3GHD-EO-D15xx

3GHD Electrical to Optical converter for

dense wavelength division multiplexing

User manual

Rev. 1

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Revision history

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

Rev.	Repl.	Date	Sign	Change description
1	0	2010-07-07	AA	Added information about power constraint in Chapter 1.1.
0	-	2009-07-16	AJM	First version and release

Contents

1 Product overview

The Flashlink 3GHD-EO-D15xx.xx is a single multi bit-rate electrical to optical converter module providing high performance media conversion for various signal formats from 19.4Mbps up to 2970Mbps. Unmatched signal accuracy, even in critical applications with pathological signal patterns makes the 3GHD-EO-D15xx.xx first choice for all optical transport demands.

The 3GHD-EO-D15xx.xx can transport all HD and SD signal formats in addition to DVB-ASI and SMPTE310M. It performs electrical equalizing and signal re-clocking, which is selectable on application. High quality optical transmitters using narrowband temperature stabilized 0dBm/+5dBm DWDM DFB lasers. 3GHD-EO-D15xx.xx is suitable for medium and long haul applications. The open system platform of Nevion Flashlink system allows easy interoperability with third party fiber optical systems.

The 3GHD-EO-D15xx.xx unit has also two electrical outputs, which reduces the need for additional DA's. The electrical input is equipped with a multi rate cable equalizer providing an equalization of typically 75m of high quality coax cable at 2970Mbps.

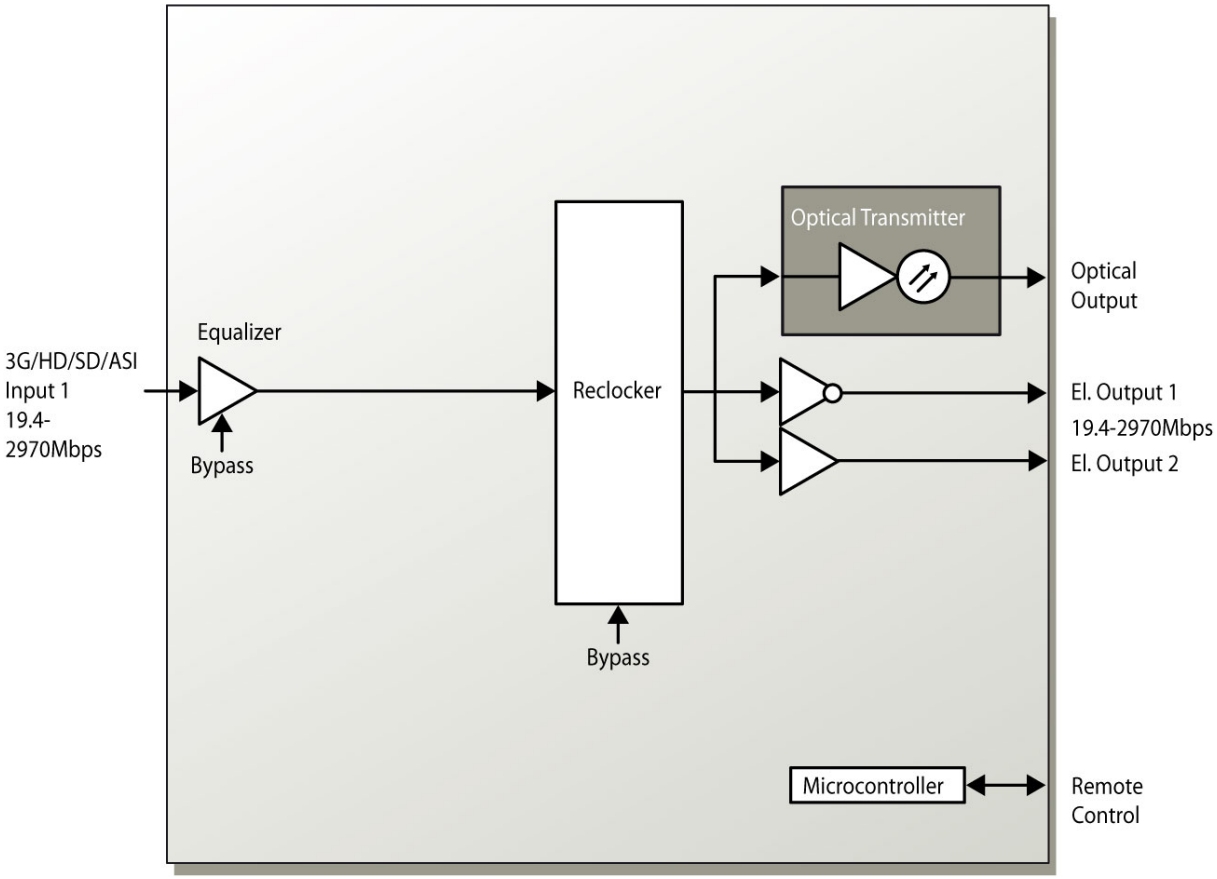

Figure 1: 3GHD-EO-D Electrical to optical converter

1.1 Constraint on number of cards in a frame

Only 5 cards with DWDM transmitters should be assembled in one Flashlink frame (FR-2RU-10-2). This constraint applies for both PWR-AC15/15/5/5V and PWR-AC-75W, in single and redundant power configuration.

This constraint applies also regardless of the normal power consumption of the card, as it is related to the start current at power up.

2 Specifications

2.1 General

Power	+5V DC / 3W, +15V DC/1.5W
Control	Control system for access to setup and module status with BITE (Built-In Test Equip.)

With standard ITU-T G.652 single mode fiber, we recommend to use the +5dBm DWDM laser for distances longer than 60km for 3G-SDI.

2.2 General functions

Card labeling

Firmware upgrades

Card location in frame through blinking LED

The following parameters can be set and monitored via the web and SNMP interface:

Function	Options
Laser	On or off
Electrical input	Normal or bypass
Reclocker 1	Enable or bypass
Reclocker 2	Enable or bypass

The following parameters can be alarmed via the web and SNMP interface:

Voltage	+5V, +3.3V, +5V, +15V and +58V.
Reclocker	Loss of lock

2.3 Optical Output

Transmission circuit fiber	Single mode 9/125um
Light source	DWDM DFB Laser
Optical power	0dBm (optionally +5dBm)
Optical centre wavelength	According to ITU-T G.694.1 for DWDM
Max number of channels per fiber	40 within the C-band for DWDM.
Channel spacing	100GHz
Max. wavelength drift	± 0.16nm DWDM
Temperature range	0 to +40 °C
Jitter (UI=Unit Interval)	0.135 UI max. @ 270Mbps, 0.2 UI max. @ 1485Mbps 0.2UI typ. @ 2970Mbps
Connector return loss	>40dB w/SM fiber
Maximum reflected power	4%
Connector	SC/UPC

2.4 Electrical Input

Data rate NRC	19.4 to 2970 Mbps
Data rate re-clocked	270, 1483.5, 1485, 2967 and 2970 Mbps
Equalization	Automatic, Cable equalizer and reclocker can be bypassed to support bitrates down to 2Mbps
Impedance	75 ohm
Return loss	>15dB @ 0-1500MHz >10dB @ 1500-3000MHz
Signal level	Nom. 800mV
Connector	BNC

2.5 Electrical Output

Number of outputs	2
Connector	BNC
Impedance	75 ohm
Return loss	>15dB @ 0-1500MHz >10dB @ 1500-3000MHz
Jitter max	Max. 0.2UI
Peak to peak signal level	0.8V ± 0.1V
Signal polarity	- 1 non-inverting, - 1 inverting

2.6 Standards

Supported standards for electrical and optical ports

SMPTE	SMPTE 292M, SMPTE 259M-C, SMPTE 297M, SMPTE 305.2M, SMPTE 310M, SMPTE424M
DVB-ASI	EN50083-9

3 Configuration

3.1 Format configuration

The 3GHD-EO-D15xx can support a number of different formats. The correct configuration can either be set with a DIP switch or with the GYDA System Controller. The layout of 3GHD-EO-D15xx is shown in the drawing below with the DIP switch to the upper left position.

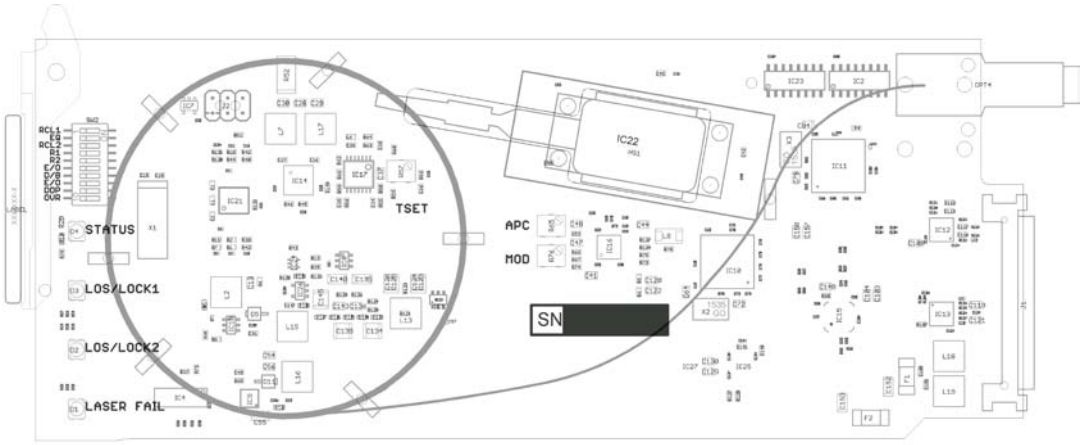

Figure 2: 3GHD-EO-D15xx.xx board layout

DIP switch configuration must be set according to the table below:

Switch #	Label	Function, DIP = ON	Function, DIP = OFF	Comment
1	RCL1	Reclocker ON	Reclocker Bypass	Reclocker mode
2	EQ	Cable equalizer ON	Cable equalizer Bypass	Equalizer mode
3	RCL2	Not used		
4	R1			
5	R2			
6	E/O			
7	D/B			
8	E/O			
9	DOP			
10	OVR	Override GYDA control Config. with DIP switch	GYDA control Config. with GYDA	Select configuration from GYDA

All DIP switches are off when pointing towards the release handle.

4 Connector module

The 3GHD-EO-D15xx has a dedicated connector module: MR-TR-C2. This module is mounted at the rear of the sub-rack. The module is shown in the figure below. Unused electrical ports should be terminated with 75ohm.

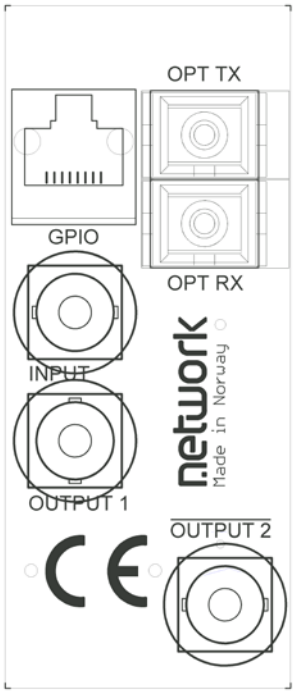

Figure 8: Connector module for 3GHD-EO-D15xx.xx

4.1 Mounting the connector module

The details of how the connector module is mounted, is found in the user manual for the sub-rack frame FR-2RU-10-2.

This manual is also available from our web site: http://www.nevion.com/

4.2 Terminal format support

The different input and output ports on 3GHD-EO-D15xx.xx can support a number of formats. The table below shows which signal formats are supported on the selected terminals.

Terminal format support:

Terminal	Function	Supported Format	Mode
INPUT	Electrical input	3GHD-SDI, HD-SDI, SDI, DVB-ASI, SMPTE310, Transparent[1]	Input
OPT TX	Optical output (Transmitter)	3GHD-SDI, HD-SDI, SDI, DVB-ASI, SMPTE310, Transparent[1]	Input
OUTPUT 1	Electrical Output – Non inverted	3GHD-SDI, HD-SDI, SDI, DVB-ASI, SMPTE310, Transparent[1]	Output

[1] 3GHD-EO-D15xx.xx has a “Transparent mode”. In this mode all reclockers and CDRs are switched off and no jitter attenuation will be performed. This mode may be used for non-standard or unsupported bit rates over shorter distances and up to 1 Gbps.

OUTPUT 2	Electrical Output – Inverted	3GHD-SDI, HD-SDI, SDI, Transparent[1]	Output
OPT RX	Not used		
GPI ALARM	Open Collector Alarms	Wired alarms	OC Output
		Disable laser	Input

5 Module status

The status of the module can be monitored in three ways.

1. GYDA System Controller (optional).
2. GPI at the rear of the sub-rack.
3. LEDs at the front of the sub-rack.

Of these three, the GPI and the LEDs are mounted on the module itself, whereas the GYDA System Controller is a separate module giving detailed information on the card status. The functions of the GPI and the LEDs are described in sections 5.1 and 5.2. The GYDA controller is described in a separate user manual.

5.1 GPI Alarm – Module status outputs

These outputs can be used for wiring up alarms for third party control systems. The GPI outputs are open collector outputs, sinking to ground when an alarm is triggered. The GPI input laser disable will turn off the laser if this input is shortening to ground/chassis. The GPI connector is shown in figure below.

3GHD-EO-D15xx.xx module GPI pinning:

Signal	**Name**	**Pin #**	**Mode**
Status	General error status for the module	Pin 1	Open Collector
Laser Fail	Laser Fail Alarm	Pin 2	Open Collector
Not used		Pin 3	Open Collector
LOS el	Los of electrical input signal	Pin 4	Open Collector
Laser disable	Turn off laser	Pin 5	Input
Ground	0 volt pin	Pin 8	0V.

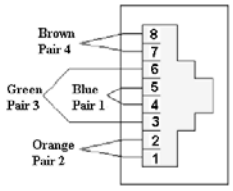

Figure 9: GPI output.

Electrical Maximums for GPI outputs
Max current: 100mA
Max voltage: 30V

5.2 Front panel – Status monitoring

The status of the module can be easily monitored visually by the LED's at the front of the module. The LEDs are visible through the front panel as shown in the figure below.

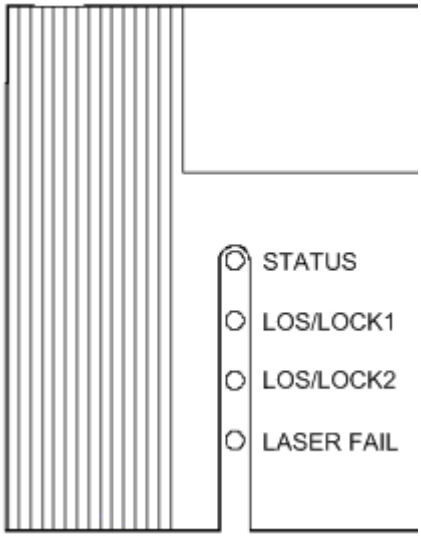

Figure 10: Front panel indicators for the 3GHD-EO-D15xx.xx.

The 3GHD-EO-D15xx.xx has 4 LED's each showing a status corresponding to the GPI pinning.

Diode \ State	**Red LED**	**Yellow LED**	**Green LED**	**No light**
Status	Module is faulty	Yellow blinking, DWDM laser temperature stabilizing.	Module is OK Module power is OK	Module has no power
LOS/LOCK1	Loss of signal on electrical output reclocker	Loss of lock on reclocker	Signal OK	
LOS/LOCK2	Not used			
Laser fail	Laser is malfunctioning.	Laser is off	Laser is OK	

6 Flashlink control

This card uses the FLP 4.0 protocol. See separate documents for definition of this protocol.

7 DWDM wavelength

ITU694.1 DWDM wavelength.

No.	[THz]	[nm]
59	195,9	1530,33
58	195,8	1531,12
57	195,7	1531,90
56	195,6	1532,68
55	195,5	1533,47
54	195,4	1534,25
53	195,3	1535,04
52	195,2	1535,82
51	195,1	1536,61
50	195,0	1537,40
49	194,9	1538,19
48	194,8	1538,98
47	194,7	1539,77
46	194,6	1540,56
45	194,5	1541,35
44	194,4	1542,14
43	194,3	1542,94
42	194,2	1543,73
41	194,1	1544,53
40	194,0	1545,32
39	193,9	1546,12
38	193,8	1546,92
37	193,7	1547,72
36	193,6	1548,51
35	193,5	1549,32
34	193,4	1550,12
33	193,3	1550,92
32	193,2	1551,72
31	193,1	1552,52
30	193,0	1553,33
29	192,9	1554,13
28	192,8	1554,94
27	192,7	1555,75
26	192,6	1556,55
25	192,5	1557,36
24	192,4	1558,17
23	192,3	1558,98
22	192,2	1559,79
21	192,1	1560,61
20	192,0	1561,41

General environmental requirements for Nevion equipment

1. The equipment will meet the guaranteed performance specification under the following environmental conditions:
   - Operating room temperature range: 0°C to 40°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 Nevion, which are available on the company web site:

www.nevion.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)	镉 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)
3GHD-EO-D15xx	X	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.						

A.2 Environmentally-friendly use period

The manual must include a statement of the "environmentally friendly use period". This is defined as the period of normal use before any hazardous material is released to the environment. The guidance on how the EFUP is to be calculated is not finalised at the time of writing. See http://www.aeanet.org/GovernmentAffairs/qfLeOpAaZXaMxqGjSFbEidSdPNtpT.pdf for an unofficial translation of the draft guidance. For our own products, Nevion has chosen to use the *50 year figure* recommended in this draft regulation.

Nevion suggests the following statement on An "Environmentally Friendly Use Period" (EFUP) setting out normal use:

> **EFUP is the time the product can be used in normal service life without leaking the hazardous materials. We expect the normal use environment to be in an equipment room at controlled temperature range (0ºC - 40ºC) with moderate humidity (< 90%, non-condensing) and clean air, not subject to vibration or shock.**

Further, a statement on any hazardous material content, for instance, for a product that uses some tin/lead solders:

> **Where a product contains potentially hazardous materials, this is indicated on the product by the appropriate symbol containing the EFUP. The hazardous material content is limited to lead (Pb) in some solders. This is extremely stable in normal use and the EFUP is taken as 50 years, by comparison with the EFUP given for Digital Exchange/Switching Platform in equipment in Appendix A of "General Rule of Environment-Friendly Use Period of Electronic Information Products". This is indicated by the product marking:**

> **It is assumed that while the product is in normal use, any batteries associated with real-time clocks or battery-backed RAM will be replaced at the regular intervals.**

The EFUP relates only to the environmental impact of the product in normal use, it does not imply that the product will continue to be supported for 50 years.

A.3 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 labelled 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.

EC Declaration of Conformity

MANUFACTURER	Nevion Europe AS P.O. Box 1020, 3204 Sandefjord, Norway	
AUTHORIZED REPRESENTATIVE (Established within the EEA)	Not applicable	
MODEL NUMBER(S)	3GHD-EO-D15xx	
DESCRIPTION	3GHD Electrical to Optical converter	
DIRECTIVES this equipment complies with	LVD 73/23/EEC EMC 2004/108/EEC	
HARMONISED STANDARDS applied in order to verify compliance with Directive(s)	EN 55103-1:1996 EN 55103-2:1996	
TEST REPORTS ISSUED BY	**Notified/Competent Body**	**Report no:**
	Nemko	E08503.00
TECHNICAL CONSTRUCTION FILE NO	Not applicable	
YEAR WHICH THE CE-MARK WAS AFFIXED	2008	
TEST AUTHORIZED SIGNATORY		
MANUFACTURER	**AUTHORIZED REPRESENTATIVE (Established within EEA)**	**Date of Issue**
		2009-07-16
		Place of Issue
NEVION EUROPE AS O.nr. 976 584 201 MVA	Not applicable	Sandefjord, Norway

Name Thomas Øhrbom

Position QA Director, Nevion Europe
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