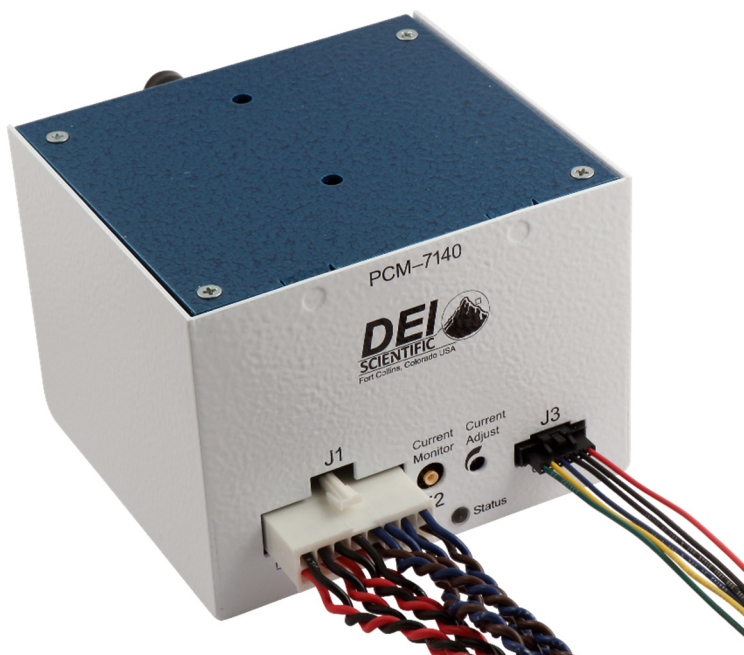




PCM-7140

Pulsed Current Source

Operation Manual



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Safety

- Do not open the cover of the PCM-7140. There are no user-serviceable parts inside. Opening the cover exposes you to shock and voids the factory warranty.
- Do not install, handle, or remove the output cables or laser diode while the PCM-7140 is operating. Allow at least 10 minutes after powering down before handling the output cable or laser diode.
- 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. Clean this instrument by wiping with a dry or damp cloth.



WARNING

Risk of lethal electric shock. Do not open the chassis of this device. Do not touch the output or laser diode while it is operating. Ensure that all instrument connections, load wiring and load connections are either insulated or covered so that no accidental contact with lethal output voltages occur. This device produces LETHAL levels of electric current, both inside its cabinet and at its output.

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



CAUTION

The rear surface of this module is HOT! Do NOT touch it. The rear surface is defined by Output Connector J1 of the module.

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

❖ Description

Precision Pulse Control

The PCM-7140 is a compact and lightweight pulsed current source designed to drive laser diodes, bars, arrays, or any low-impedance load.

System Operation

The output current may be set with an internal potentiometer or an analog voltage. The pulse width is controlled by the trigger signal.

The system requires two DC voltages for operation: a 12 V supply and a high-voltage supply described later in this document.

DC Input/Output Cable

The laser diode or other load is connected to the PCM-7140 with a 100-cm length of 18 AWG twisted pair cable (included). The same cable connects the high voltage supply to the PCM-7140.

What is included?

- PCM-7140 Pulser Module
- DC Input/Output Cable
- Control Signal Cable
- Load Board Assembly
- Control Board Assembly

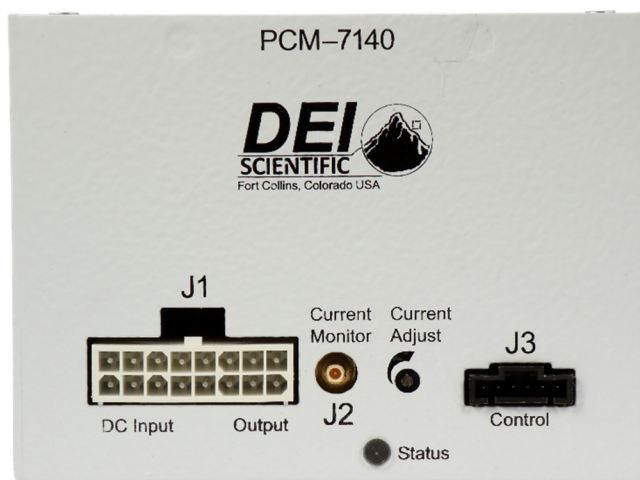
Liquid Cooling

The PCM-7140 module is liquid cooled. The liquid should have a temperature of 11 °C to 22 °C and a flow rate of 6 liters per minute. The connection type is 3/8-inch tubing.

Ordering Information

PCM-7140	PCM-7140 Pulser
	DC Input/Output Cable
	Control Signal Cable
	Load Board
	Control Board

❖ Front Panel Features



DC Input/Output Connector (J1)

Connector type	TE AMP 1-770974-0
Output +	Pins 1, 2, 3, 4
Output –	Pins 9, 10, 11, 12

HV Input +	Pins 13, 14, 15, 16
HV –	Pins 5, 6, 7, 8



SHOCK HAZARD

DO NOT TOUCH any part of this cable while the PCM-7140 is powered up. Please review the Safety section.

Current Monitor Connector (J2)

J2, an SMB connector, allows monitoring the output current waveform with an oscilloscope equipped with a 50 Ω termination (SMB-to-BNC cable not supplied).

- For the 200 A model, a current monitor voltage of 0.500 V corresponds to 200 A typically.
- For the 10 A model, a current monitor voltage of 0.210 V corresponds to 10 A typically.
- For the 1 A model, current monitor voltage of 0.165 V corresponds to 1 A typically.

Internal Current Setpoint Control

This control adjusts the output current. Turn clockwise to increase the current, counterclockwise to decrease the current.

Control Signal Connector (J3)

J3 provides connections for module control:

- Pin 1: 12 V DC support voltage
- Pin 2: Return
- Pin 3: Return
- Pin 4: Current setpoint control, internal or external
- Pin 5: Analog current setpoint, 0 V to 2.0 V.
- Pin 6: Trigger input

❖ Accessories Included

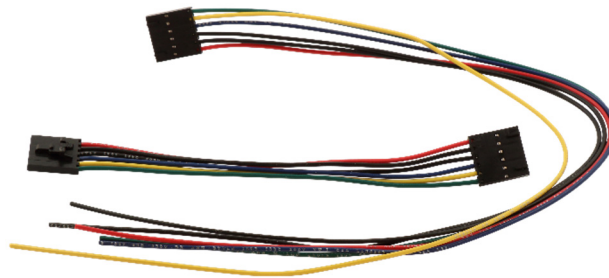
DC Input/Output Cable

Connects the high voltage supply and the external load device to J1 of the PCM-7140.



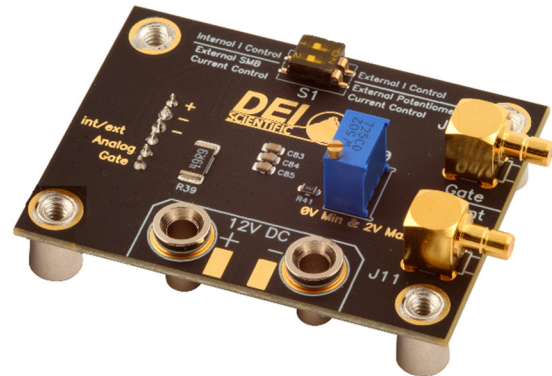
Control Signal Cable

Connects the 12 V support supply, trigger source, and analog current control (if used) to J3 of the PCM-7140.



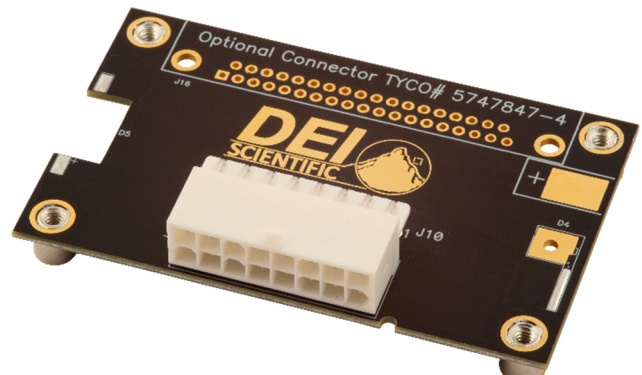
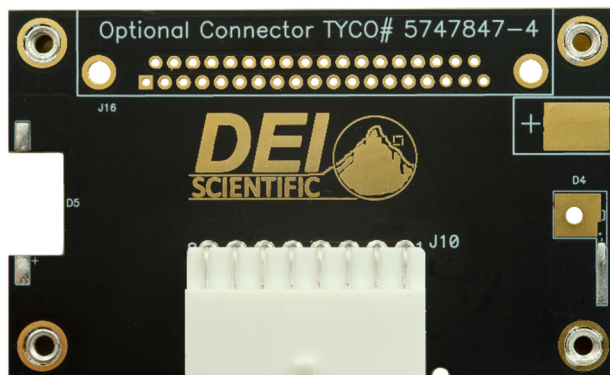
Control Board

Allows the user to easily connect the 12 V support supply, trigger source, and analog current control (if used) to J3 of the PCM-7140



Load Board

Simplifies the connection from the output cable to the laser diode or other load



❖ Rear Panel Features



Liquid Cooling

- The PCM-7140 module is liquid cooled.
- The liquid should have a temperature of 11 °C to 22 °C and a flow rate of 6 liters per minute.
- The connection type is 3/8-inch inside diameter tubing. Typically, polyethylene plastic tubing works well, McMaster-Carr # 9336T2 with a hose clamp of McMaster-Carr # 5321K17.

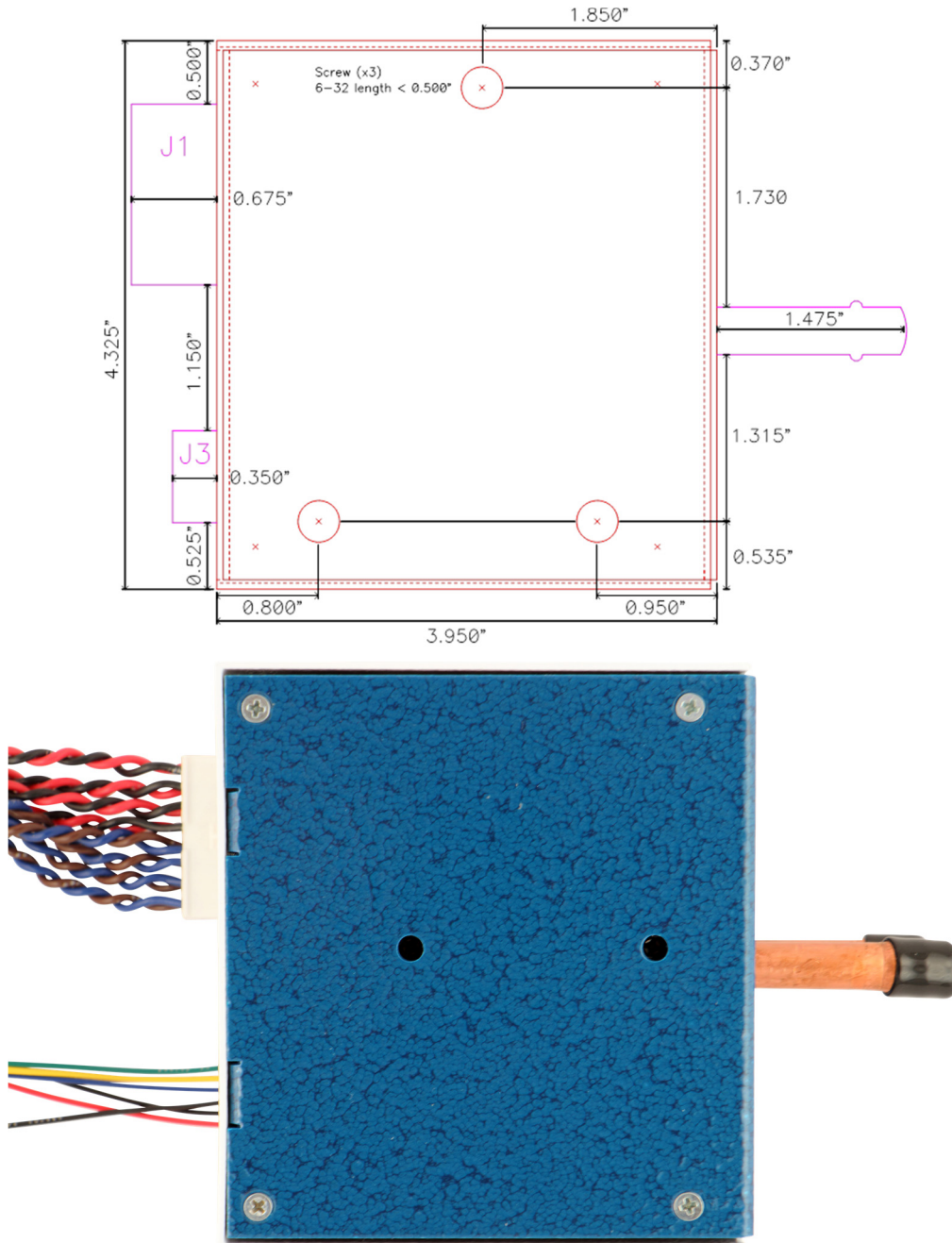
❖ Mechanical Layout

Mounting Module

There are three (3) mounting nuts for the PCM-7140 module. The mounting screws are 6-32. The screw must have less than 0.5" inside the chassis.

Drawing

The below drawing is from the top looking down to the bottom of the module.



Operation

❖ Setup

1. ALL connections must be made prior to powering up of the PCM-7140 system.
2. Make sure the PCM-7140 has been OFF for at least ten minutes.
 - a. The 12 V support power at the **Control Signal Connector (J3)** should be OFF or disconnected.
 - b. The high voltage at the **DC Input/Output Connector (J1)** should be OFF or disconnected.
3. Connect the water (coolant) supply to the copper tubes with 3/8-inch tubing.
4. Connect the current output from J1 to the laser diode or output device (load), observing correct polarity. If necessary, review the output cable for polarity specifications earlier in this document. When possible, use the factory-supplied cable and load board to make the connection.
5. Connect the high voltage DC supply to J1. The DC voltage should be greater than the laser diode forward voltage (V_F) by the amount shown in the table below. Use the factory supplied cable to make this connection (cable information appears earlier in this document).

- a. The PCM-7140 200 A model is capable of 100% duty cycle operation at 20 A or lower.

<u>Output Current</u>	<u>High Voltage requirements</u>
5 A to 20 A	Laser diode forward voltage plus 5 V DC $\pm$ 5% ^{*1}
20.1 A to 99.9 A	Laser diode forward voltage plus 12 V DC $\pm$ 5% ^{*1}
100 A to 200 A	Laser diode forward voltage plus 20 V DC $\pm$ 5% ^{*1}

- b. The PCM-7140 10 A model is capable of 100% duty cycle operation.

<u>Output Current</u>	<u>High Voltage requirements</u>
1 A to 10 A	Laser diode forward voltage plus 10 V DC $\pm$ 5% ^{*1}
0 A to 10 A	100% duty cycle $V_{Forward}$ plus 5 V DC $\pm$ 5% ^{*1}

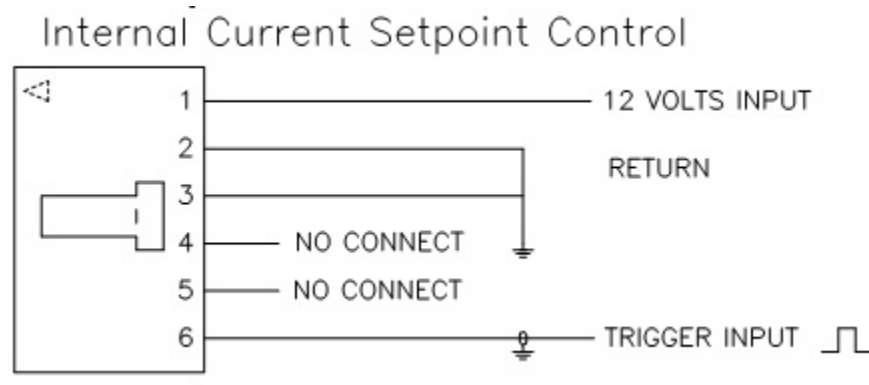
- c. The PCM-7140 1 A model is capable of 100% duty cycle operation.

<u>Output Current</u>	<u>High Voltage requirements</u>
0 A to 1.0 A	Laser diode forward voltage plus 10 V DC $\pm$ 5% ^{*1}
0 A to 1.0 A	100% duty cycle $V_{Forward}$ plus 5 V DC $\pm$ 5% ^{*1}

^{*1} Operation of instrument outside of this voltage can cause permanent damage to the instrument and/or load. Do not exceed 75 V DC.

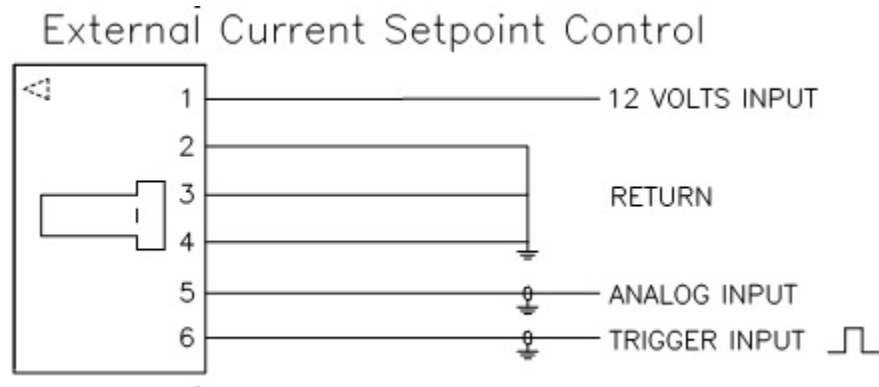
6. Connect the control signals to J3. The control signals are the 12 V DC supply, the trigger source, and the analog current control (if used). Use the factory-supplied control board and control signal cable whenever possible.
7. Set the current setpoint control to use either internal or external control.
 - a. If using the factory-supplied control board:
 - i. Place S1.1 in the OFF position for internal current setpoint control, or in the ON position for external current setpoint control.
 - ii. If using external current setpoint control, place S1.2 in the OFF position for analog external SMB (J11) current control, or in the ON position to adjust the current using control board potentiometer R40.
 - iii. Do not connect J11 Current Setpoint Control if you are using the internal or external potentiometer current setpoint control.
 - b. Internal current setpoint control involves adjusting the internal potentiometer (located on the front panel of the PCM-7140) for the required current output.
 - i. Disconnect Current Setpoint Control (J3 pin 4, No Connect).
 - ii. Disconnect Analog Current Setpoint (J3 pin 5, No Connect).
 - Rotate the potentiometer clockwise to increase the output current.
 - Rotate the potentiometer counter clockwise to decrease the output current.

Below is an example of the control cable at J3 using internal control.



- c. External current setpoint control uses an external analog voltage to set the output current.
 - i. Connect Current Setpoint Control (J3 pin 4) to ground at J3 pins 2 and 3.
 - ii. Connect Analog Current Setpoint (J3 pin 5) to an external analog device capable of 0 V to 2.048 V. Do not connect this if you are using the internal or external potentiometer current setpoint control.

Below is an example of the control cable at J3 using external control.



- 8. Connect a current monitoring device with a 50 Ω termination, such as an oscilloscope, to the SMB at J2.

❖ Power Up

1. ALL connections must be made prior to powering on the PCM-7140 system.
2. Turn ON the water supply (coolant) with a flow rate of 6 liters per minute.
3. Power ON the 12 V DC support voltage at J3 pin 1.
4. Power ON the high voltage at J1 within 10 seconds of powering on the 12 V DC. If the DC input voltage is not on within 10 seconds, the PCM-7140 will go into an error state and will require a power reset of the 12 V DC support voltage.

NOTE: Do not exceed the maximum high voltage indicated in the **Setup** section above.

5. Apply a trigger signal to J3 pin 6. Adjust the trigger source as necessary, staying within the constraints defined in the Safe Operating Area graphs found in the PCM-7140 Datasheet.
6. The output signal is available 10 seconds after turning the power on. The red LED on the front panel will power off when the system is ready for a trigger and will begin output when the trigger is applied.
7. Adjust the output current as required:
 - a. If using internal current setpoint control, set the Current Adjust potentiometer on the front panel to the output current required.
 - b. If using external current setpoint control, set the analog current device or the external potentiometer R40 on the control board assembly to the output current required



EQUIPMENT DAMAGE

The power on sequence listed above must be followed. Otherwise, a surge current may be sent to the load from the compliance voltage power supply, damaging the load and/or the PCM-7140.

❖ Power Down



SHOCK HAZARD

Do NOT disconnect the output device or cable until the module is powered OFF and the capacitor bank has discharged. Follow the steps below to discharge the capacitor bank.

1. Turn OFF the high voltage supply connected to J1.
2. Stop the trigger source connected to J3 pin 6.
3. If using the analog control, turn OFF the analog control device connected to J3 pin 5, or set it to 0 V.
4. Turn OFF the 12 V DC support voltage at J3 pin 1.
5. Turn OFF the water supply.
6. **Wait TEN (10) minutes for the capacitor bank to discharge before disconnecting the output device from J1.**

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 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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