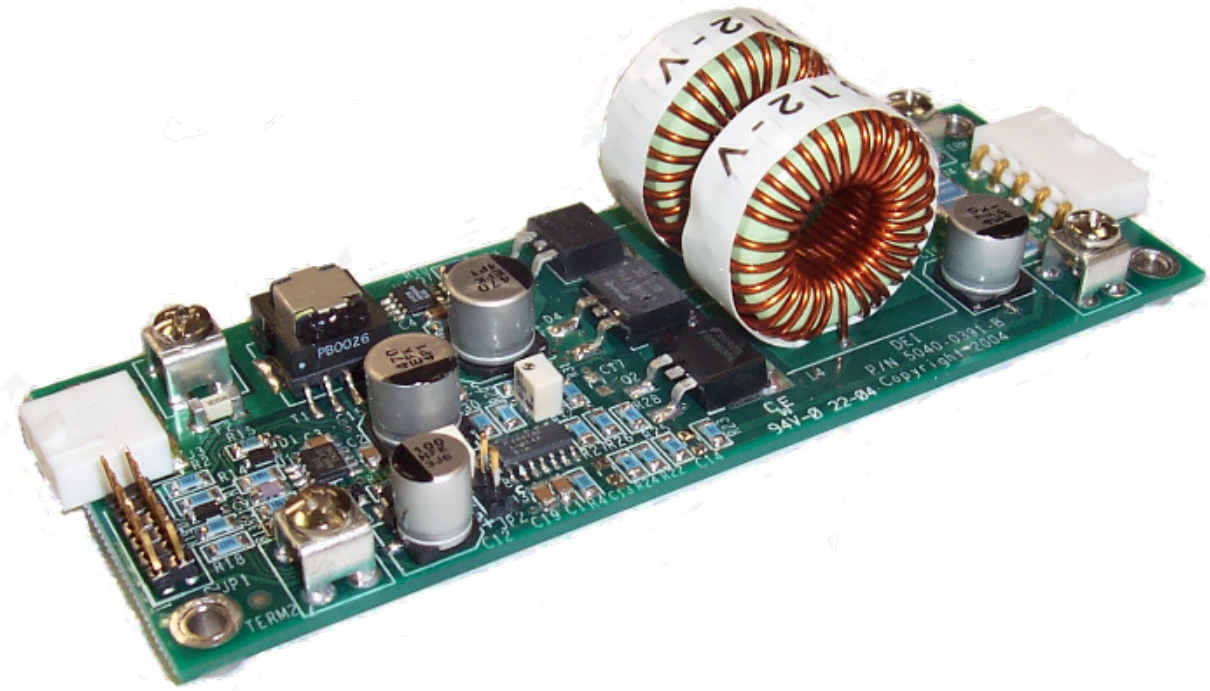
PCO-6511

CW Laser Diode Driver Module

Operation Manual



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Contents

Safety

- Do not install, handle, or remove the PCO-6511 while it is operating.
- Do not use this device in a manner not specified by the manufacturer.
- Allow sufficient space around this device for air circulation.
- Do not use where liquids are present or in corrosive environments.

WARNING
Risk of lethal electric shock. Do not touch the output or laser diode while it is operating. This device produces LETHAL levels of electric current at its output.

DO NOT OPERATE THIS DEVICE UNLESS ANOTHER PERSON, CAPABLE OF RENDERING FIRST AID OR RESUSCITATION, IS PRESENT.

SAFE AND PROPER OPERATION OF THIS DEVICE IS THE RESPONSIBILITY OF THE USER.

Directed Energy, Inc. (DEI) provides information on its products and associated hazards, but it assumes no responsibility for the after-sale operation and safety practices.

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Introduction

❖ Description

The PCO-6511 is a compact and economical OEM CW laser diode driver module. It features an adjustable output current of 3.0 A to 10.0 A and a compliance voltage of 10 V.

The ease of setup and operation of the PCO-6511 makes it an ideal CW driver. The output current is set by a board-mounted trim potentiometer or by an external voltage (jumper selectable). Connector JP1, a 2x6 male header, is used for all control signals.

Input power is connected via two #6 screw terminals, TERM1 (+) and TERM2 (–), or via J3, a 3-pin Molex connector. The compatible Molex part numbers are 39-01-4030 (housing) and 5556 (female terminals).

The load is connected via two #6 screw terminals, TERM3 (+) and TERM4 (–), or via J4, a 5-pin Molex connector. The compatible Molex part numbers are 39-01-4050 (housing) and 5556 (female terminals). **NOTE: Do not operate the PCO-6511 without a load unless the crowbar is activated.**

There are many load packages and mounting preferences; use the type of output connection that best works for your laser diode. Always use a twisted pair when connecting the laser diode to the PCO-6511. If using the screw terminals, twist the two wires together. If using the J4 5-pin connector, use two such sets of twisted wires connected in parallel.

A current monitor output is provided to observe the diode current in real time with an oscilloscope. The analog output is provided on connector JP1 pin 10 (+) and 9 (–). The output is scaled such that 4.06 V represents 10.0 A.

❖ Design Considerations

The heart of the PCO-6511 is a step-down DC/DC converter consisting of a MOSFET, a diode, an inductor and an output filter. The input/output current ratio is the inverse of the input/output voltage ratio. If losses are disregarded, the input power in watts equals the output power in watts.

The PCO-6511 has a CVR (Current Viewing Resistor) in series with the load (laser diode). The voltage drop across the CVR is proportional to the current flowing in the circuit. This voltage is used as the current monitor output and is also fed back to the control circuit so that the output current is held constant.

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A safety feature referred to as a “crowbar” circuit is added in the form of a power MOSFET in parallel with the load. When the crowbar is held low (0 V) the output to the laser diode is operational. There is a 10 kΩ pullup resistor in the DC input voltage of this circuit at JP1 pin-12.

The PCO-6511 output current is set by an onboard potentiometer or by an external voltage control. When jumper JP2 is in place, the onboard potentiometer is used for current amplitude setpoint. When jumper JP2 is removed, the external voltage input (pin 4 of JP1) is used to adjust the output current.

The operating temperature should be maintained below 40 ºC. If the temperature exceeds 40 ºC, additional cooling should be provided either by forced air cooling across the driver, or by mounting the board to a heat sink or cold plate using the mounting holes provided. Operation above 8 A requires forced air cooling.

The PCO-6511 requires 15 minutes to thermally stabilize. When operating, adjust the PCO-6511 to the desired current. Readjust the current after 15 minutes.

The circuit board has four mounting holes in the corners of the board with short (6.04 mm) non-threaded standoffs. The board mounting hole spacing is 40.64 mm x 129.54 mm. The hole diameter is 3.45 mm.

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Connections

❖ JP1 Control Connector

Control signals are connected via a 2x6 female header socket. Use FCI 65043-031LF housing and FCI 48236-000LF contacts.
Connector JP1 has the following pin connections for controlling the PCO-6511:

- Pins 1, 3, 5, 7, 9, 11: Ground
- Pin 2: Reference voltage output (5 V ±0.1 V)
- Pin 4: External Control (analog input). If JP2 is removed, 0 V to 4.095 V applied to this input sets the output current amplitude.
- Pin 6: V_{CC} output
- Pin 8: Shutdown
  - No connect = operate
  - 5 V (connect pins 8 and 2) = OFF
- Pin 10: Current Monitor (I_{MON})
  - Analog output: 4.06 V = 10 A
- Pin 12: Crowbar
  - No connect = output load bypassed
  - 0 V (connect pins 12 and 11) = operate

❖ JP2 Method of Output Current Adjustment

Jumper JP2 selects the method of adjusting the output current amplitude.

- If jumper JP2 is in place, the board-mounted trim potentiometer (R20) sets the output current.
- If jumper JP2 is removed, the external voltage input (pin 4 of JP1) sets the output current.

❖ Power Input Connections

The source (power supply) can be connected to the PCO-6511 via two screw terminals or a 3-pin Molex connector (J3).

- Screw terminals: Use 18 AWG stranded wire and #6 ring lugs (Tyco 32947).
  - TERM1, (+) 12 V to 16 V DC input

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    - TERM2, (–) input return
- J3 Molex connector: Use Molex 39-01-4030 housing and Molex 5556 female terminals (the specific terminal part number varies with the plating, wire gauge, etc.). Pin 2 = no connection.
    - Pin 1: (+) 12 V to 16 V DC input
    - Pin 3: (–) Return

❖ Power Output Connections

The load (laser diode) can be connected to the PCO-6511 via two screw terminals or a 5-pin Molex connector (J4). If using the Molex connector, use two twisted wires in parallel (+ and –) for each connection. Do not operate the PCO-6511 without a load unless crowbar is activated.

- Screw terminals, use 18 AWG stranded wire as a twisted pair and #6 ring lugs (Tyco 32947).
    - TERM3, (+) Output
    - TERM4, (–) Output return
- J4 Molex connector, use Molex 39-01-4050 housing and Molex 5556 female terminals, (the specific terminal part number varies with the plating, wire gauge, etc.). Pin 3 = no connection.
    - Pins 1 and 2: (+) Output
    - Pin 4 and 5: (–) Output Return

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Operation

❖ Safety

Follow the safety guidelines are located at the beginning of this document. DO NOT PROCEED WITHOUT UNDERSTANDING AND OBSERVING THESE GUIDELINES.

❖ Requirements

Verify that the PCO-6511:

- Is connected with the proper cables and the correct impedance set.
- Has its output connected to a load or output device with the proper polarity?

❖ Setup

1. Verify the PCO-6511 is OFF when connecting or disconnecting the laser diode or load.
2. Connect the power supply source to the PCO-6511 via either the two screw terminals (Term1 and Term2) or the 3-pin Molex connector (J3).
3. Make the laser diode or a load connection with the correct polarity to the PCO-6511 via two screw terminals (Term3 and Term4) or a 5-pin Molex connector (J4).
4. Connect the control cable to JP1 as noted in the section above marked Control Connections.
5. Connect an oscilloscope to the current monitor if desired.
    a. JP1 (+ pin-10 and – pin-9).

❖ Power Up

1. If using the Shutdown pin 8 set to off
    a. 0 V or no-connect = operate
    b. 5 V = off (pin 2 to pin 8)
2. If using the Crowbar pin 12 set to bypass
    a. 0 V = output crowbarred (shorted to ground) (pin 11 to 12 = operate).
    b. No-connect = load bypass, when not connected pin 12 is the same voltage as DC power source.
3. Power up the + DC power source between +12 V and +16 V DC. Do not exceed 16 V DC.

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❖ Enable the PCO-6511

1. Enable the PCO-6511:
    a. Change (Shutdown) pin 8 to 0 V or no connect.
    b. Change (Crowbar) pin 12 to 0 V, (shorted to ground).
2. Set the output current by:
    a. varying the R20 potentiometer
    b. changing the external voltage input at pin 4 of JP1. Do not exceed 4.095 V DC.
3. Verify the output is correct with the current monitor and an oscilloscope.
4. After 15 minutes readjust the current and if necessary the DC power source. Do not exceed 16 V DC. Adjusting the DC power source can help stabilize the current.

❖ Power Down

1. Disable the PCO-6511:
    a. Change (Shutdown) pin-8 to 5 V (pin 2 to pin 8)
    b. Or change (Crowbar) pin-12 to no-connect
    c. Shutdown the DC power source (+12 V to +16 V DC)

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Warranty and Service

❖ Warranty

Directed Energy, Inc. (DEI) warrants equipment it manufactures to be free from defects in materials and factory workmanship under conditions of normal use, and agrees to repair or replace any standard product that fails to perform as specified within ninety days (90) after date of shipment to the original owner. OEM, modified, and custom products are warranted, as stated above, for ninety (90) days from date of shipment to original owner. This Warranty shall not apply to any product that has been:

I. Repaired, worked on, or altered by persons unauthorized by DEI in such a manner as to injure, in DEI's sole judgment, the performance, stability, or reliability of the product;
II. Subjected the product to misuse, neglect, or accident; or
III. Connected, installed, adjusted, or used otherwise than in accordance with instructions furnished by DEI.

DEI reserves the right to make any changes in the design or construction of its products at any time, without incurring any obligation to make any change whatever in units previously delivered.

DEI's sole obligation, and buyer's sole remedies, under this agreement shall be limited to a refund of the purchase price, or at DEI's sole discretion, to the repair or replacement of products in kind that prove, to DEI's satisfaction, to be defective, when returned to the DEI factory, transportation prepaid by the buyer, within the warranty period. DEI shall in no way be liable for damages consequential or incidental to defects in its products, for failure of delivery in whole or in part, for injuries resulting from its use, or for any other cause.

Returns must be preauthorized and accompanied by a DEI return authorization number.

The foregoing states the entire warranty extended by DEI, and is given and accepted in lieu of 1) any and all other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and fitness for any particular purpose and 2) any obligation, liability, right, claim or remedy in contract or tort.

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❖ Factory Service and Support

For more information about your instrument or for an operation problem, please contact the factory:

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