipped from factory.

6.14 Connector module variant

Multiple connector module variants are supported, as described in **Chapter 5**. Which variant that is used must be configured. When a new card is purchased with a connector module, this configuration is already set from factory. But if the card is later moved to another connector module variant, it needs to be updated. This can be done using Multicon GYDA by changing "Connector module".

Connector module [C1 - Single slot ▼]

Warning: Changing connector module will cause the card to restart. This will stop the data flow on some interfaces.

Note: If the connector module is configured incorrect, the slot position in Multicon GYDA might have a one slot offset from the physical location.

7 Operation

7.1 Front panel - status monitoring

There are 4 LEDs on the front side of the card, see **Figure 7.1**. How these LEDs are used can be configured by setting "Front LED usage".

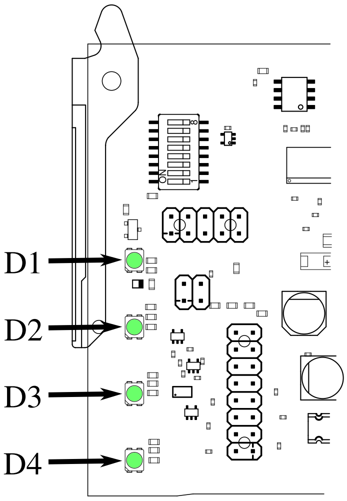

Figure 7.1 Location of the LEDs

7.1.1 Front LED usage: Normal

When "Front LED usage" is configured to "Normal", the LEDs are used to show general state of the card. **Table 7.1** shows what each LED indicates.

Selecting "Front LED usage" was introduce in firmware release 1.5.0. Older firmware releases will behave like "Normal" was selected.

Table 7.1 LED statuses in normal operation

	Red LED	Yellow LED	Green LED	No light
D1 Card status	Card error	Not applicable	Overall status of the card is OK	Card has no power, or is not inserted correctly
D2 Status on GBE1	Link, 10 Mb/s	Link, 100 Mb/s	Link, 1 Gb/s	No link
D3 Status on GBE2	Link, 10 Mb/s	Link, 100 Mb/s	Link, 1 Gb/s	No link
D4 Status on GBE OPT	Not applicable	Not applicable	Link, 1 Gb/s	No link

7.1.2 Front LED usage: Signal present serial inputs/outputs

When “Front LED usage” is configured to “Signal present Serial inputs” or “Signal present Serial outputs” the front LEDs are used to show the signal present on the serial ports. D1 shows the status on “Serial port 1”, D2 on “Serial port 2”, and so on.

When LED is green, signal is present. When LED is off, signal is missing.

For the input, signal is defined as present as soon as data is received on the serial port. When no data has been received for the last 20 seconds, signal is defined as missing.

For the output, signal is defined as present when data is written to the serial port. When nothing has been written for the last 20 seconds, signal is defined as missing.

7.1.3 Special card states

When ETH1000-SW-COM is in special states, the LED statuses will be overridden. **Table 7.2** shows the LED statuses it will have in these states.

Table 7.2 Special LED statuses

D1	D2	D3	D4	Description
Red	Off	Off	Off	Card error.
Off	Off	Off	Off	Unable to start bootloader. MicroSD card is missing or does not have the software installed.
Yellow	Yellow	Yellow	Yellow	Same as above.
Yellow	Off	Off	Off	Bootloader is running.
Off	Yellow	Off	Off	Operating system is booting.
Off	Off	Off	Yellow	Operating system is halted.
Blink yellow	Blink yellow	Blink yellow	Blink yellow	“Locate Card” is activated. See Multicon user manual for details.

7.2 Firmware upgrade

ETH1000-SW-COM can be upgraded as any other Flashlink card using Multicon GYDA. It will send the data over the management bus and will take aproximately one hour. During this time, the card will function as normal. When the upgrade is completed, the card will reboot automatically.

ETH1000-SW-COM contains a web server that also can be used for firmware upgrade. If you have a PC with a web browser on the same network as ETH1000-SW-COM, this is a good alternative. The card will work as normal during firmware upgrade and when done, the user must manually ask the card to reboot. This alternative methode is much faster then upgrading using Multicon GYDA. Select “Maintenance” from the first drop-down menu, see **Figure 7.2** for a screenshot.

Note: Cards with firmware 1.0.0 can't handle big upgrade files. All firmware files from 1.1.0 and later are too big for it. To upgrade these cards, first upgrade to 1.0.1, and then upgrade to the latest firmware.

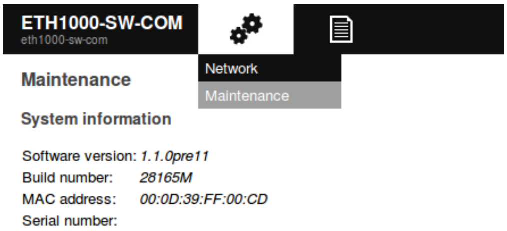

Figure 7.2 Screenshot showing firmware upgrade.

If firmware upgrade failes, it is possible to go back to factory default image. This is described in **Section 6.13**.

It is also possible to upgrade firmware by writing a new image on the microSD card. More about this in **Appendix D**.

8 General environmental requirements

1. The equipment will meet the guaranteed performance specification under the following environmental conditions:
   - Operating room temperature range: 0°C to 45°C
   - Operating relative humidity range: <90% (non-condensing)
2. The equipment will operate without damage under the following environmental conditions:
   - Temperature range: 10°C to 55°C
   - Relative humidity range: <90% (non-condensing)

9 Product Warranty

The warranty terms and conditions for the product(s) covered by this manual follow the General Sales Conditions by Nevion, which are available on the company web site:
http://www.nevion.com

Appendix A Quick start guides

A.1 Quick start: In-band management

Challenge	Multicon GYDA is used to manage all the Flashlink cards on a location. An ETH1000-SW-COM is used to create an ethernet connection to another ETH1000-SW-COM on another location. It isn't any Multicon GYDA on that location. Instead the management bus can be extended to make Multicon GYDA on the first location manage the cards on both locations. This can be done by configuring in-band management on the ETH1000-SW-COM cards.
Goal	Configure the ETH1000-SW-COM cards with in-band management.
Starting point	Both ETH1000-SW-COM has factory default configuration.
Requirements	- Optical or copper cable to establish an ethernet link between the locations. - A computer with WEB browser connected to the same network as Multicon Gyda.

A minimum knowledge of Multicon GYDA web interface is required to complete this guide. See Multicon GYDA manual for more information.

In this guide we assume that monitoring of the system will be done on the location where Multicon GYDA is installed, and we will call this "local location". The location without Multicon GYDA we will call "remote location". This will give us a system as illustrated in Figure A.1.

Figure A.1 In-band management

Note: We don't need to have an ethernet connection between Multicon GYDA and ETH1000-SW-COM on local location. The management bus inside the frame will make Multicon GYDA capable of configuring all the cards in the location including ETH1000-SW-COM.

We assume that both ETH1000-SW-COM cards have factory default configuration. **Table A.1** shows configuration relevant to in-band management for the cards. If your cards has different or unknown settings, it is possible to get factory default configurations as explained in **Section 6.12**.

Table A.1 Settings relevant for inband-management while starting.

Location	IP settings	Local bus master	In-band management
Local	192.168.1.1/24 192.168.1.254	No (DIP switch 8 OFF)	All configured to "No".
Remote	192.168.1.1/24 192.168.1.254	No (DIP switch 8 OFF)	All configured to "No".

The Flashlink cards on both locations can be installed as normal, but when using in-band management some extra attention is needed. On remote location, do the following steps:

1. Set the frames' addresses. Each frame must have unique address for both locations, i. e. no frame on remote location can have the same address as a frame on local location.
2. Make ETH1000-SW-COM master on the frame's local control bus by setting DIP switch 8 to "ON".
3. Connect ETH1000-SW-COM to the optical or copper cable going to the other location.

On local location, do the following steps:

1. Set the frames' unique addresses.
2. Make sure ETH1000-SW-COM isn't master on frame's local control bus, DIP switch 8 must be "OFF".
3. Connect ETH1000-SW-COM to the optical or copper cable going to the other location.
4. Verify that the ethernet link between the two locations is working by checking the LEDs on ETH1000-SW-COM. If not, check the cable.
5. Connect a PC to the same LAN as Multicon GYDA.

Now the hardware should be set up correctly and we have an ethernet link between the locations. On the next steps Multicon GYDA web interface is used:

1. Open a web browser and type the IP address of Multicon GYDA in the URL[1 2].
2. Verify that all the cards in local location is detected by Multicon GYDA.

[1] Factory default IP address on Multicon GYDA is 192.168.0.10.
[2] Nevion Configurator can be used to detect Multicon GYDA's IP address

3. As seen in **Table A.1**, both ETH1000-SW-COM cards has the same IP address. This must be fixed before in-band management can be configured. On Multicon GYDA web interface, select ETH1000-SW-COM and set “Local IP address” to 192.168.1.2
4. Set “Card 2 IP address” - “Mode” to “Static” and press the save button.
5. Add the IP address on the remote ETH1000-SW-COM, which is still 192.168.1.1, to “Card 2 IP address” - “IP address”.
6. In the “In-band management” matrix, configure it to connect to “Card 2”.

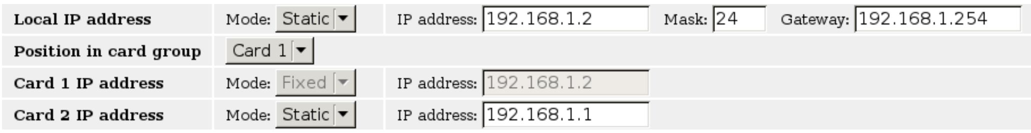

Figure A.2 Screenshot showing current settings on local location.

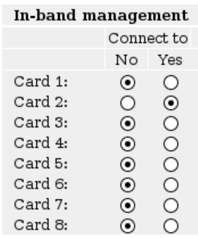

Figure A.3 Screenshot showing In-band management configuration on local location.

After pressing the save button, the configuration should look like the screenshots in **Figure A.2** and **Figure A.3**. In-band management should be working and all the Flashlink cards on the remote location should soon be visible in Multicon GYDA web interface.

In-band management is working, but the remote ETH1000-SW-COM still has factory default IP settings, and local ETH1000-SW-COM has an IP address on the same range. If other IP settings are needed, do the following steps on Multicon GYDA web interface:

1. Select the remote ETH1000-SW-COM. Set “Local IP address” to selected IP settings for this card. In our example we are using 10.10.10.2. Press the save button. The two ETH1000-SW-COM cards are now on different IP ranges, and in-band management will be broken, and all cards from remote location will be removed from Multicon GYDA web interface.
2. Select local ETH1000-SW-COM and set “Local IP address” to selected IP settings for this card. In our example we are using 10.10.10.1.
3. Update “Card 2 IP address” - “IP address” with the IP address on the remote card, in our example 10.10.10.2.

After pressing the save button, the configuration on ETH1000-SW-COM in local location should look like the screenshot in **Figure A.4**. In-band management should be working again and Multicon GYDA will be able to control all cards on both locations. **Table A.2** shows the settings on the ETH1000-SW-COM cards after configuration.

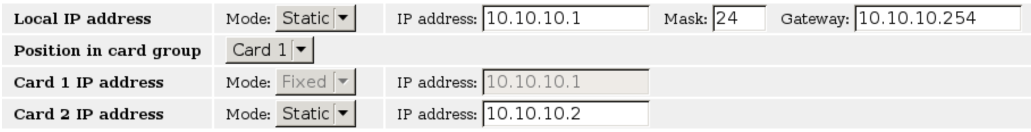

Figure A.4 Screenshot showing settings on local location.

Table A.2 Settings on the two ETH1000-SW-COM cards after configuration.

Location	IP settings	Local bus master	In-band management
Local	10.10.10.1/24 10.10.10.254	No (DIP switch 8 OFF)	As in **Figure A.3**
Remote	10.10.10.2/24 10.10.10.254	Yes (DIP switch 8 ON)	All configured to "No".

While it is not required for in-band management, it is highly recommended to have identical "Group of cards"-lists on all ETH1000-SW-COM cards that is communicating with each other. ETH1000-SW-COM in the local location already has a list. The will get the same list on remote location by doing the following steps:

1. On Multicon GYDA web interface, select the remote ETH1000-SW-COM.
2. Set "Position in card group" to "Card 2" and press save button. This will copy the card's IP address to "Card 2 IP address".
3. Set "Card 1 IP address" - "Mode" to "Static" and press save button.
4. Set "Card 1 IP address" - "IP address" to the IP address of ETH1000-SW-COM in local location. In our example this will be "10.10.10.1". Press save button

Figure A.5 shows a screenshot of the settings on remote location. Comparing it with **Figure A.4** shows that the two ETH1000-SW-COM cards now have identical "Group of cards"-lists.

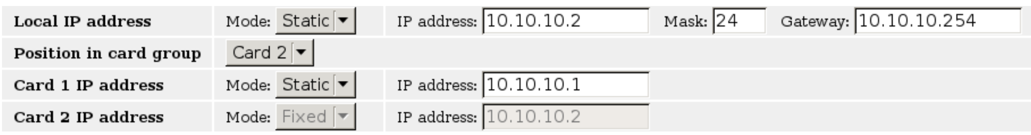

Figure A.5 Screenshot showing settings on remote location.

A.2 Quick start: Serial ports many-to-many.

Challenge	Distribute serial data from one source to multiple destinations.
Goal	Configure ETH1000-SW-COM cards to distribute serial data to multiple receivers over a network.
Starting point	ETH1000-SW-COM cards with factory default configuration.
Requirements	- Network connecting all ETH1000-SW-COM cards. - One ore more Multicon Gyda capable to configure all ETH1000-SW-COM cards. - A computer with WEB browser connected to the same network as the Multicon Gyda cards.

This guide will explain how to distribute serial data from one source to multiple destination. Figure A.6 shows a simple block diagram where one ETH1000-SW-COM card is sending data to three receiving cards.

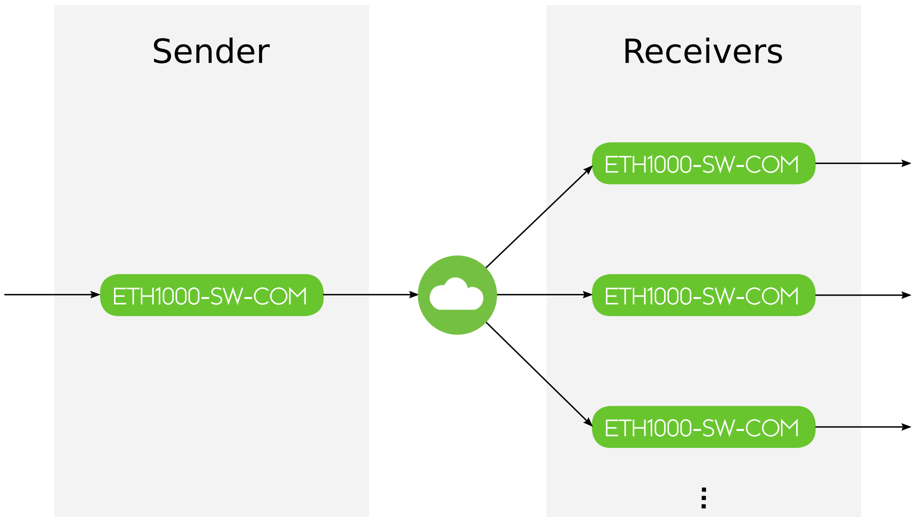

Figure A.6 Sending data from a single sender to multiple receivers.

Serial port matrix has multiple ways it can behave. To be able to distribute to multiple receivers, the behavior must be capable of accepting connections from multiple cards. In this guide we will use serial port behavior “Unidirectional many-to-many”. All ETH1000-SW-COM must be set to this behavior.

Figure A.7 Setting serial port matrix behavior to unidirectional many-to-many.

Configuration of IP addresses to create a group of cards, with equal list order on all the cards, is normally the best choice. It makes it easier to create a virtual matrix to control all cards form a single place. It will also limit the number of cards to eight. In this quick start guide, we will be able to send data to more then eight cards. To archive this we will have individual IP address list for each card.

A.2.1 Configure ETH1000-SW-COM card on sender side

In this setup, the sender will wait for the receivers to connect to it. It doesn’t need the IP addresses to the other cards, so the IP address setup will only include itself, like in Figure A.8.

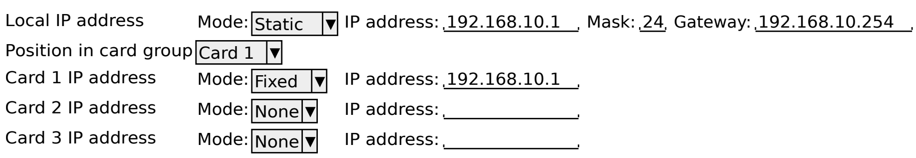

Figure A.8 Configuration of IP addresses on sender card.

A.2.2 Configure ETH1000-SW-COM cards on receiver side

The receivers needs two IP addresses in the list, its own and the sender. In this guide we will set the sender as “Card 1 IP address” and let all receiver cards be “Card 2”. Figure A.9 and Figure A.10 shows the configuration for two receiver cards. The other receiver cards will be equal, except with a unique local IP address.

Local IP address Mode: Static IP address: 192.168.10.2 Mask: 24 Gateway: 192.168.10.254
Position in card group Card 2
Card 1 IP address Mode: Static IP address: 192.168.10.1
Card 2 IP address Mode: Fixed IP address: 192.168.10.2
Card 3 IP address Mode: None IP address:

Figure A.9 Configuration of IP addresses on a receiver card.

Local IP address Mode: Static IP address: 192.168.10.3 Mask: 24 Gateway: 192.168.10.254
Position in card group Card 2
Card 1 IP address Mode: Static IP address: 192.168.10.1
Card 2 IP address Mode: Fixed IP address: 192.168.10.3
Card 3 IP address Mode: None IP address:

Figure A.10 Configuration of IP addresses on another receiver card.

As all the receiver cards are configured to have the sender card in position one, the serial port matrix can be the same for all of them. Figure A.11 shows a configuration where the receiver will get data from the sender’s “Serial port 1” and put that on it’s own “Serial port 1”.

Serial port matrix

		Card 1				Card 2				Card 3				Card 4				Card 5			
	Listen	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Serial port 1:	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 2:	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 3:	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Serial port 4:	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Figure A.11 Serial port matrix for the receiver cards.

Appendix B ETH1000-SW-COM-PB

ETH1000-SW-COM-PB is a special variant of ETH1000-SW-COM with passive bypass. A pair of ETH1000-SW-COM-PB can be used to create an ethernet link with 1+1 redundancy, see **Figure B.1**. To archive this, the ethernet switch inside ETH1000-SW-COM is configured in a special way to form a block which duplicate and select the data.

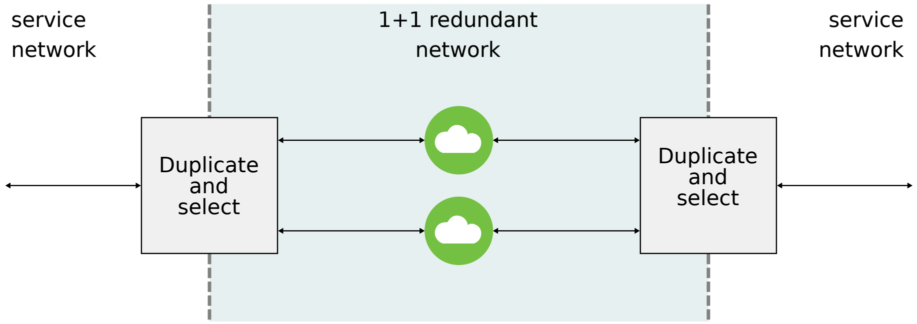

Figure B.1 Redundant network

Figure B.2 shows the principals of the duplicate and select block. Data received on Eth1 will be duplicated and sent to both Eth2 and Eth3. Data received on Eth2 and Eth3 will continuously be monitored. Based on this, one of them will be selected, and the received data from it will be send to Eth1.

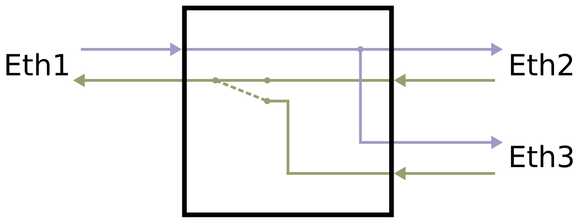

Figure B.2 Principals of the duplicate and select block

To make sure ETH1000-SW-COM-PB will not be a single point of failure, it is important to have a passive bypass mechanism. This will connect the line from the service network with one of the lines in the redundant network if ETH1000-SW-COM-PB looses power. ETH1000-SW-COM-PB supports two passive bypass modes, copper and optical, see **Section B.1** and **Section B.2**.

B.1 Copper bypass

ETH1000-SW-COM-PB is using the ETH1000-SW-COM-C2 connector module which supports two optical and two electrical ethernet ports. The electrical ethernet ports have a relay in between which can be used to pass the data through on power failure.

The relay will shortcut GBE1 and GBE2 when power is lost. On power-up it will still shortcut the ports until all needed configuration is completed.

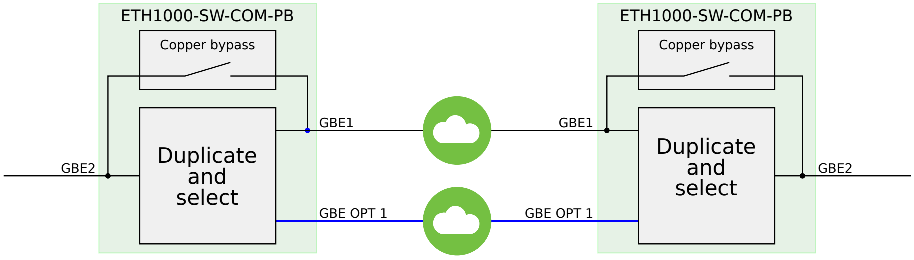

Figure B.3 Redundant network with copper bypass

ETH1000-SW-COM-PB is splitting the ethernet switch in two parts. Three interfaces are used in the duplicate and select block, and one interface is connected to the IP encapsulation block, see **Figure B.4**. No data will be sent between these two parts.

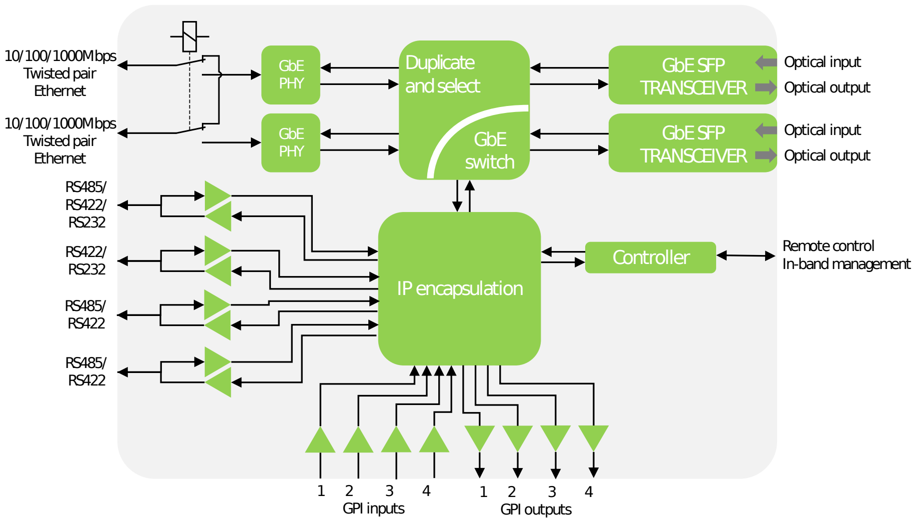

Figure B.4 ETH1000-SW-COM block diagram when using copper bypass

Note: GPI output 4 is used to control the bypass relay. This is handled automatically and manual control is not possible.

B.1.1 Boot process with copper bypass

When ETH1000-SW-COM-PB is powering up, the ethernet switch will include all interface, but the bypass relay will disconnect the electric interfaces. The result is that the optical interfaces and the IP encapsulation block will be part of the switch, see **Figure B.5**. It will typically take eight seconds from the card is powered up until it is ready.

Warning: The optical interfaces will be on the same ethernet switch at boot time when copper bypass is used. If they are connected to the same network, they will create a loop. If they are connected to different networks, they will connect the networks together.

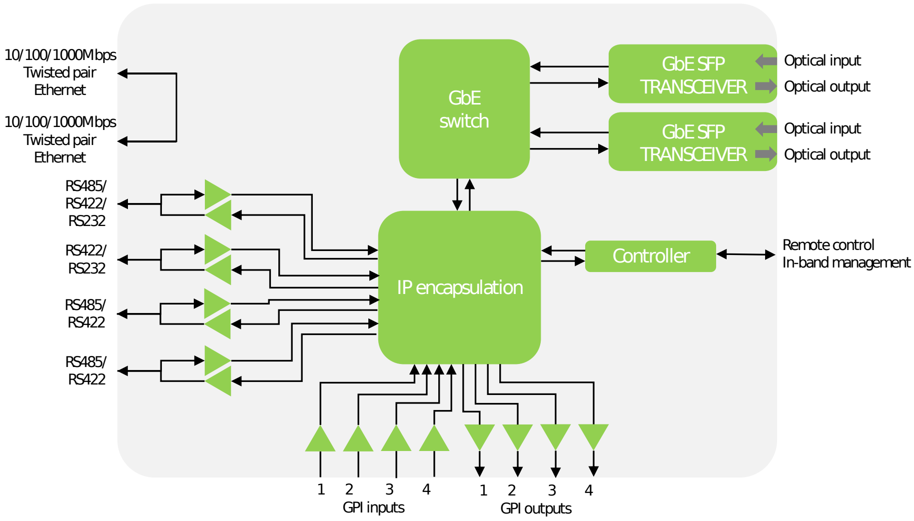

Figure B.5 ETH1000-SW-COM block diagram when booting

B.2 Optical bypass

Optical bypass is archived by using two WOS-2x2U cards, see **Figure B.6**. The optical switch on the WOS-2x2U cards are controlled from ETH1000-SW-COM-PB using GPI output 4. If power is lost, the optical switch will bypass ETH1000-SW-COM-PB. When power is back, it will still be bypassed until ETH1000-SW-COM-PB is properly configured.

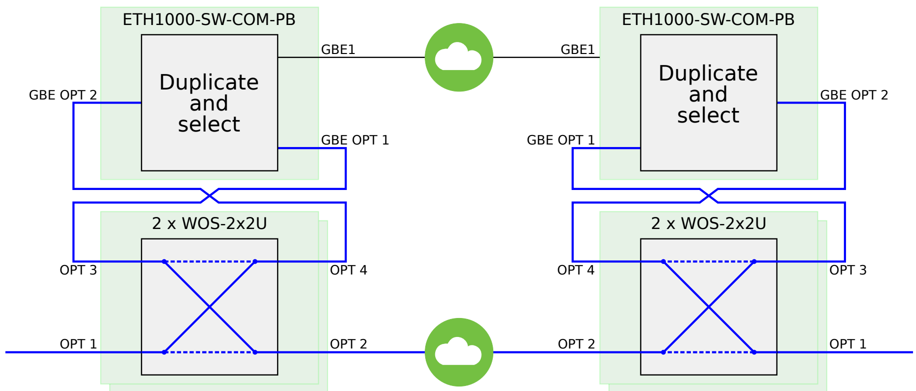

Figure B.6 Redundant network with optical bypass

Table B.1 Optical cables between ETH1000-SW-COM-PB and two WOS-2x2U.

ETH1000-SW-COM-PB	WOS-2x2U	WOS-2x2U
GBE OPT TX1	OPT3	
GBE OPT RX1		OPT3
GBE OPT TX2		OPT4
GEB OPT RX2	OPT4	

Table B.2 GPI cable between ETH1000-SW-COM-PB and two WOS-2x2U.

ETH1000-SW-COM-PB			WOS-2x2U		WOS-2x2U	
Signal name	**Connector**	**Pin**	**Connector**	**Pin**	**Connector**	**Pin**
GPI output 4	GPI2	1	GPI	5	GPI	5
GND	GPI2	5	GPI	8	GPI	8

The ethernet switch is, as for copper bypass, splitted in two parts. It is however using other interface, see **Figure B.7**.

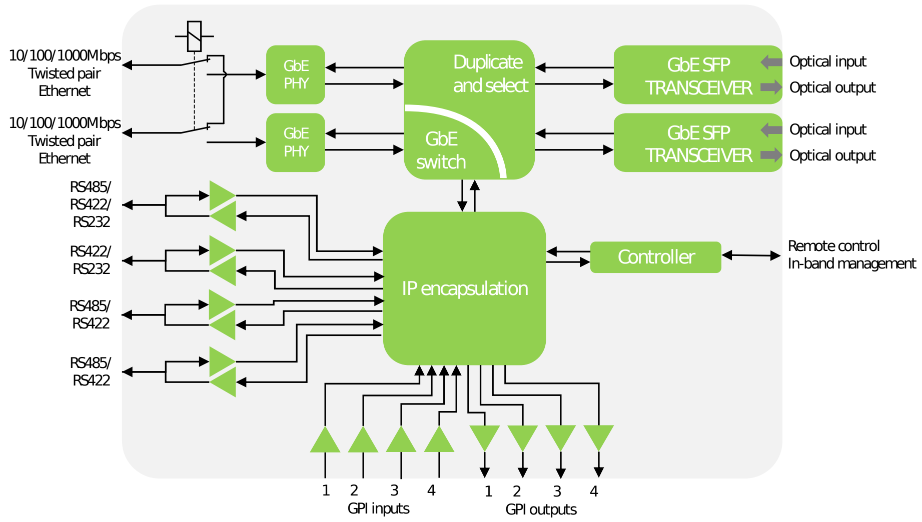

Figure B.7 ETH1000-SW-COM block diagram when using optical bypass

B.2.1 Boot process with optical bypass

Section B.1.1 and **Figure B.5** are describing how ETH1000-SW-COM-PB behaves when powering up with copper bypass. ETH1000-SW-COM-PB will behave identical when in optical bypass. The difference is that the two WOS-2x2U cards will bypass the optical interfaces. The result is that while booting, no interfaces will be connected to the switch.

Warning: At boot time the backplane relay will shortcut the connectors to the electrical interfaces. The two WOS-2x2U cards will optically shortcut the optical interfaces. This might result in switch loops or that different networks are connected together.

B.3 Configuration

ETH1000-SW-COM-PB has the same configuration options as ETH1000-SW-COM. When configured with Multicon GYDA, it will have an additional section, see screenshot in **Figure B.8** and description in **Table B.3**.

Figure B.8 Screenshot of GUI used to configure ETH1000-SW-COM-PB.

Table B.3 Configuration options

Bypass mode			Select which bypass mode to use. Default is copper bypass.
	Copper bypass		Use copper bypass as described in **Section B.1**.
	Optical bypass		Use optical bypass as described in **Section B.2**.
Path select			Configure how the duplicate and select block will behave.
	Mode		Specify which path that is selected. Must be Auto to get redundancy. Default is Auto.
		GBE1	Always receive data from GB1.
		GBE OPT 1	Always receive data from GBE OPT 1.
		Auto	The best path will automatically be selected.
	Main		Specify which path that is preferred. When data is received on both interfaces, preferred path will be used. Only used if Latch is Off or Latch Reset is clicked. Default is GBE1.
		GBE1	Make GBE1 the preferred path.
		GBE OPT 1	Make GBE OPT 1 the preferred path.
	Latch		Specifies the behavior when receiving data on both paths. If Latch is On, the selected path will be used even if the path selected as Main is also receiving data. Default is Off.
		On	Stay on currently selected path.
		Off	If receiving data on both interfaces, use the path selected as Main.
		Reset	Can be used when Latch is On to manually select the path selected as Main.
	Hold time		Specify the time from the last data was received on selected interface until it should select the other. This time must be longer then the delay difference between the two paths. Default is 1000 ms.
	Lock time		Used when Latch is Off to specify the time from preferred path is valid until we starts using it again. Default is 5000 ms.

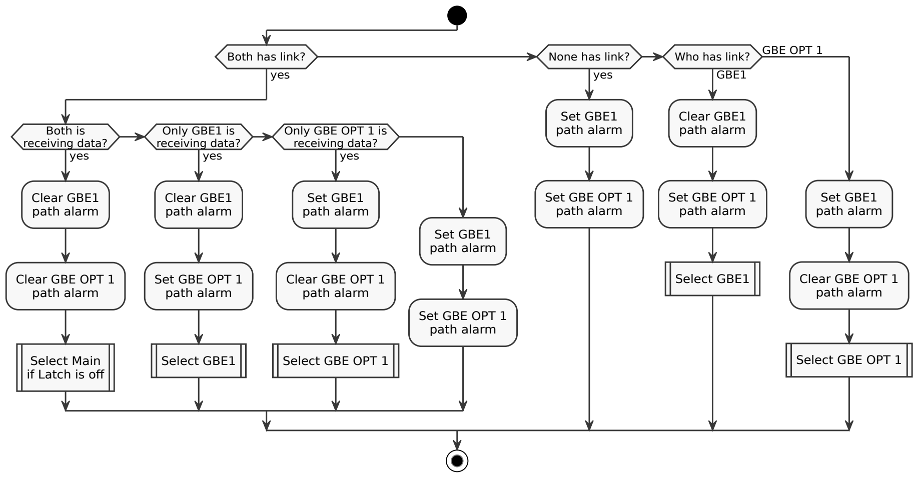

Figure B.9 Path selection block diagram.

Appendix C Using ETH1000-SW-COM-C3

ETH1000-SW-COM-C3 is a connector module with relays on two serial ports and on all the GPI outputs. This enables flexible wiring solutions that in some situations are very useful.

C.1 GPI outputs

When using ETH1000-SW-COM-C3, the GPI outputs are connected to relays. **Figure C.1** shows the pinout and **Table C.1** shows the maximum ratings for the contact.

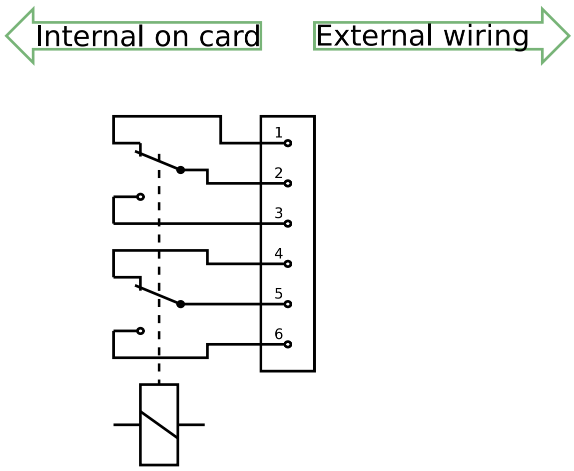

Figure C.1 Pinout on GPI outputs when using ETH1000-SW-COM-C3

Table C.1 Maximum ratings for GPI outputs on ETH1000-SW-COM-C3

Maximum voltage	48V
Maximum current	2A
Maximum power	60W

C.2 RS232 with redundancy

RS232 is a one-to-one interface. Redundancy is hard because it is not possible to disable the transmitter. Having two redundant cards connected to the same device can't be done and the solution is often to manually swap the cables if one of the cards are missing data. Using ETH1000-SW-COM-C3 connector module solves this challenge.

Serial port 1 and 2 are connected through relays. **Figure C.2** show how the relays on the connector module are connected.

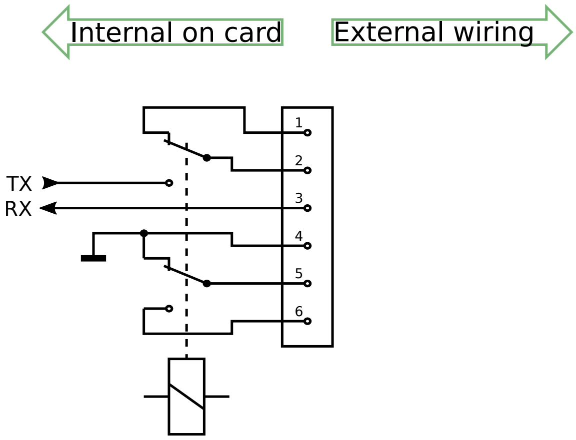

Figure C.2 Pinout on RS232_1 when using ETH1000-SW-COM-C3. Same pinout is used on RS232_2.

Data sent from the card (TX) will only be on pin 2 if the relay is activated. If it's not, data connected on pin 1 will be transferred to pin 2. This makes it possible for the card to make a decision if it has valid data or not, and use that to control if its data should be sent out or not.

Warning: RS232 with redundancy will not work when "Serial port matrix behavior" is set to "Bidirectional one-to-one".

During boot the relay will be inactive, and pin 1 will be connected to pin 2. After booting the relay will be active, connecting TX to pin 2, unless:

- Serial port is connected to "Listen".
- Serial port is configured to connect to other card, but connection failed.

- Serial port doesn't have data for a period (spo timeout).

"Signal present output" timeout (spo timeout) can be configured for each of the serial ports that supports RS232 with redundancy. In the GUI they are labeled "Serial port 1 spo timeout" and "Serial port 2 spo timeout".

Figure C.3 shows how two card can be connected together for redundancy. Card 1 will be the master, if it has data to send, it will activate the relay. If not, it will release the relay and forward data transmitted from Card 2.

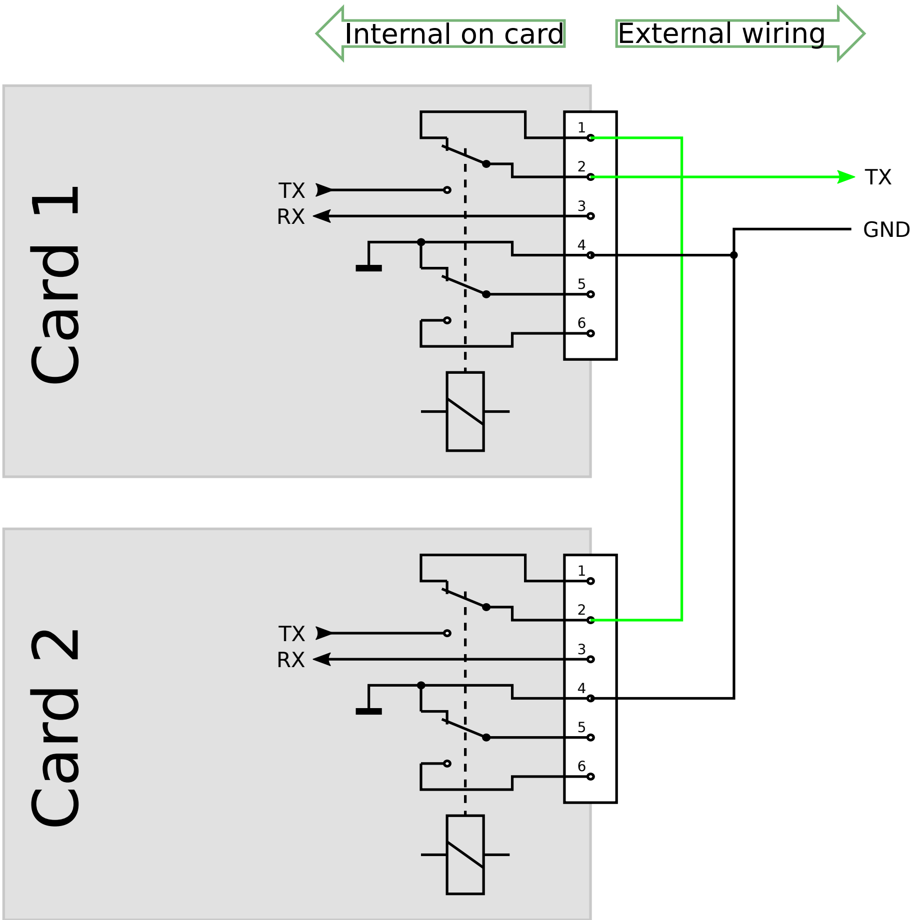

Figure C.3 External wiring for transmitting RS232 data with redundancy.

The dataflow from the external device to the redundant cards are easier as it will be only one transmitter on the line. **Figure C.4** shows a wiring where both cards are directly connected to the device.

Figure C.5 shows the wiring where RX is connected through the relay contact. This improves the robustness. A typical scenario that shows this is if one of the cards get power failure. The relay contact will disconnect it from the device and the other card, and we are sure that it won't take the line down.

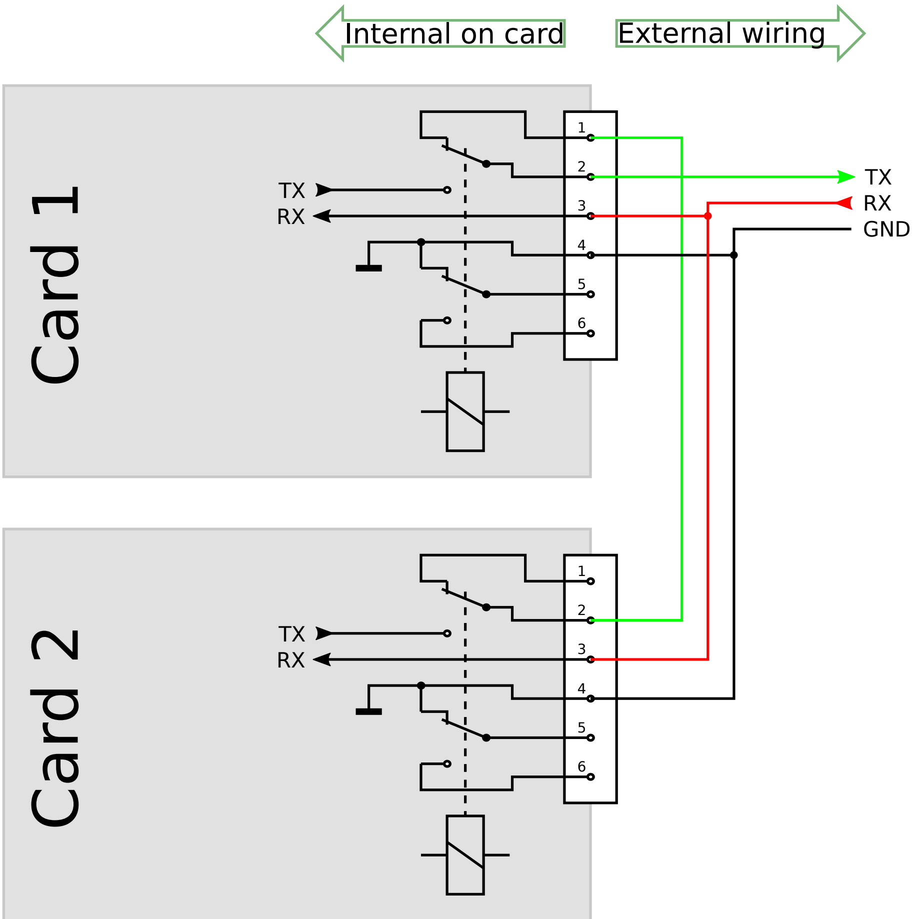

Figure C.4 External wiring with RX directly connected to all cards.

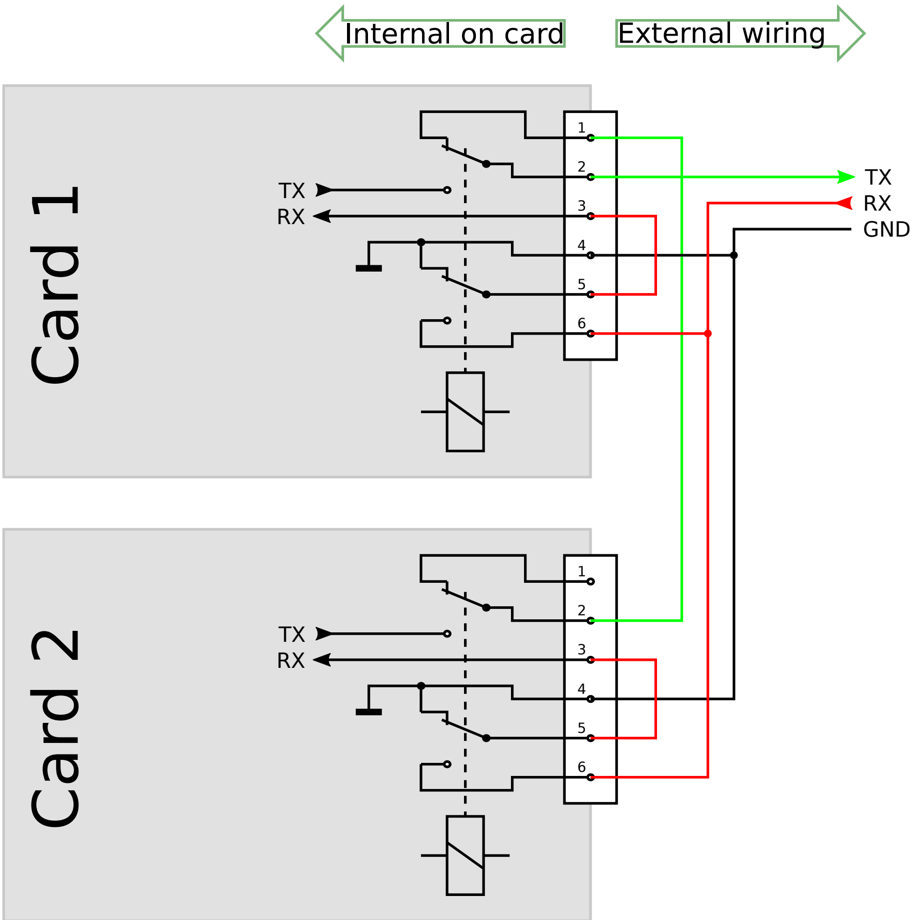

Figure C.5 Externa wiring with RX connected through the relay contact.

Appendix D Prepare a microSD card to be used on ETH1000-SW-COM

Firmware upgrade is normally done live without having to pull out the card and take out the microSD card. In some situation, like when a microSD card fails, creating a new microSD card for ETH1000-SW-COM is needed.

Most microSD cards are supported. It must be at least 4GB.

After the microSD card is prepared for ETH1000-SW-COM, all configuration settings will be set to its default values. The new active image on the microSD card will be the new "factory default" image, see **Section 6.13** for more info.

Warning: All data on the microSD card will be deleted!

An image file is needed. It is compressed with zip and will have a .zip extension on the filename.

D.1 Prepare microSD card in Linux

Download the image file and insert the microSD card.

Some Linux distributions have tools to auto-mount detected disks. Make sure the microSD card is not mounted before continuing.

Run the following command:

```
unzip -p <filename> | dd bs=64K of=<microsd device file>
```

D.2 Prepare microSD card in Windows

Many programs exists that are capable of writing a raw disk image to a microSD card. We recommend "Win32 Disk Imager" that can be downloaded from http://win32diskimager.sourceforge.net.

First step is to unzip the downloaded file. This will give you a new file with .img extension. Use this file and follow the instructions of your selected program.

Appendix E Materials declaration and recycling information

E.1 Materials declaration

For product sold into China after 1st March 2007, we comply with the "Administrative Measure on the Control of Pollution by Electronic Information Products". In the first stage of this legislation, content of six hazardous materials has to be declared. The table below shows the required information.

Part Name	Toxic or hazardous substances and elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
ETH1000-SW-COM	O	O	O	O	O	O
ETH1000-SW-COM-SFP	O	O	O	O	O	O
ETH1000-SW-COM-PB	O	O	O	O	O	O

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.

This is indicated by the product marking:

E.2 Recycling information

Nevion provides assistance to customers and recyclers through our web site http://www.nevion.com/. Please contact Nevion's Customer Support for assistance with recycling if this site does not show the information you require.

Where it is not possible to return the product to Nevion or its agents for recycling, the following general information may be of assistance:

- Before attempting disassembly, ensure the product is completely disconnected from power and signal connections.
- All major parts are marked or labeled to show their material content.
- Depending on the date of manufacture, this product may contain lead in solder.
- Some circuit boards may contain battery-backed memory devices.