

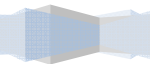
## INSTRUCTION MANUAL - HIGH CURRENT DRIVER BOARD STAND ALONE



### Models:

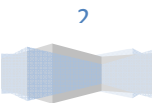
1 AMP:	HCDBSA1_0AMP
1.5 AMP:	HCDBSA1_5AMP
2.0 AMP:	HCDBSA2_0AMP
2.5 AMP:	HCDBSA2_5AMP

Version: 1.3



## CONTENTS

Instruction Manual - High Current Driver Board Stand Alone .....	1
General .....	3
Overview .....	3
Specifications .....	3
Safety.....	4
Disclaimer.....	4
Getting Started .....	4
Unpacking.....	4
Operation.....	5
Front of Driver Board .....	5
Back of Driver Board.....	6
Configuration Settings.....	7
Output Connection.....	8
Mode Selector Switch .....	8
Control Signal and performance .....	8
First Operation .....	9
General Operation.....	10
Current Ranges and Adjusting current.....	10
Checking the output current on a meter .....	11
Compliance Voltage and power adapters .....	13
OEM power Supply selection.....	13
Mounting .....	14



## GENERAL

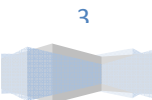
## OVERVIEW

This is the third generation of the popular High Current Laser Diode Driver series. We designed this new generation to give the most features at a exceptional value. At the heart of the product are laser trimmed parallel regulators to give constant current without the large temperature dissipation of other regulators. This allows the driver board to be room temperature stable without the need for additional cooling in most cases. Couple this with inherent safety features like soft starting, current isolation, reverse protection, ESD protection, and thermal shutdown control and you have all you need in a small package.

The high power laser diode driver is cost effective and easily integrated into industrial, research, or enthusiast projects and products. The driver can be operated in CW mode or in Input Control Mode to be interfaced to remote electronics. This new design uses digital isolators for super fast response and input range while protecting the laser from deadly ground loops. The board has screw terminal connections as well as Molex mini-fit Jr. connectors for easy connections to external equipment for control and the laser diode output.

## SPECIFICATIONS

Specification	HCDBSA 1 AMP	HCDBSA 1.5 AMP	HCDBSA 2.0 AMP	HCDBSA 2.5 AMP
Current Source Range:	0 - 1 Amps	0 - 1.5 Amps	0 - 2.0 Amps	0 - 2.5 Amps
Current Limit Jumper Settings:	0.5, 1.0 Amps	0.5, 1.0, 1.5 Amps	0.5, 1.0, 1.5, 2.0 Amps	0.5, 1.0, 1.5, 2.0, 2.5 Amps
Compliance Voltage w/7.5V adapter:	3.5 Volts			
Compliance Voltage w/12V adapter:	8 volts			
Current Resolution:	0.1%			
Current Adjustment:	Analog Trim Pot			
Current Range Accuracy	Always greater than limit, no more than 10%			
Laser Diode Protection:	Soft Start, Reverse Voltage, Current Limit, Thermal Shutdown			
AC Adapter Input Voltage:	100 - 240 VAC			
Control Signal Digital Isolation Voltage:	4500 Vrms			
Minimum Control Signal "Turn On" Voltage:	2.8 Volts			
Control Signal Maximum Voltage:	36 Volts			



Control Signal Maximum Current:	50 ma
Control Signal Maximum Frequency:	5KHz
Connectors:	Screw Terminal and Molex Mini-Fit Jr™ Connectors
Operating Temperature:	0 to 40 °C
Storage Temperature:	-40 to 70 °C
Dimensions:	2.85" x 2.1"

## SAFETY

- Operate the High Current Driver Board in an explosion free area.
- The Driver Board may reach high temperatures under operation. Make sure there is adequate airflow to the Driver Board. Also, make sure there is adequate protection around the Driver Board and that it is not in contact with other materials.
- When connected to laser diode components, the output of the laser can be up to several watts of power. Always use proper safety eyewear and laser safety protection when connecting to laser components in your final system. When operated incorrectly the laser component can cause severe damage to eyes and health.

## DISCLAIMER

- The High Current Driver board is designed as an OEM product to be integrated into a final solution.
- All statements of safety are only applied when the driver board is used in its intended purpose.
- You are legally responsible for any injury to anybody resulting from the use of or assembly of the driver board or their finished products.
- You Accept this driver board as a COMPONENT for integration in a system of YOUR OWN design and will be legally responsible from any and all LIABILITIES.

## GETTING STARTED

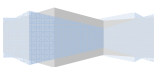
### UNPACKING

Inspect the shipping container for damage.

Verify the contents of the package:

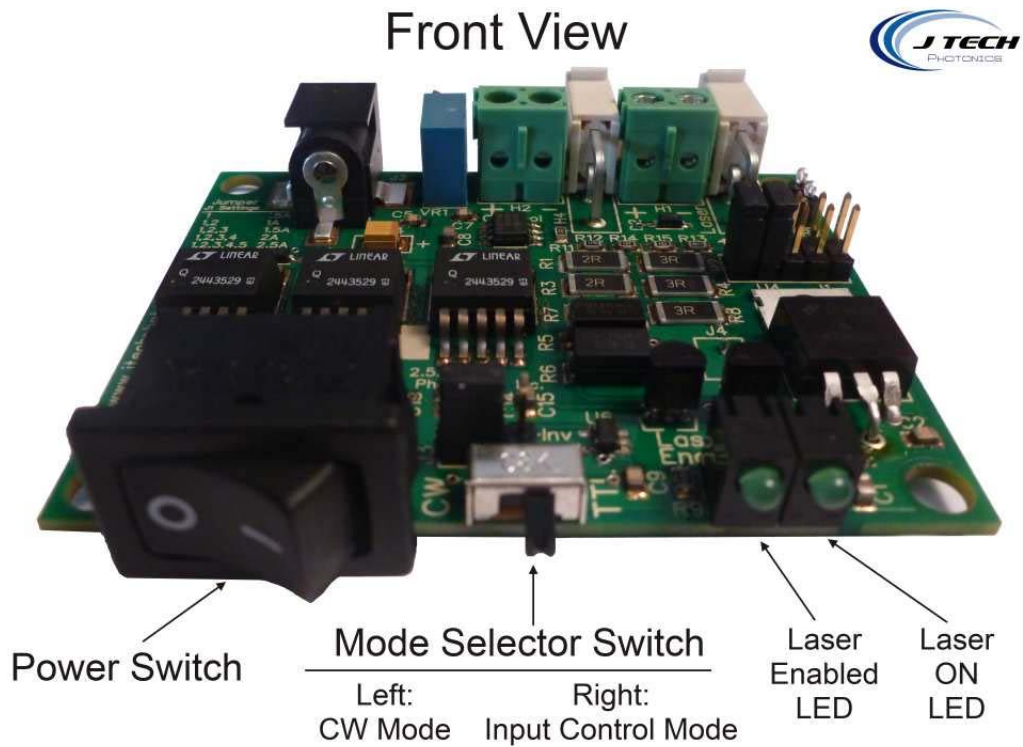
1 - High Current Driver Board.

1- Power Adapter with connector according to ordering country or OEM cable.



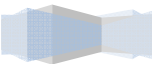
## OPERATION

## FRONT OF DRIVER BOARD

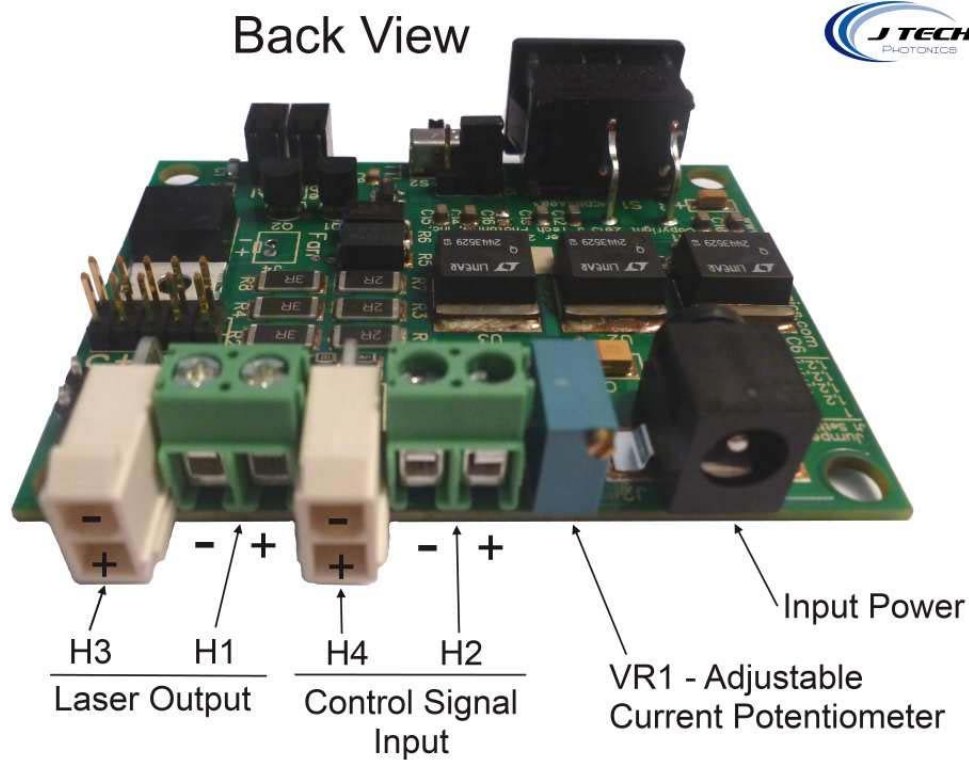


The front contains:

- Power / Enable Switch:    Left = OFF, Right = ON
- Mode Selector Switch:    Left = CW Mode, Right = Input Control Mode
- LED Indicators:    Left = Driver Board Enabled, Right = Laser ON

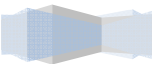


## BACK OF DRIVER BOARD

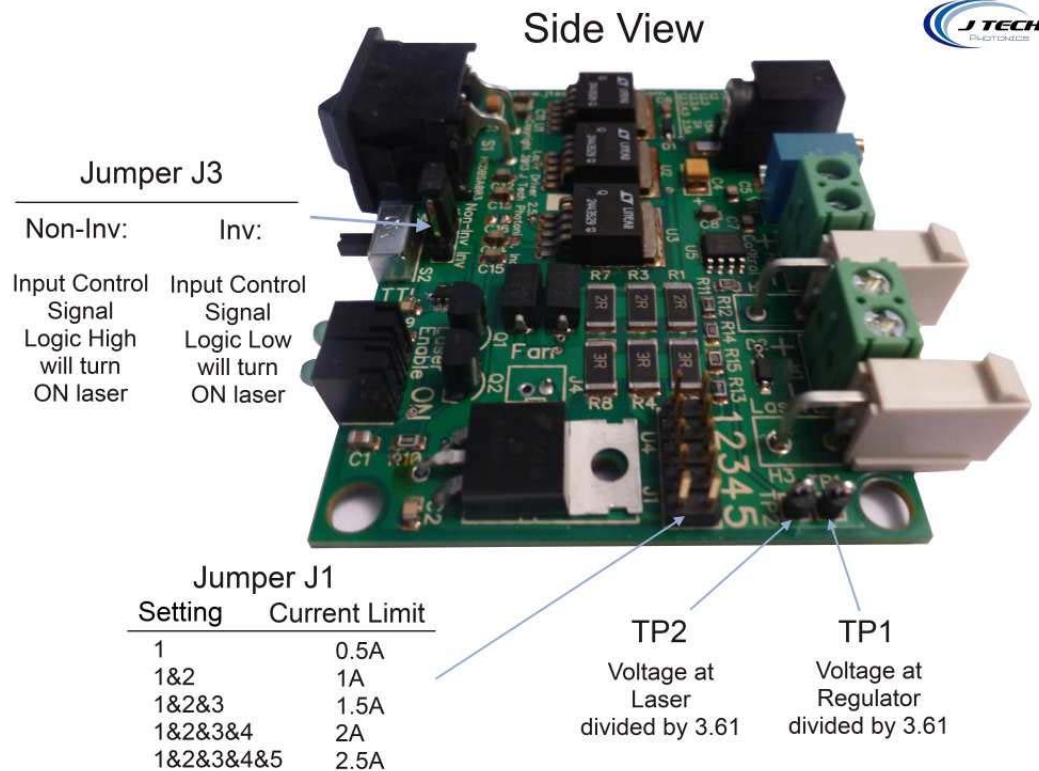


The back contains:

- H3 - Laser / LED Output Connector: Top = Negative Output, Bottom = Positive Output
- H1 - Laser / LED Output Screw Terminal: Left = Negative Output, Right = Positive Output
- H4 - Input Control Connector: Top = Negative Input, Bottom = Positive Input
- H2 - Input Control Screw Terminal: Left = Negative Input, Right = Positive Input
- VR1 - Potentiometer for Analog Current Level
- Power Adapter Plug



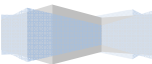
## CONFIGURATION SETTINGS



There are two configuration settings on the Driver Board. They are:

- J3 - Control Signal Jumper:** This will either invert or not invert the incoming control signal. When interfacing with equipment that is not under the users control, it is sometimes needed to invert the incoming logic.  
 Left Two Jumpers On = Non-Inverting Input  
 Right Two Jumpers On = Inverting Input
- Current Limit Selector:** This will limit the output current of the driver to the selected level. The maximum level is based on the driver version that was purchased.

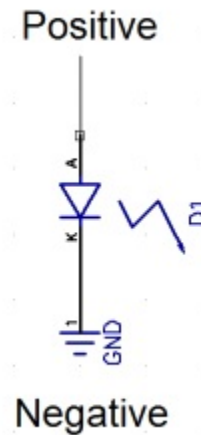
Current Limit (Amps)	Jumper Position On
0.5	1
1	1,2
1.5	1,2,3
2	1,2,3,4
2.5	1,2,3,4,5



- Fan: There is the ability to put a 5V fan if needed for cooling. This is only needed if the input power adapter voltage is significantly higher than the required voltage (compliance voltage) of the laser diode.

## OUTPUT CONNECTION

A typical connection for a laser diode or LED will be:



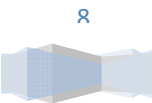
## MODE SELECTOR SWITCH

The driver board has a selector switch for the two different modes of the board.

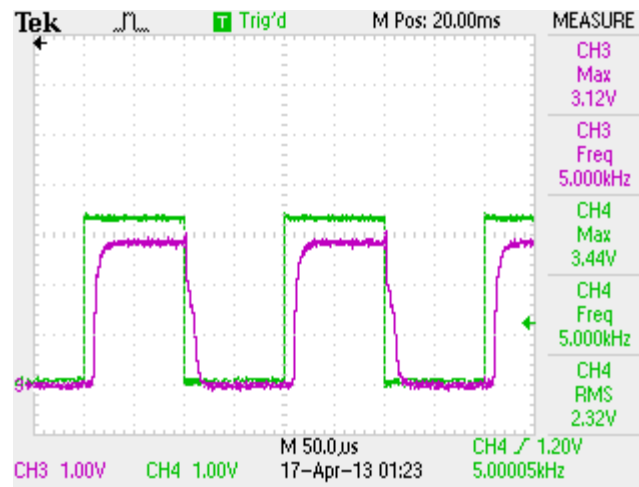
- Input Control Mode: This is when the switch is on the RIGHT. This mode allows for a signal to be connected to connectors H2 or H4 for a signal to turn the laser on and off. Use this input with your controller to turn the laser on and off with G Code commands.
- CW Mode: This is when the switch is on the LEFT. This mode stands for "Constant Wave", which means that the laser will turn on and stay on until the switch is turned back to the right or the power on the board is turned off.

## CONTROL SIGNAL AND PERFORMANCE

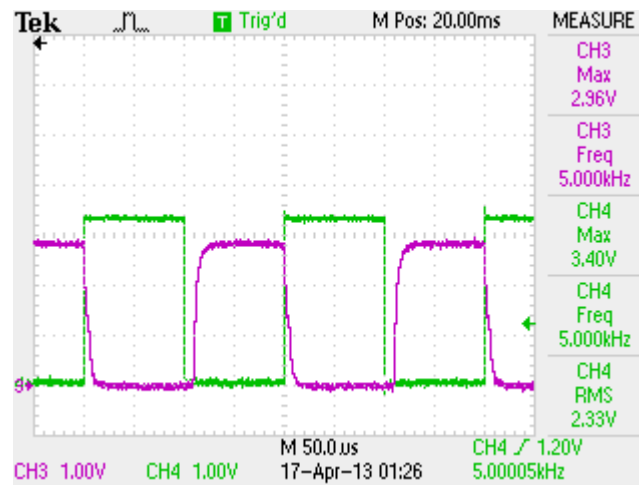
The input connection provides an optically isolated input for control of the laser diode. The connection and the jumper settings were described in the previous sections. The voltage required to turn on the opto-isolator is 2.8 volts. The input can handle up to 40 volts at no more than 50 ma. The input can be cycled with no degradation up to 100 Hz. It will work with 3.3V, 5.0V and 12V, 24V logic boards from various manufacturers like National Instruments.







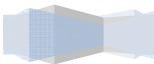
Typical Control Signal with "non inverting" set running at 5KHz. Ch 1 control, Ch 3 output.



Typical Control Signal with "inverting" set running at 5KHz. Ch 1 control, Ch 3 output.

## FIRST OPERATION

- **Before operation read the Safety section of this manual.**
- Properly connect the output of the driver to the laser or LED to be driven. Ensure the connections are correct.
- If using input control, connect the input signal to the driver board.
- Make sure the jumpers are correctly set for current limit and input control to the desired settings.
- Plug in the adapter to the AC power.
- Plug in the adapter to the Driver Board.



- Pressing the Enable Switch will enable the output. If in CW mode, the "enabled" and "laser on" LEDs will light up and the output will be enabled. If in input control mode and the input signal is not enabled, the "enabled" LED will only light up. When the input control signal gets enabled, the "laser on" LED will light up and the driver output will be enabled.

## GENERAL OPERATION

- Laser Diodes and LEDs are meant to be driven within their specifications. Degradation of the diode will occur when diodes are overdriven beyond their specifications.
- Keeping laser diodes on for a long continuous time will degrade the diode if thermal issues are not addressed.
- The high current driver board will reach high temperatures if the board is continuously driving high current for long durations. An optional fan can be ordered to increase air flow if needed.
- Keep the driver board in a well ventilated area.
- Using the Mode Selector Switch as an ON/OFF switch for the laser:
  - Make sure Jumper J3 is on "non inverting".
  - When there is no input control, you can keep the power switch on and use the Mode Selector Switch to control the output of the laser.

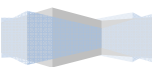
## CURRENT RANGES AND ADJUSTING CURRENT

There are two sets of adjustment for controlling the current output. There are the current limit jumpers and the potentiometer. The current limit jumpers are J1 and have the "1 2 3 4 5" on them will set the MAX current the board can provide with the potentiometer set to FULL (all the way turned clockwise). The numbers are in 500ma increments:

- 1 - 500ma limit
- 1&2 - 1amp limit
- 1&2&3 - 1.5 amp limit
- 1&2&3&4 - 2 amp limit
- 1&2&3&4&5 - 2.5 amp limit

Having all four jumpers on gives a maximum of 2 amps possible. Having three jumpers on gives a maximum of 1.5 amps. We recommend keeping it below the maximum current for your laser diode if you don't want the possibility of over current the laser which will probably kill it quickly.

Set the jumper on J1 to the appropriate range you desire to drive the diode. For example, a 1Amp range will have the jumper 1 and 2 on. This will give an output current of greater than 1 Amp within 10% (with the potentiometer VR1 completely turned counter-clockwise.)



To get a specific current, adjust the potentiometer VR1 with a small flat head screwdriver.

- To **REDUCE** current, turn counter clockwise
- To **INCREASE** current, turn clockwise

To get exactly 1 Amp of current, adjust the potentiometer VR1 counter counter-clockwise to decrease the current to the diode and clockwise to increase the current to the diode.

The potentiometer has 21 turns of adjustment and can achieve a resolution of 1% or better.

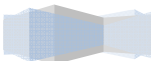
## CHECKING THE OUTPUT CURRENT ON A METER

We recommend using a current meter to check the output of the driver board before hooking up the laser to verify the output is within the limits of operation of the diode laser. This is a very useful tool when adjusting the current to a specific value with the potentiometer.



Klein Tools Digital Multi-meter

HOME Depot Model # MM1000 Internet # 202521270 Store SKU # 362878

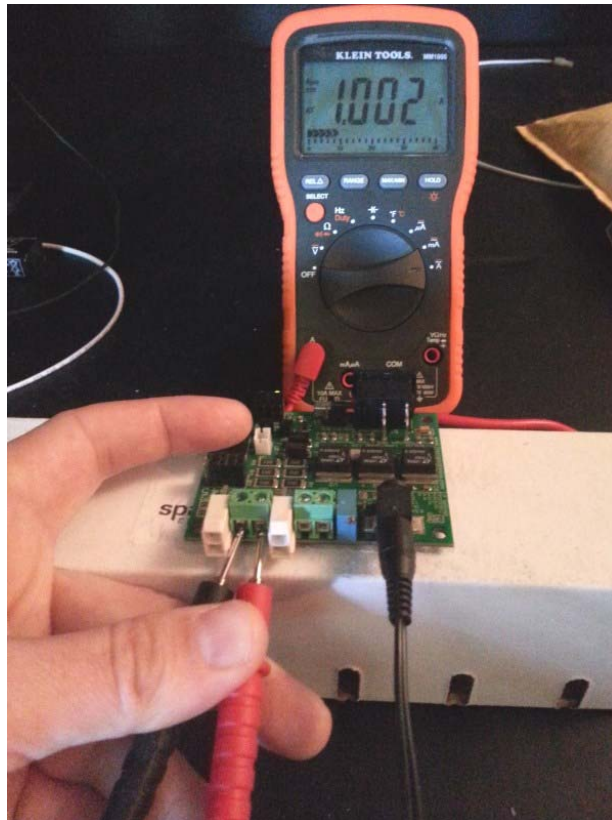




Alternatively, you can use a clamp style meter to check the current on the output wire to the laser. This method is normally not as accurate as the multi meter but can provide a view of the current as the laser is in operation.

Under normal conditions, output power of the laser usually is 1:1 of current (+ - 10% or so). So 1 amp usually will be 1W.

To check the current of the board with a multi-meter, simply connect the test leads of the multi meter to the output connector from the laser driver. Always check the current **WITHOUT** the laser connected! Because you are connecting your meter test leads to the output connector they may make spurious connections causing power spikes and will be sent to the laser diode directly bypassing the safety protection features of the laser driver board. You can adjust the current here using the potentiometer. This is shown in the following picture:



Checking output current with Multi-meter. Laser Diode is **UNPLUGGED** for this procedure.

## COMPLIANCE VOLTAGE AND POWER ADAPTERS

Depending on the compliance voltage of the laser diode, it is preferable to choose the correct power adapter to meet the needs of the laser while minimizing excess voltage dissipated as heat across the regulators.

There are several AC/DC wall adapters in the accessories section of [www.jtechphotonics.com](http://www.jtechphotonics.com) to choose from, or you can purchase your own. The requirements are:

- AC to DC current
- Positive center
- 2.1mm I.D. x 5.5mm O.D
- Female

## OEM POWER SUPPLY SELECTION

If you purchased the OEM version of the laser driver, you can either purchase your own adapter or connect it to your own power supply. For integration into other systems, it is advisable to use the system power supply as long as it is in the range of the laser diode you are driving.

It is necessary to choose a power supply that will have enough voltage to run the laser diode at maximum current as well as be not more than a few volts over the compliance of the laser diode. Any additional voltage above the compliance voltage of the laser diode will be dissipated as heat. Excessive additional voltage can lead to overheating of the laser driver. To figure out how much voltage is needed for a minimum, take the compliance voltage of the laser diode and add the voltage drop from the laser driver.

The voltage drop for the laser drivers are:

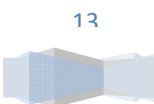
- HCDBSA 1.0 Amp : 1 Volt Drop
- HCDBSA 2.0 Amp: 3 Volts Drop
- HCDBSA 2.5 Amp: 3 Volts Drop

**Minimum Power Supply Voltage = Laser Diode Compliance Voltage + Laser Driver Voltage Drop**

For example, the 445nm laser diode component has a compliance voltage of 5.5 volts at 1.7 amps. Using a HCDBSA 2.0 Amp driver, the minimum power supply needed is:

$$8.5 \text{ volts} = 5.5 \text{ V} + 3 \text{ V}$$

A power supply above 8.5 volts and not more than 12 volts should be chosen to stay within the thermal limits of the laser driver.



**MOUNTING**

The following drawing is provided for mounting. Units are in inches.

