

UniBoard² Manual (DRAFT)

	Organisatie / Organization	Datum / Date
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Table of contents:

1	Introduction.....	4
1.1	Reference documents (RD)	4
2	Safety, Regulatory and Environmental Information	4
2.1	Warranty.....	4
2.2	General Safety Considerations	4
2.3	Preventing Electrostatic Discharge Damage.....	5
2.4	Preventing Connector Damage.....	5
2.5	Shipment for Service	5
2.6	Regulatory Information.....	5
2.7	CE directive.....	5
2.8	Waste Electrical and Electronic Equipment (WEEE) Directive	5
2.8.1	Known Hazardous materials:	6
2.9	Environmental conditions	6
2.10	Contact Information	6
3	Included in the package	6
4	Peripherals	6
4.1	Needed peripherals, with recommendations.....	6
4.2	Optional peripherals.....	7
4.2.1	QSFP+	7
5	Specifications.....	7
6	ON/OFF	7
7	How to connect to UniBoard.....	8
7.1	Ethernet control	8
7.2	PPS-input	8
7.3	Fuses	8
8	Default flash firmware Image.....	9
8.1	Board ID.....	9
9	JUMPERS	9
9.1	JTAG Jumpers.....	9
9.2	Clock Jumpers.....	10
9.2.1	System Clock.....	10
9.2.2	Transceiver Clocks	10
9.3	Power Supply Jumpers	11
10	LEDs.....	11
11	Onboard Connectors	12
11.1.1	Ethernet Connector.....	12
11.2	Switch readout.....	12
11.3	Power Readout.....	13
12	Test result summary	15
13	Instrument Markings	16

List of figures:

Figure 1 ON/OFF switch.....	7
Figure 2 Fuse on UniBoard ²	8
Figure 3 JTAG jumper locations	9
Figure 4 Location of clock selection jumpers	10
Figure 5 Location of Transceiver clock enable jumpers.....	10
Figure 6 FPGA Power enable jumpers	11
Figure 7 Ethernet Connections.....	12
Figure 8 Switch Terminal Connector.....	12
Figure 9 POL readout connector	14

1 Introduction

Please read the following manual carefully before using your UniBoard² board revision 1.0. This manual contains important information on how to properly operate this unit. In this manual the safety and regulatory information is included. In this manual the parts included in the delivery package as well as peripheral parts for UniBoard² are described. In a separate section optional parts are discussed. The parts discussed in this document have been tested with UniBoard² rev 1.

All boards are tested with boundary scan and functional tests using the peripherals and tests as described in this document. For known issues or new issues please use the issue tracer at <http://support.astron.nl/redmine> (ask for more details about the issue tracker Andre Gunst, gunst@astron.nl)

1.1 Reference documents (RD)

Reference document which can be found on <http://www.radionet-eu.org/radionet3wiki/doku.php?id=jra:uniboard2:documents> (ask for more details about the wiki Arpad Szomoru, szomoru@jive.nl)

Ref.nr.	Document number	Title
RD-1	ASTRON-IS-?? 1.0	UniBoard ² Hardware rev 2.0 Firmware Build in Self Test
RD-2	ASTRON-RP-???	Risk analysis report UniBoard2
RD-3	ASTRON-RP-???	Measurements for CE

2 Safety, Regulatory and Environmental Information

2.1 Warranty

This ASTRON product is warranted against defects in material and workmanship for a period of one year from the date of shipment. During the warranty period ASTRON will, at its option, either repair or replace UniBoard² that prove to be defective. For warranty service or repair, UniBoard² must be returned to ASTRON. Buyer shall pay shipping charges to ASTRON and ASTRON shall pay shipping charges to return the product to buyer. However, buyer shall pay all shipping charges, duties and taxes for products returned to Astron from another country.

2.2 General Safety Considerations

WARNING	If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.
CAUTION	Ventilation Requirements: When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.
WARNING	These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.
WARNING	The opening of covers or removal of parts may expose dangerous voltages. Disconnect the UniBoard ² from all voltage sources before it is being opened.
WARNING	UniBoard ² in made for indoor use, don't expose the device to water.
CAUTION	The customer has to include over temperature protection in the firmware.
CAUTION	Changes or modifications not expressly approved by ASTRON, which is responsible for CE compliance, could void the user's authority to operate this equipment.

2.3 Preventing Electrostatic Discharge Damage

Protection against electrostatic discharge (ESD) is essential while connecting cables and assemblies (DUT) to the UniBoard². Static electricity can build up on your body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. To prevent damage to the UniBoard:

- always have a grounded, conductive table mat in front of UniBoard².
- always wear a grounded wrist strap, connected to a grounded conductive table mat, having a 1 MΩ resistor in series with it, when handling components and assemblies or when making connections.
- always wear a heel strap or ESD shoes when working in an area with a conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.
- always ground yourself before you clean, inspect, or make a connection.

2.4 Preventing Connector Damage

Visual Inspection and Gaging Connectors	
Do	Do Not
Inspect connectors with magnifying glass	Use a connector with a bent or broken center conductor
Look for metal debris, deep scratches or dents	Use a connector with deformed threads
Inspect and gage connectors	Use a connect or with a protruding center conductor
Use correct torque wrench	Use an out-of-specification connector
Making Connections	
Align connectors first	Cross-thread the connection
For SMA connector rotate only the connector nut	Twist connector body to make the connection
Use correct torque wrench	Mate different connector types

2.5 Shipment for Service

Contact ASTRON for instructions on how to ship the UniBoard² for service. Ship UniBoard² only using the original packaging material. Shipping UniBoard² in anything other than the original packaging may result in non-warranted damage.

2.6 Regulatory Information

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

2.7 CE directive

This product complies with the CE directive.

2.8 Waste Electrical and Electronic Equipment (WEEE) Directive



Directive 2002/96/EC of the European Parliament and of the Council. The wheeled bin symbol (left) is shown on this product. It indicates that the product should not be disposed of with regular household waste, but should be disposed of separately. Electrical and electronic equipment can contain materials that are hazardous to the environment and human health and therefore should be disposed of at a designated waste facility or returned to ASTRON for the appropriate recycling to take place. If you wish to dispose of this product and the product still functions, please consider recycling/reusing it.

This product has been designed for proto type purposes. Therefore this product is not RoHS compliant. To ensure compliance with the requirement of the WEEE directive, UniBoards which achieved at the end of their life must be returned to ASTRON. ASTRON will ensure environment friendly recycling of UniBoard.

2.8.1 Known Hazardous materials:

For the production of this board, leaded solder is used.

2.9 Environmental conditions

UniBoard² is developed for stationary, 19" rack mount use in a building.

Temperature range: +10°C to +30°C

Humidity 20% RH to 90% RH (non condensing)

UniBoard² should not be subjected to water.

2.10 Contact Information

All inquiries, comments or suggestions concerning this and other ASTRON equipment and manuals should be directed to:

ASTRON
 Gijs Schoonderbeek
 Oude Hoogeveensedijk 4
 7991 PD Dwingeloo
 Tel: +31 (0)521-595101

3 Included in the package

Table 1 Package content

	Number	Manufacturer.	Type
UniBoard ²	1	ASTRON	rev 2.0
UNB2_TB	1	ASTRON	rev
Memory	8	Micron	MTA18ASF1G72HZ-2G1A1
Fans for cooling	4	Multicomp	MC21689, Axial 60mm 48VDC
Power connector	1		
Metal Housing	1		

4 Peripherals

4.1 Needed peripherals, with recommendations

Table 2 Recommended peripherals

	Specification	Manufacturer	Type
Power Source	48V 500W	Meanwell	RCP-1K1UI-48
JTAG programmer		Altera	USB Blaster2

4.2 Optional peripherals

4.2.1 QSFP+

Connections to the front nodes, each node has 4 slots, given 16 slots for a single UniBoard.

Table 3 QSFP examples

	Specification	Manufacturer	Type
Transceiver	QSFP+, 40Gb, 850nm	Avago	AFBR-79EIPZ
AOCA	40GbE, 10m	TE	2123909-4

5 Specifications

Table 4 UniBoard² Specifications

Input power	48V DC
Power consumption	500W
Size	
Weight	??
Ambient temperature	10-27°C

6 ON/OFF

The FPGAs on UniBoard² need sequencing to **prevent damage** on the FPGA's. It is therefore better to **use the button on UniBoard² for power down** the board before the power board is switched on and off.

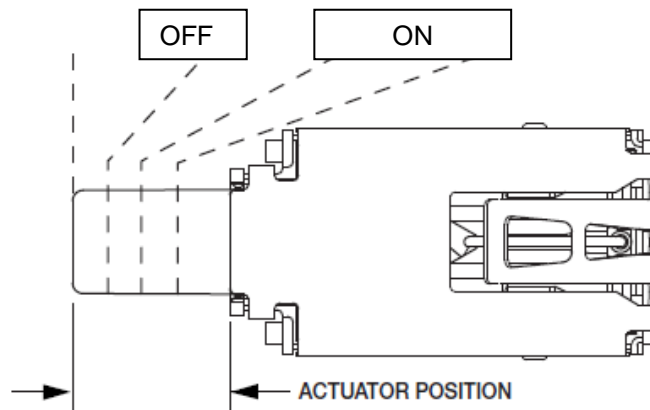


Figure 1 ON/OFF switch

7 How to connect to UniBoard

Minimal connections see **Error! Reference source not found.** and **Error! Reference source not found.** for the location of the connections are:

Table 5 UniBoard² connectors

Connection	Side	Specification
Power	Back side	Isolated 48V DC
Clock	Back side	200MHz
JTAG	Back side	Altera pinning
Ethernet	Front side	Standard RJ45

In **Error! Reference source not found.** the back side is shown. **Error! Reference source not found.** shows more details about the connections which have to be made to power up the board. **48V input remark:** UniBoard² has an isolated 48V power input. This means that a positive 48V power supply should be connected with the +48V-connection to the pin in the middle of connector P31 and the GND-connection to the left and right pins of P31.

7.1 Ethernet control

Up to four cables can be connected to UniBoard. Standard CAT6 10/100/1000BASE-T cables can be used.

7.2 PPS-input

For the pulse per second input (PPS) a simple pulse generator like the Agilent 33250A can be used. The setting depends on the firmware used. For the test image a pulse with an edge time of 5ns, a pulse width of 5ms and a period of 1s can be used. This pulse generator can be locked to the clock through the 10MHz reference input.

7.3 Fuses

On UniBoard², direct behind the power connector a fuse is placed. The fuses is 10A fast acting Littlefuse 154 Series type, with part number 0453010. In Figure 2 the location of the fuses are shown.

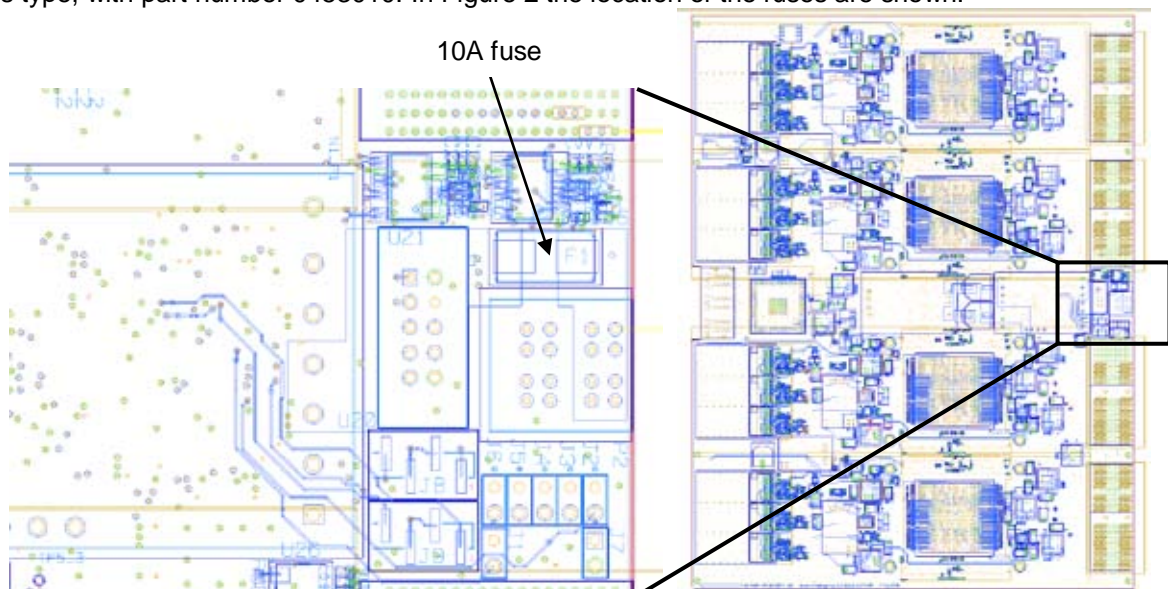


Figure 2 Fuse on UniBoard²

8 Default flash firmware Image

In the flash a default image, see RD-4, is installed. When the board is powered up the QSFP LED's will be red during build in self test and start blinking green when the test is successful.

8.1 Board ID

Depending on the firmware an external ID can be used for example the Ethernet IP/MAC. In **Error! Reference source not found.** the location of the dip-switch is shown. This dipswitch is located at the back side of the box.

9 JUMPERS

9.1 JTAG Jumpers

To use JTAG, Node 3 has to be enabled, see section 9.3. In the firmware of the Lattice CPLD (U4) the JTAG jumpers are programmed as shown in Table 6.

Table 6 JTAG jumper functions

J6	J5	J4	J3	J2	Function
open	x	x	x	x	Scanbridge mode
placed	open	open	open	Open	All FPGAs in the loop
placed	x	x	x	placed	Skip node 0
placed	x	x	placed	x	Skip node 1
placed	x	placed	x	x	Skip node 2
placed	placed	X	x	x	Skip node 3

J8 and J9 must be placed to pin 1-2 for normal operation (to the backplane side of the board), by placing the jumpers to 3-4 the CPLD (U4) can be programmed. J1 and J7 are not used by the firmware in the Lattice device (U4). In Figure 3 the locations of the jumpers are shown.

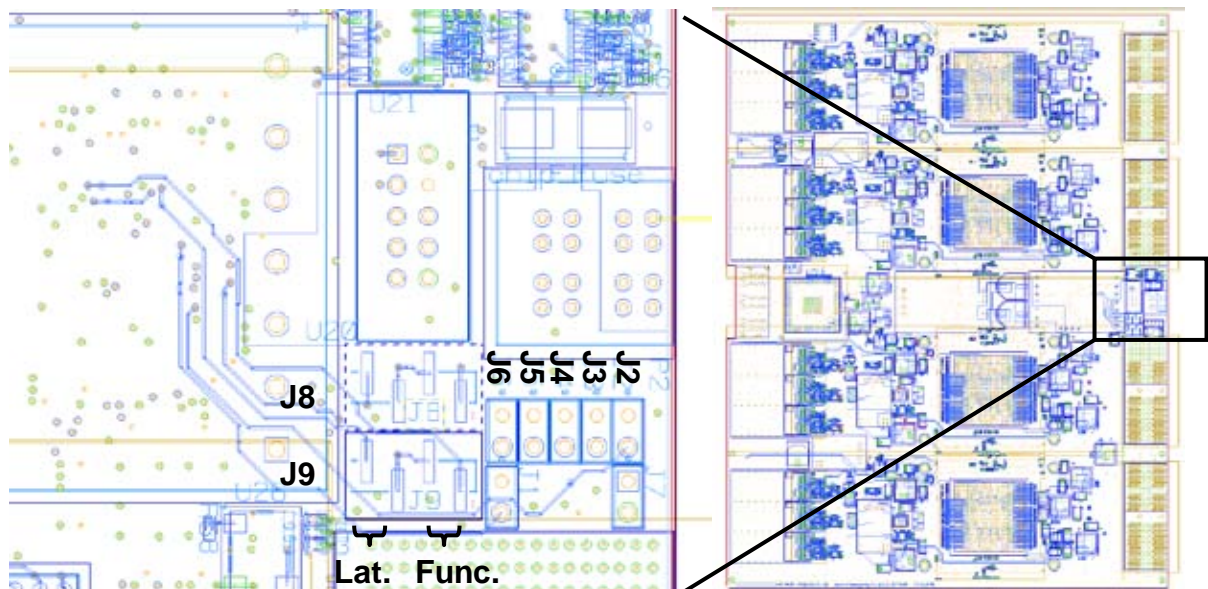


Figure 3 JTAG jumper locations

For programming the FPGAs with the Altera USBBlaster the front and back nodes can be placed in a single loop by placing J4 and J9 (see Table 6). In Altera's Quartus II programming utility Node 0 is placed at location 1, Node 1 at location 2, Node 2 at location 3 and Node 3 at location 4.

9.2 Clock Jumpers

9.2.1 System Clock

With J12 1-2 the clock can be selected. By placing the jumper onboard XO is used. By removing the jumper the input from the backplane is used. In Figure 4 the location of the jumpers are shown.

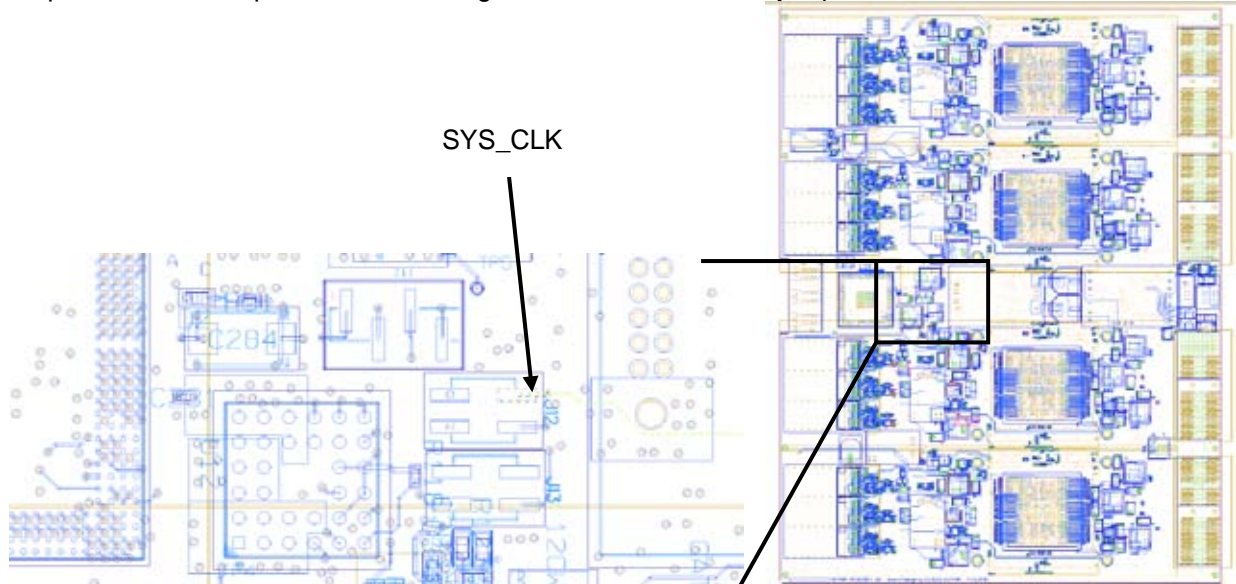


Figure 4 Location of clock selection jumpers

9.2.2 Transceiver Clocks

To enable the transceiver clocks the jumpers J13 3-4 (SER_CLK_A) and J12 3-4 (SER_CLK_B) should be placed, see Figure 5 Location of Transceiver clock enable jumpers

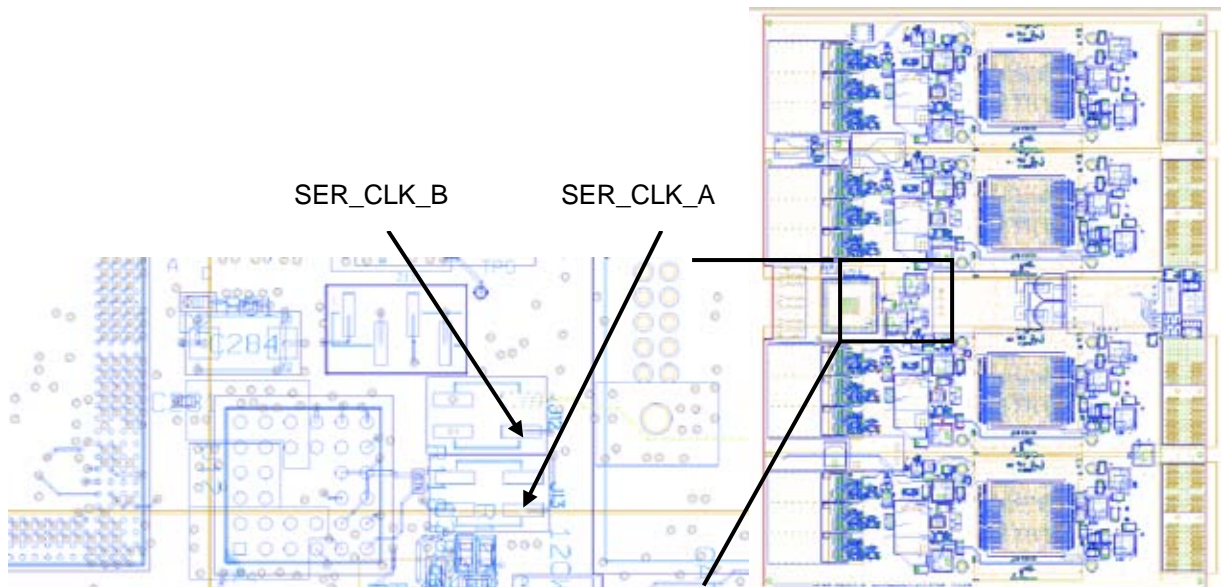


Figure 5 Location of Transceiver clock enable jumpers

9.3 Power Supply Jumpers

The power of every FPGA can be disabled when needed. For this J3_x is placed next to every FPGA, see Figure 6. By placing the jumper between 1-2 the FPGA are powered as normal, by placing the jumper between 3-4 the power of the FPGA is disabled.

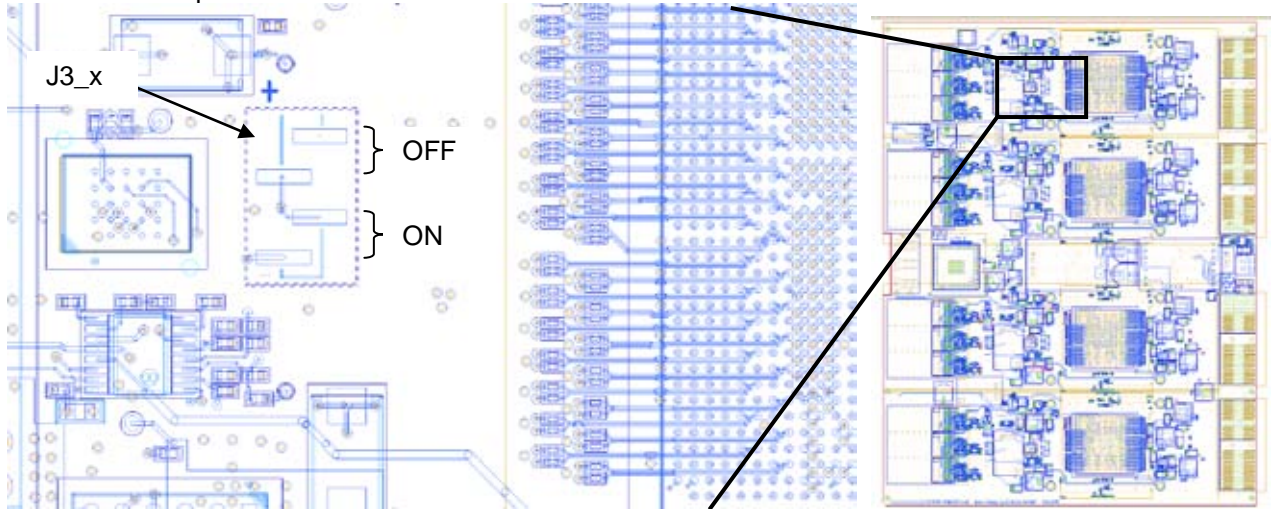


Figure 6 FPGA Power enable jumpers

10 LEDs

The power LED is integrated in the ON/OFF switch, the functions of the LED are shown in Table 7.

Table 7 Power LED

LED	State
Red	Power down
Green	Power on

On the QSFP cage light pipe are placed to show one LED per cage. The function of the LED is determined by the firmware. The function of the LED for the factory image is shown in Table 8

Table 8 QSFP Cage LED

LED	State
Red	???
Green	???

11 Onboard Connectors

11.1.1 Ethernet Connector

The Ethernet connector is shown in Figure 7.

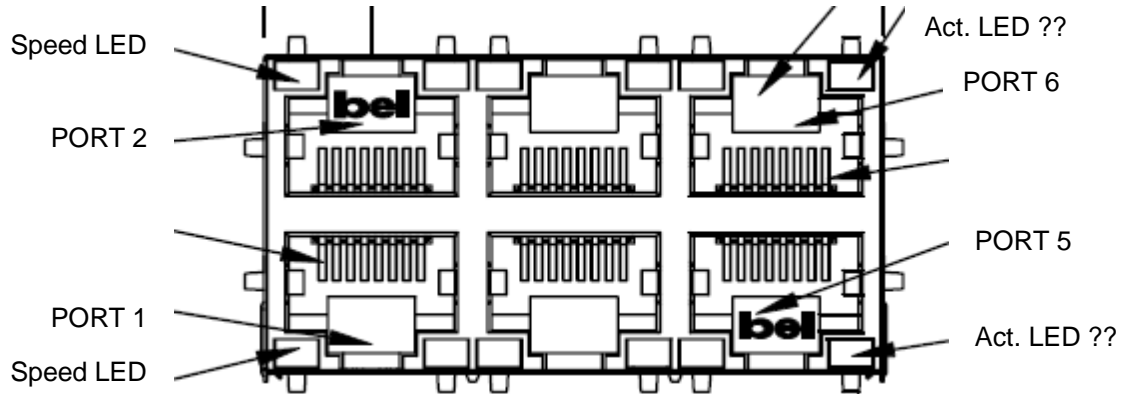


Figure 7 Ethernet Connections

In table the function of the ports are shown

Table 9 Function of Ethernet ports

PORT	Function	PORT	Function
1	VLAN 0	4	VLAN 0
2	VLAN 0	5	NOT USED
3	VLAN 0	6	NOT USED

11.2 Switch readout

On UniBoard2 a connector is placed for a RS232 terminal to readout the statistics of the Ethernet switch. In Figure 8 the pinning of the connector is shown.

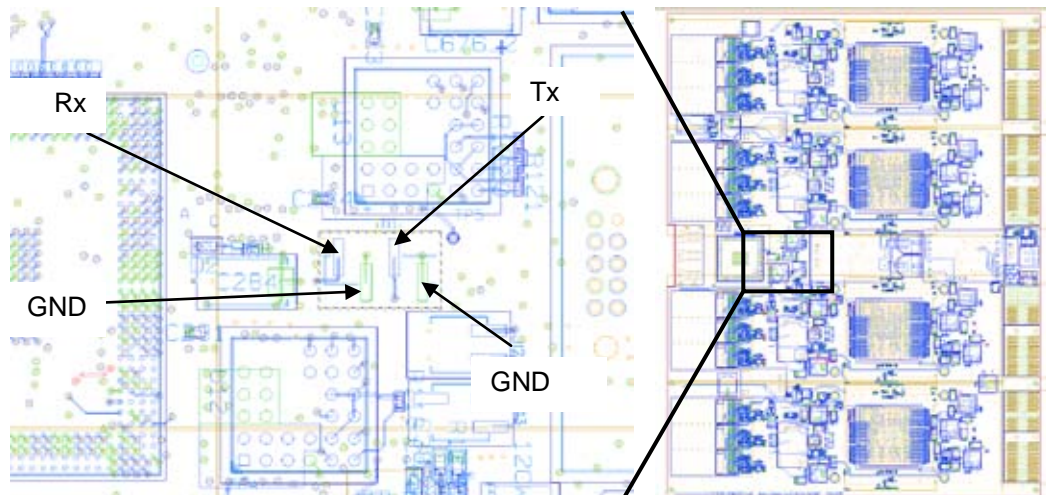


Figure 8 Switch Terminal Connector

For the communication to UniBoard Realterm could be used. The COM port must be set to 8 data bits, 1 stop bit, no parity 9600 baud and without flow control.

In the following subsections debug functions are described. The basic functions are described in [RD-5].

11.2.1 Version

With 'v' the version of the software and the chip can be readout. On the bottom of the version the mapping of the switch ports to FPGA and copper ports are shown, where "ll" stands for lower left RJ45 port, "ul" for upper left, "lr" for lower left and "ur" for the upper left port.

The result will look like:

```
UniBoard2 0.4
UniBoard2
Length Jumbo: 9600
Chip id: 273890e9
```

```
PRT0 PRT1 PRT2 PRT3 PRT4 PRT5 PRT6 PRT7 PRT8 PRT9 PRT10 PRT11 PRT12 PRT13
N0-0 N0-1 N1-0 N1-1 N2-0 N2-1 N3-0 N3-1 C ll C ul C lm C um C lr C ur
```

11.2.2 Status

With 's' the status of the switch can be readout. This will plot the status of the port and the number of transmitted and received octets since the last read out. The result will look like:

Port	Status	RXOCT	TXOCT
0	Port Up	0x00000000	0x00000000
1	Port Down	0x00000000	0x00000000
2	Port Up	0x00000000	0x00000000
3	Port Down	0x00000000	0x00000000
4	Port Up	0x00000000	0x00000000
5	Port Down	0x00000000	0x00000000
6	Port Up	0x00000000	0x00000000
7	Port Down	0x00000000	0x00000000
8	Port Down	0x00000000	0x00000000
9	Port Up	0x00000000	0x00000000
10	Port Down	0x00000000	0x00000000
11	Port Down	0x00000000	0x00000000
12	Port Down	0x00000000	0x00000000
13	Port Down	0x00000000	0x00000000

11.2.3 Reboot

With 'b' the switch can be rebooted.

11.3 Power Readout

On Uniboard² digital power Point of loads are placed. This will enable readout of the power consumption per regulator. This can be done by the FPGA, but for debugging an Ericsson controller and software can be used to readout and adjust the converters. For this a header is placed close to every FPGA, see Figure 9.

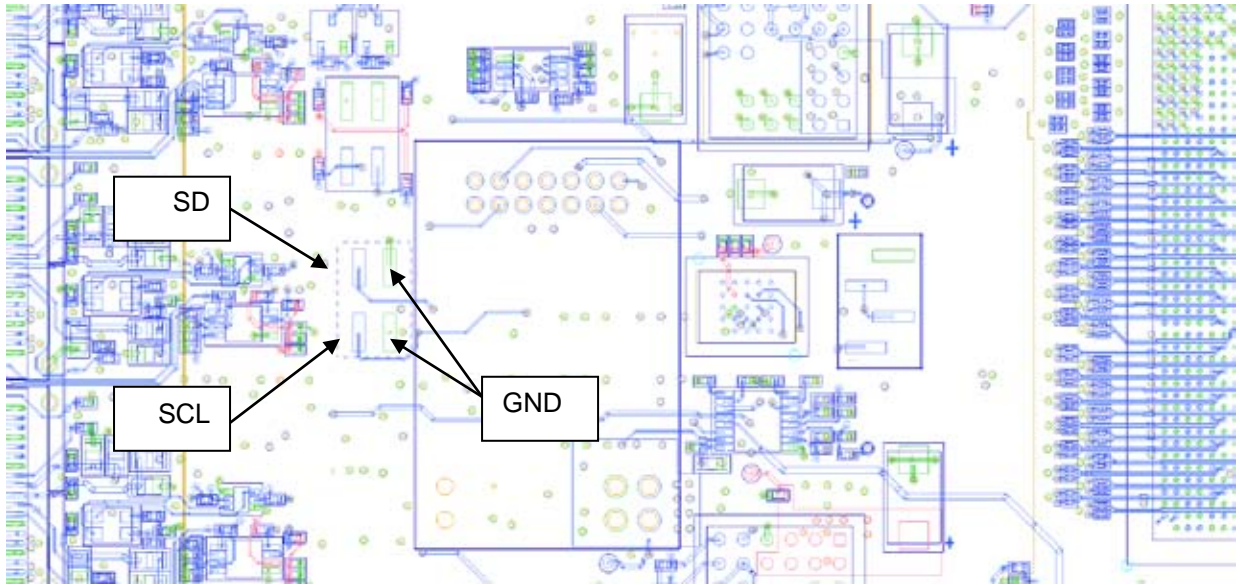


Figure 9 POL readout connector

The input brick and the PIM cannot be read out with an external controller.

12 Test result summary

UniBoard² Test Result Summary		
Customer:.....		
UniBoard ² serial number:		
Date of test:		
Test conductor:		
Items to be checked during the end test / inspection:	Yes	No
1. PCB tested?	<input type="checkbox"/>	<input type="checkbox"/>
2. Production test, X-Ray and Optical inspection passed ?	<input type="checkbox"/>	<input type="checkbox"/>
3. All power supplies within 5%? ¹	<input type="checkbox"/>	<input type="checkbox"/>
4. Boundary scan passed?	<input type="checkbox"/>	<input type="checkbox"/>
5. Default firmware stored in flash?	<input type="checkbox"/>	<input type="checkbox"/>
6. Basic board interconnections passed?	<input type="checkbox"/>	<input type="checkbox"/>
7. Board IO interconnections passed?	<input type="checkbox"/>	<input type="checkbox"/>
8. Visual inspection: UniBoard ² , memory, housing, manual, power cables and CE mark?	<input type="checkbox"/>	<input type="checkbox"/>
<p>The UniBoard² with serial number mentioned above is:</p> <p><input type="checkbox"/> Rejected if one or more items of above list indicate "No"</p> <p><input type="checkbox"/> Passed and released for shipment if all items indicate "Yes"</p>		
Company: ASTRON		
Inspector:		
Date of end inspection:		
Signature:.....		
Copy of this sheet to be added with the Hardware		

¹ Measured with unconfigured FPGAs

13 Instrument Markings



The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.



This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electrical and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).



The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)