ETH6608 Scanner Controller

Users Manual

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ETH6608 hardware and design © by Sintec Optronics

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1 Copyright

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The ETH6608 hardware and design is © by Sintec Optronics.

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2 Safety

The hardware described within this document is designed to control a laser scanner system. Laser radiation may effect a person's health or may otherwise cause damage. Prior to installation and operation compliance with all relevant safety regulations including additional hardware-controlled safety measures has to be secured. The client shall solely be responsible to strictly comply with all applicable and relevant safety regulations regarding installation and operation of the system at any time.

Beside of that some laser equipment can be damaged in case it is controlled with wrong signals. Thus it is highly recommended to check the output generated by this device using e.g. an oscilloscope to avoid problems caused by wrong configurations. This should be done prior to putting a system into operation for the first time, whenever some parameters have been changed or whenever any kind of software update was installed.

3   Overview

This document describes the ETH6608 scanner controller board, its electrical characteristics and usage.

ATTENTION: The ETH6608 board is a 3rd party hardware solution OpenAPC is not responsible for. This board is intended to be used together with the BeamConstruct laser marking software or within a ControlRoom process control project out of the OpenAPC software package. For a detailed description of this software package and its components please refer to the related manual at http://www.beamconstruct.com/download/manual.pdf , for further details and information please refer to http://www.beamconstruct.com/ or http://www.openapc.com

The ETH6608 scanner controller board is designed for controlling galvanometric scanner systems with two axes. When it is used together with BeamConstruct or within a ControlRoom project it can be operated in 3D mode too, here three axes can be controlled. It supplies also several signals for laser and external control.

The communication between the host system and the controller board is done via Ethernet.

The allowed temperature range for proper operation is from -5°C to 50°C.

3.1   Features

Together with BeamConstruct and ControlRoom the ETH6608 scanner controller card offers following features:
- 100 Mbit Ethernet connection
- XYZ grid correction
- 10 microseconds cycle time and resolution
- X, Y and Z output channels (16 bit direct analogue outputs)
- optionally X, Y and Z output channels
- XY2/100 signals (requires hardware variant B)
- digital inputs and outputs
- power control via 16 bit DAC, 8 bit laser port or PWM signal
- static marking on-the-fly in X and Y direction or combinations of both
- wobble with freely definable frequency and amplitude
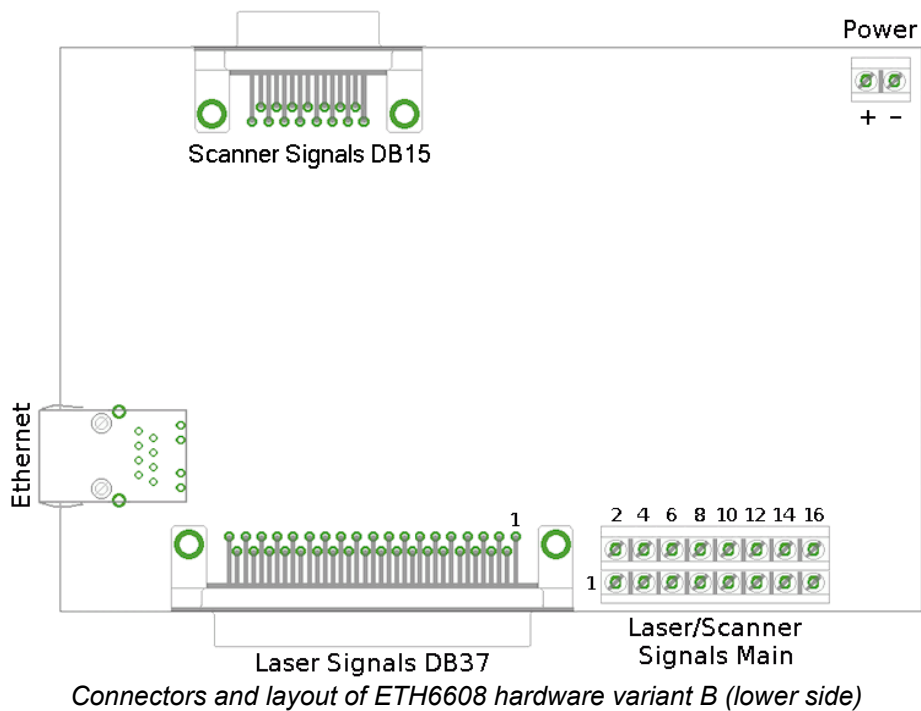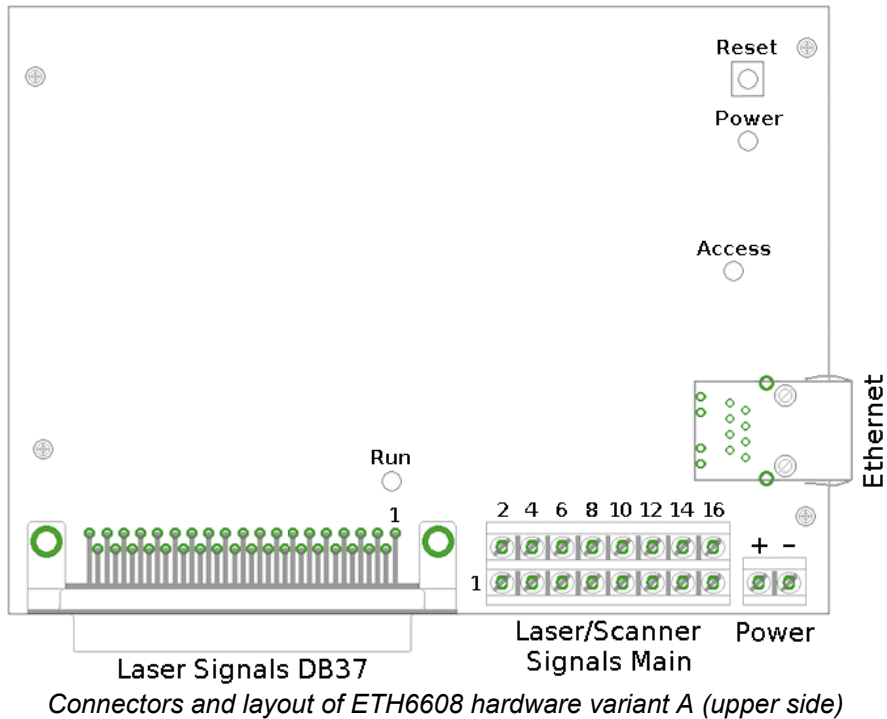- bitmap marking

4 Position Within The System

The ETH6608 scanner controller board is connected to the host system via Ethernet to receive laser marking data from BeamConstruct main application or from ControlRoom process control software. The board itself is connected with the scan head to submit 2D or 3D position information to it. Beside of that it is connected to a laser to submit motion-synchronous laser data.
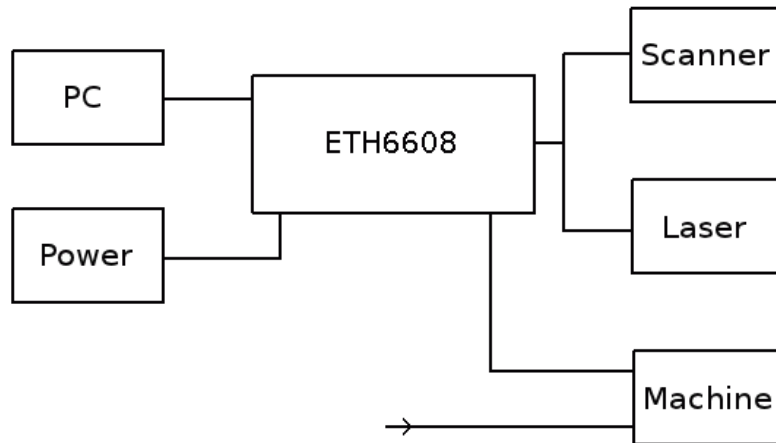
Additional communication channels between the ETH6608 scanner controller board and a connected machine can be done via separate IOs of the controller board.

5 Board And Connectors

Connectors and layout of ETH6608 hardware variant A (upper side)

Connectors and layout of ETH6608 hardware variant B (lower side)

The ETH6608 board provides the following connectors:

- Ethernet – for communication with the host system, marking information are submitted via this path
- Power – connect with power supply 5V DC via screw/plug connector
- Laser-/Scanner Signals Main – screw/plug connector for analogue power and scanner signals as well as some specific digital signals

- Laser Signals DB37 – output for additional laser signals
- Scanner Signals DB15 (hardware variant B only) – output for XY2/100 signals

5.1 Ethernet

This is a standard RJ45 Ethernet plug for connection of the board with the host system.

The controller board is accessed via this connection exclusively, all scanner and laser data are sent via Ethernet only. Thus it is recommended for security reasons to have a separate 1:1 connection from the host to the scanner controller card by using a separate Ethernet port. In case this is not possible at least an own, physically separated sub-net for all scanner controller cards should be set up. This network of course should be separated from normal network completely.

By default the ETH6608 is using IP 192.168.1.55, thus the Ethernet port the card is connected with needs to belong to subnet 192.168.1.0/24.

PLEASE NOTE: For security reasons it is highly recommended not to mix a standard communication network with an ETH6608 network or to connect the scanner controller card with a standard network. Here it may be possible someone else in that network (accidentally) connects to that scanner controller and causes laser emission.

5.1.1 Configuration of the IP

The IP of the scanner controller can be changed. This is necessary e.g. in case an other subnet has to be used or in case the ETH6608 board has to be used in multi-head environment where more than on card has to be accessed at the same time.

To change the IP a Telnet-connection has to be established to the card. Once this is done following command has to be executed:

```
vi /home/rc.app
```

This starts an editor named "vi" together with a text file "rc.app" that is located in directory "home". "vi" is a very specific editor designed to be slim, fast and to be used via console easily. "vi" has a command and a editing mode. To switch from command to editing mode a special key has to be pressed. To switch back, "Escape" has to be pressed. For a more detailed description of "vi" please refer to http://www.washington.edu/computing/unix/vi.html.

Following the sequences that have to be typed are shown together with a short explanation:

To be typed in console	Remarks
i	Switches to editing mode, everything is typed as text from now on
ifconfig eth0 192.168.1.56	Text that defines new IP 192.168.1.56 for the network interface on next start-up
[ESC]	Leave editing mode
:wq[RETURN]	Commands for writing the file and exiting the editor

After this the file rc.app contains the required data. Finally it has to made executable by typing

```
chmod 755 /home/rc.app
```

in console. Afterwards the card can be rebooted by typing

```
reboot
```

As soon as the card is back, it will use the new IP defined in rc.app.

5.2 Power

Screw terminal and plug connector to connect the power supply with the ETH6608 scanner controller board. The voltage has to be 5V DC (smoothed). To avoid high frequency interferences from other electrical equipment or from within the power supply it is recommended to place a ferrite bead at the cable close to the board.

5.3 Laser-/Scanner Signals Main

The most relevant laser and scanner signals are provided via 16 pin screw terminal / 16 pin plug connector

Following signals are available at these connectors:

Lower / Front Pin	Signal	Voltage	Remarks	Higher / Back Pin	Signal	Voltage	Remarks
1	reserved		Do not connect!	**2**	Analogue OUT	0..10V	Laser power control
3	reserved		Do not connect!	**4**	Analogue Gnd		
5	reserved		Do not connect!	**6**	Z Axis	0..10V	Analogue galvo control
7	reserved		Do not connect!	**8**	Z Gnd		
9	reserved		Do not connect!	**10**	X Axis	0..10V	Analogue galvo control
11	GND	0V	TTL low level for inputs	**12**	X Gnd		
13	V_{CC}	5V	TTL high level for inputs	**14**	Y Axis	0..10V	Analogue galvo control
15	reserved		Do not connect!	**16**	Y Gnd		

5.4 Laser Signals DB37

The laser signal connector is a 37 pin header that provides some additional laser signals such as a laser port (LP, 8 bit parallel port) to control e.g. the power output of a laser as well as some other additional out- and inputs.

The maximum current that is allowed to be pulled out of the outputs is 10 mA each.

Upper Pin Row	Signal	Voltage	Remarks	Lower Pin Row	Signal	Voltage	Remarks
1	V_{CC}	5V	TTL high level for inputs	**20**	Digi OUT0	TTL	
2	reserved		Do not connect!	**21**	Digi OUT1	TTL	
3	reserved		Do not connect!	**22**	PWM	TTL	Q-Switch / PWM power control / stand-by frequency output
4	Digi OUT2	TTL		**23**	Lasergate	TTL	Turns the laser on and off
5	Digi OUT4	TTL		**24**	Digi OUT3 / Master	TTL	Digital output or Master Oscillator switch in Fiber Laser

Pin	Signal	Type	Description	Pin	Signal	Type	Description
					Oscillator		mode
6	LP Bit 0	TTL	Least significant bit of laser port / 8 bit parallel port	25	Digi OUT5 / Power Amplifier	TTL	Digital output or Power Amplifier switch in Fiber Laser mode
7	LP Bit 2	TTL		26	LP Bit 1		
8	LP Bit 4	TTL		27	LP Bit 3		
9	LP Bit 6	TTL		28	LP Bit 5		
10	Digi OUT6 / PLATCH	TTL	Digital output or power latch signal in Fiber Laser maode	29	LP Bit 7		Most significant bit of laser port / 8 bit parallel port
11	reserved		Do not connect!	30	Digi OUT7	TTL	Digital output
12	GND	0V	TTL low level all inputs have to be pulled to for 0 input	31	reserved		Do not connect!
13	reserved		Do not connect!	32	reserved		Do not connect!
14	reserved		Do not connect!	33	reserved		Do not connect!
15	Stop Marking	TTL	External mark stop signal, **has to be pulled to LOW or controller has to be operated with inverted input logic for proper marking!**	34	Digi IN4		Do not connect!
16	Digi IN1	TTL		35	Digi IN0	TTL	
17	Digi IN2	TTL		36	Digi IN6	TTL	
18	Digi IN3	TTL		37	Digi IN5	TTL	
19	Digi IN7	TTL					

5.5   Scanner Signals DB15

This connector is only available on ETH6608 hardware variant B. It provides XY2/100 compatible output signals:

Upper Pin Row	Signal	Lower Pin Row	Signal
1	CLK-	9	CLK+
2	SYNC+	10	SYNC-
3	X-	11	X+
4	Y-	12	Y+
5	reserved	13	reserved
6	reserved	14	reserved
7	reserved	15	reserved
8	Ground		

5.6   Status of LEDs

There are three relevant LEDs on the board that signal the state of the controller.

Power – scanner card is powered
Access – scanner card is active accesses internal data
Run – scanner card is alive and running

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