

User's Guide

Compact High Power Laser Diode / TEC Driver
DRV-002



SHEAUMANN

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INTRODUCTION AND SPECIFICATIONS



This chapter is an introduction to the Sheumann DRV-002 Compact High Power Laser Diode / TEC Driver. It contains initial setup instructions, instrument specifications, and general DRV-002 information.

Product Overview

Sheumann Laser's DRV-002 provides a current source for driving a high power laser diode and up to two thermoelectric coolers (TECs), all in a lightweight, portable enclosure that fits in the palm of your hand. No other driver on the market today offers the performance, ease of use, practicality, flexibility, and value that the DRV-002 offers.

The DRV-002 provides up to 10A of DC current with a compliance voltage of 3 Volts for testing and controlling high power laser diodes. Standard features include a 4mA setpoint resolution, constant current or constant optical power operating modes, laser diode forward voltage measurement, and a current modulation input.

In addition, the DRV-002 can provide up to 4A of DC current to one bidirectional thermoelectric cooler (TEC), and up to 4A of DC current to one unidirectional TEC. This is ideal for driving diode-pumped solid state (DPSS) modules that require the heating or cooling of the pump laser as well as the cooling of the crystal.

The driver offers many features that protect the diode and crystal (if applicable) from damage, including adjustable current limiters, temperature oscillation controls, soft start, and automatic shut-off mechanisms. A prominent emergency shutoff button, a key switch, and an interlock connection provide additional safeguards against inadvertent laser operation.

Closed loop, constant power operation is another distinguishing feature due to the presence of a transimpedance amplifier circuit for photodetectors.

The DRV-002 may be operated using the LCD and control buttons on the unit, or on a computer through a USB interface.

Features:

Interlock

An interlock is located within the DB-9 connector on the left side of the unit. It is a normally open switch which defeats the output of the laser driver if left in the open state. Shorting Pins 6 (+) and 7 (gnd) will satisfy the interlock circuitry and allow the current source output for the laser to be enabled. The DRV-002 cable assembly is shipped with the interlock (green and white wires) left unconnected.

Photodiode Feedback circuit (Closed loop operation)

The driver is equipped with a transimpedance amplifier circuit, for operating a laser with a photodetector (optional on some lasers). This allows for closed-loop operation, typically stabilizing the output laser power.

Grounding Requirements

The DRV-002 comes with a three conductor AC power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact or two-contact adapter with the grounding wire connected to an electrical ground (safety ground). The DRV-002's power jack and supplied power cable meet IEC safety standards.

AC Line Power Requirements

The DRV-002 can be operated from a single phase power source delivering nominal line voltages of 100-120 VAC and 230 VAC (all values RMS) at 50/60 Hz. The line power voltage can vary $\pm 10\%$ but cannot exceed 250 VAC. The unit's operational voltage is factory configurable and need not be changed before operating the instrument.

Shipping Kit

The DRV-002 comes with a Laser Cable assembly. Accessories shipped with the unit include a 5V AC-DC power adapter, USB cable and a CD with the USB driver and desktop software.

Driver and Software Installation

To install the driver:

1. In the “LDD_control\supportfiles” directory, extract the file “win_cp2102_drivers.zip” into a temporary folder.
2. Open the temporary folder and run “PololuUSBInstaller.exe.” A Driver Installer dialog box will appear. Select the directory where you would like the driver to be installed, and click “Install.”
3. If a Software Installation dialog box opens with a warning that the driver has not been tested by Microsoft and recommending to stop the installation, ignore it and continue with the installation.
4. When the installation is complete, a dialog box will appear saying that the installation was successful. Click “OK.”

To install the software program:

1. In the “LDD_control” directory, run “setup.exe.”
2. Follow the setup instructions.

CHAPTER 2

OPERATION

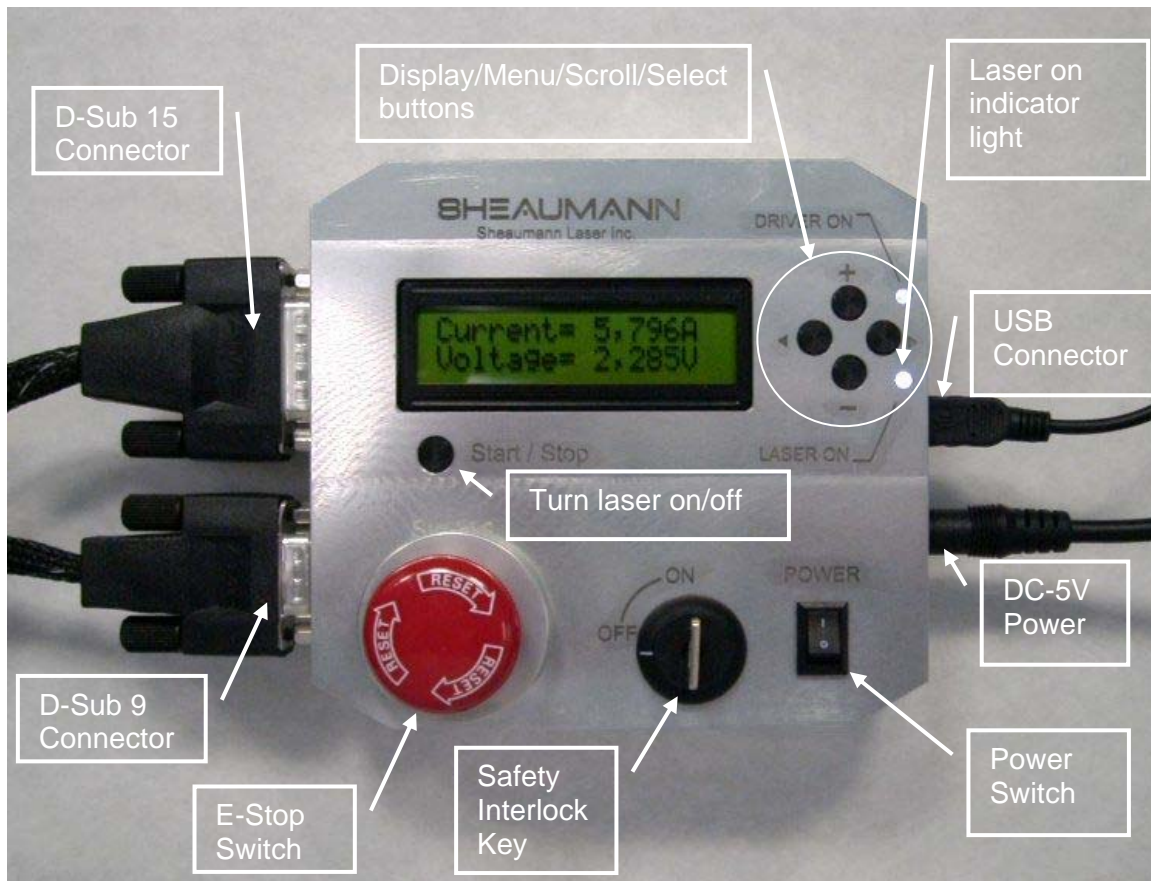


This chapter is an introduction to the operation of the DRV-002. It offers information on connecting the laser and TEC(s) to the current sources and describes powering up the unit. This chapter also contains instructions on how to operate the driver in Constant Current Mode and Constant Power Mode (closed loop).

Operating the DRV-002

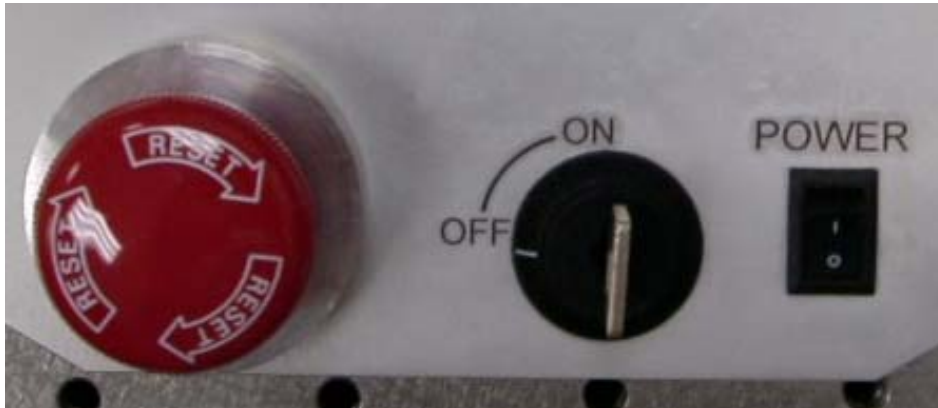
Figure 2.1 shows the switches, buttons, and connectors on the unit.

Figure 2.1



Connect the 5V DC power supply to either of two holes on the right-hand side of the unit. To turn on the unit, first reset the emergency stop (E-Stop) switch (if it is activated) by turning it clockwise until it pops up. Then turn the power switch on by pressing the top part of it towards the “1” and turning the key clockwise to the “on” position. When the laser is on and active, the white “LASER ON” LED on the front of the unit will turn on.

Figure 2.2



Use proper laser safety eyewear and protective gear at all times while operating the laser.

Operation Using the LCD Display

The following table describes the menu items when using the LCD control panel on the DRV-002. (The same features may be accessed using the software panel as described later.)

LCD Menu view	Comments
Current = ___ A Voltage = ___ V	Laser diode current monitoring with 0.004A accuracy. Laser diode voltage measured on unit. Always greater than voltage at laser diode.
LD: ___°C ___ A Xt: ___°C ___ A	Laser diode temperature and measured current across TEC. Crystal temperature and measured current across TEC. If NTC (thermistor) is not connected, Not detected is displayed.
1. LD temp. ctrl. Set temp: ___°C	Temperature setting for laser diode with 0.1°C accuracy. Range: 10 to 50°C (This may be locked by Sheumann)
2. Xtal temp. Set temp: ___°C	Temperature setting for crystal with 0.1°C accuracy. Range: 5 to 50°C. (This may be locked by Sheumann)

3. Current ctrl. Set I: ___A	Current setting for laser diode with 0.004A accuracy. Range: 0.400 to 10.000A. (the upper limit may be locked by Sheaumann) This will run the laser in Constant Current mode and will set the upper current limit while running in Constant Power mode (see LCD menu 14)
4. Voltage limit Set U: ___ V	Voltage limit for laser diode with 0.001V accuracy. Range: 1.500 to 3.000V. This value must always be greater than laser diode operating voltage in case of voltage drop in wires.
5. LD TEC Param1. Set P1: ___	Temperature stabilization speed parameter. Range 1 to 20. If temperature oscillates, increase the value for slower temperature stabilization. Typical value: 5-10.
6. Limit LD TEC Current : ___A	Current limiter for laser diode TEC. Range 1.0 to 4.0A. Strongly recommended for limiting max TEC current to avoid overloading of main power supply.
7. Xt TEC Param 1 Set P1: ___	Temperature stabilization speed parameter. Range 1 to 20. If temperature oscillates, increase the value for slower temperature stabilization. Typical value: 5-10.
8. Limit Xt TEC Current : ___A	Current limiter for crystal TEC. Range 1.0 to 4.0A. Strongly recommended for limiting max TEC current to avoid overloading of main power supply.
9. (TEC driver mode) _____	Select Two unipolar TEC drivers (actually one unipolar, one bipolar) or Single bipolar TEC driver .
10. Cooling when LD is off: ____	If set to no , TEC is on only when LD is on. If set to yes , TEC stays on even when LD is turned off.
11. Soft start _____	If ON , LD current will be increased step by step from zero to set value. Recommend to avoid damage to laser diode.
12. Int. trigger _____	Driver has internal pulse generator with output on Pin 7 of DB-15 connector. If Single shoot is selected, each press of the "Down" button on Pin 7 transmits 500µs of positive pulse. Can also select constant pulse generation of 1kHz, 2KHz, 5KHz, 10KHz and 20kHz .
13. PCB board temp.: ___°C	Driver's internal NTC temperature is displayed, 75°C upper limit.
14. Op. pwr. _____	This controls the photodetector, when connected. The user may adjust the set point and the laser will self-adjust the power to achieve the set point, controlling the laser current, up to but not to exceed the current (limit) or value on menu #3 (LD current control) When set to zero (0), the feedback circuit is disabled, and will display as such)
15. 7 pin act as Pulse generator	Not functional at this time

Operation Using the Software Panel

Most of the features controlled and displayed by the LCD can be accessed via the software panel. The software must first be installed as described earlier.

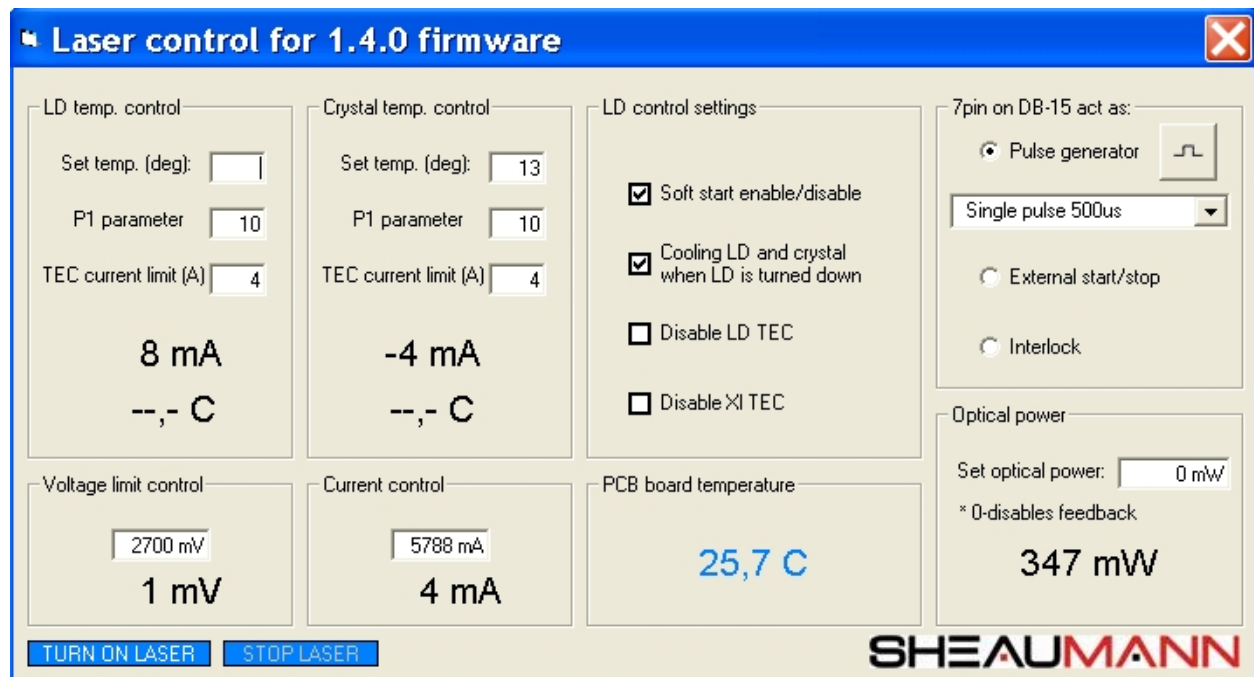
1. Open the software by selecting from the Start menu : Programs : LDD_control : LDD_control.
2. Select the COM port from the pull down menu (each computer system will be different; the user must determine this from the hardware manager). In the Device Manager, the CP210x USB to UART Bridge Controller should show the COM port that was installed (see Figure 2.3).

Figure 2.3



3. Figure 2.4 shows the software panel. This screen includes the same menu items that are on the LCD display.

Figure 2.4



4. To turn on the laser, click the TURN ON LASER button at the lower left. It should turn red after a few moments.
5. To stop the laser, click the STOP LASER button.

Note: If the laser or crystal temperature is not within ± 5 degrees of the setpoint, the laser will become disabled until the temperature reaches this range.

Specifications

	Laser diode	TEC #1	TEC #2
Drive Current Output			
Output Current Setpoint	Up to 10A	Up to 4A	Up to 4A
Range	0-10A	-4 to 4A	0 to 4A
Resolution	4mA	4mA	4mA
Compliance Voltage	3.5V	4.5V	4.5V
Compliance Voltage Adjust			
Range	1.5 – 3.0 V	1.5 – 3.0 V	1.5 – 3.0 V
Resolution	1 mV	1 mV	1 mV
Drive Current Limit Settings			
Range	0.4 to 10.0 A	-4 to 4 A	0 – 4 A
Resolution	4mA	4mA	4mA
Interlock	Normally open, close to enable power		
General			
Remote Interface	USB 2.0		
Power Requirements	100-120 VAC \pm 10% 220-240 VAC \pm 10%		
Maximum Current Draw	1.6A (1 power module), 3.2A (2 power modules)		
Size (H x W x D)	130 x 115 x 70 mm (5.12 x 4.5 x 2.8 in)		
Weight	0.8 kg (1.75 lbs)		
Operating Temperature	15 – 40°C		
Storage Temperature	0 – 70°C		

Electrical connections

15-pin D-Sub connector		9-pin D-Sub connector	
Pin 1	Laser anode (+)	Pin 1	Photodetector (+)
Pin 2	Laser anode (+)	Pin 2	Photodetector (-)
Pin 3	Unidirectional TEC (crystal) thermistor	Pin 3	Not used
Pin 4	Unidirectional TEC (crystal) (-)	Pin 4	Bidirectional TEC (laser) (-)
Pin 5	Unidirectional TEC (crystal) (+)	Pin 5	Not used
Pin 6	Bidirectional TEC (laser) thermistor	Pin 6	Interlock (+ 5V)
Pin 7	Not used	Pin 7	Interlock (ground)
Pin 8	Bidirectional TEC (laser) (+)	Pin 8	Not used
Pin 9	Laser cathode (-)	Pin 9	Not used
Pin 10	Laser cathode (-)		
Pin 11	Unidirectional TEC (crystal) thermistor		
Pin 12	Not used		
Pin 13	Bidirectional TEC (laser) thermistor		
Pin 14	Not used		
Pin 15	Not used		