QUAD-DA-1x2-PB

Quad 1x2 3G/HD/SD-SDI Distribution Amplifier

with Passive Input Bypass

User manual

Rev. D

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Revision history

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

Rev.	Repl.	Date	Sign	Change description
D	C	2017-12-19	MR	Added new chapter; 4.4 Passive input bypass (-PB) In chapter 4.2 Terminal format support: Removed listing of SMPTE 310.
C	B	2017-11-17	MR	2.2 Electrical SDI inputs; changed min. cable lengths for all formats to be in accordance with current datasheet.
B	A	2017-09-27	MR	Corrected value of saturation voltage in 2.4 Open drain GPIOs Updated index. Lack of update caused error messages. Corrected descriptions of GPIO functions in the following chapters; 4.2, 4.3, 5.1.2
A	-	2017-07-14	GAJ/MR	Initial version

Contents

1 Product overview

The QUAD-DA-1x2-PB is a quad 1x2 3G/HD/SD-SDI Distribution amplifier with passive input bypass well suited for quad stream UHD/4K applications.

The card can operate as either four independent DAs or a quad stream DA monitoring the 4 inputs as one. When operated in quad stream mode the card´s signal alarming will be given on the combined stream.

A passive relayed bypass of all four main inputs enables signal pass-thru in case of mains or card failure.

The Flashlink element manager Multicon enables web and SNMP interface for configuring card settings and monitoring signal status.

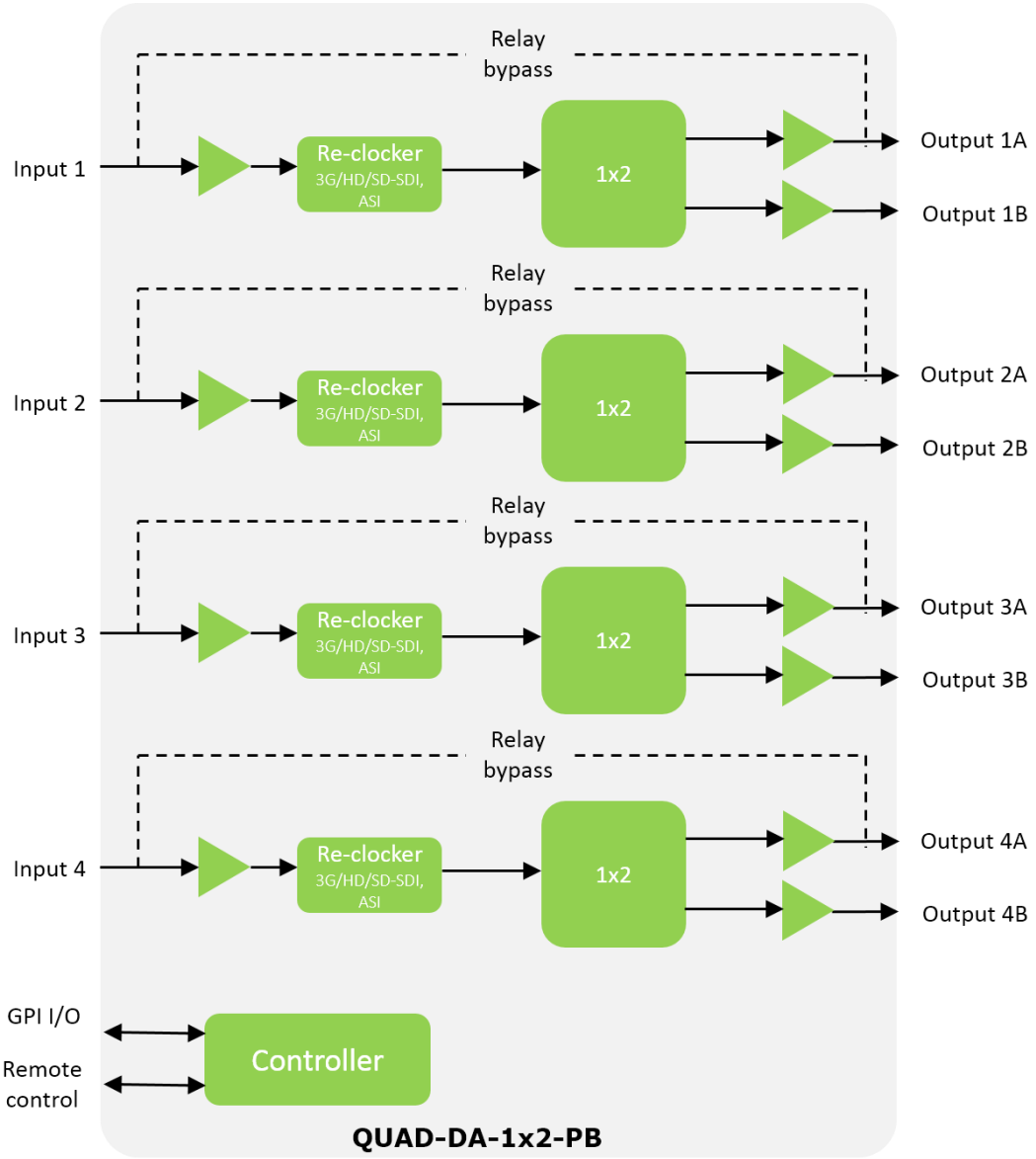

Figure 1: Block diagrams of the QUAD-DA-1x2-PB

1.1 Product versions

There are two connector backplane versions, one with DIN 1.0/2.3 and one with HD-BNC connectors.

2 Specifications

2.1 General

Power (DC)	+5 V / +15 V (Configurable DIP switch setting)
	3.0 W / +5 V, 0.6 W / +15 V maximum
	2.8 W / +5 V, 0.6 W / +15 V typical
User interface	Status LED, Status GPIOs, configuration DIP switches
	Web interface and SNMP thru Multicon controller
Operating environmental temperature	0 to +45 °C

2.2 Electrical SDI inputs

Number of inputs	4, relay protected			
Data rate	125 Mbps – 2970 Mbps			
Connectors	75 Ohm, DIN 1.0/2.3 or HD-BNC			
	(depends on backplane type)			
Input Return loss	< -15 dB,	5 MHz – 1.5 GHz		
	< -10 dB,	1.5 GHz – 3 GHz		
Jitter tolerance	SD limit:			
	10 Hz – 10 kHz:	> 1	UI	
	10 kHz – 10 MHz:	> 0.2	UI	
	HD limit:			
	10 Hz – 10 kHz:	> 1	UI	
	10 kHz – 10 MHz:	> 0.2	UI	
	3G limit:			
	10 Hz – 10 kHz:	> 2	UI	
	10 kHz – 10 MHz:	> 0.3	UI	
Equalized cable lengths	SD:			
(BER < 10E-12)	280m min.	300m typ.	(Belden 8281)	
Checkfield pattern	400m min.	450m typ.	(Belden 1694A)	
	HD:			
Unused outputs terminated	90m min.	100m typ.	(Belden 1694A)	
with 75 ohm terminators	3G:			
	50m min.	55m typ.	(Belden 1694A)	
Remark	The **I-xA** input signals pass through relays resulting in degraded levels and rise/fall time equivalent to 15 meters of 1694A cable. The cable lengths above include this.			

2.3 Electrical SDI outputs

Number of outputs	8, 4 relay protected
Connectors	75 Ohm, DIN 1.0/2.3 or HD-BNC
	(depends on backplane type)
Output Return loss	< -15 dB, 5 MHz – 1.5 GHz
	< -10 dB, 1.5 GHz – 3 GHz
Output signal level	800 mV +/- 10%
Output signal rise / fall time	- SD limit: [0.4 ns – 1.5 ns]; < 0.5 ns rise/fall variation
(20% - 80 %)	- HD limit: < 270 ps, < 100 ps rise/fall variation
	- 3G limit: < 135 ps, < 50 ps rise/fall variation
Remark	Due to Nevion's design philosophy with use of passive backplanes, the output signals pass significant PCB trace lengths between the cable drivers and output ports. This will result in significant degradation of levels and rise/fall times at HD and 3GHD at the backplane connectors compared to the listed specifications above which states launch levels at the cable drivers. The degradation equals approximately 10 meters of 1694A cable.
Remark	The **O-xA** outputs pass through relays resulting in degraded levels and rise/fall time equivalent to 15 meters of 1694A cable.
Amplitude overshoot/undershoot	< 10%
Polarity	All non-inverting (DVB-ASI compliant)
Output timing jitter	SD: < 0.2 UI
	HD: < 1 UI
	3G: < 1 UI
Output alignment jitter	SD: < 0.15 UI
	HD: < 0.15 UI
	3G: < 0.2 UI

2.4 Open drain GPIOs

Connector	PTSA 0,5 mm^2 Push-in spring wire connector
No of ports	3
Applied voltage (DC)	25V max.
Permitted current drain in output "low" state	150 mA max.
Saturation voltage at max. permitted current drain	600 mV max.

2.5 Features

Re-clocking:	Automatic SD, HD, 3GHD detection
	Automatic output slew rate adjustment according to SMPTE- 259M, SMPTE-292 and SMPTE424M
Supported clock rates:	125Mbps, 270Mbps, 1.485 and 1.485/1.001Gbps, 2.97 and 2.97/1.001Gbps
MADI:	According to AES10 with the following exemption; Amplitude and rise and fall times according to SD-SDI (SMPTE- 292M) at electrical outputs.

2.6 Supported standards

SMPTE:	SMPTE259M, SMPTE292 and SMPTE424M
DVB-ASI:	EN50083-9
MADI:	AES10

3 Configuration

Configuration of this card can either be done from Multicon GYDA element manager or locally on the card by DIP switches.

3.1 Multicon GYDA configuration

Below is a snapshot from the Multicon GYDA interface.

Quad Dist Amp 1x2 with Passive Bypass

Card label		Locate card sec
Firmware upgrade	Programming mode	Finalize
Firmware upgrade	Upload file: None	Upload
Gpi 7	○ Active ◉ Inactive	
Electrical input I-1A	◉ Normal ○ Bypass	
Electrical input I-2A	◉ Normal ○ Bypass	
Electrical input I-3A	◉ Normal ○ Bypass	
Electrical input I-4A	◉ Normal ○ Bypass	
Reclocker channel 1	◉ Enable ○ Bypass	Autobypass: ◉ On ○ Off
Reclocker channel 2	◉ Enable ○ Bypass	Autobypass: ◉ On ○ Off
Reclocker channel 3	◉ Enable ○ Bypass	Autobypass: ◉ On ○ Off
Reclocker channel 4	◉ Enable ○ Bypass	Autobypass: ◉ On ○ Off
Electrical output O-1A/B		Slewrate: ◉ Auto ○ SD ○ HD
Electrical output O-2A/B		Slewrate: ◉ Auto ○ SD ○ HD
Electrical output O-3A/B		Slewrate: ◉ Auto ○ SD ○ HD
Electrical output O-4A/B		Slewrate: ◉ Auto ○ SD ○ HD

Alarm	Lower limit	Upper limit	Alarm	SNMP trap
Electrical input I-1A			◉ Normal ○ Ignore	○ Send ◉ Ignore
Electrical input I-2A			◉ Normal ○ Ignore	○ Send ◉ Ignore
Electrical input I-3A			◉ Normal ○ Ignore	○ Send ◉ Ignore
Electrical input I-4A			◉ Normal ○ Ignore	○ Send ◉ Ignore
Voltage (5V)	4500 mV	5500 mV	◉ Normal ○ Ignore	○ Send ◉ Ignore
Voltage (15V)	13500 mV	16500 mV	◉ Normal ○ Ignore	○ Send ◉ Ignore
Voltage (1.8V)	1600 mV	2000 mV	◉ Normal ○ Ignore	○ Send ◉ Ignore
Voltage (3.3V)	3000 mV	3600 mV	◉ Normal ○ Ignore	○ Send ◉ Ignore
Reclocker channel 1			◉ Normal ○ Ignore	○ Send ◉ Ignore
Reclocker channel 2			◉ Normal ○ Ignore	○ Send ◉ Ignore
Reclocker channel 3			◉ Normal ○ Ignore	○ Send ◉ Ignore
Reclocker channel 4			◉ Normal ○ Ignore	○ Send ◉ Ignore

Card version	
hw	0.0
lib	1.3.2
sw	0.0.63

Figure 2: Configuration tab example

3.1.1 Card label

Figure 3: Card label

Assign a name to the Flashlink module, up to 31 characters. When the “locate card” button is pushed, all indicators/LED’s on the front of the module will flash for 120 seconds, alternatively a period can be entered into the sec box.

3.1.2 Firmware upgrade

Figure 4: Firmware upgrade

Update the firmware on the Flashlink module. The firmware file first has to be uploaded to Multicon Gyda by ftp. See user manual for Multicon Gyda concerning help on uploading.

3.1.3 Electrical inputs

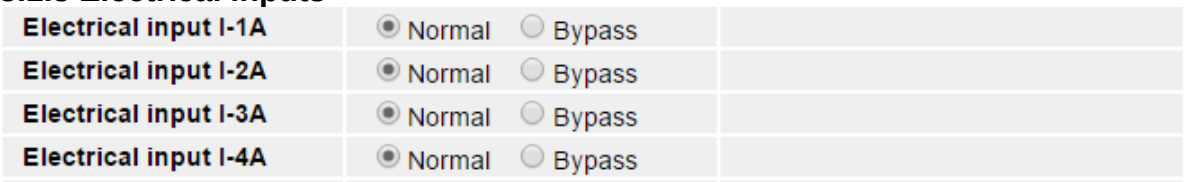

Figure 5: Electrical inputs

For SDI signals set the electrical input to “normal”. For non-supported signal formats “bypass” mode may be used. The cable equalizer will then be bypassed. This may give better performance since the cable equalizer is optimized for the supported standards.

3.1.4 Reclockers

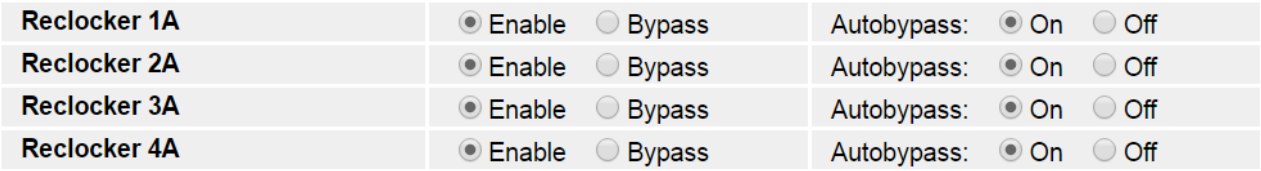

Figure 6: Reclockers

For supported formats; set to enable, else it may be set to bypass. Autobypass only works if the reclocker is enabled. In “autobypass” mode the reclocker will bypass not supported formats.

3.1.5 Electrical outputs

Figure 7: Electrical outputs

With slew rate set to “Auto” the rise- and fall time of the cable driver will be automatically adjusted according to the actual signal format.
For bit rates below 270Mbps the slew rate is automatically set to SD slew rate.For not supported signals with bitrates above 270Mbps the proper slew rate can be selected manually.

3.2 Configuration through DIP settings

The correct configuration can either be set with the DIP switch on the card or through the GYDA Control System. The layout is shown in the drawing below with the DIP switch to the upper left position.

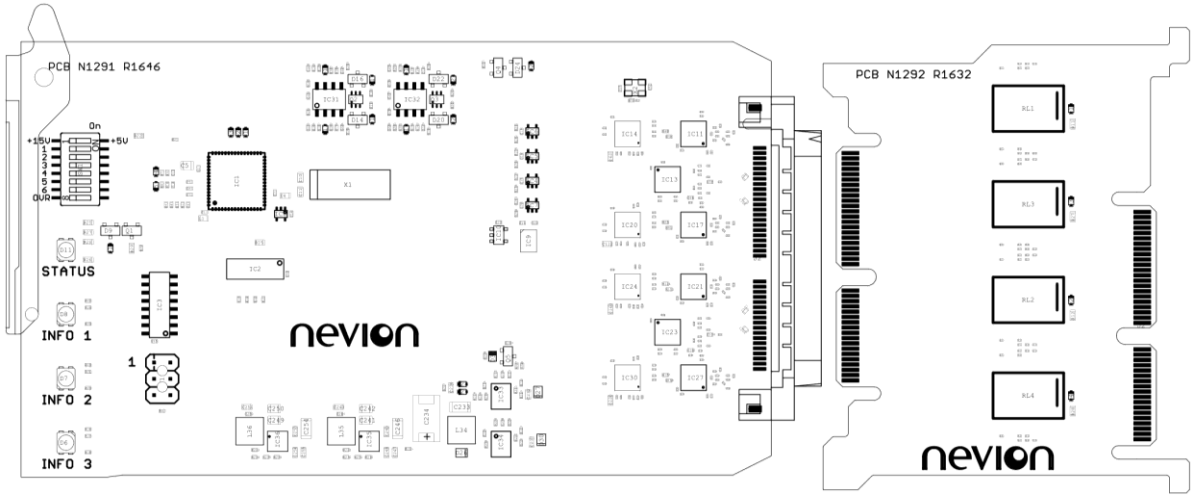

Figure 8: QUAD-DA-1x2-PB board layout

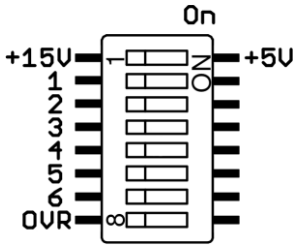

Figure 9: DIP switch

Table 1: DIP settings

Switch #	Label	Function, DIP=OFF	Function, DIP=ON	Comment
1	+15V	Board supplied by +15 V DC	Board supplied by +5 V DC	Selection of power **Attention:** Must only be operated when the board is unpowered
2	1	Not used	Not used	
3	2	Not used	Not used	
4	3	Not used	Not used	
5	4	Reclocker Bypass (Loss of lock will not work on this mode)	Reclocker ON	Reclocker mode
6	5	Cable Equalizer Bypass (Loss of signal will not work on this mode)	Cable Equalizer ON	Equalizer mode
7	6	Not used	Not used	
8	OVR	GYDA control. Config. with GYDA	Override GYDA control Config. with DIP switch	Select config. from GYDA

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

3.2.1 Selection of power supply

(Only DIP configurable)

The module can be configured to be powered from either +5 V or +15 V DC power rails with DIP switch labeled “+15V”. This feature is useful to improve utilization of, or balancing the available power in a frame.

The DIP switch must only be operated when the board is unpowered to prevent instability.

The configuration is set to +5 V as default.

4 Connections

The QUAD-DA-1x2-PB has a dedicated connector module; DA-CHO-C1 and –C2/-C3. This module is mounted at the rear of the sub-rack. The layout of the module is shown in the figure below.

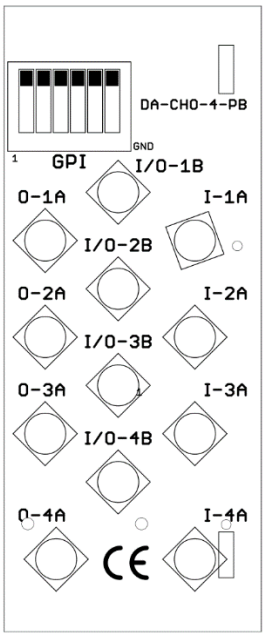

Figure 10: Backplane connector module for QUAD-DA-1x2-PB

- Passive input bypass is connected through the ***I-xA*** to ***O-xA*** connectors respectively, where *x* is the stream number from 1 to 4.
- In QUAD-DA-1x2-PB, the ***I/O-xB*** connectors are ***O-xB*** outputs, while in QUAD-CHO-2x1-PB the ***I/O-xB*** connectors are ***I-xB*** inputs.

4.1 Mounting the connector module

Product consists of three main parts as seen in **Figure 11**.

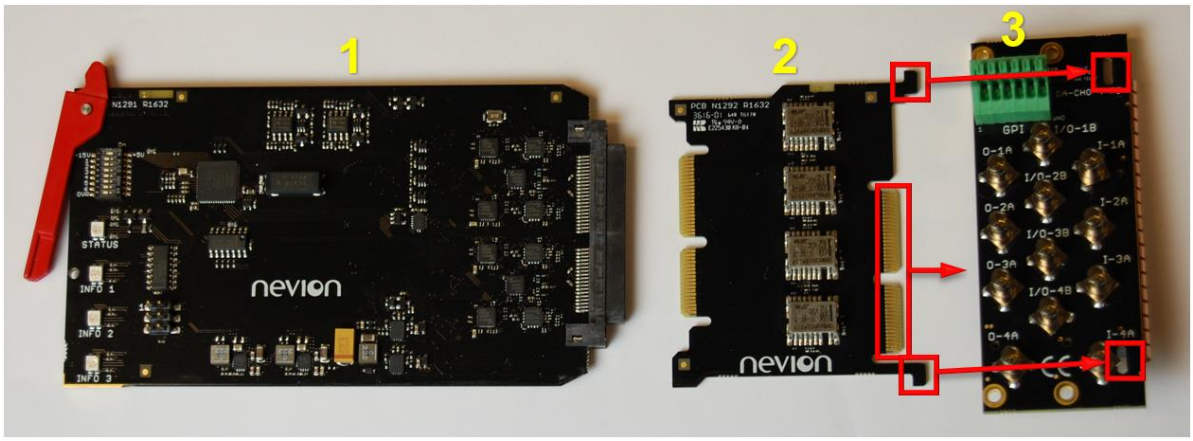

Figure 11: the three main parts of the product

Some assembly is needed before this can be installed into a frame:

1. Connect connector module (3, Figure 11) to relay module (2, Figure 11) and make sure the connectors are completely mated with the two guide pins located on top/bottom as seen in Figure 11.
2. Slide the assembled modules into the back of the frame while making sure the C1 board slides correctly into the frame's guide rail. Make sure the pins align and correctly connects to the power bus connector as seen in Figure 12.
3. Fasten the backplane with the supplied screws.

More details on how the connector module is mounted, are 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

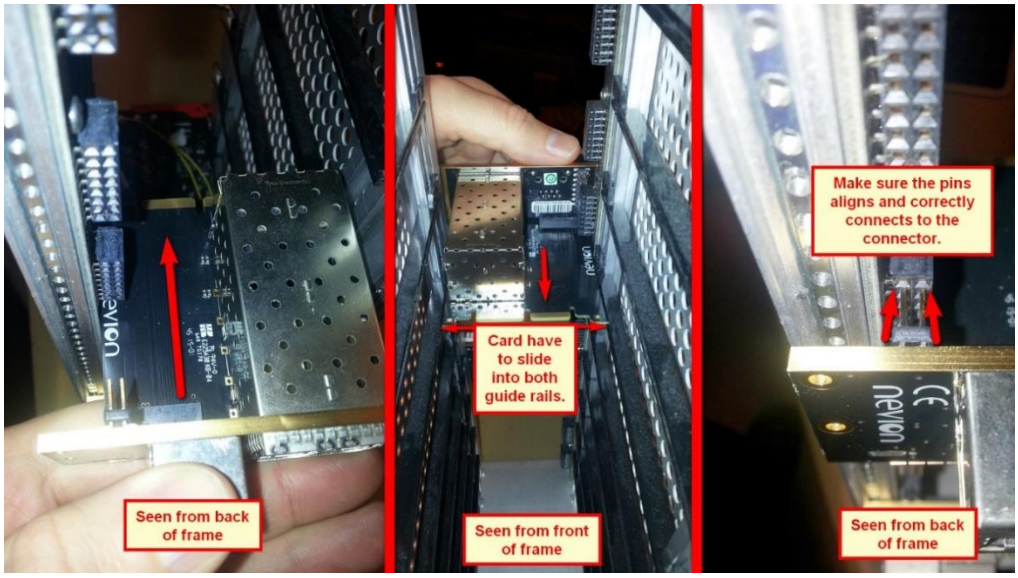

Figure 12: Instalment from the back of the frame
(NB: Picture of CONV-SFP-4, but the procedure is equal).

4.2 Terminal format support

The different input and output ports on QUAD-DA-1x2-PB can support a number of formats. The table below show which signal formats are supported on the selected terminals.

Unused input and output ports should be terminated with 75 Ohm terminators.

Table 2: Signal support

Terminal	Function	Supported Format	Mode
I-xA *(x = 1,2,3,4)*	Electrical Input	SDI, DVB-ASI, Transparent	Input
O-xA I/O-xB *(x = 1,2,3,4)*	Electrical Output Reclocked Output	SDI, DVB-ASI, Transparent	Output
GPIO-(2-3)	Status	Wired alarms	Open Drain output
GPIO-5	Module status	Wired alarms	Open drain 0utput

4.3 GPIO connections

GPI connector is shown in figures below.

Table 3: QUAD-DA-1x2-PB module GPI pinning

Signal	Function	Pin #	Mode
GPIO-1 / Status	Not used	Pin 1	
GPIO-2	Reflects “Info 1” LED. See also 5.1.2	Pin 2	Open drain
GPIO-3	Reflects “Info 2” LED. See also 5.1.2	Pin 3	Open drain
GPIO-4	Not used	Pin 4	Open drain
GPIO-5	Module status, reflects the status LED. See also 5.1.2	Pin 5	Open drain
Ground	0V / gnd pin	Pin 8	0V

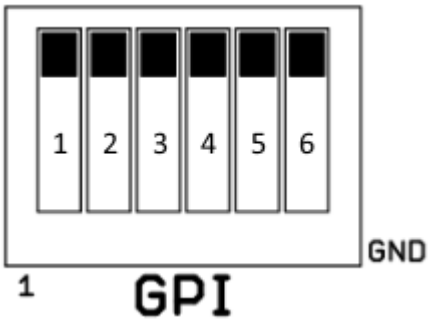

Figure 13: GPI connector

4.4 Passive input bypass (-PB)

The equalized cable lengths specified under chapter “2.2 Electrical SDI inputs” are valid only when the main board is active and are based on the equalizing properties of the specific cable equalizer solution used in this product.

When utilizing the “Passive input bypass” solution, the sum of cable lengths from the source via the relay inside QUAD-CHO-2x1-PB to the next product in the chain must be dimensioned according to the equalizing properties of this next product.

It is strongly recommended to perform thorough testing of the function before taking it into use.

5 Operation

5.1 Module status

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

1. Multicon 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 product itself, whereas the Multicon GYDA System Controller is a separate module giving detailed information on the card status.

5.1.1 Multicon GYDA status interface

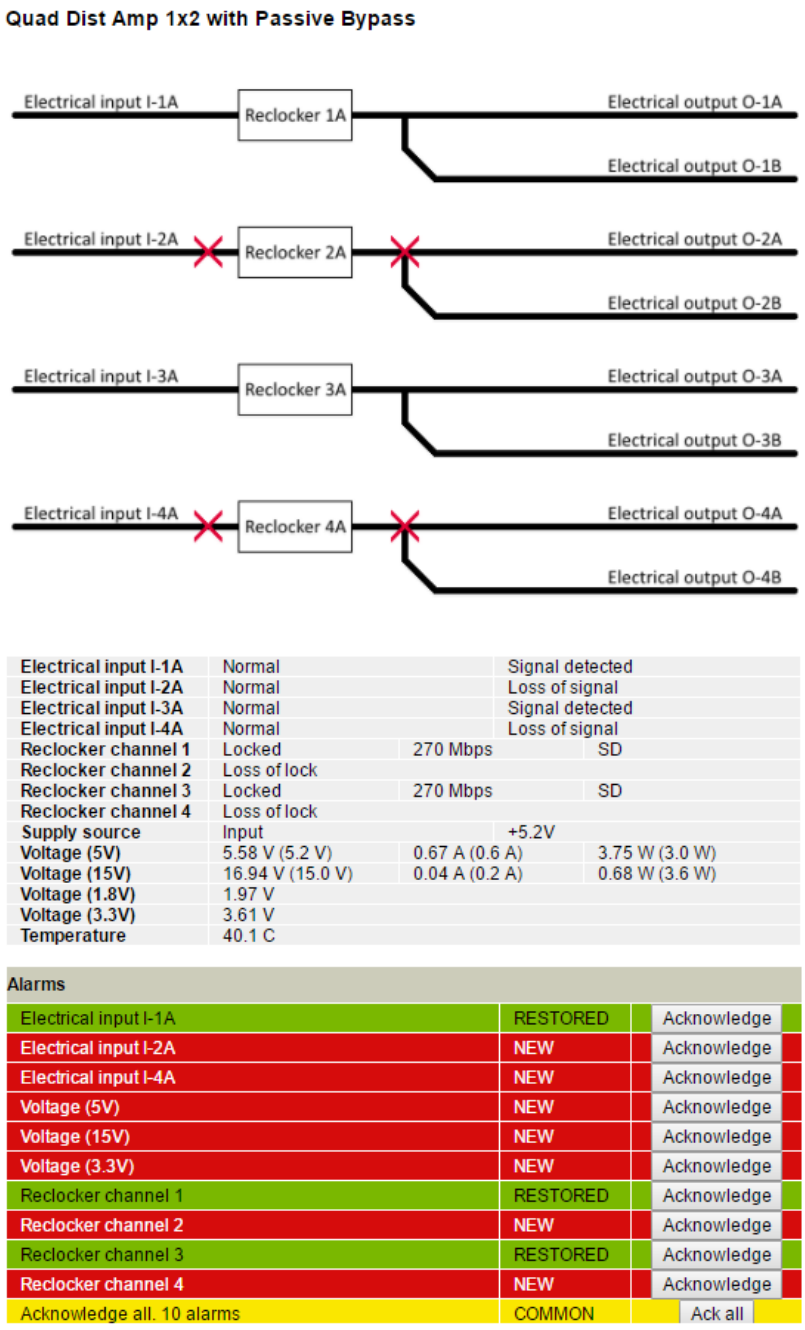

Figure 14: Status tab example

The on-board temperature measurement is a feature used for monitoring variations in temperature over time and can be accessed thru SNMP. The absolute value of the temperature measurement has little value of its own as it does not reflect the temperature inside the electronics nor the ambient frame temperature.

When +5V is chosen as supply source, the presented current value for +15V will be approximately 0.04A due to current drain of the four high frequency relays.

If a reclocker is configured to “Bypass” mode and a recognizable signal rate is applied, the shown info will be “Locked” and “Actual rate” though the signal is not reclocked. Otherwise the shown info will be “Bypass” and no rate information.

5.1.2 GPI ALARM – Module Status Outputs

These outputs can be used for wiring up alarms for third party control systems. All GPIO outputs are of open drain type.

Open drain GPIO (#5) function:

This output is low ohmic referred to GND when no severe system errors are detected

and high ohmic in opposite situation and when no main board is connected

Open drain GPIOs (#2-3) function:

These outputs reflect the status on LEDs “INFO 1-2” respectively as follows;

- Low ohmic referred to GND when LED is green or orange
- High ohmic referred to GND when LED is red

Open drain GPIO #5 function:

This output reflects the status on the “Status” LED as follows;

- Low ohmic referred to GND when LED is green
- High ohmic referred to GND when LED is red

5.1.3 Front panel - Status monitoring

The status of the module can be easily monitored visually by the LEDs at the front of the module. The LEDs are visible through the front panel of FR-2RU-10-2(-MkII) as shown in the figure below.

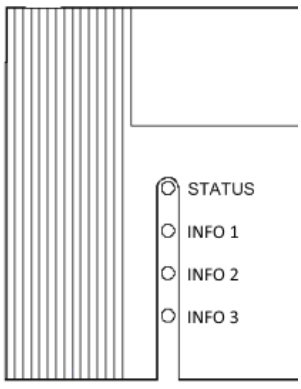

Figure 15: Front panel LEDs

Table 4: Front panel LEDs

LED \ State	Red	Orange	Green	No light	Comment
Status	Module is faulty, or module is initializing	N/A	Module is OK Module power is OK	Module has no power	
INFO 1	Loss Of Signal, all inputs	1-3 Inputs Loss Of Signal	Signal present at all inputs	N/A	All Input Equalizer alarms OR'ed
INFO 2	Loss Of Lock, all inputs	1-3 Inputs Loss Of Lock	Lock present at all inputs	N/A	All Input Reclocker alarms OR'ed
INFO 3	Not used	Not used	Not used	Constant	

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 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 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)
QUAD-DA-1x2-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:

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.