RedWave Labs

C490 LASER DRIVER

OPERATING MANUAL

Document Abstract

This document provides detailed information relating to the purchased hardware/system. It includes specifications; physical attributes and if required installation/setup instructions.

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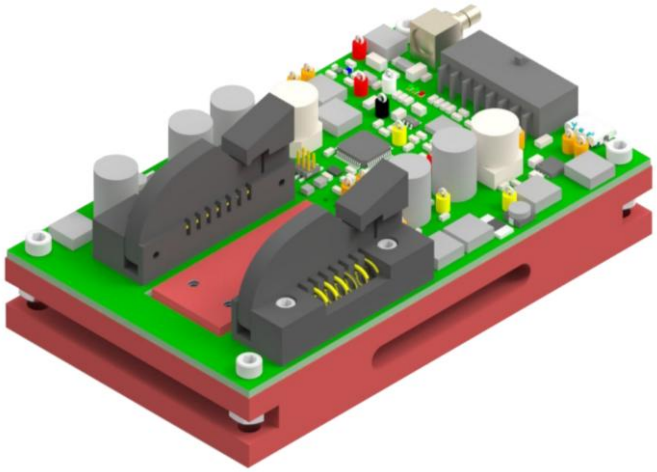
INTRODUCTION

Redwave Labs' C490 is a compact and affordable integrated laser driver and temperature controller. It combines an integrated temperature driver and laser driver in one package with full digital control.



Features

- 1 500 mA max Laser Current
- External modulation signal can be applied via SMB connector
- Standard Laser Connector Type I, Other types on request
- Full digital control with Software included

Applications

- Spectroscopy
- Gas Spectrometry
- Precision Instrument
- Laser
- OEM applications

SPECIFICATION

Specifications	Parameter	Value
Power	Single	+5V, 3A
Laser Current Control	Laser current	0 – 1 500 mA. Set in software or using external voltage.
	Compliance voltage	> 4.0 V
	Current setting accuracy	2 % fs
	Noise (RMS)	< 2 µA
	Drift	< 20 µA
	Temperature coefficient	50 ppm/C
	Current limit	Hardware-enforced, set by on-board DAC (software-programmable)
	Setting accuracy of current limit	2 % fs
Laser External Control	Voltage range	0 – 5 V default, laser dependent
	Input impedance	10 kOhm
	Modulation coefficient (I const)	20 mA/V, laser dependant
	3dB Bandwidth	DC … 90 kHz
	TTL modulation, rise / fall-time	250 ns
	Modulation	External; Internal; variable External/Internal combination
	External modulation	Up to 90 kHz (Optional)
	Internal modulation	Up to 250 kHz (Optional)
	Interlock	Yes
Photodiode	Gain	100; 1k; 10k; 100k V/A (depends on PO request)
	Bandwidth	50 kHz
	Control	Digital
TEC Control	TEC current	0 … ± 2.0 A
	TEC Voltage	> 4.5 V
	Max output power	9 W
	Current limit	0 – 2.0 A, digitally controlled
	Input sensor	10k Thermistor, 7 excitation current settings

		10; 50; 100; 250; 500; 1000; 1500 µA
	PID control	Fully digital. Typical stability 1mK RMS
Connectors	Laser	Integrated Azimuth Electronics 14 pin connector with heat sink. Multiple pinouts can be accommodated with different order request.
	Power and Control	Molex Micro-Fit 16 pin
	Control	Micro USB
Digital Control		Computer control via USB or TTL UART. Can be programmed to start independently without computer connected
Dimensions	W x D x H	101.4 x 61.4 x 36.67mm (3.99 x 2.42 x 1.44 Inch) (Height varies dependent on laser package variant)
	Weight	260 g (dependent on laser package variant)
	Storage Temp	-55 to 100 C
	Operating Temp	-40 to 85 C

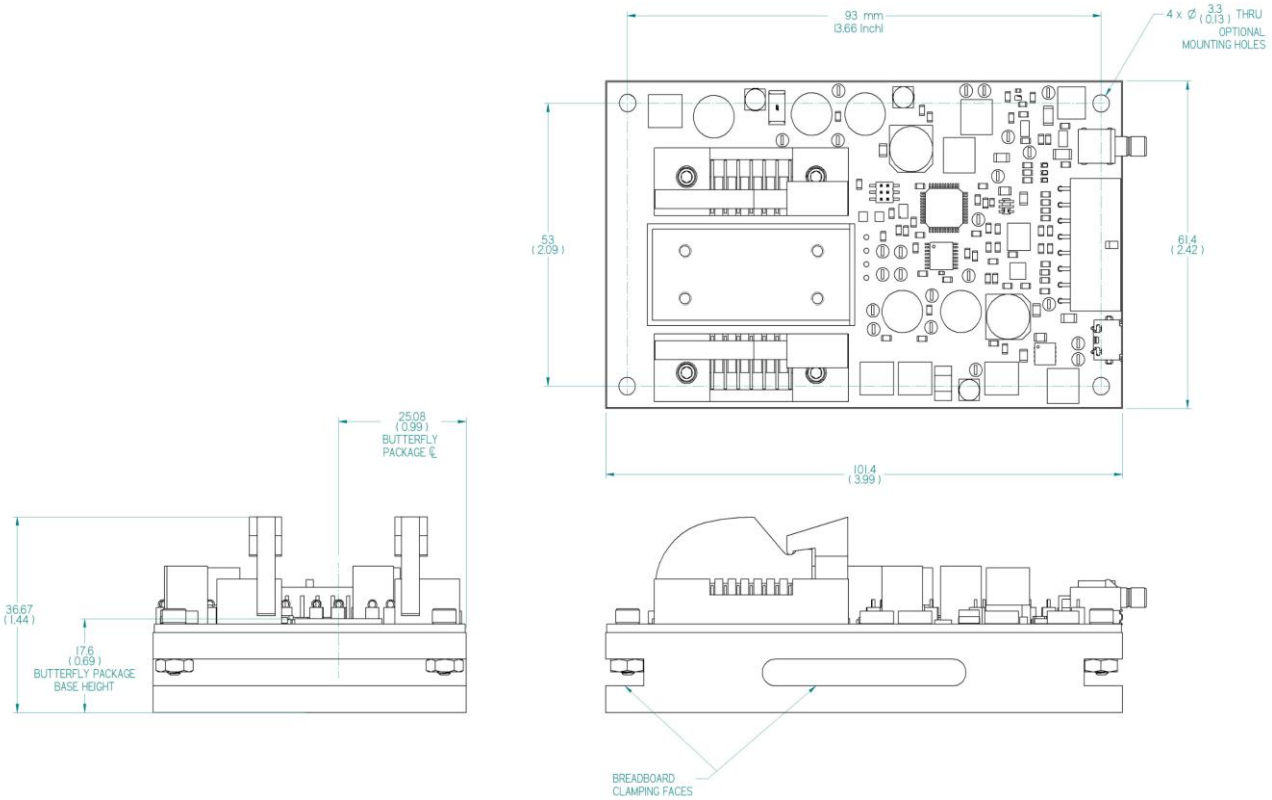
RedWave Labs Ltd keeps improving its products and therefore some specifications can vary.

ABSOLUTE MAXIMUM RATINGS

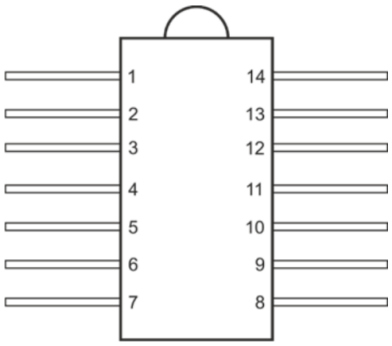
Symbol	Parameter	Ratings	Unit
V_{dd}	Supply positive voltage / Laser driver and TEC	+5V ±10%	Volt
T_{op}	Operational Temperature	-40 to 85	Deg C
T_{st}	Storage Temperature	-55 to 100	Deg C
T_c	TEC Current	-2 to +2	A
L_I	Laser Current	1 500	mA

ELECTRICAL AND MECHANICAL INFORMATION

BUTTERFLY LASER VARIANT



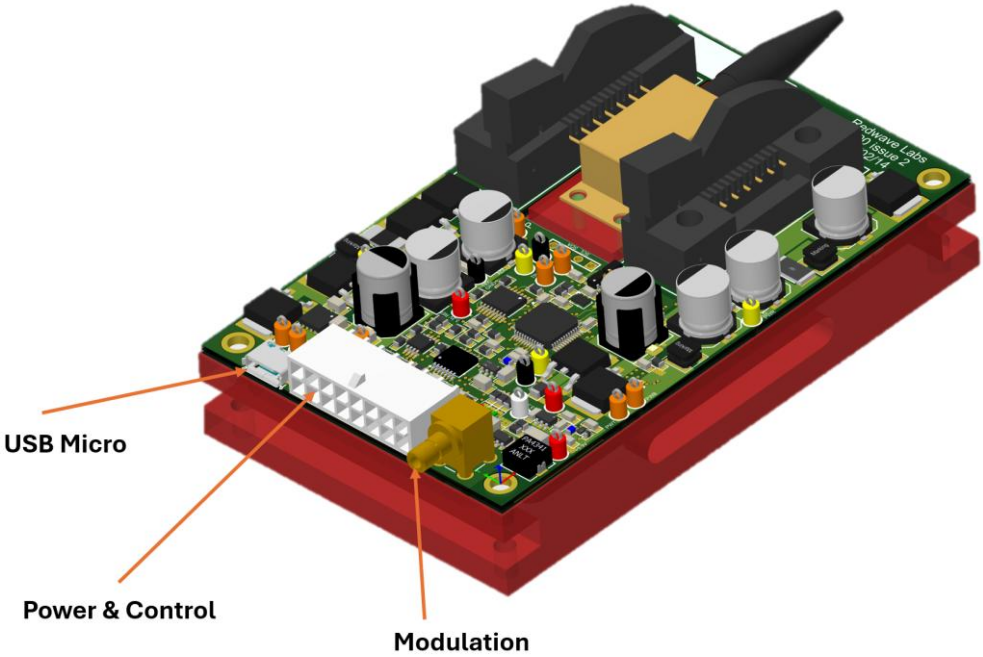
BUTTERFLY CONNECTOR TYPE I



Pin Layout

1	TEC+	14	TEC-
2	TH-	13	Not in use
3	PD+	12	Not in use
4	PD-	11	LD -
5	TH+	10	LD +
6	Not in use	9	Not in use
7	Not in use	8	Not in use

CONNECTIONS



Connection	Name	Description
Molex 16 way	Power & Control	5V 3A , LD enable; interlock; external laser control pin
USB Micro	USB	USB Micro Allows the board to be driven using Redwave Labs software or API
RCA	Modulation	Contains: Laser High Freq Modulation

POWER AND CONTROL CONNECTOR

Molex part number 2125281600.

PIN#	Description
1	GND
2	+5V In
3	Interlock (5V On)
4	LD Enable (5V On)
5	Set LD Current
6	GND
7	Set TEC Current
8	AGND
9	UART TX
10	UART RX
11	TEC Enable (5v On)
12	TEC Error
13	LD Error
14	LD I Monitor
15	TEC Temp Monitor
16	PD Output

PD_Output	ACT_T_Mon	LD_I_Mon	LD_Error	TEC_Error	TEC-Enable	UART_RX	UART_TX
AGND	Set_T_TEC	GND	SET_LD_I	LD_Enable	LD_Interlock	+5V IN	GND

Appropriate mating parts: Molex 2064611600.

Appropriate mating parts pins: Molex 2064600021.

MODES OF OPERATION

LASER DIODE

Constant Current

The laser diode can be run in constant current mode with the setpoint either defined using software or the external control input, or a combination of both.

Modulated Current

The laser diode current can be modulated, up to the device bandwidth, using the external modulation input.

SETUP

SOFTWARE CONTROL (WINDOWS ONLY)

Install the Control Software

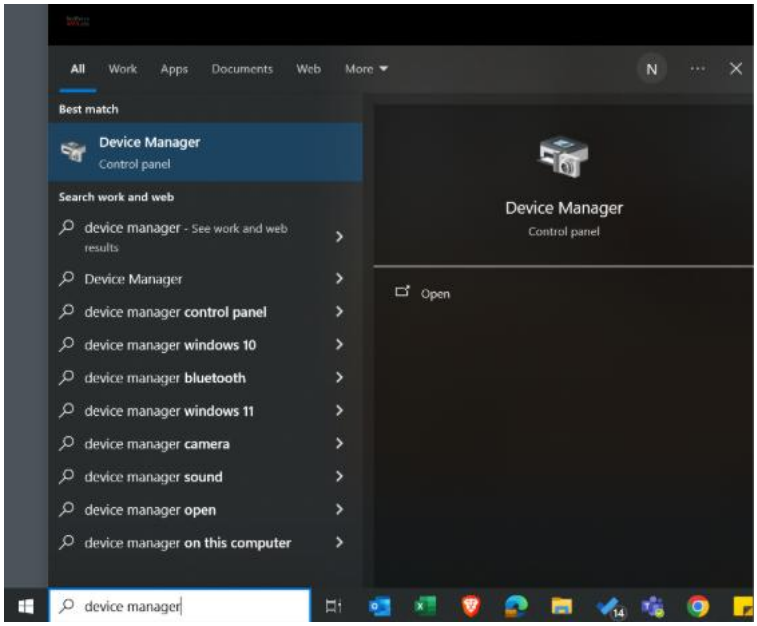
On a Windows computer Install the ‘Term Tool’ control software via the installer ‘TermTool_vXXXX.XX.X.msi’ (Version dependent on hardware version)

Connect the device

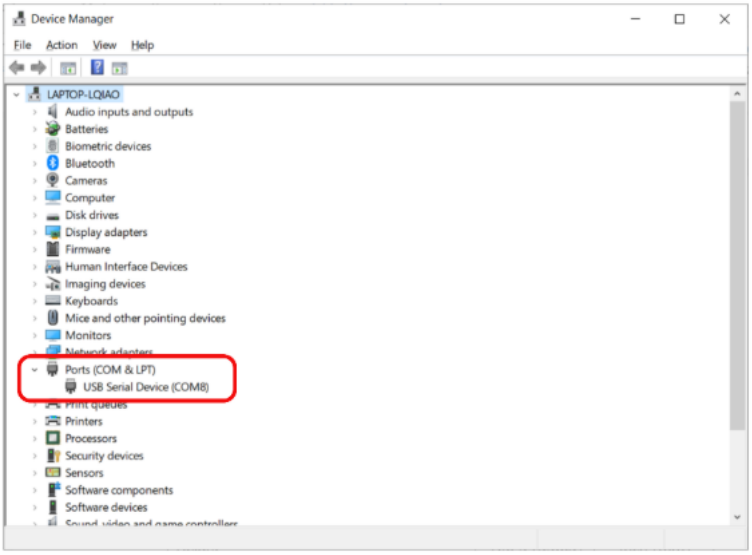
Connect the C490 to the supplied power supply, which will automatically power up the device. Connect a USB-B cable from the controlling computer to the C490.

Find the COM port assigned to the connected device, then select that port in the software:

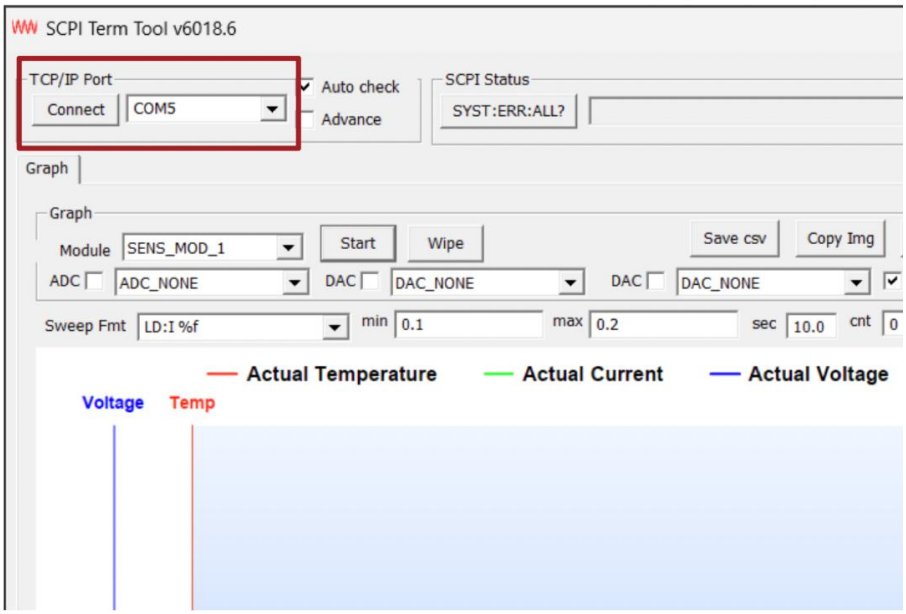
- Launch the device manager on the computer



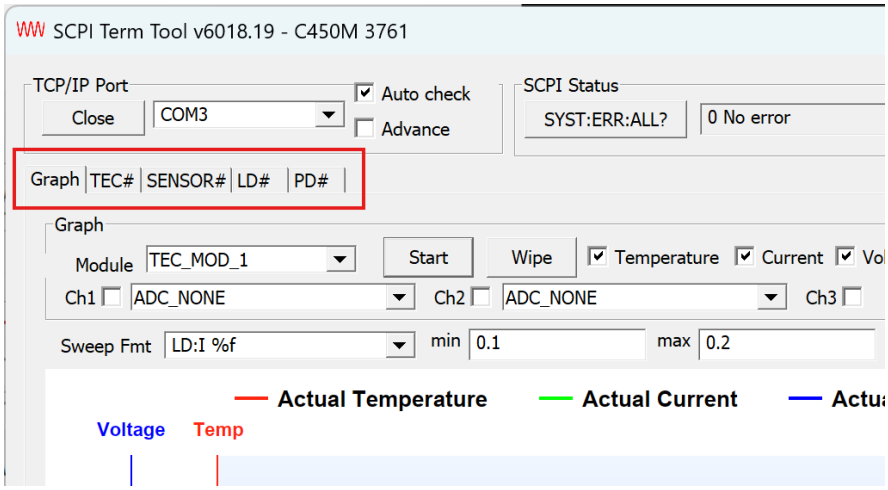
- Find the USB Serial Device (COM). USB Serial Device (COM?) can be found in the Device Manager (COM8 in the example shown).



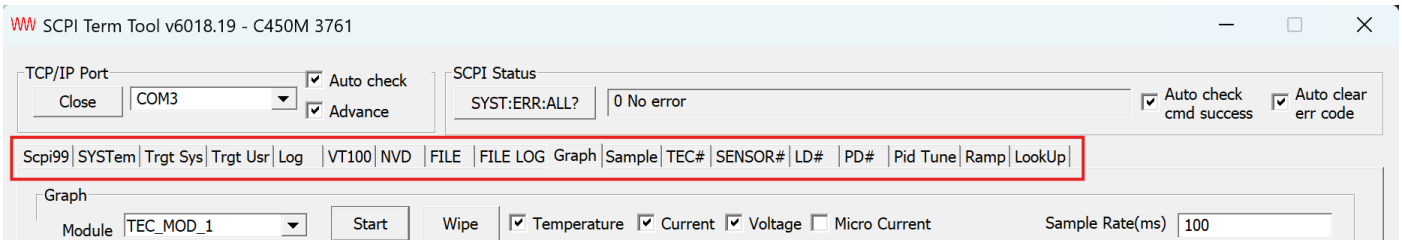
- Connection to the hardware via USB selecting the appropriate COM port.



- The menu is dynamic depending on the device that the term tool is connected to and limited to key features if Advanced is unticked.



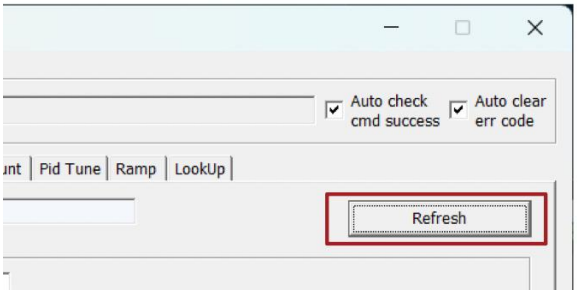
- Graph – A simple graph tool to assist with logging
- TEC# - Available TEC controllers and configuration
- SENSOR# - Temperature Sensor Readout
- LD# - Laser diode current controller.
- PD# - Photodiode configuration and readout.



- Log – Provides a log of commands sent to the HW
- Pid Tune - Can be used to tune the response of the TEC PID loop.
- Other tabs are specific to Redwave Labs development.

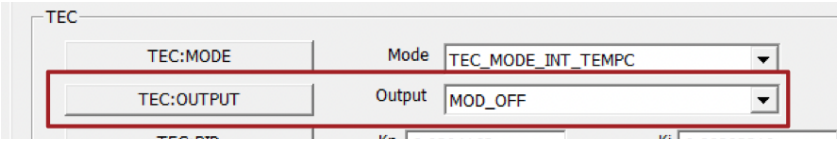
Read data from the device

Each tab (Module) has a refresh button. Clicking this will request the module the current data set configured.



Write Data to the device

Within the term tool most settings/controls have a transmit button and a value to transmit. They are named after the SCPI command referenced in the SCPI Manual. For example, to turn on the TEC, change the drop down option from MOD_OFF to MOD_ON (TEC Module on) and transmit this by clicking the 'TEC:OUTPUT' Button

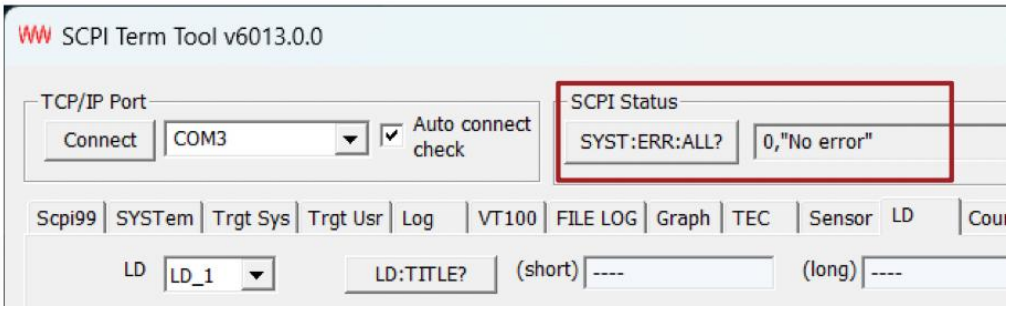


From the Log Tab you can see this command sent to the device

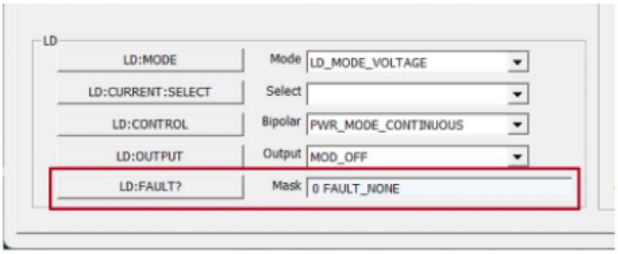
```
164 10:09.01    SCPI    TX TEC:OUTPUT 1
cmd_TEC_OUTPUT_wr
w_state  1= 1(01) MOD_ON
```

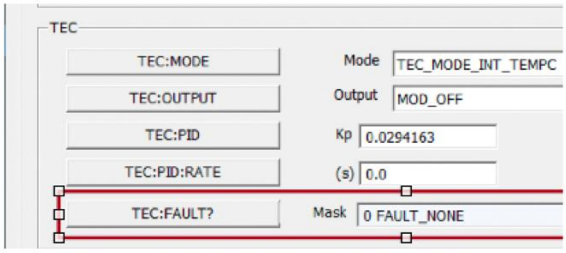
Status of the Device and Modules

The overall state of the system can be read by clicking the SYST:ERR:ALL? Button



Each tab (Module) has an Error check



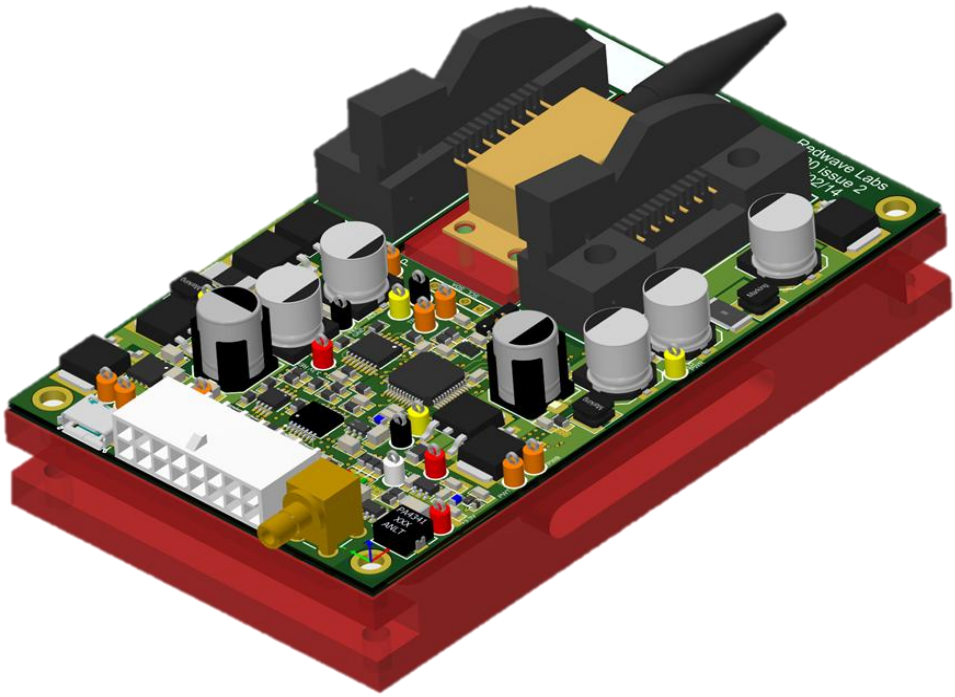


DEVICE MODULES

Interlock

The interlock of the device can be enabled by disconnecting Interlock Pint from 5V. The additional control is then triggered using the appropriate pins on the control connector (TEC Control, LD Control). By connecting the pins to 5V, the interlock will allow the laser to turn on. If the pins are disconnected, the laser will turn off and a fault will be visible in the LD panel of Termtool.

The default state of the device does have the interlock enabled.



Temperature Sensor

The SENSOR tab shown below allows configuration of the temperature sensor monitoring the laser diode temperature.

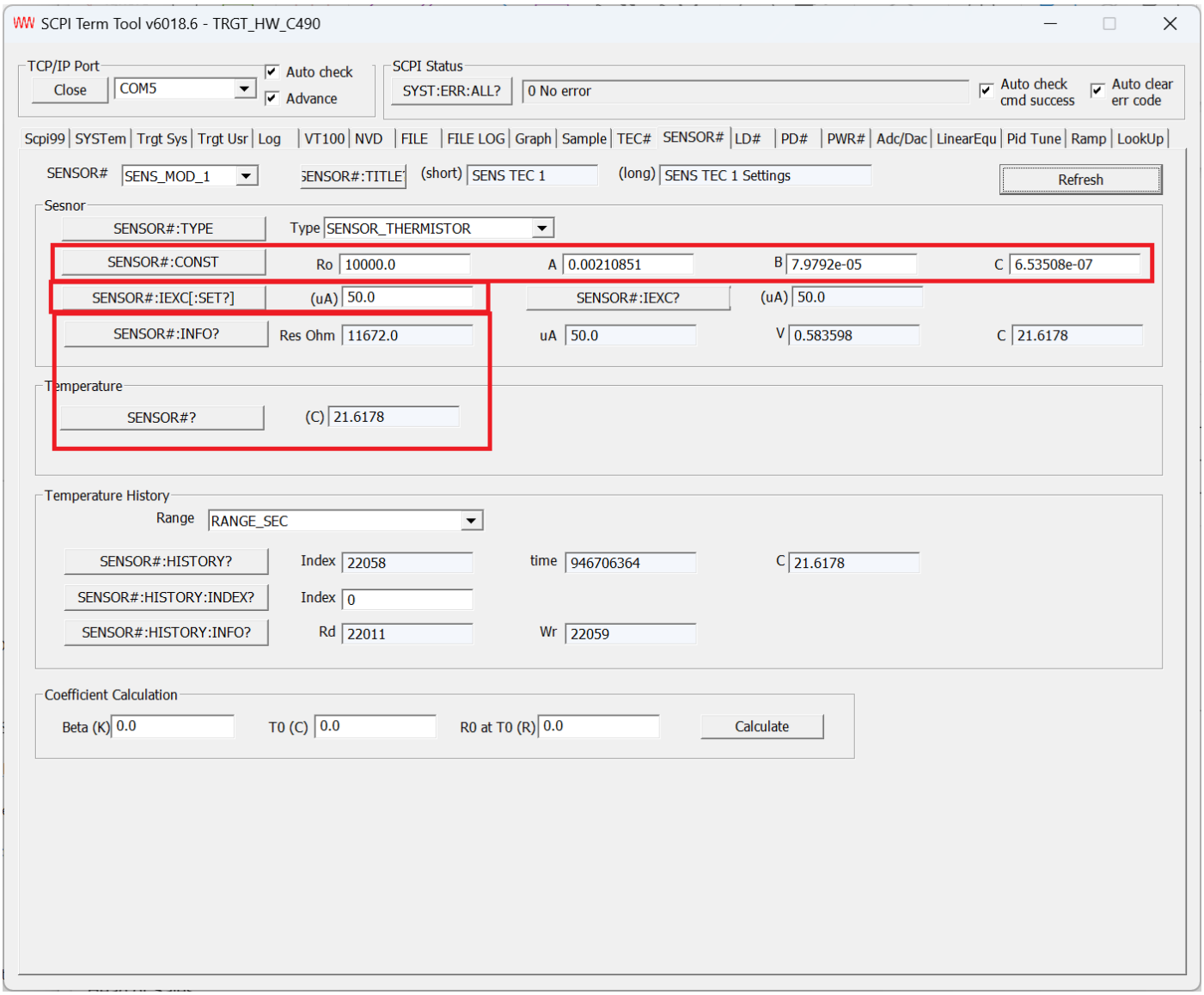
Steinhart-Hart coefficients can be input into the SENSOR#:CONST boxes, and programmed to the driver.

The excitation current for the temperature sensor is set using SENSOR#:IEXC:SET. The default value is 50 uA. This is recommended to avoid thermistor self-heating effects.

The SENSOR#:INFO can be used to read out the resistance value of the thermistor and the converted temperature value.

The coefficient calculation can be used to calculate the appropriate A, B and C values from a thermistor beta value.

Default values for the laser driver are A=1.129e-3 B=2.341e-4 C=8.78e-8, For AreoDiode the defaut can be use: A=0.00210851, B= 7.9792e-5, C= 6.53508e-7



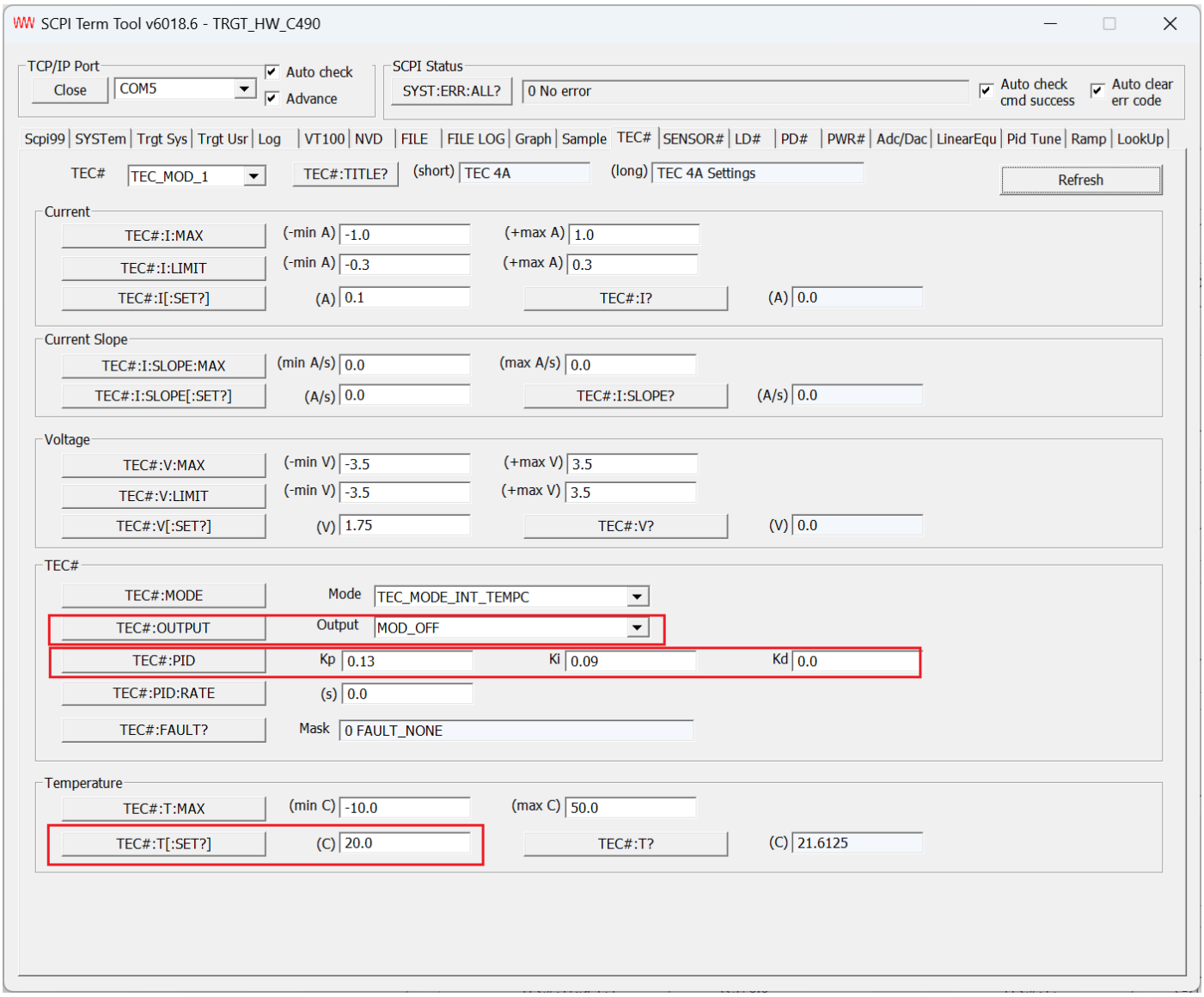
Diode Temperature Control

The TEC tab shown below allows configuration of the TEC used to control the temperature of the laser diode.

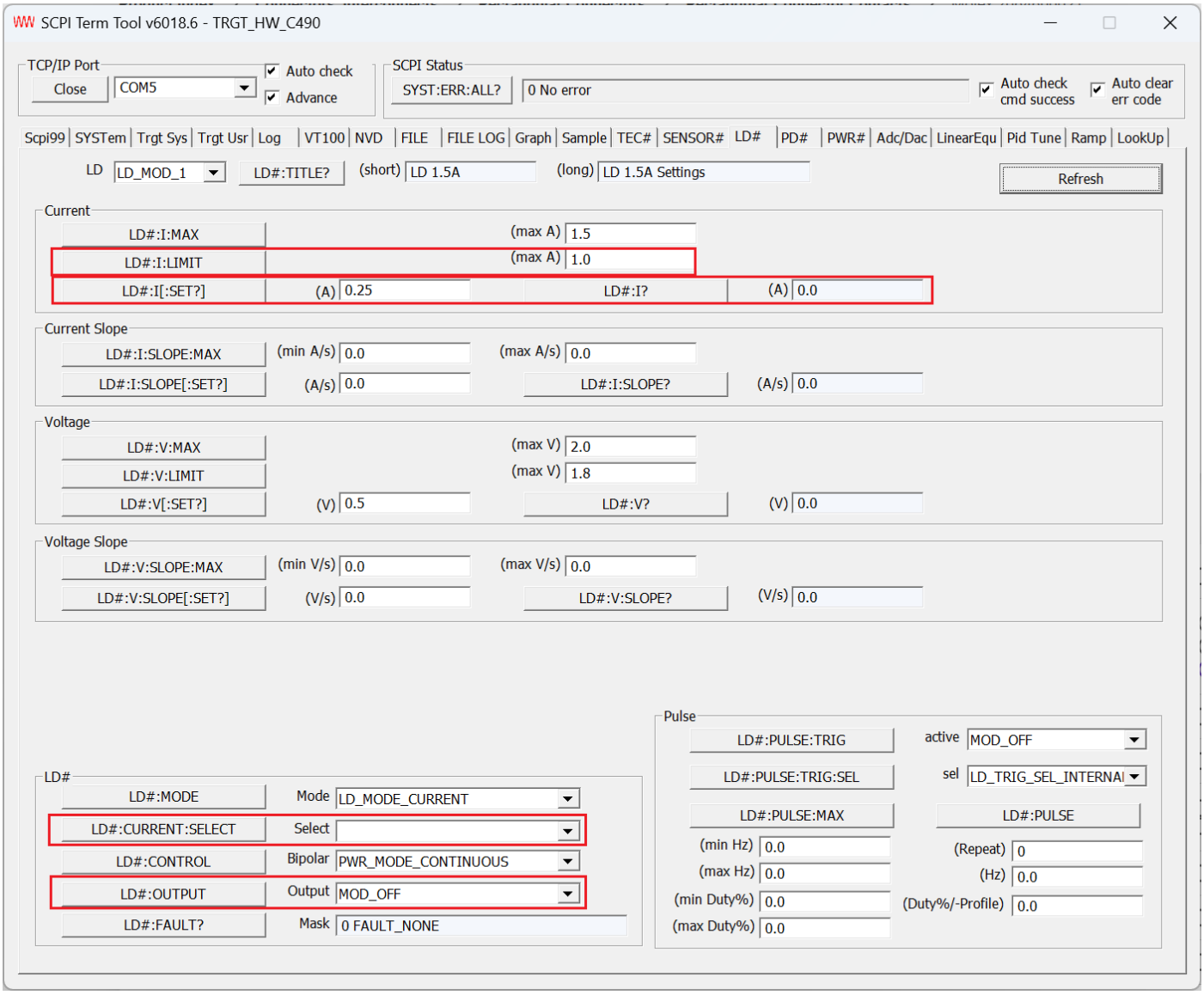
The PID parameters can be set using the TEC:PID parameters. Default values are Kp = 0.65, Ki = 0.25, Kd = 0.07.

The temperature is then set using the TEC:T[:SET] parameter shown below.

The PID controller can be enabled by setting TEC:OUTPUT to MOD_ON and disabled by setting to MOD_OFF.



Diode Current Control



CERTIFICATION

RedWave Labs Ltd certifies that: i) the parts and/or materials were produced in conformance with all contractually applicable Government and/or Buyer's specification as referenced in, or furnished with, the above purchase order and ii) all processes required in the production of these parts and/or materials are listed and were performed by a facility or by personnel specifically approved or certified by the seller's cognizant government quality control agency when such approval or certification is required by an applicable specification. RedWave Labs products are not authorized for use in safety-critical applications (such as life support) where a failure of the product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use of the products.

WARRANTY AND RETURNS

RedWave Labs Ltd products are warranted against defects in materials and workmanship for a period of 180 days from date of shipment. During the warranty period RedWave Labs Ltd will replace or repair products which prove to be defective or damaged. Our warranty shall not apply to defects or damages resulting from: i) misuse of the product or ii) operation beyond specifications detailed in the current manual.

RETURN PROCEDURE

Customer must obtain a valid RMA number by contacting RedWave Labs prior to the return. In all cases the customer is responsible for duty fees incurred on all received shipments and on all international returns for both warranty and non-warranty items; the customer is responsible for any duties, brokers fees or freight charges deemed chargeable to RedWave Labs Ltd.

REVISIONS

Revision 1.0: First revision