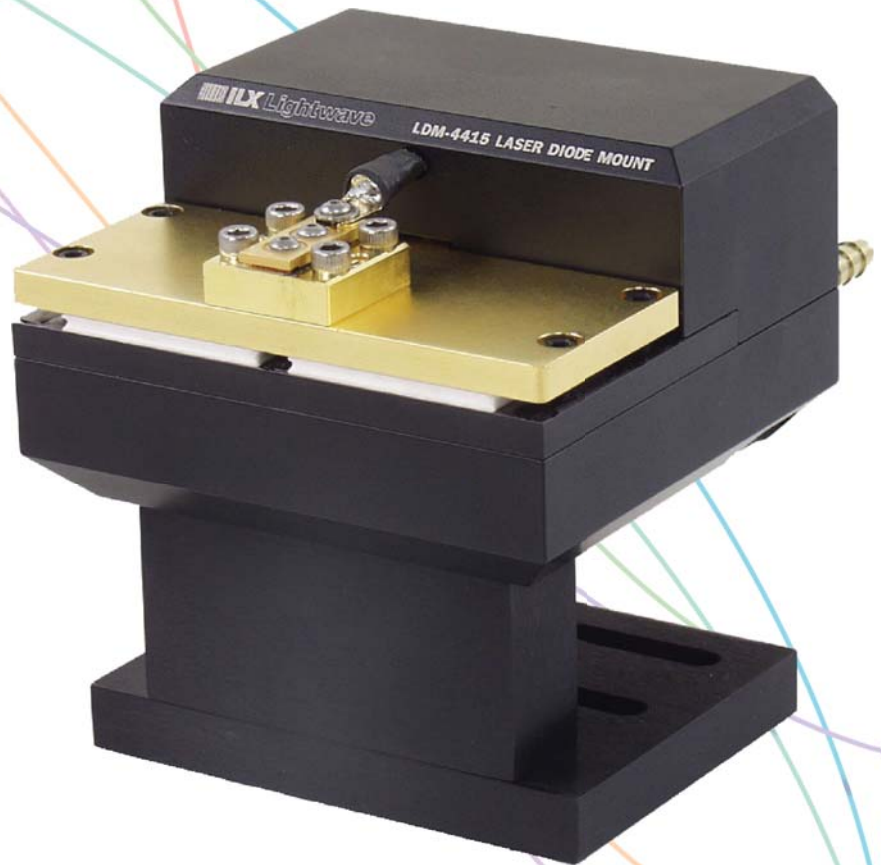


# User's Guide

## Temperature Controlled CS Bar Packaged Mount LDM-4415



 **ILX Lightwave**<sup>®</sup>  
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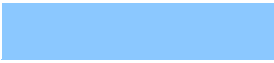
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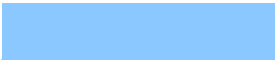
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# SAFETY AND WARRANTY INFORMATION



The Safety and Warranty Information section provides details about cautionary symbols used in the manual, safety markings used on the instrument, and information about the Warranty including Customer Service contact information.

## Safety Information and the Manual

Throughout this manual, you will see the words *Caution* and *Warning* indicating potentially dangerous or hazardous situations which, if not avoided, could result in death, serious or minor injury, or damage to the product. Specifically:

### CAUTION

Caution indicates a potentially hazardous situation which can result in minor or moderate injury or damage to the product or equipment.

### WARNING

Warning indicates a potentially dangerous situation which can result in serious injury or death.

### WARNING

Visible and/or invisible laser radiation. Avoid direct exposure to the beam.

## General Safety Considerations

If any of the following conditions exist, or are even suspected, do not use the instrument until safe operation can be verified by trained service personnel:

- Visible damage
- Severe transport stress
- Prolonged storage under adverse conditions
- Failure to perform intended measurements or functions

If necessary, return the instrument to ILX Lightwave, or authorized local ILX Lightwave distributor, for service or repair to ensure that safety features are maintained (see the contact information on page vi).

All instruments returned to ILX Lightwave are required to have a Return Authorization Number assigned by an official representative of ILX Lightwave Corporation. See Returning an Instrument on page v for more information.

# SAFETY SYMBOLS








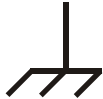


This section describes the safety symbols and classifications.

Technical specifications including electrical ratings and weight are included within the manual. See the Table of Contents to locate the specifications and other product information. The following classifications are standard across all ILX Lightwave products:

- Indoor use only
- Ordinary Protection: This product is NOT protected against the harmful ingress of moisture.
- Class I Equipment (grounded type)
- Main supply voltage fluctuations are not to exceed  $\pm 10\%$  of the nominal supply voltage.
- Pollution Degree II
- Installation (overvoltage) Category II for transient overvoltages
- Maximum Relative Humidity:  $< 80\%$  RH, non-condensing
- Operating temperature range of  $0\text{ }^{\circ}\text{C}$  to  $40\text{ }^{\circ}\text{C}$
- Storage and transportation temperature of  $-40\text{ }^{\circ}\text{C}$  to  $70\text{ }^{\circ}\text{C}$
- This equipment is suitable for continuous operation.

## Safety Marking Symbols

This section provides a description of the safety marking symbols that appear on the instrument. These symbols provide information about potentially dangerous situations which can result in death, injury, or damage to the instrument and other components.

|  |   |   |                               |   |   |   |  |
|--|---|---|-------------------------------|---|---|---|--|
|               | Caution, refer to manual  |  | Earth ground Terminal         |               | Alternating current   |  | Visible and/or invisible laser radiation |
|               | Caution, risk of electric shock   |  | Protective Conductor Terminal |               | Caution, hot surface  |  | Frame or chassis Terminal                |
| <br>or<br>(I) | On: In position of a bistable push control. The slash (I) only denotes that mains are on. |   |                               | <br>or<br>(O) | Off: Out position of a bistable push control. The circle (O) only denotes that mains are off. |   |  |



# WARRANTY

ILX LIGHTWAVE CORPORATION warrants this instrument to be free from defects in material and workmanship for a period of one year from date of shipment. During the warranty period, ILX will repair or replace the unit, at our option, without charge.

## Limitations

This warranty does not apply to fuses, lamps, defects caused by abuse, modifications, or to use of the product for which it was not intended.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for any particular purpose. ILX Lightwave Corporation shall not be liable for any incidental, special, or consequential damages.

If a problem occurs, please contact ILX Lightwave Corporation with the instrument's serial number, and thoroughly describe the nature of the problem.

## Returning an Instrument

If an instrument is to be shipped to ILX Lightwave for repair or service, be sure to:

- 1 Obtain a Return Authorization number (RA) from ILX Customer Service.
- 2 Attach a tag to the instrument identifying the owner and indicating the required service or repair. Include the instrument serial number.
- 3 Attach the anti-static protective caps that were shipped with the instrument and place the instrument in a protective anti-static bag.
- 4 Place the instrument in the original packing container with at least 3 inches (7.5 cm) of compressible packaging material. **Shipping damage is not covered by this warranty.**
- 5 Secure the packing box with fiber reinforced strapping tape or metal bands.
- 6 Send the instrument, transportation pre-paid, to ILX Lightwave. Clearly write the return authorization number on the outside of the box and on the shipping paperwork. ILX Lightwave recommends you insure the shipment.

If the original shipping container is not available, place your instrument in a container with at least 3 inches (7.5 cm) of compressible packaging material on all sides.

Repairs are made and the instrument returned transportation pre-paid. Repairs are warranted for the remainder of the original warranty or for 90 days, whichever is greater.

## Claims for Shipping Damage

When you receive the instrument, inspect it immediately for any damage or shortages on the packing list. If the instrument is damaged, file a claim with the carrier. The factory will supply you with a quotation for estimated costs of repair. You must negotiate and settle with the carrier for the amount of damage.

## Comments, Suggestions, and Problems

To ensure that you get the most out of your ILX Lightwave product, we ask that you direct any product operation or service related questions or comments to ILX Lightwave Customer Support. You may contact us in whatever way is most convenient:

Phone . . . . . (800) 459-9459 or (406) 586-1244

Fax . . . . . (406) 586-9405

On the web at: . . . . . ilx.custhelp.com

Or mail to:

ILX Lightwave Corporation  
P. O. Box 6310  
Bozeman, Montana, U.S.A 59771  
www.ilxlightwave.com

When you contact us, please have the following information:

Model Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

End-user Name: \_\_\_\_\_

Company: \_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Description of what is connected to the ILX Lightwave instrument:  
\_\_\_\_\_

Description of the problem:  
\_\_\_\_\_

If ILX Lightwave determines that a return to the factory is necessary, you will be issued a Return Authorization (RA) number. Please mark this number on the outside of the shipping box.

You or your shipping service are responsible for any shipping damage when returning the instrument to ILX Lightwave; ILX recommends you insure the shipment. If the original shipping container is not available, place your instrument in a container with at least 3 inches (7.5 cm) of compressible packaging material on all sides.

# INTRODUCTION AND SPECIFICATIONS

---

This manual describes the LDM-4415 Temperature Controlled CS Bar Package Fixture and related accessories and options and explains their operation. This chapter provides an overview of the LDM-4415 and contains general information and specifications important in its use. You should read the entire manual to familiarize yourself with the operation of your LDM-4415 Laser Diode Mount before installing laser diodes. In particular, you should read the section on Electrical Connections before installing a laser diode. The information contained in this section is necessary to provide correct electrical connection to your particular laser.

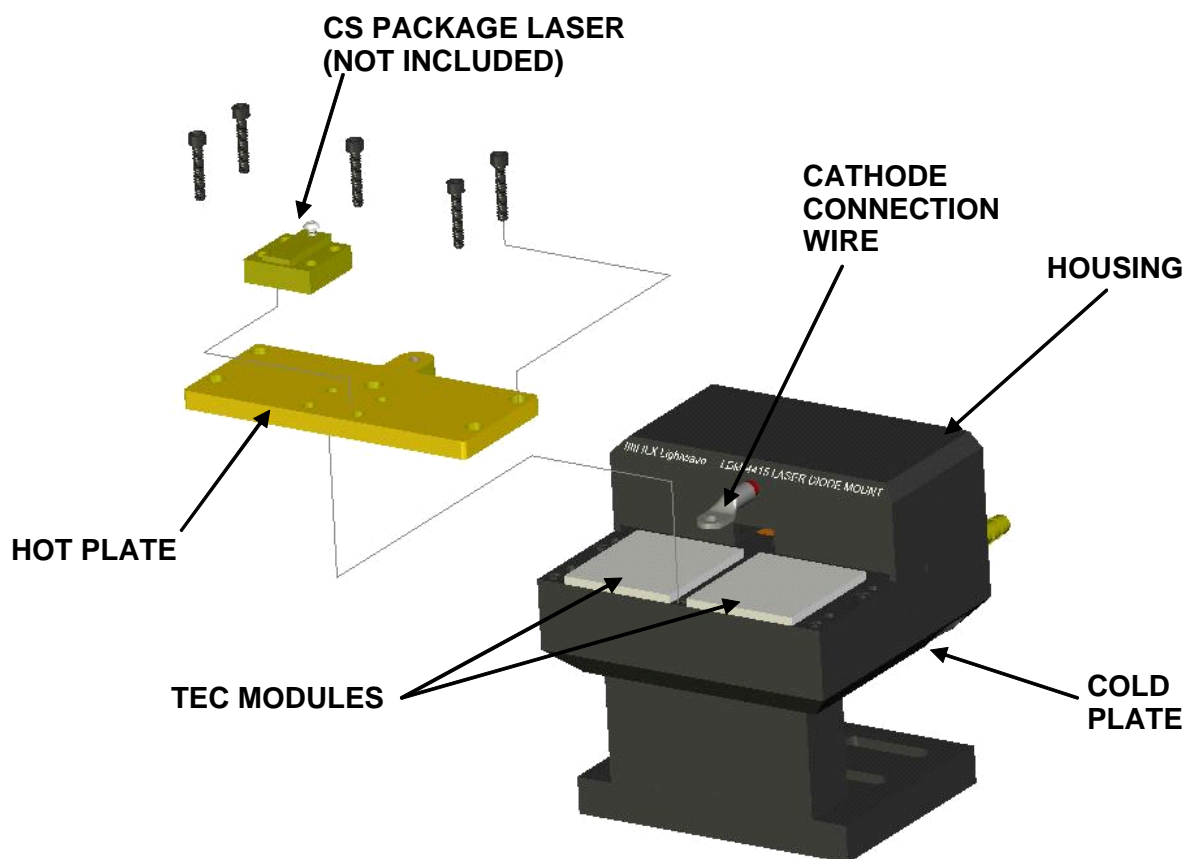
## Product Overview

The LDM-4415 Laser Diode Mounting Fixture provides a compact, easy to use instrument for conductively cooled CS packaged laser diodes. The fixture offers active temperature control capable of dissipating up to 100W with integrated thermoelectric modules and a water cooled heat sink for a temperature control range of 20°C to 85°C.

The LDM-4415 is quick to set up with connectors for both laser current and temperature control, a ground post for laser diode static protection during device insertion and removal, female banana jacks for device forward voltage, and connections for cooling water. CS packaged lasers are simply fastened to the top mounting plate with four #8-32 socket head cap screws or equivalent. The LDM-4415 mount allows direct interfacing to ILX Lightwave LDX-36000 Series high power current sources and LDT-5900 high power temperature controllers through ILX current and temperature control cables.

The LDM-4415 is intended for research and development applications where a CS mounted laser diode needs to be tested over a wide range of temperatures. The fixture can be mounted to an optical table or positioner through standard spaced ¼" mounting holes at the base with unobstructed access to the front facets.

Figure 1.1 provides a view of the construction of a LDM-4415.



**Figure 1.1** Exploded View of LDM-4415

# Specifications

|                                 |  |
|---------------------------------|--|
| Laser Packages                  |  |
| Laser Diode Dimensions          | 24.9 mm x 24.9 mm  |
| Maximum Laser Current           | 125A   |
| Thermal Load                    | 100W   |
| Laser Clamping                  | #8-32 UNC  |
| Recommended Torque              | 15 in-lbs  |
| Rear Connectors                 |  |
| Laser Diode Current             | Dual crown clip socket; #10-32; power lugs (anode and cathode) |
| Case Temperature Control        | Hybrid D-sub, male, 7W2  |
| Ground                          | Female banana jack   |
| Forward Voltage                 | Female banana plugs  |
| Laser Diode Connections         |  |
| Anode                           | Laser mounting plate   |
| Cathode                         | 10 ga terminated wire  |
| Temperature Control             | Solid state  |
| Range <sup>1</sup>              | +20°C to 85°C  |
| Sensor Type                     | 10 kΩ NTC thermistor   |
| Chilled Water                   |  |
| Temperature                     | ≤15°C  |
| Connectors                      | 1/8" NPT to 1/4" nipple, barbed                                |
| TE Modules <sup>2</sup>         |  |
| Q <sub>max</sub>                | 252W   |
| I <sub>max</sub>                | 14.6A  |
| V <sub>max</sub>                | 28.8V  |
| DT <sub>max</sub>               | 67°C   |
| Thermal Resistance <sup>3</sup> | ≤0.1°C/W   |
| Repeatability                   | ≤0.01°C/W  |
| General                         |  |
| Size (H x W x D)                | 4.5" x 4.25" x 5" (114mm x 108mm x 127mm)                      |
| Weight                          | 3.6 lbs (1.6 kg)   |
| Regulatory Compliance           | RoHS   |

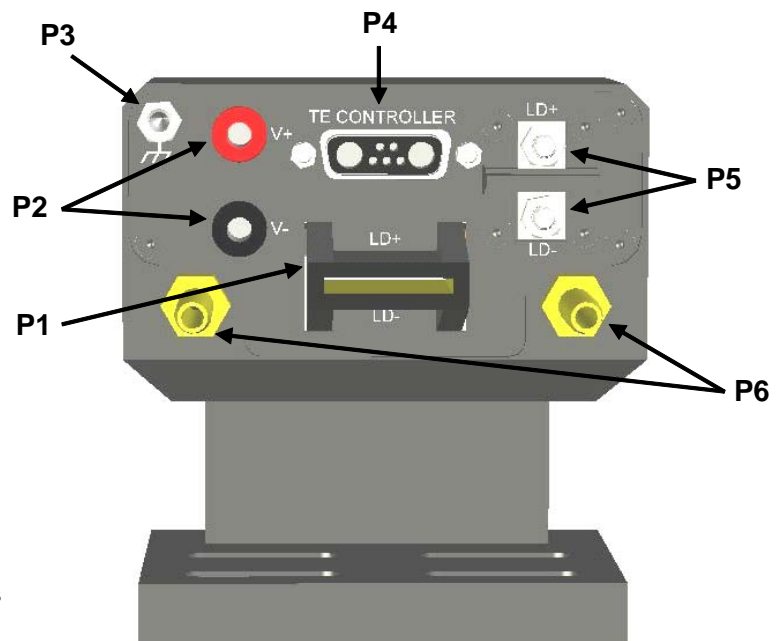
1. Control range based on 100W heat load on hot plate. Tested with LDT-53540 with 12.4°C cooled water and 1.9 liter/min) flow rate. Lower control temperatures can be achieved with lower water temperatures for any given heat load.
2. Module ratings based on two thermoelectric modules wired in series at 25°C operating temperature.
3. Laser to mounting plate.

Our goal is to make the best laser diode instrumentation available anywhere. To achieve this, we need your ideas and comments on ways we can improve our products. We invite you to contact us at any time with your suggestions.

This chapter describes the electrical connection to and operation of the LDM-4415 CS Mount Laser Diode Fixture.

### LDM-4415 Mount Electrical Connections

There are six connectors on the LDM-4415 as shown in Figure 2.1.



- P1 - ILX laser current source connector
- P2 - Laser voltage measurement connector
- P3 - Ground Terminal
- P4 - Temperature controller connector
- P5 - #10-32 laser anode and cathode terminals
- P6 - Water inlet and outlet

Figure 2.1 LDM-4415 Laser Mount Connections

The Crown Clip connector (P1) for the laser current is compatible with ILX Lightwave LDX-36000 Series current sources through the CC-390 interconnect cable. If an ILX Lightwave current source is not being used, two #10-32 screw terminals (P5) are provided to allow connection to the laser anode (top terminal) and cathode (bottom terminal), labeled LD+ and LD- respectively.

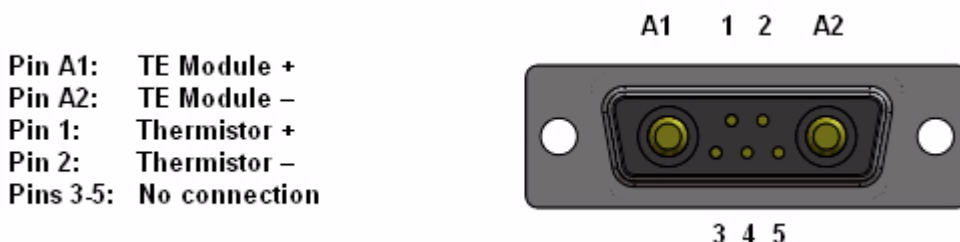
Two female banana jacks (P2) are provided on the instrument for forward voltage measurement of the laser diode. The jacks are spaced at 3/4" apart for use with a two-pronged banana jack adapter.

**CAUTION**

**Do not connect laser current to the voltage measurement terminals (V+ and V-). Damage to the mount will occur.**

A third female banana jack (P3) is provided as a ground for grounding the mount to your system. The laser diode is isolated from the ground point.

A hybrid D-sub 7W2 male connector (P4) is provided to connect an ILX Lightwave LDT-5900 Series Temperature Controller to the LDM-4415. An ILX Lightwave CC-596H cable connects the LDT-5900 Controller to the mount. A pin out diagram of this connector is shown in Figure 2.2.



**Figure 2.2** Thermal Electric Controller Connector

**CAUTION**

**When connecting cables to the LDM-4415, tighten cable connectors to the mount connectors. Loose connectors can cause contact bounce which may result in transients and potential damage to laser diodes.**

Proper shielding of the current source and temperature controller cables is necessary to ensure proper noise-free performance. This is accomplished by grounding the shield on the interconnect cables to the controller and not to the mount. The CC-596H Temperature Control Cable provides this shielding automatically by connecting the 15 pin housing into the temperature controller.



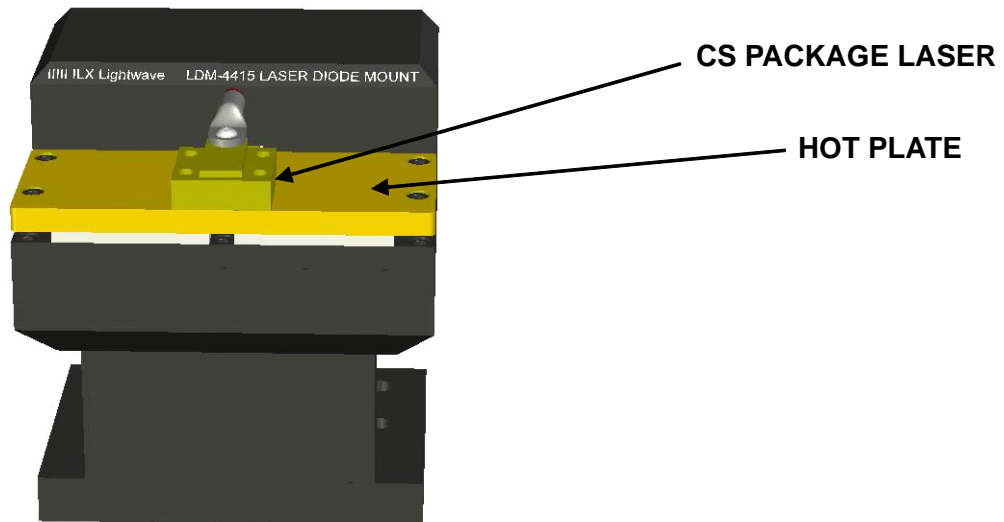
# Laser Diode Mounting

## CAUTION

Laser diodes are extremely susceptible to damage caused by electrostatic discharge and surge currents. To avoid early failure or damage to the device, workers and workbenches must be grounded at all times when handling or working with laser diodes.

The LDM-4415 is designed to allow quick, easy mounting of CS packaged lasers. Figure 2.3 illustrates a laser diode mounted to the LDM-4415. Attach the laser to the fixture's hot plate by aligning the four holes in the laser with the four holes in the hot plate and fasten with four #8-32 socket head cap screws or equivalent.

ILX recommends torquing the screws to 15 in-lbs. for best thermal performance. Four #8-32 socket head cap screws are included in the shipping kit. If the screws need to be replaced, do not exceed a screw length of ½" (12 mm) with a CS package thickness of 0.3" (7.6 mm).



**Figure 2.3** LDM-4415 Front View with CS Package

The laser anode connection is made through the hot plate. The laser cathode connection is made with the wire protruding from the front face of the mount and connected to the top of the laser through the spade terminal connector. Secure the spade connector to the laser cathode with a #4-40 cap screw or equivalent. The laser anode and cathode is isolated from the mount.

Voltage connections are provided on the rear panel of the instrument for four wire voltage measurements. No additional connections are required.

## Current Sources and Current Measurements

### CAUTION

**Do not exceed the specified current settings of the laser. Excessive drive current may cause laser failure.**

Operate the LDM-4415 Laser Diode Mount using ILX Lightwave current sources or temperature controllers. Operation with other current sources or temperature controllers is also possible, provided that the correct wiring is observed (refer to Figures 2.2).

Do not exceed the specified maximum drive current of the laser. If you are using an ILX Lightwave current source, or any other current source which has an adjustable limit setting, be sure to set the current limit to a safe level for your laser. If it is necessary to measure the current of your laser during operation, follow these steps:

- 1 NEVER connect an ammeter in series with the laser circuit.
- 2 Place a known resistance (0.5 ohm works well) in series with the laser diode circuit. Then, measure the voltage across the resistor. Calculate the current by using Ohm's Law,  $I = E/R$ .
- 3 NEVER turn the voltmeter on or off, or change the voltage measurement range, while current is flowing to the laser. These actions could result in failure of your laser diode.

## Temperature Control

### Thermoelectric Temperature Control

The operating characteristics of diode lasers vary considerably with temperature. Emission wavelength, threshold current and operating lifetime all are strong functions of device temperature. The operating lifetime drops by a factor of two for every 25°C rise in operating temperature. Thermoelectric (Peltier) devices provide a simple, reliable solution to precise temperature control in many applications of optoelectronic devices. These solid-state devices can heat or cool thermal loads to more than 60°C from ambient and achieve temperature stabilities of better than 0.001°C.

Active temperature control of the LDM-4415 is accomplished with two thermoelectric modules and a temperature measurement element using a thermistor for real-time feedback to a thermoelectric temperature controller such as an ILX Lightwave LDT-5980. The actual temperature is measured by the temperature sensor under the top plate near the front of the mount. This temperature is then compared to a set-point temperature, to produce an error

signal proportional to the difference between set-point and actual temperature. The temperature controller outputs a proportional bi-directional current to the thermoelectric modules depending on the direction of the error.

 **CAUTION**

Thermal resistance, measured in °C/W, between the laser package and the laser plate results in a temperature difference between the laser plate and laser diode. The laser plate is gold plated for better thermal conductivity. Caution must be used when placing a laser diode in the mount and removing it not to scratch the surface between the laser and the laser plate. Scratches and contamination of the surface will degrade the thermal performance of the mount resulting in an increase of the thermal resistance between the laser and laser plate.

## Water Cooling

The LDM-4415 is configured for use as a forced convection heat sink using chilled water. Water cooling allows lowering the operating temperature by providing higher heat dissipation than natural convection.

Water cooling the LDM-4415 is accomplished by attaching the brass water fittings on the rear of the mounting fixture. A 2600 cc/min flow of 15°C or less water is adequate for controlling the temperature over the specified range. If higher performance is required, the flow and/or the water temperature can be adjusted.

- 1 Apply teflon tape or a pipe sealant to the threads of each fitting, and thread them into the mount. Use a ½" open-end wrench to tighten the fittings. Use caution when tightening the fittings to avoid damaging the threads in the LDM-4415 fixture.
- 2 Connect 1/4" I.D. flexible tubing to each fitting and to a water source and drain.



## MAINTENANCE



No maintenance procedures are required for the LDM-4415 other than an occasional cleaning, as needed, to remove any accumulated dust or dirt from the hot plate. When the mount is not in use for prolonged periods it is recommended to insert plastic anti-static covers over the temperature control connector.



# SAFETY



Laser diodes used with the LDM-4415 Laser Diode Mount may emit infrared radiation which is invisible to the human eye. Extreme care must be taken to prevent the beam from being viewed either directly or through external optics or mirrors. Remove rings, jewelry, and other reflective materials when working with lasers.



## **WARNING**

Viewing of emissions from the laser may cause eye damage. Use of protective goggles is recommended when operating these lasers.



## **CAUTION**

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

This product conforms to all applicable DHHS regulations 21 CFR Subchapter J, at the date of manufacture.

