**Laser Diode driver - Construction Notes**

**Warning!**

**You are constructing a Class 3B Laser device.**

**Avoid direct eye exposure to beam.**

**Approved safety goggles must be worn whenever the device is in operation.**

A set of photos is provided to help with construction.

Also see the parts list file, *Laser diode driver V2A BOM*.

**Printed circuit board (PCB)**

The PCB may be purchased from Oshpark ([www.oshpark.com](http://www.oshpark.com)). Search *Shared Projects* using the phrase “Laser Diode Driver”. The project “Laser Diode Driver, Ver 2a” by Emory-CellBio should come up. The cost is $25.10 for three boards.

If you wish to modify the board to your own specifications, CadSoft Eagle files are provided in the *Eagle PCB Files* folder. The files are laser\_diode\_driver.sch (schematic) and laser\_diode\_driver.brd (board physical layout). A free version of the Eagle editor is available at <http://www.cadsoftusa.com/product-overview/> in the Freeware column.

All components, except for connectors, are surface mount. Mount all the surface mount components first, before soldering the two connectors. This is because the connectors are large and can interfere with placing the smaller components. It is important to use a fine-tipped soldering iron and fine solder.

Note that the 3 tantalum (yellow case) capacitors are polarized, i.e. they must be placed in a particular orientation. C1 and C3 must have the bar facing down, and C5 must have the bar to the left. Likewise, diode D1 is polarized - its bar must face right.

The ICs are also polarized. Place them with the pin 1 dot at the lower left. If there is no dot, place the writing on the chip in the “right side up” orientation. See photo of the circuit board.

If you are right-handed, place a small amount of solder on the right pad only of each component. Then, using tweezers to hold the component with your left hand, put it in place and reheat the right-hand pad. This technique allows you to tack down the components so they are held in place while the left pad is soldered. For the ICs, put solder on the bottom right pad and carefully align the chip so all pins are above their pads, then solder the remaining pins.

Solder connectors SV1 and SV2 last. SV1 should be aligned so the vertical locking tab faces in toward the circuit board.

**Drilling case and mounting components**

Bottom case: place case in vise, rear toward you (rear is end without ribbing on outside), inside of case up. Set origin at front left corner. Mount a #33 bit in spindle. Drill 3 holes:

Hole X coord Y coord

1 22.5mm 81.0mm

2 70.75 81.0

3 22.5 126.7

Top case: place case in vise, rear toward you (rear is end without ribbing on outside), OUTSIDE of case UP. Set origin at front left corner. Drill 4 holes:

Hole Bit X coord Y coord Note

1 ¼” 76.3mm 100.0mm pushbutton switch

2 ¼” 46.3 43.0 range switch

3 ⅜” 46.3 100 intensity pot

4 “B” 16.3 100 LED

Mount PCB to bottom using 4-40 screws and ¼” high standoffs.

Battery Holders: Using a sharp knife, cut away the PCB card guides from the bottom case where the battery holders will go - see photo *Battery Holder mounting*. You can see that the holders will not fit flush against the edges unless the card guides are cut away. Part of the guides will also need to be cut away in the top of the case. Glue the battery holders in place, aligning the + marks toward the front of the case.

Top case: Mount the LED, intensity pot, pushbutton and range switch in their respective locations.

**Rear Metal Panel**

Mount panel in vise, set origin at left center.

Hole Bit X coord Y coord Note

1 ¼” 9.0mm 0.0mm Power switch

2 ¼” 76.0mm 0.0 Computer/Manual

3 ⅜” 26.0 0.0 Power input

4 ⅜” 43.0 0.0 Pulse out

5 ⅜” 59.0 0.0 D/A in

**Front Metal Panel**

Mount panel in vise, set origin at X and Y center.

Drill a 12.0mm hole at origin.

**Interior wiring**

Consult photos to aid wiring. The document *Laser Diode Box Wiring* details how to wire the IDC26 connector to the various components. Cut a piece of 26-conductor ribbon cable to 7” length. Crimp the socket connector on one end using a vice. **NOTE: The socket connector pin 1, denoted by a small triangle, must match the brown wire on the cable!** Also be sure the cable is aligned straight into the connector before crimping.

Push the socket onto the connector on the PCB. Separate sets of wire by their function, e.g. wires 1-3 (brown, red, orange) go to the intensity pot. Cut each set so you have plenty of length to solder to the component without stressing the wires. Use heat shrink tubing on the wires to act as a strain relief and to prevent one contact from touching the next.

Note that wire 17 (violet) goes to the common pin on one side of the DPDT switch, and an extra length of wire goes from this point to the center pin of the Pulse Out BNC.

**Laser Diode Module**

Modules may be ordered from DTR’s Laser Shop, <https://sites.google.com/site/dtrlpf/home/diode-modules>

Order a 12mm module (12mm is the outer diameter of the case) with glass lens, in the color you need for your optogenetic work.

**Special part: Collimator adapter**

Stock: ¾” dia. black Delrin rod, 20mm long

Drill 12.0mm hole all the way through, then drill 12.15mm hole halfway through.

Press the laser diode module in from the 12.0mm side.

Press the Thorlabs collimator in from the 12.15mm side until it touches the diode module.