Modular Laser Diode Linear Controller (Driver)

Product Description

LDRVUNI is a current drive and temperature control module for a variety of semiconductor lasers. Its main functions include: controlling the internal temperature of the laser, driving the laser with a constant current, and converting the external input voltage signal into a current drive. The module has three Max current drive ranges, suitable for lasers of different power sizes, which can be selected through the circuit board jumper.

Part Number

LDRVUNI

Product features

Support one-key restore function (no need to restart and preheat)、 Software remote control, intelligent control 、 Stable output power, continuously adjustable、 Compact and compact structure、 High-precision ACC and ATC control circuit、 Built-in high and low modulation bandwidth BNC interface

Application area

Laser sensor、 Mode-locked fiber laser、 Ytterbium-doped fiber amplifier、 Test and measurement

Parameters

Characteristic	Min	Max	Unit	Notes
Power supply voltage	22	26	DC	For minimal system noise, use DC regulated power supply
Power	5	45	W	
Laser driving current	0	128/266/590	mA	Selectable via patch cable
Laser driving voltage	3	15	V	Programmable control
Response frequency	0	5	MHz	-3db
Temperature control range	0	50	℃	
TEC output current	-1.5	1.5	A	
TEC output voltage	-4.5	+4.5	V	
Analog input (low frequency)	-2.5	2.5	V	
Analog input (high frequency)	-2.5	2.5	V	

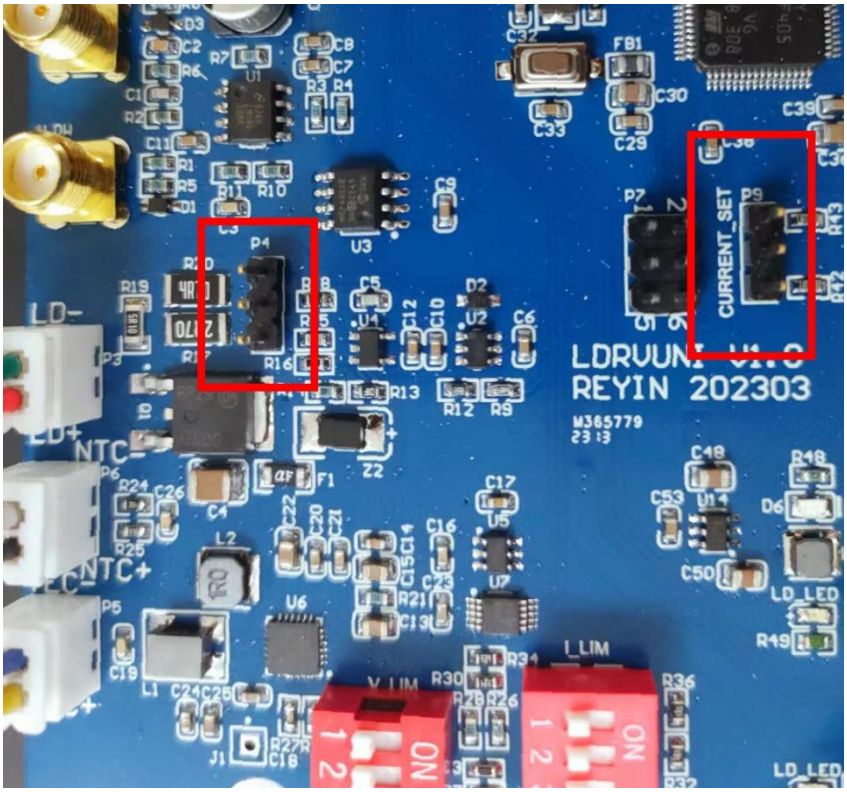
Dimension 340(L)x240(W)x100(H) mm

Control Panel

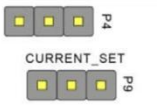
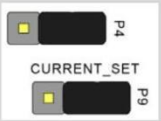
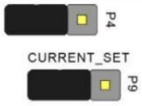
1.Power Input；2.Power Indicator；3.Operating Indicator；4.Low Frequency Input；5.High Frequency Input；6.Manual Button；7.Trigger Button；8.Amplifier Power；9.USB Interface

Instrument Settings

Current Range



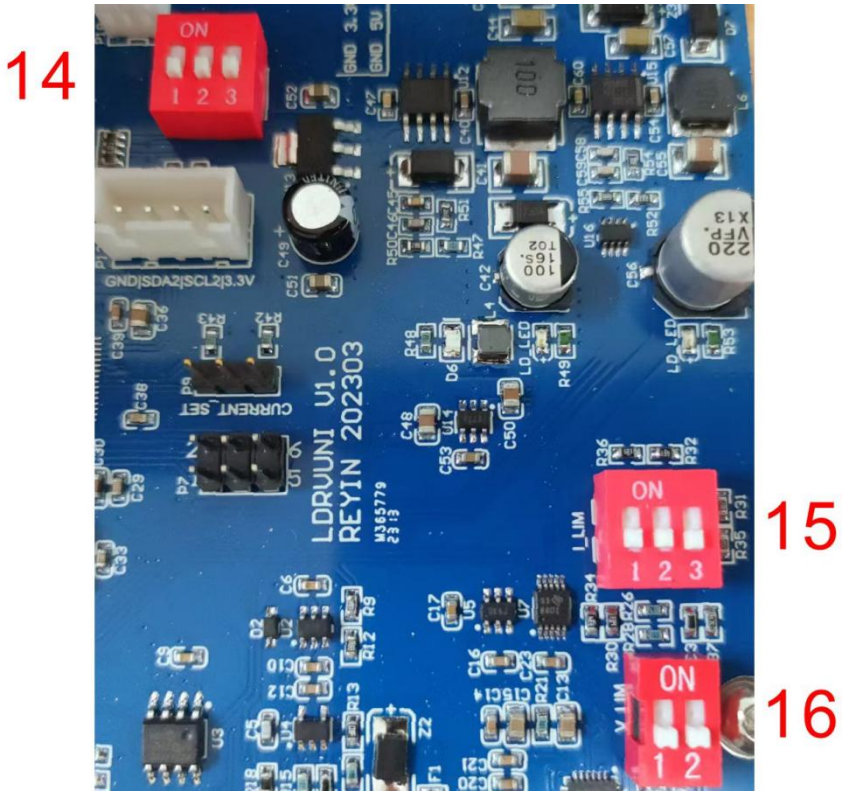
On the circuit board, P4 and P9 (CURRENT_SET) are used to set the maximum current range of the circuit board. Note that the jumper positions on both must be exactly the same to ensure correct settings.

Jumper	Model	Max current
	LDRVUNI120	128 mA
	LDRVUNI250	266 mA
	LDRVUNI600	590 mA

The jumpers must be operated while the power is off. Both jumpers must be set to the same position, otherwise the computer control software will not be able to determine the instrument model, leading to abnormal current.

Temperature Control

The TEC parameters are adjusted using the multi-position dip switches on the circuit board, located above the laser mounting plate, as shown in the diagram below:



14 Temperature Control PID Parameter Adjustment,15 TEC Current Adjustment I_LIM,16 TEC Voltage Adjustment V_LIM

Based on the parameters of the laser used, set 15 to slightly lower than the Max working current value of the internal TEC of the laser, and set 16 to slightly lower than the Max working voltage of the internal TEC of the laser. If a sufficiently close value for 16 cannot be found, it can be set to a slightly higher value; however, 15 must always be strictly lower than the Max working current of the TEC.

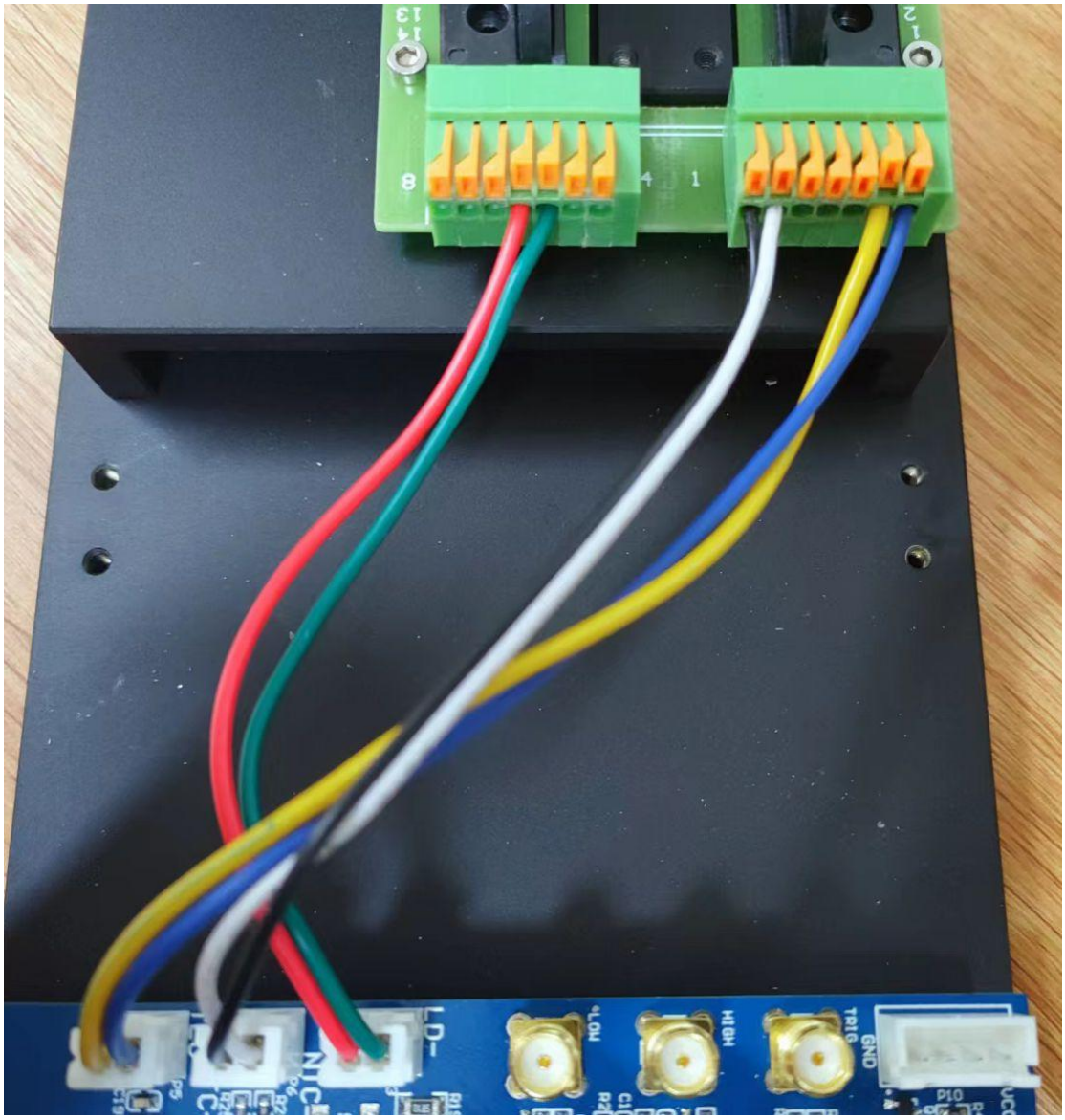
14 Adjust the time constant of the temperature control PID system. If oscillation in the laser temperature is observed in the software, indicating that the PID response is too fast, the PID response speed should be reduced. Sequentially open switches 1 to 3 until oscillation no longer occurs. (Operate in the power-off state!)

(14)Temperature control PID parameter adjustment, each level can be superimposed		
 KP/2 KD/2	 KD/2	 KD/4


When the above three gears are all in ON, the PID parameters can be set together through software commands.

(15)I_LIM maximum current regulation(A)		(16)V_LIM maximum voltage regulation	
	0.5		2.5
	0.7		3.3
	0.85		4
	1.0		4.5
	1.2		
	1.5		

Wiring



Connect the laser leads according to the markings on the circuit board and different laser mounting seats. After installing the laser, carefully check the connections again before powering on.

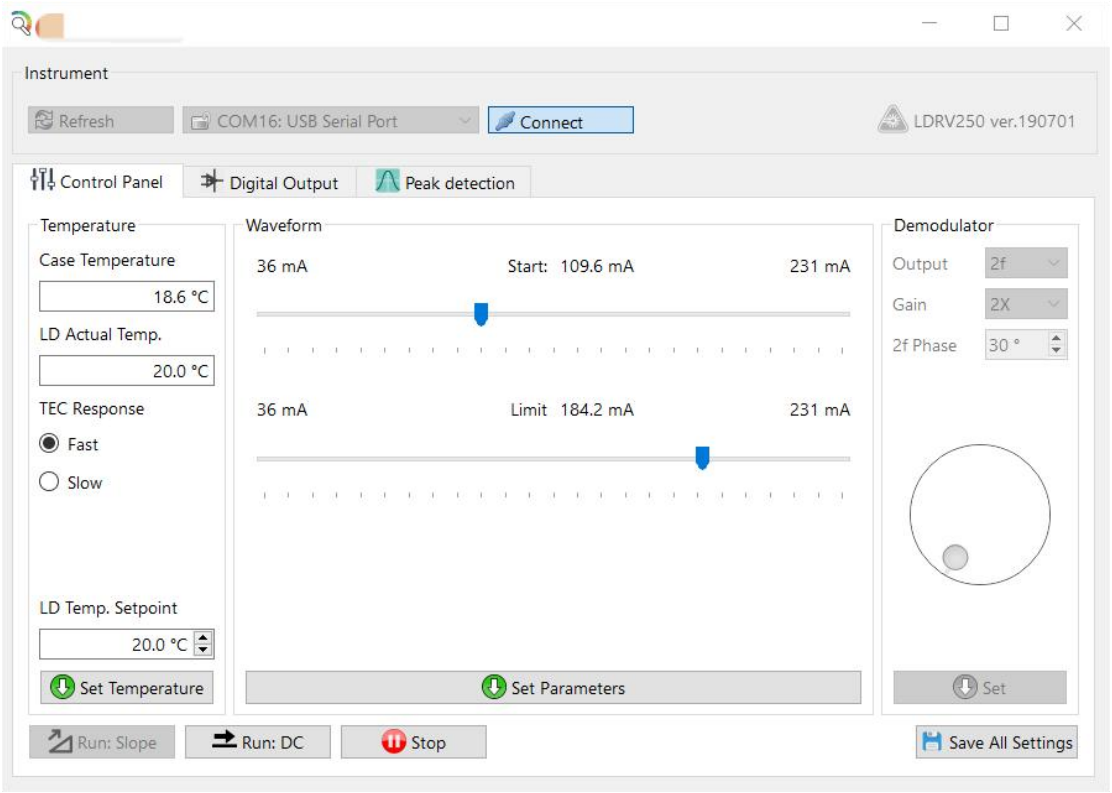
If any functional pin of the laser (such as LD+, LD-) is connected to the housing, the laser housing should be insulated from the mounting plate. This can be achieved by placing a silicone insulating pad under the laser or using plastic screws and washers to fix the mounting plate. Additionally, NTC- is connected to the system ground, which can be used to ground the laser housing. For grounding issues, please consult the electrical engineer from the supplier!

Usage

Computer Control

Reinstall the instrument cover, connect the controller to the dedicated power supply, and use a USB cable to connect the computer. Once the instrument is powered on, a Windows system (WIN 7 and above) will prompt an automatic network installation of the USB driver. If using another system or if the network installation fails, please download the corresponding driver from http://www.ftdichip.com/Drivers/VCP.htm. After installing the driver, a virtual serial device will appear in the "Device Manager."

Open the dedicated software on the computer, as shown in the following diagram:

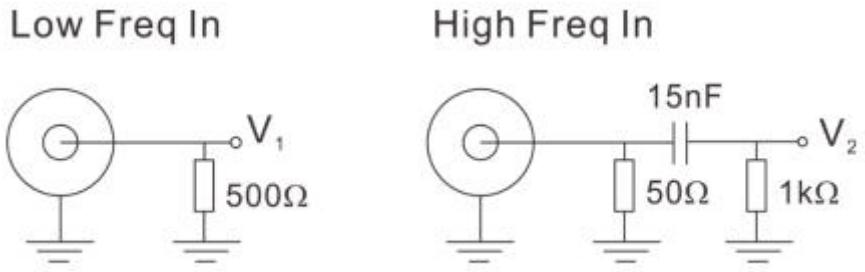


In the Communication Port, find the corresponding virtual COM port. If it is not found, click the Refresh button. Click the Connect button, and after a successful handshake, the console will light up and read the controller's current settings.
Enter the desired operating temperature in the LD Temp Setpoint field, and click Set Temperature to adjust. Use the Start slider to set the constant operating current, and the Limit slider to set the Max current limit. Click the Set Parameters button to send the parameters to the instrument. To save all settings in the instrument, click Save All Settings.
Click Run:DC to start the laser at the set current value. The Limit slider is used to

protect the laser by limiting the current, even with external inputs. Please set it to the Max working current value from the laser's parameter table.
Note: Before starting the laser, carefully check that all parameters are within the allowed operating range of the laser!

External Signals

The 4 and 5 ports on the instrument panel are standard BNC connectors used to receive external inputs. The equivalent circuit for the input is shown in the diagram below:



The laser driver current is as follows:

$$I = \frac{V_1 + V_2}{2.5V} \times I_{max} + I_{internal}$$

Where Iinternal is the current value set in the software, and Iinternal is the Max current in the instrument's range. The instrument can receive a frequency modulation up to 5 MHz.

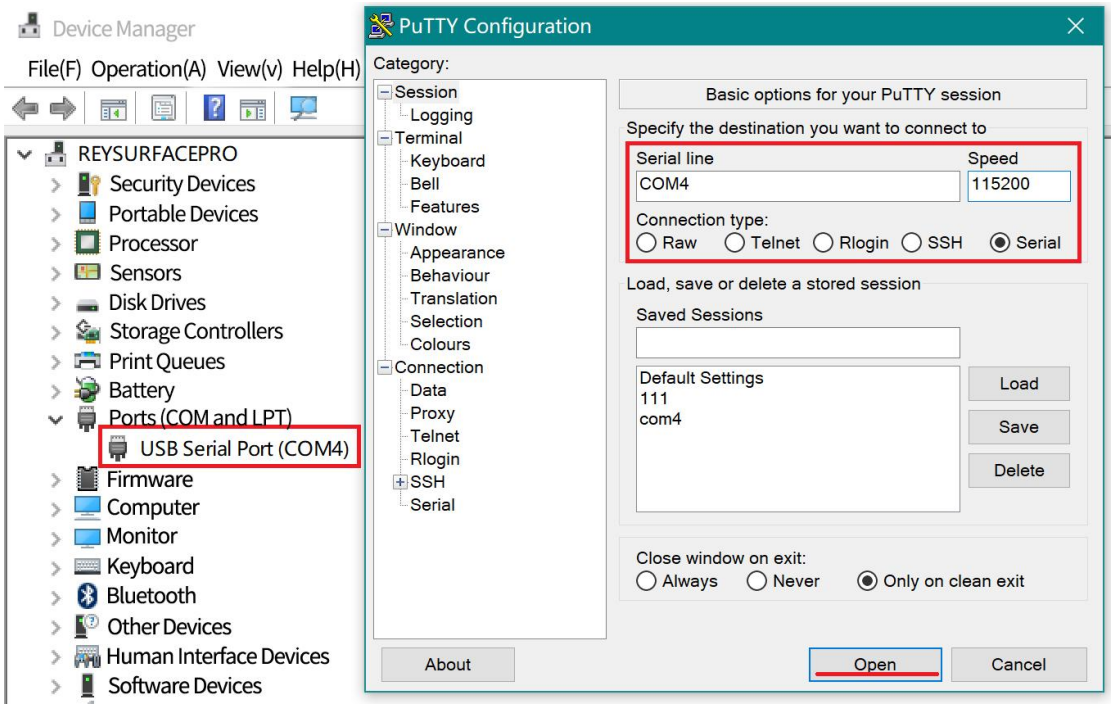
External Control
Once all parameters are properly set via the software and saved with Save All Settings, the instrument can operate offline. To do so, turn on the power, and move the button 6 on the panel to the left. The instrument will start working with the previously saved temperature and current values and will allow external input. Moving button 6 to the OFF position will stop the operation. Note that the laser will be in a protected state, and external input will not work at this time.

You can also trigger the laser by pulling the TRIG input low (shorting the center electrode to the shield layer). It is recommended to connect the TRIG to an external optocoupler or relay for program-controlled operation.

Communication Instructions

A dedicated conversion cable connects the circuit board to the computer's USB or serial port. The USB converter uses the FT232R chip to simulate a serial port. Windows 7 and above systems will automatically install the driver. If using another system or the system is not connected, please download the appropriate driver from http://www.ftdichip.com/Drivers/VCP.htm. After the driver is installed, a new serial device will appear in the Device Manager, and the communication baud rate is set to 115200 bps by default. Parameters can be changed by receiving ASCII-format serial commands, with the commands ending in a carriage return.

Below is an example of the communication method using PuTTY. Open PuTTY, select Serial for the connection, enter the port number that matches the one in Device Manager, and set Speed to 115200. Click Open to open the black interactive port. You can input commands using the keyboard (note that the Backspace key does not work). After entering the correct command, the system will prompt the setting result; if an error occurs, it will return an error message.



The computer acts as the master control (host), sending string commands. Each command begins with a colon (":") as the starting symbol, and ends with a carriage return (\r\n). After the lower machine executes the command, it will return a response. All functions can be accessed through the accompanying software. It is recommended to use the LDPD software to complete the settings and obtain the correct waveform, then click Save to store the parameters in the lower machine,

after which control can be taken over by another client.

Operating Modes:
>>>>>> Send auto on to start, response: (1) Auto run started. [[OK]]
>>>>>> The laser loads the set current.
>>>>>>Send auto off to stop, response: (0) Auto run stopped. [[OK]]

Parameter settings

Sned	Function and return value
about	Return the current parameters of the lower computer: >>Excellent line (%f) TEC.\r\n >>(Floating point number, consistent with the parameters sent) >>Second line (%d,%d,%d) PGA,freq,amp.Irn >>(For LDRV module, the above are meaningless parameters) >>Third line (%d,%d,%d) bias.\rn >>(The value is consistent with the sent command bias a,b,c) >>Fourth line (%d,%d) dm,phase.\r\n >>(The parameters on LDRV are meaningless)
version	Reply: RYMLASER<machine model×version number>
temp	Returns the current ambient temperature value, laser temperature
tecx	x is the Celsius temperature, which sets the target temperature of the laser and can be a decimal.
tecp kP kl kD	Set the PID parameters of the temperature control system to ensure the stability of the temperature control system. Users can adjust the parameters to achieve fast or slow response. Restricted to professional users! Bad PID parameters will cause temperature oscillation and even damage the laser system. Factory value: kP=3000; kl=6000; kD=10
tecfast	TEC normal mode, using stored PID parameters
tecslow	TEC slow mode, kP/2, kl/8, will reduce the time constant of the temperature system
bias abc	a: Current setting (0~65535) b: Current limit setting (0~65535) c: Meaningless parameter, set to a value greater than 1 a and b values are calculated using the following formula a=(Iset/Imax)*65536 Iset is the current to be set, Imax is the instrument Max current (check in Instrument.ini according to the machine model)
save	Save all current parameters and they will be automatically called next time the computer is turned on.