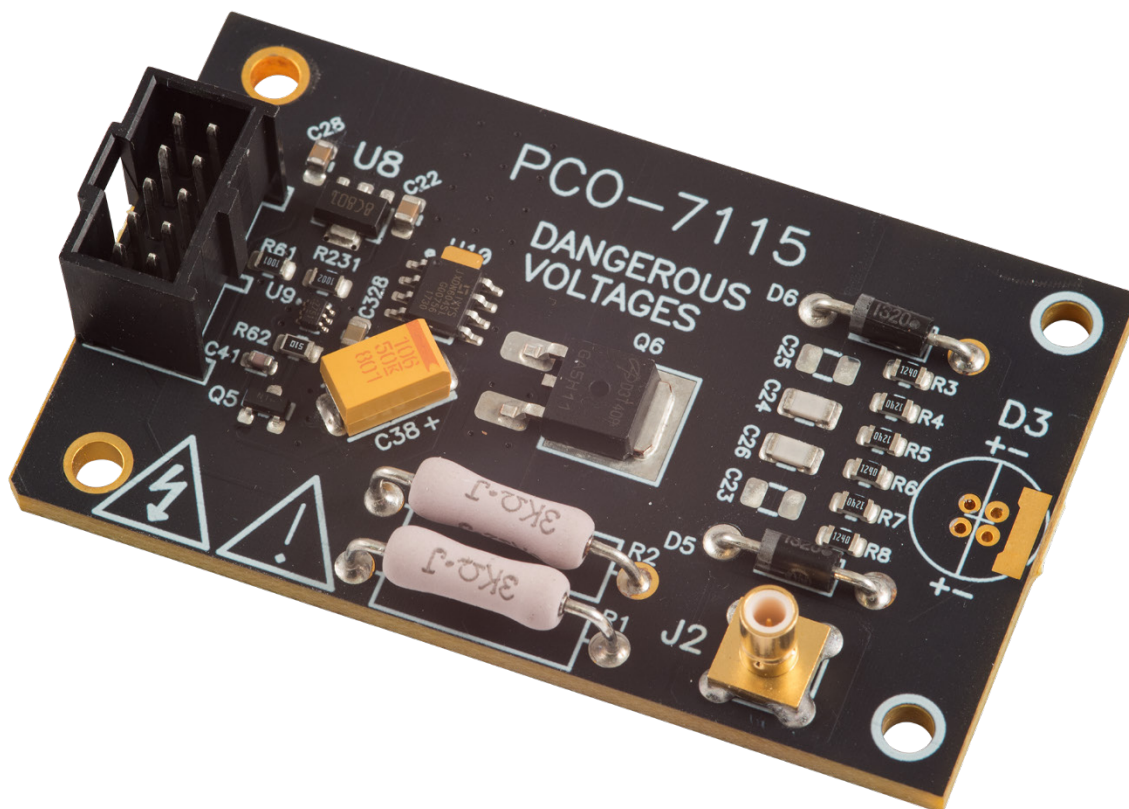


# PCO-7115

## Laser Diode Driver Module

# Operating Manual

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# Safety

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- Do not install, handle, or remove the PCO-7115 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.

# Introduction

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## ❖ Description

The PCO-7115 is an economical pulsed-current laser diode driver in a compact OEM module. It is designed to drive laser diodes with extremely fast current pulses in rangefinder, LIDAR (Light Imaging, Detection and Ranging), ADAS (Advanced Driver Assistance Systems), atmospheric communication, and other applications requiring high-current nanosecond pulses.

Mounting pads are provided to mount the laser diode directly to the driver. The four-hole mounting pattern accepts TO-18, TO-5, TO-52, 5.6 mm, and 9 mm packages.

There are two solder pads at the end of the board that facilitate mounting laser diode packages on-axis to the driver. Alternately, the diode can be connected remotely from the driver using low-impedance stripline cable between the mounting pads and the leads of the laser diode.

The PCO-7115 output current is set by the amplitude of the voltage at the high voltage input. The frequency is set by pulses applied to the trigger input. To improve pulse fidelity, all connections should be as short as possible. The trigger signal should be +5 V into 50  $\Omega$ .

A current monitor is provided as a straightforward means to observe the diode current waveform in real time with an oscilloscope.

## ❖ Design Considerations

Many stray elements and components can affect PCO-7115 performance. One of the most important is stray inductance, which includes the output current loop's circuit elements and the physical inductance of that loop. The magnitude of this inductance has a great effect on pulse width and peak output current. The PCO-7115 design minimizes the stray inductance of the circuit components to approximately 2 nH. However, the laser diode that it drives, and the means by which the diode is connected to the PCO-7115, also contribute to stray inductance. The user can minimize this additional inductance by choosing appropriate diode packages and interconnections between the diode and driver.

**The diode must be floating.**

## J1 Control Connector

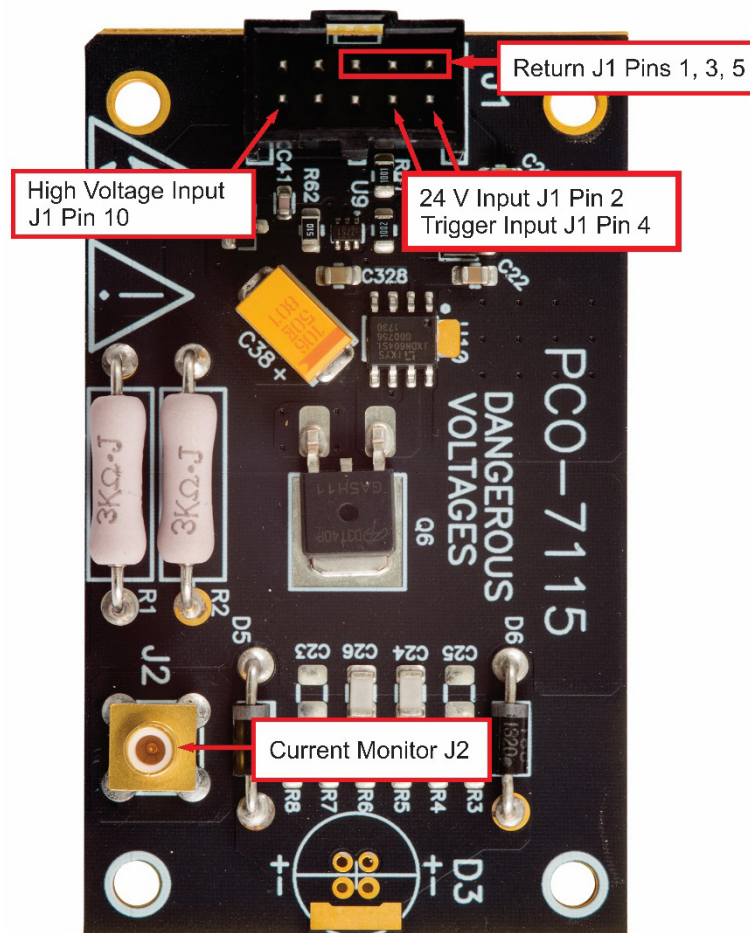
Connector J1 is a two-row header on 0.1" centers. The header mates with a rectangular 10-position connector such as Molex part number 0901420010 or equivalent.

Connector J1 has the following pin connections for controlling the PCO-7115:

- Pin 1, 3, and 5: Common returns
- Pin 2: +24 V DC input
- Pin 4: Trigger input, 50  $\Omega$  impedance
- Pin 10: High voltage input

## J2 Current Monitor

The Current Monitor connector, J2, is an SMB. Use 50  $\Omega$  termination on the oscilloscope.



## ❖ Accessories Available

### **Control Cable Assembly (PCA-9190)**

An included Control Cable connects the PCO-7115 to the 24 V Input, Trigger Input, and High Voltage Input.

### **Current Monitor Cable Assembly (PCA-9245)**

An optional Current Monitor Cable allows the user to monitor the output current pulses with an oscilloscope. The current-to-voltage ratio is 2:1 (2 A to 1 V).

### **Output Cable Assembly (1820-0030)**

An optional micro-stripline Output Cable allows the user to connect the PCO-7115 to a remote laser diode with minimum added inductance.



**Control Cable Assembly (PCA-9190)**

# Operation

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## ❖ Safety

Follow the safety guidelines. DO NOT PROCEED WITHOUT UNDERSTANDING AND OBSERVING THESE GUIDELINES.

## ❖ Requirements

Verify that:

- Connections are made using the included cables and oriented correctly
- If using the Current Monitor, the oscilloscope input impedance is 50  $\Omega$
- The output is connected to the load observing correct polarity
- Both terminals of the load are floating

## ❖ Setup

1. Verify the PCO-7115 is OFF when connecting or disconnecting the laser diode or load.
2. Make the laser diode connection with the correct polarity. If necessary, review the output connector silkscreen for polarity specifications.
3. Connect J1 as follows, (optional control cable PCA-9190):
  - a. Connect the +24 V power supply to J1 pin 2.
  - b. Connect the trigger source to J1 pin 4.
    - i. Set the external trigger source to 50  $\Omega$  impedance and a frequency below the maximum specified for the model of PCO-7115 Safe Operating Area.
  - c. Connect the high voltage power supply to J1 pin 10.
    - i. Set the high voltage as required. **Do not exceed 190 V.**
  - d. Connect the common returns to J1 pins 1, 3, and 5.
4. Connect an oscilloscope to the current monitor, if desired.
  - a. Use the optional Current Monitor Cable Assembly (PCA-9245).
  - b. Set the oscilloscope termination impedance to 50  $\Omega$ .
  - c. When reading the current monitor, note that the ratio is 2 A/V.



## ❖ Power Up

1. Verify the external trigger is disabled.
2. Verify the high voltage is disabled.
3. Turn on the +24 DC power source.
4. Adjust the high voltage for the approximate output current per the SOA (Safe Operating Area) graph found in the datasheet.
5. Enable the external high voltage power supply.
6. Set the external trigger for the desired frequency, being careful to not exceed the maximum frequency specified in the SOA graph.
7. Enable the external trigger source.
8. Verify the output is correct with the current monitor and an oscilloscope. If necessary, adjust the high voltage power supply to obtain the desired output current.
9. Allow the system to operate for 15 minutes and verify the output current. Adjust the high voltage power supply if necessary.

## ❖ Power Down

1. Disable the external trigger source.
2. Disable the high voltage source.
3. Turn the +24 V DC power source OFF.

# Warranty and Service

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## ❖ 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 one year 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.

## ❖ Factory Service and Support

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

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