laser DIODE driver with tempERATURE CONTROLLER

LDRV-VC SERIES USER MANUAL

General Information:

The LDRV-VC is a current driver and temperature controller for 14 pins butterfly mount diode lasers. The laser current is proportional to the sum of three voltage signals: one build-in reference, one low frequency input and one high frequency input. (LDRV-RF module also provide a >100Mhz RF signal injection port). This allows flexible light modulation for a wide range of applications.

The laser and its fiber are installed inside the instrument so there will be no external wiring. All parameters can be accessed through USB2.0 port.

Specification:

Item #	Min	Max	Unit	Comments
Power supply	100	230	VAC	50/60Hz
Power	5	20	Watts	
LD current	0	128/266/590	mA	Selected through jumpers on PCB
Compliance Voltage	0	3.1	V	
Frequency response	0	20	MHz	-3db
Temperature control range	0	50	°C	
Supported Temperature Sensors	10K NTC Thermistors			
TEC output current	-1.5	1.5	A	
TEC output voltage	-4.4	+4.4	V	
Analog input (low freq)	-2.5	2.5	V	500 ohms termination.
Analog input (high freq)	-2.5	2.5	V	50 ohms termination. Capacitor coupled. 10Khz high pass.
Photocurrent Measurement Ranges	0	2.0	mA	

Specification:

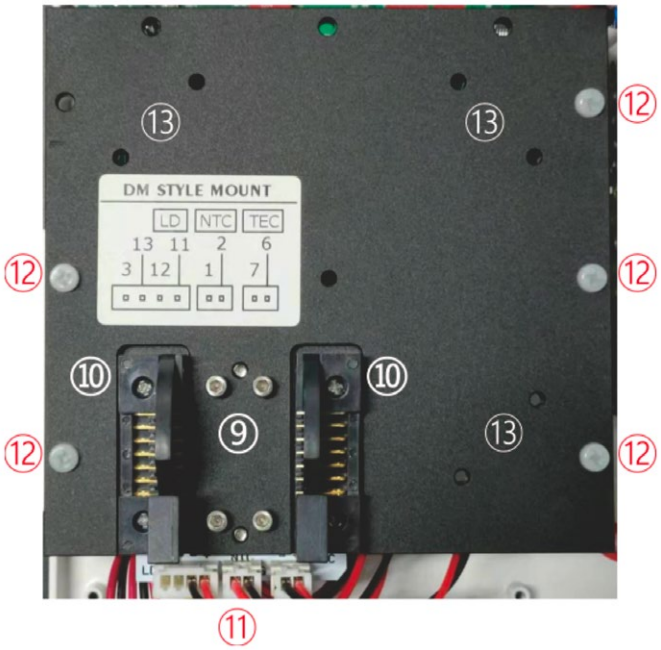
①Power switch; ②Power indicator; ③Laser indicator; ④Low freq input; ⑤High freq input; ⑥Key switch; ⑦Fiber/wire channel; ⑧Light out (FC/APC fiber adaptor)

Installation:

Remove 6 screws at the side and open the upper cover. The mounting board is seen as below:

First, remove the M2.5 screw at the mounting position. Open the (10) pin connector. Install the LD with fiber pigtail pointing upwards. Make sure all pins are clamped by the connectors. Use M2.5 screws to fix the LD.

Carefully arrange the fiber. Make multiple turns above the mounting board. Use the (13) screws holes to gently fix the fiber if necessary. Finally connect the terminal to (8) adaptor, or outside the instrument through (7).



⑨Mounting position; ⑩Pin connector; ⑪ Wire connector; ⑫ Screws(insulation); ⑬ Screw holes for fiber fix

Refer to the pin definition of the laser diode, and definition of (11) wire connector. Make sure the connection is compatible. Remove the mounting board to adjust the connection on the PCB if necessary. Pay special attention when one or more pins on the LD is connected to its shield. If not sure, insulate the LD shield from any other parts of the instrument.

Starting the LD under incorrect pin connection may damage LD and instrument.

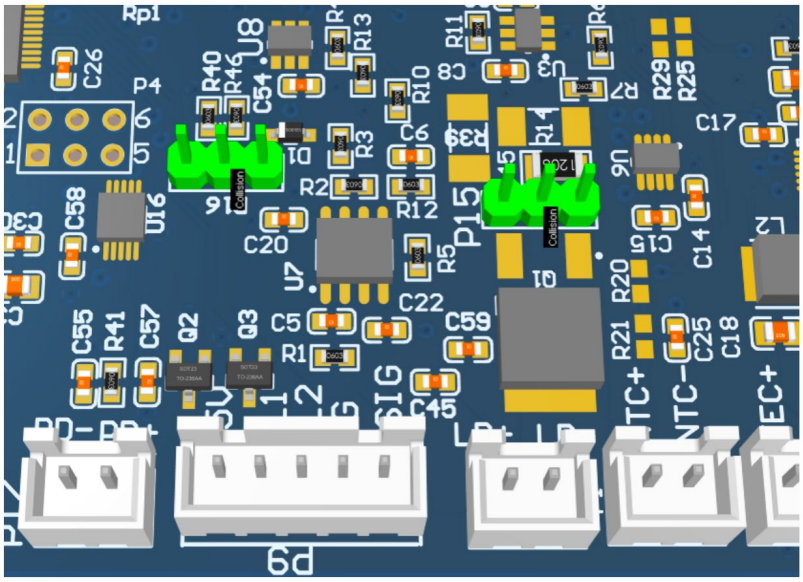
Setup:

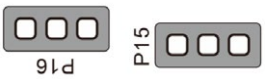
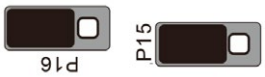
Make neccessay setup on the PCB to match the specifications of LD. Remove the mouting board first. Please operate when the instrument is disconnected from the power supply.

Current:

Set the max driving current to be equal or slightly larger than the desired working point of LD. Large current setting will increase the risk of damaging LD. Setting is done through P15 and P16 jumpers. Their location on PCB is shown as below.

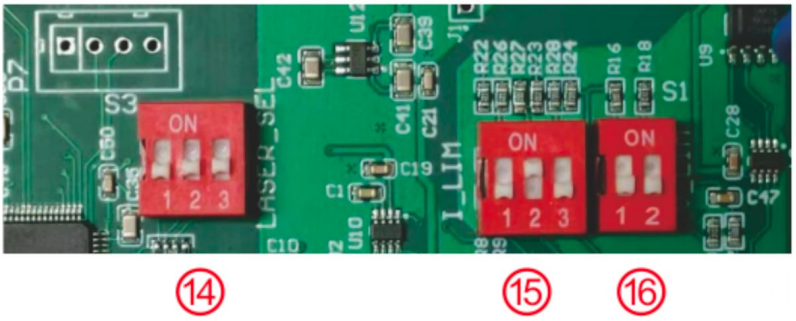
P15 and P16 jumpers MUST be set consistently. That is both left, both right or both open.



Jumpers	Model (Self-dentification)	Max driving current
	LDRV120	128 mA
	LDRV250	266 mA
	LDRV600	590 mA

TEC:

TEC current, voltage and PID constants can be set through the switchs on PCB. Their locations are shown as below.



⑭PID constants; ⑮ Max TEC current; ⑯Max TEC voltage

Refer to the specifications of LD. Both current and voltage should be lower than the absolute max rating of LD.

The PID control time constant is initially set to the shortest value, which is suitable for many low current laser diode. If temperaure oscillation is observed, time constant shall increase. This can be done by decreasing KP (propotional constant) and KI (integral constant). Please change the switches when the instrument is shutdown.

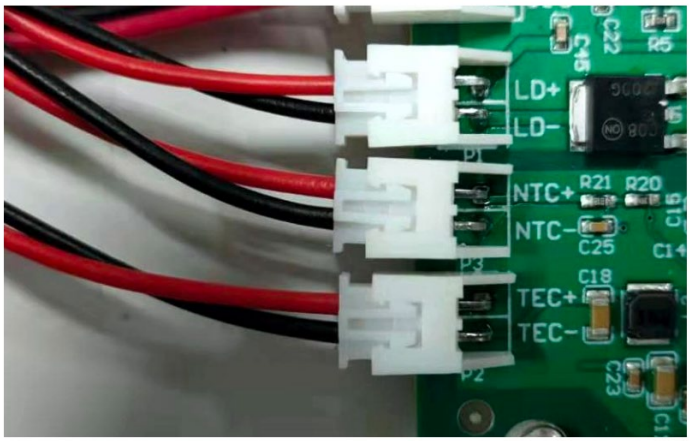
(14) PID constants adjustment switches. Each switch works independently, and the effect will combine. However, if all switches are on, the PID loop will be put into a software-controlled state. PID parameters shall be transferred using USB2.0 port.		
1  KP/2; KI/2	2  KI/2	3  KI/4

(15) Max TEC current (A)		(16)Max TEC voltage (V)	
	0.5		2.5
	0.7		3.3
	0.85		4
	1.0		4.4
	1.2		
	1.5		

Changing wires:

The functions of wires are marked on the PCB. Checking the wiring with the pin definition of LD. Notices that only NTC- is connect to the system ground and none of the other pins are connected. They will not work properly if connected to ground /VCC or with each other.

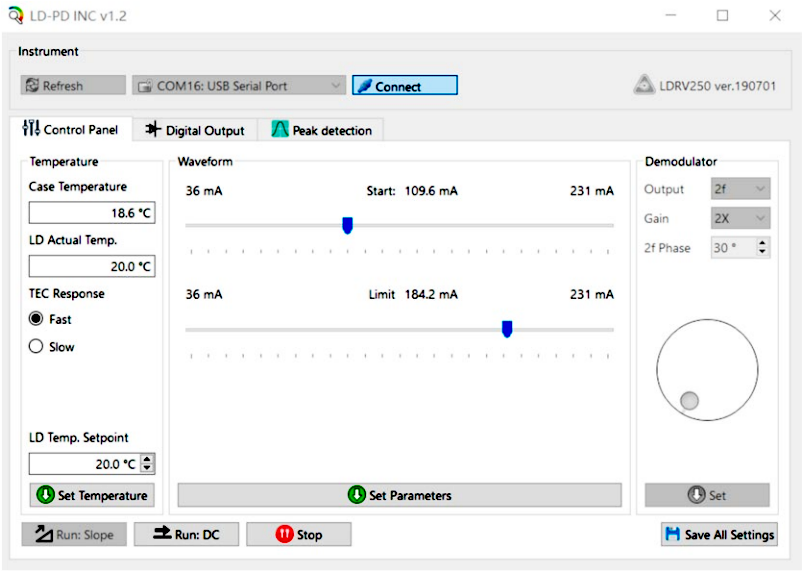
NTC- can be used for grounding. It will provide more stability in some cases. If anode of LD is connected with the laser shield. Please insulate the shield from the mounting board.



Usage software:

Install the controller software (LD-PD) on PC. Restore the mounting board, upper cover. Connect the instrument to power supply. Connect the USB wire to the PC.

Turn on the instrument. The (2) power indicator shall turn green. The PC may prompt for new hardware installation. In most cases, the installation can be done automatically. If not, download the driver from the following website and install: http://www.ftdichip.com/Drivers/VCP.htm



Open the LD-PD software. A virtual COM port appears in the lists. (if not, click the “Refresh” button). If there are multiple COM ports on the computer, you should select the right port in the list. Click the “Connect” button. The instrument model and bios version will appear at the up-right corner.

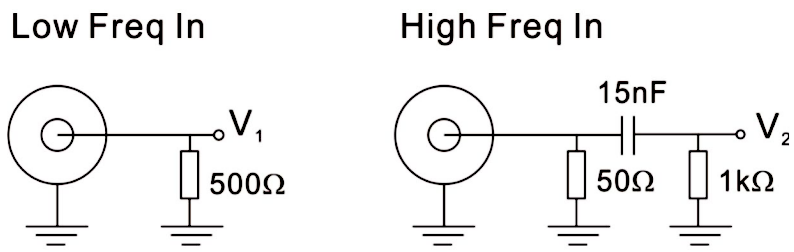
Input the desired LD working temperature at the “LD Temp Setpoint” input box. Click “Set temperature” to send the value. Set the constant current and protection limits with the sliders. Click “Set Parameters” button to make changes. Click “Save All settings” to store these values to the instrument. The saved values will be automatically loaded at next time.

Start the laser with “Run: DC” button. The laser indicator on the panel will turn red.

Check all parameters in the permitted range of LD.

Modulation input:

Use (4) and (5) ports for the external signal modulation. The equivalent input circuit are shown as below:



The current on LD is calculated as follow:

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

The max modulation frequency is 20MHz.

When the driver is in IDLE state, the protection circuit will clamp the LD current to a very low level. Thus the modulation input will no work. This will protect the LD from unwanted inputs signals. When the driver is in RUN state, the saved limits take effect.

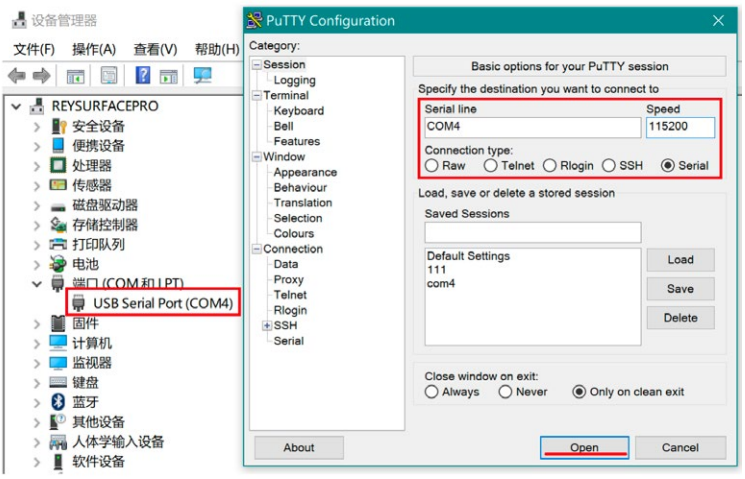
Manual operation:

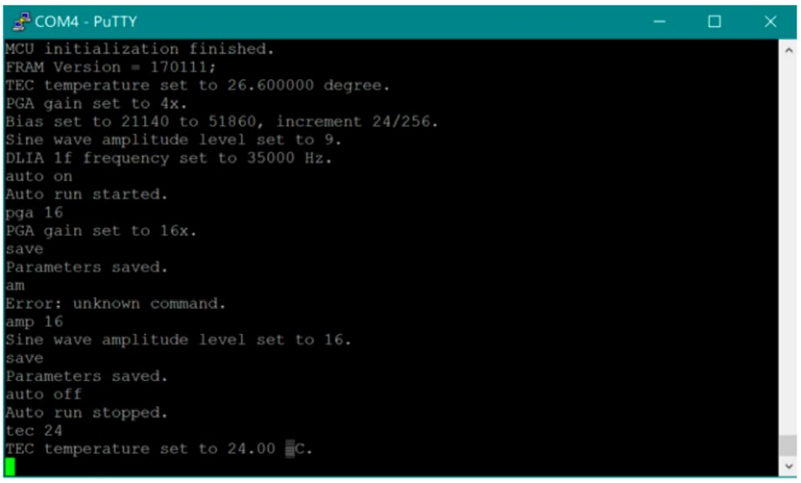
When all parameters are previously set through software ("save" button clicked), the instrument can run without a PC. Press the (6) Run/Stop button for 1 seconds will start the laser. All saved parameters (temperature, constant current, protection limits) will be loaded. Press the button again to stop.

USB communication:

The instrument communicates with PC through USB wire, in a virtual COM port manner. User can control the instrument using their own software.

The chip used for virtual COM is FT232R. Drivers can be found from the manufacture: http://www.ftdichip.com/Drivers/VCP.htm . Default settings: baud rate 115200bps, 1 stop bit, no parity check. Communications are in ASCII mode.





Commands from the host (PC) shall start with a colon ":", end with

Commands as follow: (End of line are omitted)

Send	Return	Function
:auto on	(1)Auto run started	go into RUN state
:auto off	(0)Auto run stopped	go into IDLE state
:about	TEC	return the current parameters.
	PGA,freq,amp	
	bias.	
	dm,phase.	
:version	RYMLASER	return the version
:tec x	TEC temperature set to %.2f.	set the target laser temperature
:tecslow	(1)TEC Slow Mode.	TEC slow response mode. Integral constant divided by eight. KI/8
:tecfast	(0)TEC Fast Mode.	TEC fast response mode.
:tecp KP,KI,KD	tecp(K,I,D) set to	set the temperature control PID constants. Only work when all three PID switches on PCB are ON.
:temp	%.1f,%.1f,%d	return ambient temperature, laser temperature and photocurrent reading.
:pdc	%d	photocurrent reading.
:bias a,b,c	Bias set to, increment	set current (a) and limit (b). a = (Iset/Imax)*65536. b = (Iprotect/Imax)*65536. c = 1
:save	(1)Parameters saved	save the current parameters into the build-in RAM