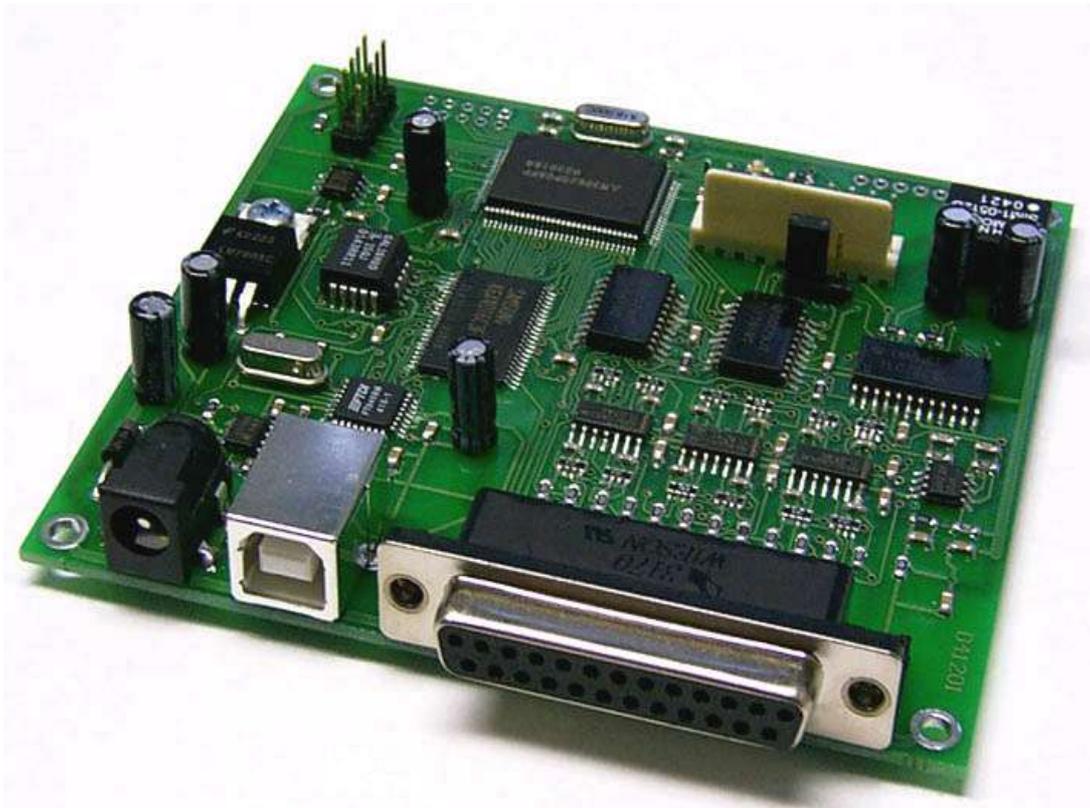


# **EasyLase<sup>®</sup> USB**

USB-Outputboard with ILDA-Interface

## **Users Manual**



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# Contents

<b>1</b>	<b>Description</b>	<b>Page 3</b>
1.1	Features	
<b>2</b>	<b>Starting up</b>	<b>Page 4</b>
2.1	Handling instructions boardversion	
2.2	Step-by-step driver installation	Pages 5-7
<b>3</b>	<b>Signal connectors</b>	<b>Page 8</b>
3.1	Connecting Signal- and Colorsignals	
3.2	TTL-Outputs	Page 9
3.3	Status-LEDs	
3.4	Intensity-Jumper	
3.5	Expansion connectors	
3.6	Boardlayout and Dimensions	Page 10
<b>4</b>	<b>Showoutput via USB</b>	<b>Page 12</b>
4.1	Reload speed	
4.2	Data jam	
4.3	Use EasyLase USB with the Showsoftware	Page 13
<b>5</b>	<b>Firmwareupdate</b>	<b>Page 14</b>
5.1	Updatefiles	
5.2	Updateprocedure	Pages 15-18
<b>5.3</b>	<b>Troubleshooting</b>	<b>Page 19</b>
<b>6</b>	<b>Problems</b>	<b>Page 20</b>
6.1	Driver malfunction	
6.2	Laseroutput distorted or no colors/blanking	
6.3	No function when running showsoftware	
6.4	Software or hardware crashes during operation	

# 1 Description

The Lasershow-outputboard EasyLaseUSB allows the control of ILDA-compatible lasershowprojectors over USB by using different Showsoftware.

There is no need for installing cards into PC-slots and Notebooks can be used to playback lasershows.

A driver-DLL with open documented API allows to use the board with self-written showsoftware.

All output signals for the laserprojector are symmetrical and are located at an ILDA-standard connector.

## 1.1 Features

- USB full speed Interface (12Mbits/Sec.)
- 1..5 Mbytes/Sec. maximum Datatransfer
- High Performance 16Bit-Microcontroller for fast dataprocessing
- 512 Kbytes RAM
- Maximum framesize 16.000 points
- Dual framebuffer for interruption-free showoutput
- X/Y-outputs 12 Bits resolution, 16 millions framecoordinates totally
- Coloroutputs RGB, Intensity, 8 Bits resolution each, 16 millions of colors
- Outputspeed up to 65000 points per second (pps)
- Additional 8 Bit TTL-compatible digital output
- Single 9V DC / 200mA powersupply
- ILDA-standard connector with symmetrical signal lines
- Error-tolerant dataprotocol
- 'Plug 'n play' driver for Windows98/ME/2000/XP included
- Open documented API for driver DLL
- Up to 16 EasyLase cards can be run simultaneous on one PC
- Supports 512 DMX-channels input and output
- Expansion connector for DMX-add-on
- Firmwareupdate over USB
- Support by Laser Design Studio, Phoenix and Mamba Software

### **Important:**

EasyLase USB supports **one outputchannel for one laserprojector**.

Multiple projectors can be connected parallel to the ILDA-connector and display the **same content** of the output (for example satellite projectors).

Should **different projectors display different contents** (channels) of a show, multiple EasyLase USB cards are necessary, one for each output channel of the software.

Also the software then must support multiple output devices (channels).

## 2 Starting up

Use regulated DC powersupply only. The device works with voltages from 8V to 24 V. It is recommended to use powersupplies which are well immunized against power line transients or to use power plugs with integrated EMI-filters. For enhanced reliability during operation, the use of a high-quality USB2.0-cable (double shielded with integrated EMI-filters) is suggested. Lowquality-cables can cause malfunction of hardware and software.

Each device is shipped together with a CD-ROM, containing documentation and drivers.

### 2.2 Handling instructions boardversion (OEM-version)

When the device is used as open board version (OEM), it should be taken into account, that the device is sensitive object. Static discharge and other external influence can damage electronic components on the board.

The device can also be damaged by applying external voltage to signal pins, by wrong connections and other kind of manipulation. Watch for correct connection of signals and careful handling.

The manufacturer excludes liability in case of damages as result of unproper handling, wrong signal connection and unspecified working conditions, unless it is verifiable that damage existed when the product left factory.

Also any liability claims regarding damage caused by the use of this product will be rejected.

### 2.2 Step-by-step driver installation for EasyLase USB

#### **Important!**

Each device, which is connected to the USB-port of the PC for the first time, needs a driver installation. Also an installation will be necessary, when the USB-port for connecting the device will be changed (depends on operating system).

Using multiple devices, it is recommended to use the same port for the same device all times to avoid driver reload.

When installing the first device, it is necessary to locate the driver files on the data media (disk, CD-ROM). When installing additional devices, the option 'automatic installation' of the driver installation wizard can be selected.

The driver can be installed directly from CD, but it is suggested to locate the driver files in a directory of the harddisk.

Copy the file 'EasyLase.dll' into the directory, where the executable file of showsoftware is located. If you want to remove the device drivers, use the program

**'Ftd2xxun.exe'**

This program removes all installed device drivers and registry-entries only for EasyLase-devices.

Connect the device to the USB-port and plug in the powersupply.

The green LED 'Device Status' should be on. All other LEDs should be off.

Until the following message appears, it can take some seconds, depending on your system.

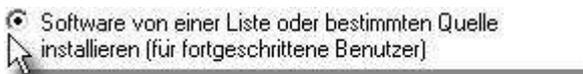
It is strongly recommended to wait until the following message appears.

Do not disconnect the device or click off any messages!

Windows will recognize the device after a few seconds and will open the installation dialog:



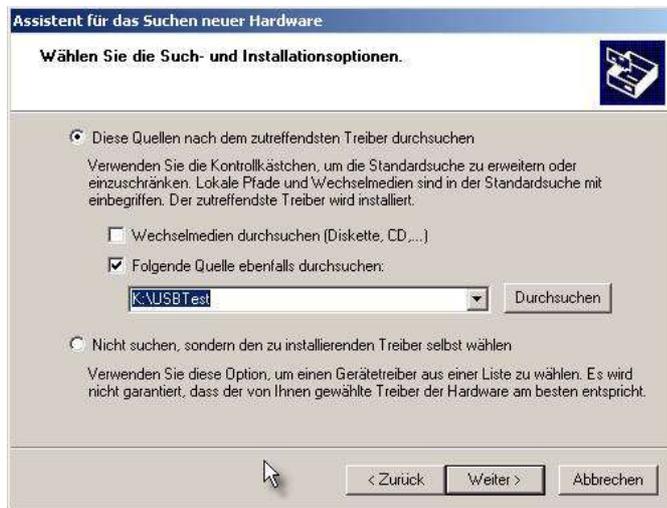
Select



and then



Now choose the drive and directory, where the driver files are located



When you want to install from the CD, choose



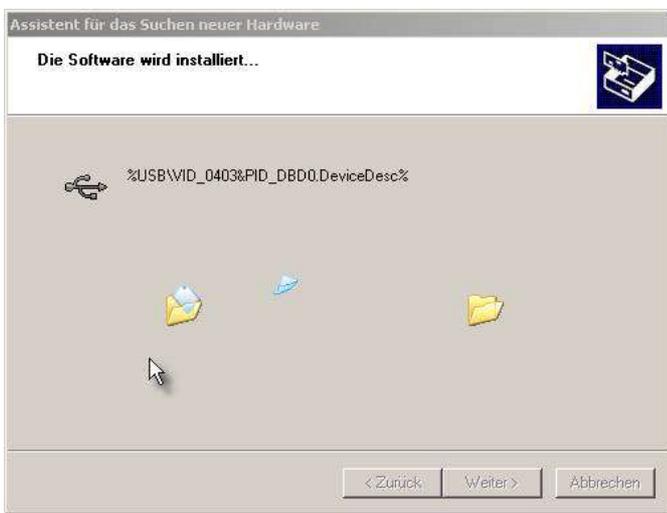
Confirm with



Windows will search the driver now



and install it



When using Windows XP as operating system, a message will appear:



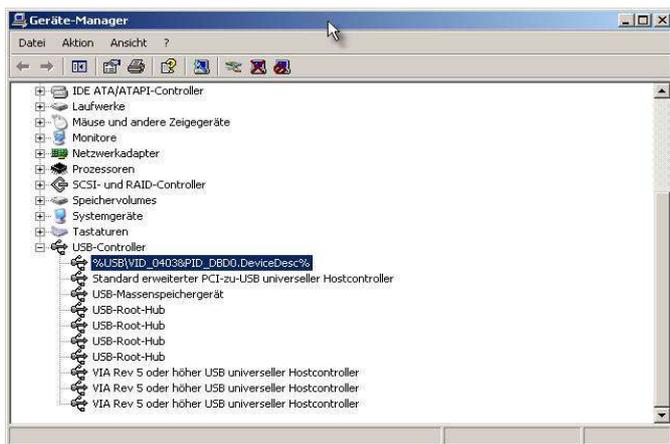
Continue with the installation. Do not exit.



After installation is complete successful, confirm with finish



Now the device should be listed in the hardware manager:



## 2 Signal connectors (see also Fig.1)

### 2.1 Connecting Scanner- and Colorsignals

All signals are located at an ILDA-standard connector. This can be a 25pin D-Sub-connector (female) or a 26pin IDC-connector, when the device should be mounted in a projector directly.

The IDC-connector allows to connect a separate D-Sub connector by using a flat cable.

All pins are routed 1:1, except pin 26, which has no function. Note the different pinnumbers of the connectors. The wirenumber of a flat cable, starting with 1 at pin 1 corresponds to the pinnumber of the DSUB connector (see table below and page 11).

Signals for X, Y and RGB-colors are available.

The intensity/blanking signal can be selected as a digital blanking or analog intensity signal (depending on used software).

All outputs are symmetrical and be used in 3 different configurations:

1. symmetrical signal. Outputs + and – are connected directly with the corresponding pins of the receiving unit. For signal inversion, the 2 lines just have to be crossed.
2. Single ended. Output – will be grounded to 0V (GND) and the outputs + and GND have to be connected to the inputs of the receiving unit.
3. Single ended inverted. Output + is grounded to GND and the outputs – and GND are connected to the inputs of the receiving unit.

**Important: Never let one half of a signal pair unconnected!**

When using single ended mode, either the + or – line of a signal **has** to be connected to the ground of the laser projector or via a 4.7 kilohm resistor!

The maximum signal level between the scanner outputs X and Y is 10V and the signal level between the color outputs is 5V.

All outputs can be grounded and are short circuit protected.

DSUB-25 (ISP)	IDC26	Name	Function
1	1	X+	Scanneroutput +
2	3	Y+	Scanneroutput +
3	5	Intens+	Intensity/Blanking +
4	7	Interlock A	Internally connected to 17
5	9	Red +	Coloroutput Red +
6	11	Green +	Coloroutput Green +
7	13	Blue +	Coloroutput Blue +
8 – 12	15 - 23	Not used	
13	25	Shutter	+5V *
14	2	X-	Scanneroutput –
15	4	Y-	Scanneroutput –
16	6	Intens-	Intensity/Blanking –
17	8	Interlock B	Internally connected to 4
18	10	Red -	Coloroutput Red -
19	12	Green -	Coloroutput Green -
20	14	Blue -	Coloroutput Blue -
21 – 24	26	Not used	
25	24	GND	Ground
Shield	-	Shield	Connected to GND via 1M-resistor

\* Note: maximum load 20mA for 5V

## 2.2 8 Bit TTL-Outputs

Also on the board, 8 TTL-compatible digital outputs are located at a 10pin single-row header.

**Important:** The TTL-outputs are not short circuit protected.

Never apply any voltage to these pins and avoid electrostatic discharge when touching or connecting the pins. Otherwise, the board can be damaged.

Also do not use more than 50mA of current at the 5V supply pin.

### Pins

1	GND	Ground
2	+5V	Powersupply internal
3	Data 1	TTL-Bit 1 (LSB)
4	Data 2	TTL-Bit 2
5	Data 3	TTL-Bit 3
6	Data 4	TTL-Bit 4
7	Data 5	TTL-Bit 5
8	Data 6	TTL-Bit 6
9	Data 7	TTL-Bit 7
10	Data 8	TTL-Bit 8 (MSB)

When using the signals to connect external devices, it is recommended to use additional TTL-drivers (74HCT241 or 74HCT244) or optocouplers to protect the circuit.

## 2.3 Status-LEDs

Functions of the LEDs:

Device Status **green** shows normal operating condition

DMX-Status **green** monitors that a valid DMX-In signal is connected.

USB-Status **yellow** shows a datatransfer via USB

ERROR **red** shows an Error or the Busy-state (data jam if the framebuffers are both full)

## 2.4 Intensity-Jumper

With the jumper, the intensity/blanking-output of the ILDA-connector is selected between digital blankingoutput (position A) or analog intensity signal (position B).

Digital blanking signal is generated by the unit automatically, if all colorvalues R, G, B and Intensity are zero.

Not all software supports intensity, like LDS does. If there is no blanking visible at the projected image, choose another jumper position.

## 2.5 Expansion connector DMX

The 10pin-expansion connector is prepared for connecting a DMX add-on board.

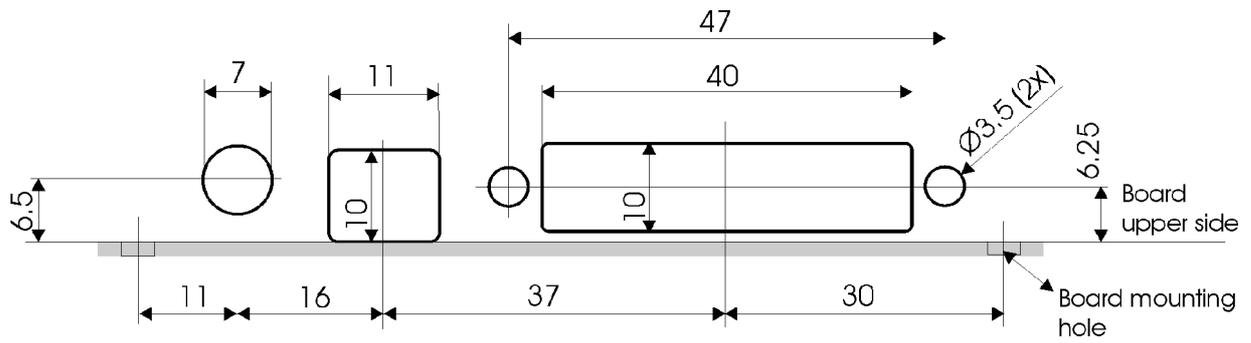
DMX-support is fully implemented from firmwareversion 019 or higher.

All 512 Channel can be used by software and all channels will be read and output by EasyLase simultaneously.

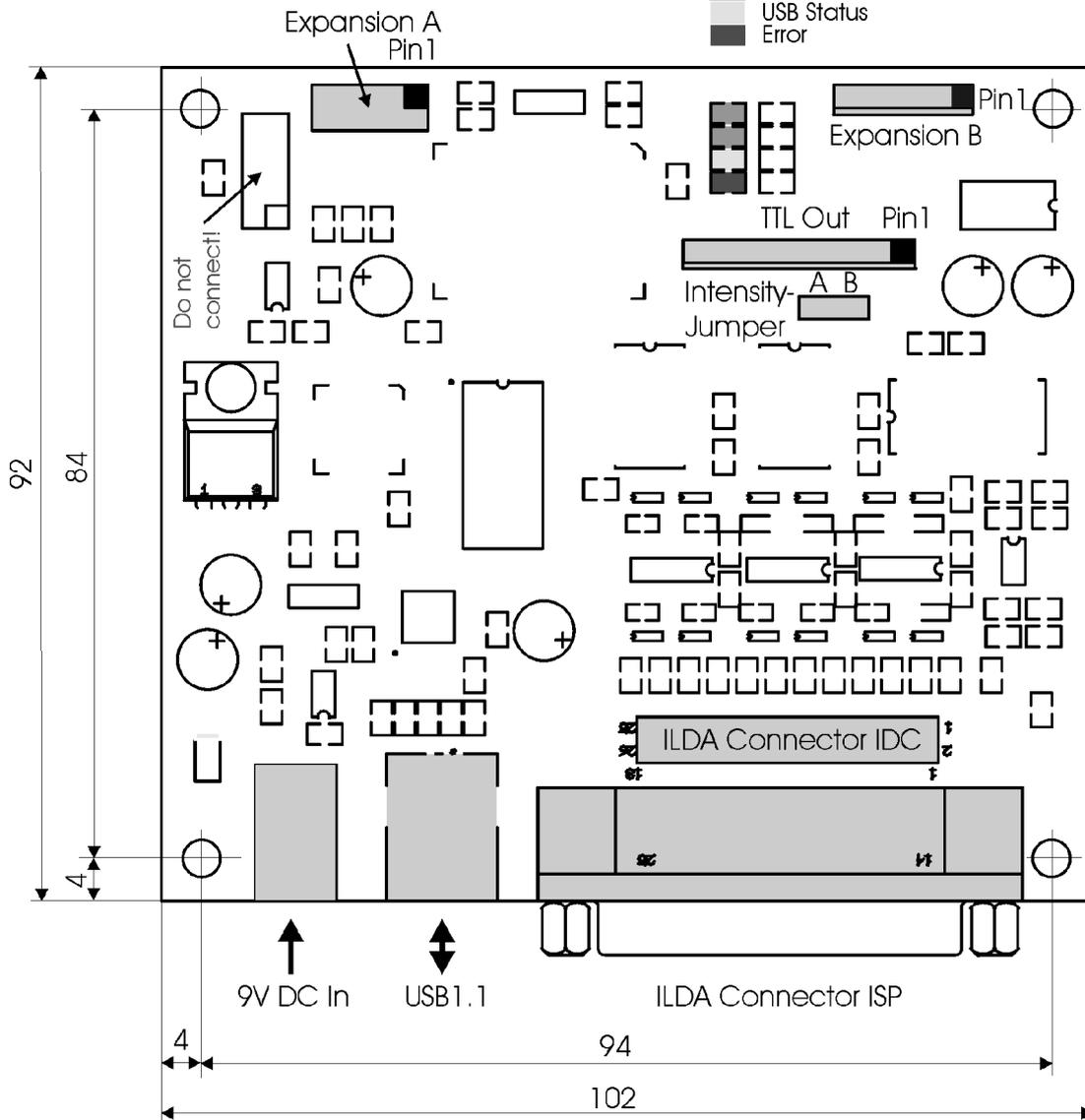
The Output of DMX is enabled once an access by software (Write DMX) occurs. So it is recommended to implement such an access at the start of the software, when DMX-out should be supported. DMX-in always is enabled at startup of the device.

**Fig. 1 Boardlayout and Dimensions**

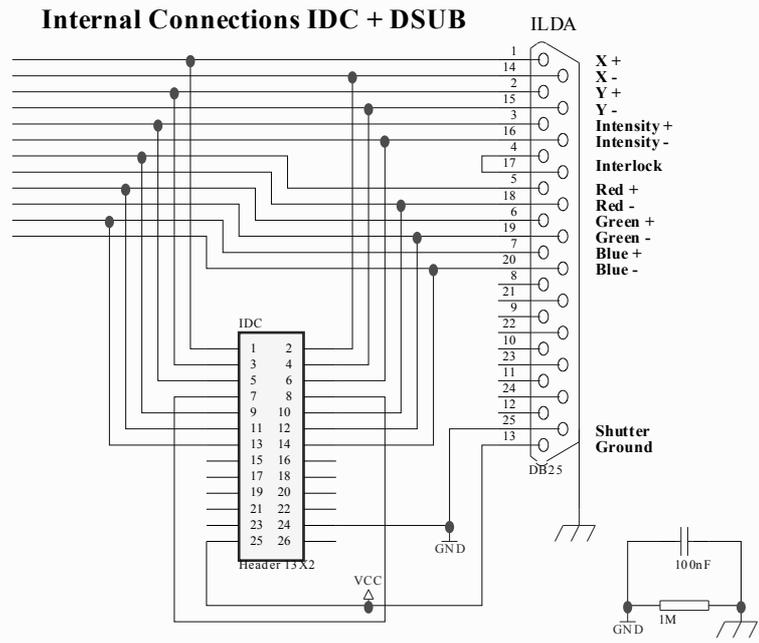
**Mountingholes for connectors:**



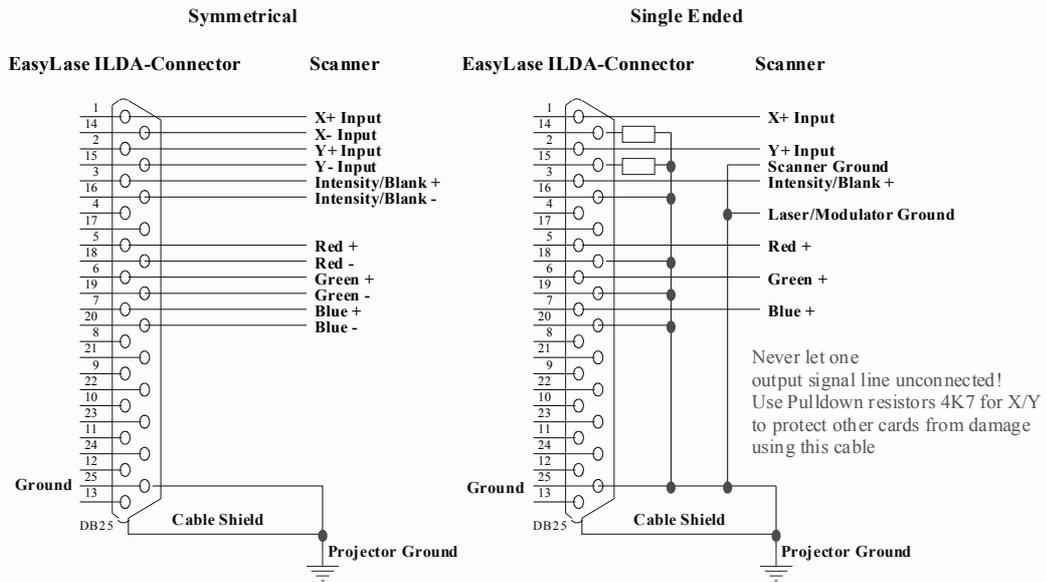
- Device Status
- DMX Status
- USB Status
- Error



All dimensions are in millimeters



### Projector Connection



For long distance >10m use symmetrical cable only.

**Fig. 2**

### 3 Showoutput via USB

Showoutput and datatransfer with EasyLase is always **framebased**. A complete frame (picture) will then be outputted to the laserprojector, when it is completely transferred via USB into the internal framebufer of the device.

EasyLase supports 2 separate framebuffers with 128 Kilobytes each.  
Because a point needs 8 Bytes, a frame can consist of 16.000 points maximum.

As soon as the first framebuffer is loaded via USB, output starts immediately and the second buffer can be filled.

When output of the first frame is finished, the system checks if the second buffer is full.

If this is not the case, the first frame will be repeated.

On the other side, when reload of the buffers is faster than showoutput, both buffers are full and no new data can be received. New incoming data would be discarded.

EasyLase gives a handshake over USB (Ready/Busy on demand), so the software can check the condition of the framebuffers, before new data is sent.

#### 3.1 Reload speed

The quality of the showoutput depends on the efficiency of the reloadsystem of the software.

Loading maximum number of frames in minimum time results in no better quality!

Framebuffers are enabled for reload, when the frames are outputted.

The duration of the output of a frame depends on the pointspeed pps.

The showsoftware must monitor the timing of the frames and should transfer frames in no faster intervals, than they can be outputted.

#### 3.2 Data jam

The condition of the datatransfer and the framebuffers can be watched at the status-LEDs.

The yellow LED is on during transfer of a frame via USB. This LED blinks faster, the more frames are transferred per second, and longer, the more data (points) is in the frame.

The red Error-LED is on, when the software tries to load a frame, while one buffer is in output-state and the second one is already full.

When the red Error-LED is on or blinks stronger, the outputspeed (points per second) is too slow compared to the framerate (frames per second).

#### **Example:**

When 20 frames per second are displayed with 1000 points each, the outputspeed has to be at least 20.000 pps.

When lowering pointspeed, frames are loaded faster then they can be outputted and a data jam occurs.

USB-transfer is not blocked by the device. Incoming unexpected frames are discarded automatically by the system.

### 4.3 Use EasyLase USB with the Showsoftware

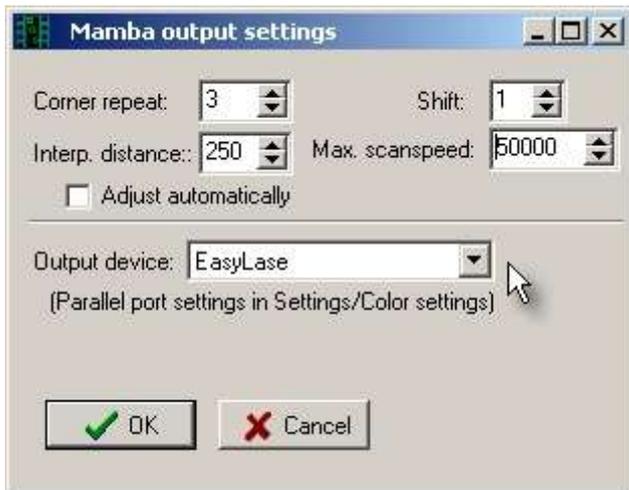
The driver-DLL 'Easylase.dll', and also additional DLLs (for example Mamba 'EasyLase.mld') must be placed in the same directory, where the application software (\*.exe) is located.

All devices must be connected to the USB-ports and powered-on, before the software is launched, otherwise, the devices cannot be found by the application.

#### Example Mamba (Medialas):

Connect all devices and switch them on. Start the software.

Select under 'Settings' -> 'Output settings'. There you should find EasyLase for a choice.



If EasyLase should not be found and displayed, quit the program and check if all connections are done correctly and if the driver is installed correctly in the hardwaremanager of Windows.

## 5 Firmwareupdate

EasyLase USB can be updated to a new firmware release, when new features are added or improvements or changes are done by the manufacturer.

The procedure for the firmwareupdate is easy-to-use and is secured against failure and manipulation to avoid an erase of the program-memory by accident.

### **Important:**

The number of possible reprogram-cycles of the device is several hundred times, theoretically. But because the complete operating system of the device will be erased and there can always happen unexpected situations when using a software and a PC, the update should not be done, if not necessary, or if the manufacturer will not suggest an update.

When the device is updated too many times, damage of the internal program-memory can occur.

**The manufacturer excludes liability in case of damages as result of defective program-memories.**

### 5.1 Updatefiles

A small program tool to do the update very comfortable over USB is part of the package. The actual release of the firmware and the update-tool can be downloaded as a ZIP-archive from the website of the manufacturer.

The following files are packed into the ZIP-File:

- The updatetool EasyLaseUSBupdate.exe
- The actual release of the firmware EasyLaseUSBxxx.bin
- A release note EasyLaseUSBxxx.txt
- The instruction manual for the update procedure as PDF

The filename of the binary file EasyLase.bin contains a release number, for example 011, to compare with the actual firmware release of the device.

All modifications of the firmware are described in the corresponding textfile.

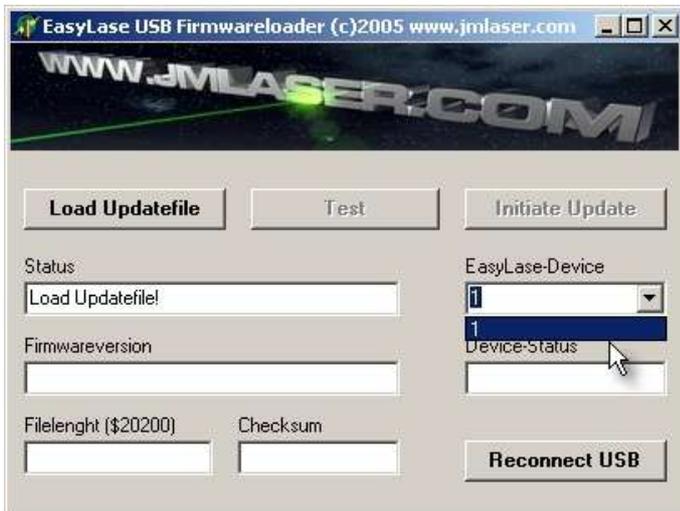
The driver-DLL EasyLase.dll is not needed for the update, because the updatetool uses direct data transfer to the device. Also the DLL is not supporting any functions to do updates or reprogram the device.

## 5.2 Updateprocedure

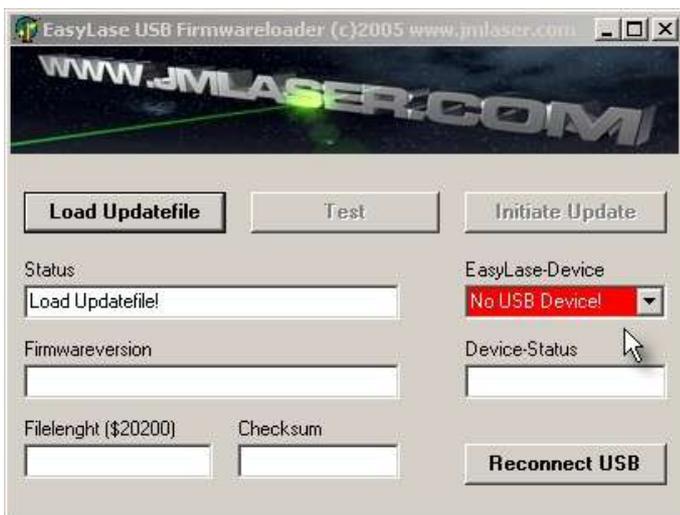
All devices which have to be updated, should be connected to USB and the powersupply, so the updatetool can identify them, when starting it.

Start the updatetool.

The programm searches for all connected EasyLase USB-devices and shows the numbers in a selection-box. The first device has the number 1.



If there is no device connected, the program will show a red message:



The connection and powersupply of the device(s) should then be checked and a reconnect can be retried by clicking



Select the devicenumber, which has to be updated, in the selection-box (1-..).  
Then the file containing the new firmwarerelease 'EasyLaseUSBxxx.bin' should be loaded.

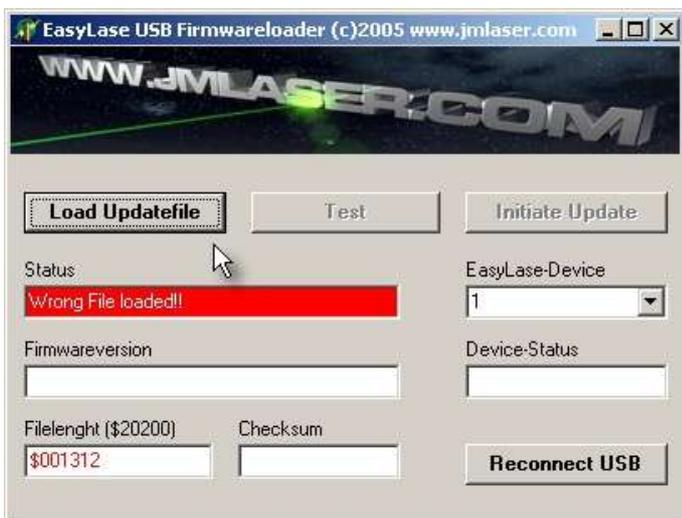
Click



A dialog for file selection opens.  
Select the correct file and confirm.

The program is secured against loading of wrong or unacceptable files.

When a file is loaded, which is not a valid firmwarefile, a message appears and the update procedure is blocked. The maximum filesize is 130KB. When trying to open a larger file, the program could crash.



The firmwarefile has to have the correct filesize and also some correct checksums, to be accepted by the program:



When a valid firmwarefile is loaded, the name and release of the file is displayed and the button to test the data communication is enabled.

By clicking



the communication for update will be tested. This is necessary to avoid an update failure. When this test finishes without problem, the button for initiating the update procedure is enabled.



Now start the update by clicking



The datatransfer to the device just takes a few milliseconds. When all data is transferred, the device starts to reprogram itself. This will take some seconds. A message is displayed:



All LEDs of the EasyLase USB board will be on, as long as the system is reprogramming itself. After update is finished successful, the device resets all its functions and the normal operating mode is displayed by the green LED 'Device Status'. All other LEDs are switched off.

The updatetool also displays a message when update was successful:



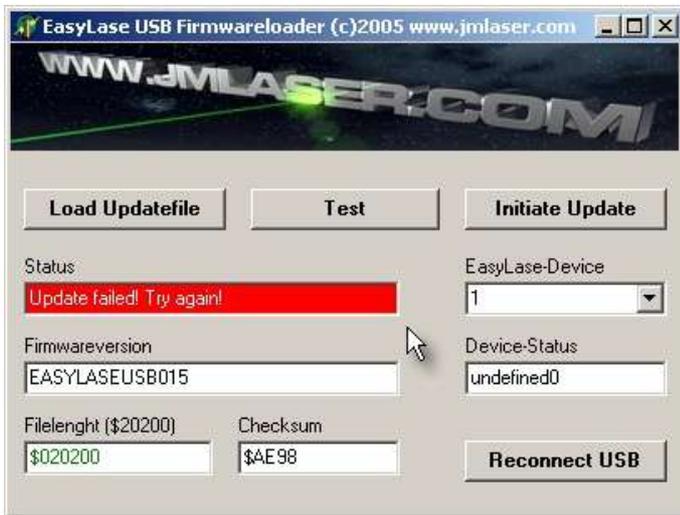
Now, another device can be selected using the selection-box and the update can be processed without any need to load the firmwarefile again.

### 5.3 Troubleshooting

If the update procedure ends unsuccessful, a message is displayed.

The red LED 'Error' of the device is on and shows an incomplete or missing operating system of the device.

This can happen, when the powersupply is removed from the device, while updating, or when the device had too many updates.



Try the update again a few times.

If there is no successful update after a few retries, please contact the manufacturer.

The device probably has to be shipped to the manufacturer to check, if the program-memory still works and if there can be done a reprogram by the factory.

## **6 Problems**

### **6.1 Driver malfunction**

If the USB-driver is not installed correctly, the device could be found by the operating system, but not accessed by software.

Also it may not be possible to install the driver again.

This can happen when aborting or interrupting the running installation of the software driver.

In this case, be sure that the device is connected and operating.

Then run the program '**Ftd2xxun.exe**' of the drivers-CD to delete all installed drivers for EasyLase USB.

If this will not help or result in any error message, change into your hardware manager in the system control of Windows, select the driver for EasyLase USB and delete it manually.

After deleted the old driver fragments, disconnect the USB-cable and reconnect it again.

Windows should now 'find new hardware EasyLase USB'.

The driver installation can now be started again.

### **6.2 Laseroutput distorted or no colors/blanking**

Check the connections of the ILDA-connector.

The device cannot operate properly, when parts of the differential signal lines are left open.

Some cheap laser projectors don't have the (-)-signals connected internally.

In this case, pull the signals down to ground with a resistor directly at the cable (see page 11).

### **6.3 No function when running showsoftware**

Check if the device is connected and powered.

Start the Testsoftware DLLTest\*\*\*\*. When the device is found and all functions work, check if the DLL EasyLase.dll or the driver EasyLase.mld (for Mamba) is located in the right directory of the software. Check if the output of the software is enabled and if the right output device is selected.

### **6.4 Software or Hardware crashes during operation**

Check if your powersupply is right connected and the DC-connector to EasyLase has good connection. Check also the connection of the USB-plugs. Some cheap cables can make bad or loose connections.

If noise on the mains power could be the source of the problem (when powering-on other devices), use EMI-filters for your powersupply. Use highquality USB-cable only.

Do not place the EasyLase card or box near strong radiation sources, like transformers, dimmerpacks or power-cables of other lighting equipment.

When mounting the OEM-card into a housing, a metal housing is suggested.