



FC-3G-ETH-D422-SFP FC-3G-ETH-D422-CWDM-SFP

Flashlink Compact optical transport solution for video, Ethernet,
data and GPI

User manual

Rev. E

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Nevion
Lysaker Torg 5
1366 Lysaker
Norway
Tel: +47 33 48 99 99
nevion.com

Nevion Support

Nevion AS

Lysaker Torg 5
1366 Lysaker, Norway
Support phone 1: +47 33 48 99 97
Support phone 2: +47 90 60 99 99

Nevion USA

400 West Ventura Boulevard, Suite 155,
Camarillo, CA 93010, USA
Toll free North America: (866) 515-0811
Outside North America: +1 (805) 247-8560

E-mail: support@nevion.com

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

Revision history

Current revision of this document is the uppermost in the table below.

Rev.	Repl.	Date	Sign	Change description
E	D	2019-01-15	MR	Front page: Corrected name for product with CWDM filter.
D	C	2018-12-11	MR	2.1 General: Corrected input voltage range.
C	B	2018-11-30	MR	2.12 Front view: Updated description for status LEDs 2.13: Corrected text in fig. 4 conc. order of SDI ports. 4.3.2: Changed header and added info concerning backshells for 25p Dsub connectors.
B	A	2018-10-30	MR	2.12 Front view: Added function description for status LEDs
A	Proto2	2018-09-26	SHH	First production model.
Proto2	Proto1	2018-09-12	MR	In chapter 3. Configuration: Changed function descriptions for DIP switches. Changes apply to fw versions 0.3 and later.
Proto1	Proto	2018-09-07	MR	In chapter 3. Configuration: Corrected function descriptions for DIP switches #6 and 7.
Proto	-	2018-05-04	MR	Initial version. Based partly on manuals; "3GHD-EO-2-SFP.revD", "3GHD-OE-2-SFP.revD", "ETH1000-SFP revB", "D422-MG RevH" and "FlashlinkCompactII.revC"

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1 Product overview

1.1 General

Nevion’s newest addition to the Flashlink Compact series provides a compact and cost efficient answer to remote production over dark fiber.

The high density chassis is designed to transport multiple video, MADi, IP based audio and intercom systems, control data and tally over a single fiber.

Its small form factor, low power and light weight makes it ideal for smaller stage boxes that can be placed close to where they are needed. And its low noise makes it perfect for forwarding baseband signals to remote production areas where other equipment such as IP switches or gateways can be too noisy.

With Nevions long haul optical interfaces and low loss optical filters distances above 80 km can be achieved making the product ideal for optical metro networks.

And combined with the optical couplers, optical switches and electrical change-overs in the modular Flashlink range improved redundancy mechanisms can be added to the system.

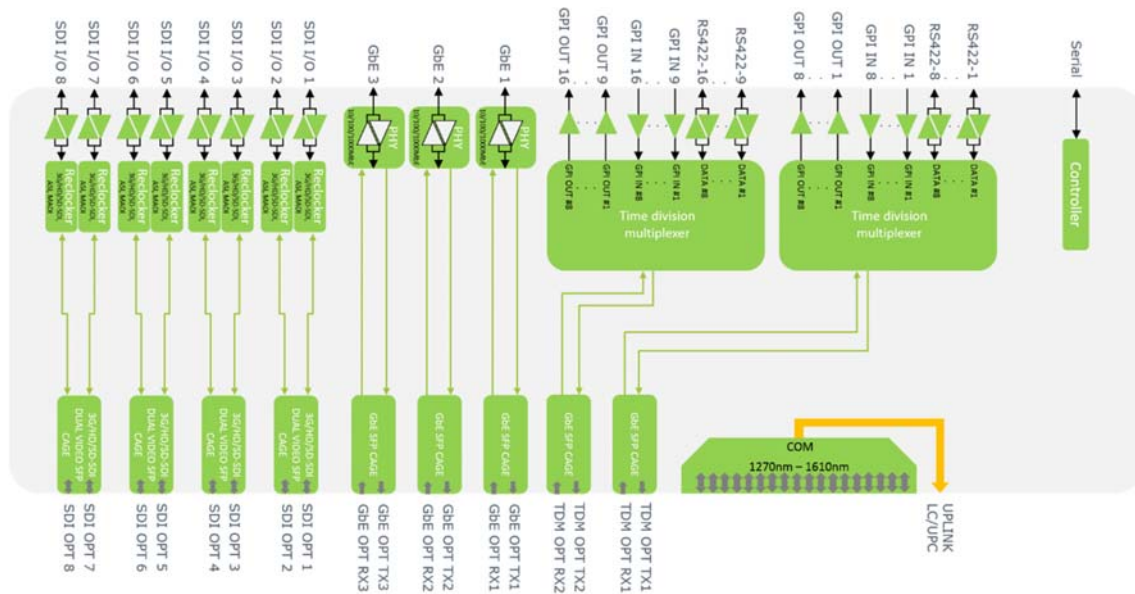


Figure 1 Signal flow

1.2 Optical video converter functionality

An FC-3G-ETH-D422-SFO unit holds four dual channel direction configurable and multi bit-rate optical converter modules providing high performance media conversion for various signal formats from 1Mbps (depending on SFP) up to 2970Mbps. Each module can transport all SD, HD and 3G signal formats in addition to DVB-ASI and SMPTE310M. They perform optical refreshing and signal re-clocking, which is selectable on application. The optical ports are embedded in video specific non-MSA SFP modules and Nevion’s dual transmitters, dual receivers and transceivers can be utilized. The open system platform of Nevion Flashlink system allows easy interoperability with third party fiber optical systems. Each electrical video port can be selected as input or output thru the Multicon web interface.

1.3 Optical GbE transceiver functionality

An FC-3G-ETH-D422-SFP includes three 1000Base-T to 1000Base-X media converter modules. These optical modules are based on SFP that makes the optical part exchangeable in field. The module converts a 1000Mbps Ethernet signal on copper to 1000Mbps optical on fibre suitable for medium haul applications. The module has one electrical Ethernet port and one optical fibre transceiver port (receiver fibre connector and transmit fibre connector). Each fibre link occupy two wavelengths in a CWDM installation.

The solution also supports 100MbE, but the transmitted signal still runs at 1000Mbps. It is important that both ends of the link is configured to support the same bit rates as auto-negotiation is not transported across the link.

1.4 RS422 and GPI functionality

FC-3G-ETH-D422-SFP includes two D422-MG modules transmitting RS-422 and GPI data signals via fiber optic cable. The D422-MG module multiplexes up to 8 RS-422 and 16 GPI inputs into an outgoing optical datastream while at the same time demultiplexing an incoming optical datastream into 8 RS-422 and 16 GPI outputs.

The optical interface is SFP based and each D422-MG module occupies two wavelength in an CWDM interface.

The D422-MG modules of FC-3G-ETH-D422-SFP/TX units are interoperable with the stand-alone Flashlink card D-422-MG.

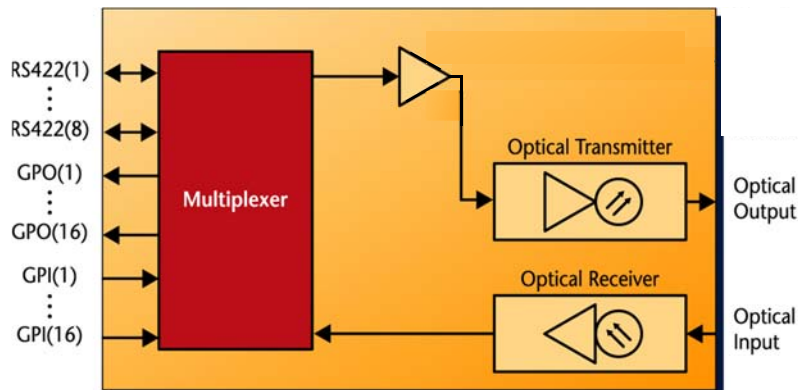


Figure 2 D-422-MG module

2 Specifications

2.1 General

Power	+12V to 16V DC / 20W, max (standard SFPs).
Size of chassis	1.7" x 19" x 5.14" (H x W x D) 43.4mm x 482.6mm x 130.5mm (H x W x D) Depth included connectors: 158,5mm
Weight	Approximately 2.06kg / 4.54lb (International pounds) including SFPs and internal CWDM filter, but not including external optical patch cables
Control	Status LED in front Configurations DIP in back
Operating temperature	0 to +45 °C
Forced ventilation	Four monitored fans, two on each side. Left to right airflow.
Data rate reclocked:	125, 270, 1485, 1485/1.001, 2970, 2970/1.001 Mbps
Data rate non-reclocked:	1 to 2970 Mbps (Depending on SFP used)

2.2 Supported standards

SD, 270Mbps	SMPTE259M
HD, 1485Mbps	SMPTE292-2008
3G, 2999Mbps	SMPTE424M
DVB-ASI	EN50083-9.
Fiber Transmission	SMPTE297-2006
AES-10/MADI	
AES-3id (non-reclocked)	
Electrical connector, BNC	IEC 61169-8

2.3 Optical SDI inputs

See Nevia SFP datasheets for specification.

2.4 Optical SDI outputs

See Nevia SFP datasheets for specification.

2.5 Electrical SDI input

Connectors	BNC, IEC 61169-8
Impedance	75ohm
Cable equalization	Automatic; 300m @270Mbps w/Belden 8281 150m @1485Mbps w/Belden 1694A 90m @ 2970Mbps w/Belden 1694A
Input Return loss	<-15dB, 5MHz-1.5GHz <-10dB, 1.5-3.0GHz

2.6 Electrical SDI outputs

Connectors	BNC, IEC 61169-8
Impedance	75ohm
Output signal level	800mV +/- 10%
Output signal rise / fall time	20% - 80% - SD, 0.4ns – 1.5ns, <0.5ns rise/fall variation - HD/3GHD, < 135ps, <50ps rise/fall variation
DC-offset	0V +/-0,5
Amplitude overshoot	<10%
Output return loss	<-15dB, 5MHz-1.5GHz <-10dB, 1.5-3.0GHz

2.7 18 channel CWDM filter (FC-3G-ETH-D422-CWDM-SFP only)

Number of channels	18
Available wavelengths (nm)	1271, 1291, 1311, 1331, 1351, 1371, 1391, 1411, 1431, 1451, 1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611
Connector	LC/UPC
Insertion loss (end to end, including connectors)	5dB typical 6dB max
Channel Spacing	20nm
Passband	13nm min
Transmission circuit fiber	9/125um single mode
Adjacent Channel Isolation	30dB min
Non-Adjacent Channel Isolation	40dB min
Directivity	45dB min
Connector Return loss	45dB min
Polarization depending loss	0.2dB max
Ripple in passband	0.5dB max
Optical Power	17mW max

2.8 GPI

Connectors	Dsub female, 2 x 25p
“Low” input level	0 to 2.0 VDC
“High” input level	3 to 5.0 VDC or open (Internal pull-ups to 3.3VDC)
Threshold	2.5 VDC

2.9 GPO

Connectors	Dsub female, 2 x 25p
Output type	Open drain (N channel MOSFET)
Max. applied voltage	30VDC
Max. applied current	100mA
“Low” output impedance	Max. 0.2 ohms to GND
“High” output leakage current	max. 10uA at 30VDC applied voltage

2.10 RS-422

Connectors	RJ-45
Signal format	RS-422
Bit rate	DC up to 115.2 kbps

2.11 GbE

Connectors	RJ-45 (GbE versions)
Signal format	Only GbE supported

2.12 Front view

Use applicable text or drawing.



Figure 3 Front view

Status A indicator: Gives status on power supply connected to the Power A connector on the back side.

- Green: Power supply connected
- Orange: No or none working power supply connected
- Red: The lower converter is malfunctioning. Please contact Nevia support for advice.
- Blinking LED
 - When green: 1s green - 1s red
 - When orange or red: 1s on-1s off

Fan speed outside limits at the right side fan module, module must be replaced.

Status B indicator: Gives status on power supply connected to the Power B connector on the back side.

- Green: Power supply connected
- Orange: No or none working power supply connected
- Red: The lower converter is malfunctioning. Please contact Nevia support for advice.
- Blinking LED
 - When green: 1s green - 1s red
 - When orange or red: 1s on-1s off

Fan speed outside limits at the left side fan module, module must be replaced.

1 to 18 indicators: Give status per SFP converter channel.

- Green: Valid input signal and reclocker in lock or bypass.
- Orange: Signal on input, but reclocker not in lock.
- Red: No valid input signal.
- No light: No valid Nevia SFP present.

SFP: Cage for fitting Nevia SFPs.

2.13 Rear view

Use applicable text or drawing.



Figure 4 Rear view

Earth point:	For connection to internal earth bar in 19" racks
GPI / GPO:	25p Dsubs, female
RS-422:	RJ45 (8pcs):
GbE:	RS-422 (3pcs)
SDI:	BNCs
DIP 1 to 8:	Configures the Flashlink Compact II. See chapter 3 for more information.
FLP:	RJ45 for programming purpose
Power A:	Main DC input connector. Standard 9pin DSUB, male.
Power B:	Spare/redundancy DC input connector. Standard 9pin DSUB, male.

3 Configuration

Configuration by 8 pos. DIP switch at rear side:

DIP switch number	Function	On position	Off position
1	“OVR”. (Multicon override)	DIP settings override Multicon settings	Configurations from Multicon
2-3	Subrack ID for Multicon	See table below	See table below
4	GbE-1 link speed	100Mbps	1000Mbps
5	GbE-2 link speed	100Mbps	1000Mbps
6	GbE-3 link speed	100Mbps	1000Mbps
7 and 8	Configuration of SFP directions	See table below	See table below

Configuration of subrack ID for Multicon with DIP switch #2 and 3:

#2 and 3 both in “Off” position:	Frame # in Multicon: 1
#2 in “Off” position, #3 in “On” position:	Frame # in Multicon: 2
#2 in “On” position, #3 in “Off” position:	Frame # in Multicon: 3
#2 and 3 both in “On” position:	Frame # in Multicon: 4

Configuration of directions with DIP switch # 7 and 8:

#7 and 8 both in “Off” position:	Tells the unit that receiver SFPs are mounted in cages # 1 to 4 (marked “1” to “8”). All SDI ports are configured to be outputs.
#7 and 8 both in “On” position:	Tells the unit that transceiver SFPs are mounted in cages # 1 to 4 (marked “1” to “8”). SDI ports are configured as follows; SDI-1, 3, 5 and 7: Inputs SDI-2, 4, 6, and 8: Outputs
#7 in “Off” position, #8 in “On” position:	Tells the unit that receiver SFPs are mounted in cages #1 and 2 (marked “1” to “4”) and transmitter SFPs are mounted in cages #3 and 4 (marked “5” to “8”). SDI ports #1-4 are configured to be outputs SDI ports #5-8 are configured to be inputs
#7 in “On” position, #8 in “Off” position:	Tells the unit that transmitter SFPs are mounted in cages # 1 to 4 (marked “1” to “8”). All SDI ports are configured to be inputs.

4 Connections

4.1 Optical video converter functionality

There are eight separate reclocked SDI channels, each group of two being equivalent to one optical video receiver module.

Remark: Be aware of the unusual order of SDI ports; 2-1-4-3-6-5-8-7.

Connections between BNCs and SFPs are as follows:

BNC marked "SDI-1":	SFP cage marked "1 2", part 1
BNC marked "SDI-2":	SFP cage marked "1 2", part 2
BNC marked "SDI-3":	SFP cage marked "3 4", part 3
BNC marked "SDI-4":	SFP cage marked "3 4", part 4
BNC marked "SDI-5":	SFP cage marked "5 6", part 5
BNC marked "SDI-6":	SFP cage marked "5 6", part 6
BNC marked "SDI-7":	SFP cage marked "7 8", part 7
BNC marked "SDI-8":	SFP cage marked "7 8", part 8

4.2 Optical GbE transceiver functionality

There are three separate GbE channels each being equivalent to one ETH1000-SFP product.

Connections to SFPs are as follows:

Single connector (Marked "GbE-1"):	SFP cage marked "9 10" (5th from left)
Upper part of dual connector (Marked "GbE-2"):	SFP cage marked "11 12" (6th from left)
Lower part of dual connector (Marked "GbE-3"):	SFP cage marked "13 14" (7th from left)

4.3 D422-MG functionality

4.3.1 General

Connectors are grouped into two sections, each being equivalent to one D-422-MG product.

Group 1:

Upper GPI connector (marked "GPI-1"), upper GPO connector (marked "GPO-1") and the four RJ-45 connectors most remote to the GPI/GPO connectors (marked "RS-422-1 to 4").

This group is internally connected to the SFP cage marked "15 16" (#8 from left)

Group 2:

Lower GPI connector (marked "GPI-2"), lower GPO connector (marked "GPO-2") and the four RJ-45 connectors closest to the GPI/GPO connectors (marked "RS-422-5 to 8").

This group is internally connected to the SFP cage marked "17 18" (#9 from left)

4.3.2 GPI/GPO connectors, pinning and backshell

Input/Output	Pin
1	12
2	24
3	23
4	10
5	9
6	21
7	20
8	7
9	6
10	18
11	17
12	4
13	3
14	15
15	14
16	1

Table 1. GPI/GPO connectors pinning

Ground is available on all remaining pins:

2, 5, 8, 11, 13, 16, 19, 22, 25

and also on the connector chassis.

To make it possible to mount two cable connectors side by side, the width of the connector backshell **must not exceed 53.3 mm.**

Among the significant available selection of housings, here are some possible candidates;

	<u>Manufacturer</u>	<u>Manufacturer Part Number</u>
Unshielded:	Multicomp	MC-DTPPK25
	Amphenol	17E-1726-1
	TE Connectivity	5748678-3
	Amphenol FCI	8655PHRA2501LF
	Amphenol FCI	86303639BLF
Shielded:	TE Connectivity	1-1478762-5
	TE Connectivity	5748676-3
	Assmann WSW Components	AGP 25 G-METALL
	3M	3357-9225
	TE Connectivity	2-2198617-5

4.3.3 RS-422 connectors, pinning

RS-422 pin layout:

Signal	Name	Port1	Port2	Mode
RX +	Receive Pos.	Pin 3	Pin 1	Input
RX -	Receive Neg.	Pin 6	Pin 2	Input
TX +	Transmit Pos.	Pin 5	Pin 7	Output
TX -	Transmit Neg.	Pin 4	Pin 8	Output

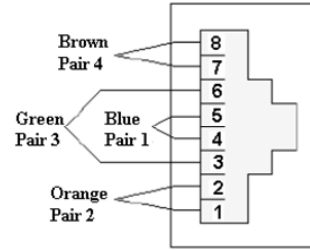


Figure 5 RS-422 outlet

4.4 Power connection

There are, for redundancy purpose, two independent power inlets (Dsub, 9p, male, redundant solution) marked “POWER A” and “POWER B” with pinning as follows;

DC input voltage: #4

GND: #1

(Identical to solution for Flashlink frame FR-2RU-10-2)

4.5 CWDM filter



Figure 6

The CWDM filter contains 20pcs. LC connectors;

- 1pcs., “Common” port, marked “C”
- 1pcs. unused marked “x”
- 18pcs. ports in the range 1270 to 1610 nm marked “27” to “61”

5 Nevion SFPs

In the four SFP positions at the left (SDI, marked “1” to “8”) only broadcast (non MSA) SFPs must be used.

In remaining 5 positions (ETH1000 and D-422-MG, marked “9” to “18”) MSA SFPs must be used.

Concerning available SFPs for the different functions please contact Nevion’s sales department.

6 Laser safety precautions

These are guidelines to limit hazards from laser exposure.

The lasers emit light at wave lengths between 1270 nm and 1610 nm. This means that the human eye cannot see the beam, and the blink reflex cannot protect the eye. (The human eye can see light between 400 nm to 700 nm).

A laser beam can be harmful to the human eye (depending on laser power and exposure time). Therefore:

Be careful when connecting / disconnecting fiber pigtails (ends).
Never look directly into the pigtail of the laser/fiber.
Never use microscopes, magnifying glasses or eye loupes to look into a fiber end.
Use laser safety goggles blocking light between 1270 nm and at 1610 nm

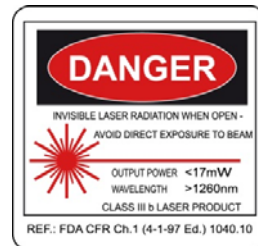
Instruments exist to verify light output power: Power meters, IR-cards etc.

Flashlink features:

The Flashlink Compact II is designed as Class 1 laser product according to EN 60 825-1:94/A11:96, and class IIIb according to CFR Ch1 (1997) Part 1040.10.

Maximum output power¹: < 17 mW

Operating wavelengths: > 1260 nm



¹ Max power is for safety analysis only and does not represent device performance.

General environmental requirements for Nevia equipment

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: <95% (non-condensing)

Product Warranty

The warranty terms and conditions for the product(s) covered by this manual follow the General Sales Conditions by Nevia, which are available on the company web site:

www.nevia.com

Appendix A Materials declaration and recycling information

A.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.

組成名稱 Part Name	Toxic or hazardous substances and elements					
	鉛 Lead (Pb)	汞 Mercury (Hg)	鎘 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr(VI))	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
FC-3G-ETH-D422-SFP FC-3G-ETH-D422-CWDM-SFP	○	○	○	○	○	○
<Power supply, if delivered with unit>	○	○	○	○	○	○
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:



A.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.