

LaserMount™

242

USER'S MANUAL



TEC C-MOUNT

Introduction

Thank you for choosing the **242 TEC C-Mount LaserMount** from Arroyo Instruments. The **242 LaserMount** is designed for high performance and long term use.

The **242 LaserMount** integrates a large 120W Peltier cooler for precise control and substantial heating and cooling capacity for your powerful devices. Featuring an integrated nitrogen purge, the **242 LaserMount** has an operating range of -5°C to +85°C, covering a broad range of temperature control needs.

For electrical connection, the **242 LaserMount** features an integrated lead clamp, making electrical connection to the c-mount lead a snap. Simply load the c-mount device into the fixture and turn the clamping knob.

The **242 LaserMount** comes standard with an integrated fan for additional cooling capacity. When used with the **5300 Series TECSource** temperature controllers, no additional power supply is needed to power the fan, or use a standard external 12V DC power supply when connecting to other temperature controllers.

The **242 LaserMount** also offers all the features you would expect from a modern c-mount laser diode fixture, including:

- Stainless steel alignment plate for easy device alignment during loading
- Designed to be quickly integrated with Arroyo's **LaserSource** and **TECSource** instruments.
- Industry-standard D-sub connectors and pin-outs allow for quick integration into existing laser applications.
- Compatible with 60mm CAGE optical systems
- Banana plug for case ground, which can be used as a wrist strap connection or to assure proper grounding to an optical table or test bench.



Installation and Use

The **242 LaserMount** setup is very quick, simply follow the directions below.

Configuring the mount:

The only configuration of the **242 LaserMount** is determining if earth ground/case is to be connected to the diode. On the side of the **242**, there is a switch labeled **DIODE PLATE**. When the switch is in the **CASE** position, then the diode plate is connected to the case (and typically earth ground through the instrument cables) of the fixture.

For example, if the **DIODE PLATE** switch is set to **CASE**, then the laser mounting plate (and therefore the anode of the laser) will be tied to the case. If the switch is set to **N/C**, then the mounting plate will only be connected to the anode connection of the laser driver and no electrical connection to the case.



In addition to the switch, there is a banana jack that provides a case connection which can be used for a wrist strap (if the case is earth grounded) or to tie the case to earth ground through something other than the laser driver.

The purpose of the switch and banana jack is to control how your laser diode is grounded. If no earth grounding is required, then the **DIODE PLATE** can be left in the **N/C** position. However, if you elect to connect the diode plate to the case, it is critical that proper grounding techniques are used.

Once you have properly configured the **DIODE PLATE** switch, if you will be operating the mount then the only other item to setup is the power supply for the internal cooling fan.

If you are using an Arroyo Instruments **5300 Series TECSource** temperature controller, the fan supply is built directly into the **TECSource**. You will need to enable the fan supply in the **TECSource** menu – see the **TECSource** manual for additional details on how to do that.

If you are using a third-party temperature controller, then you will need to provide a 12V DC power supply. The connection into the mount is a standard 2.1mm round plug with the center pin positive, and must be capable of supplying at least 150mA.

Connect to Laser Diode Driver and TEC Controller:

Next, connect the **242 LaserMount** to your laser diode driver and temperature controller. Make sure the temperature controller's current limit is set to a maximum value of 7.4A.

Where possible, we recommend the use of Arroyo Instruments laser and TEC cables. Use p/n 1262 TECSource Cable for the temperature controller connection, and p/n 1220 LaserSource Cable for the laser connection.

NOTE

Arroyo Instruments offers Laser and TEC cables designed to connect directly between our **LaserSource** and **TECSource** products. If you use your own cables, ensure the connections are properly made between the instrument and the mount, and that proper grounding techniques are used. The pin-out of the connectors can be found later in this document.

WARNING

Be sure you are properly ESD protected before handling your laser. For additional information, read the section titled "Laser Diode Protection" later in this manual.

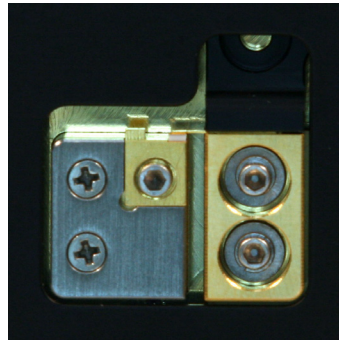
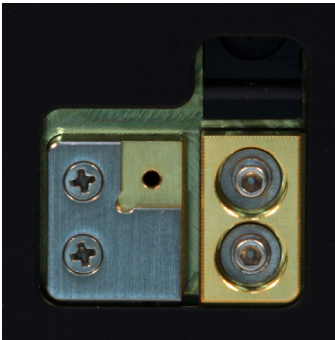
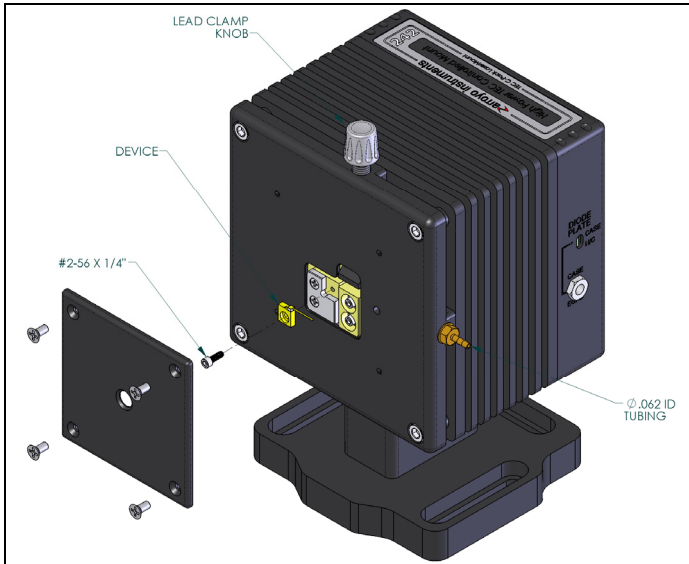
Mounting your device:

Start by turning the knob on the top of the fixture counter-clockwise to open the lead clamp. Make sure the clamp is high enough to allow sufficient space for loading the device.

The **242 LaserMount** has a stainless steel alignment plate which is there to help properly align the device to the mounting hole and clamping block. Using the alignment plate to guide the device, place the device onto the mount and use the 2-56 x 3/16" screw provided with the fixture to fasten the device to the fixture.

After the device has been mounted, tighten the clamp by turning the knob on the top of the fixture clockwise until the lead is held tightly against the clamp block. Do not over-tighten the clamp or you may damage the clamping mechanism.

The drawing and two photos below illustrate the unloaded configuration with the clamp all the way open (left), and a device loaded and clamp tightened down on the device lead (right).



The mount comes with a cover plate and nitrogen purge nipple that is recommended when operating the device below the dew point, which is the temperature at which moisture will begin to condensate. This is typically 10°C to 15°C, but is dependent on your laboratory conditions. To prevent condensation, after loading the device, mount the cover plate by using the provided 4-40 flat head screws, and screw in the nitrogen purge nipple (if it is not already installed), then connect a nitrogen source to the input nipple on the side of the mount. A very low nitrogen flow is required to prevent condensation, typically 1 to 2 SCFH (standard cubic feet per hour).

Electrical connections to your device:

A c-mount typically makes electrical connection through the body of the sub-mount and a wire tab that extends to one side of the device. When the device is screwed to the 242, this provides the body connection through the cold plate. The tab connection is made via a compression foot that tightly presses the tab of the c-mount onto a metal block, making the other connection.

A standard **242 LaserMount** has the body of the device as the anode and the tab of the device as the cathode. Ensure that your c-mount matches this electrical wiring configuration. In the event that your device is backwards, simply re-wire the cable, swapping the anode and cathode pins. This will reverse the polarity of the **242**.

Semi-custom versions of the **242** are available that support 2-tab devices, where a tab exits the device on both sides of the sub-mount. If you have one of these styles of mounts, see the supplemental documentation for that configuration which details the wiring information.

Connector Pin-Outs



242 TEC C-Mount **LaserMount** Rear Connectors

DB-9 Pin	Description
1 & 2	No Connection
3	Chassis Ground (GND)
4 & 5	Laser Cathode
6	Photodiode (PD) Cathode
7	Photodiode (PD) Anode
8 & 9	Laser Anode

Laser DB-9 Connector Pin-Out

DB-15 Pin	Description
1, 2, & 9	TE (+)
3, 4, & 10	TE (-)
5 & 6	Earth Ground
7	Thermistor
8	Thermistor
11	FAN (+)
12	FAN (-)
13 thru 15	No Connection

TEC DB-15 Connector Pin-Out

Connection	Description
Tip	+12VDC (8 to 12VDC)
Sleeve	Fan Ground

12V Fan Connector Pin-Out

Technical Specifications

242 TEC C-Mount LaserMount

LASER PACKAGE SUPPORTED

Package

C-mount

TEMPERATURE CONTROL

Temperature Range (°C)

-5 to +85

Sensor Type

BetaTHERM 10K3A1IA
10k Ω Thermistor

TE Module

I_{max} = 7.4A
V_{max} = 16.4V
Q_{max} = 78W

INPUT CONNECTORS

Laser Diode

DB-9, male

Temperature Controller

DB-15, male

Fan

2.1mm round, 8 to 12VDC, 120mA

Nitrogen

1/8" barb

GENERAL

Recommended nitrogen flow

1 to 2 SCFH

Size without base (H x W x D)
[in(mm)]

4.0 (101.6) x 4.0 (101.6) x 3.5 (76.2)

Mounting holes

Slotted holes for 1/4-20 (base)
1/4-20 x 2 (for post mount)
M6 (for post mount)
4-40 x 4 for nitrogen cover plate,
60mm on center, compatible with
60mm CAGE optical systems

Configuring the Temperature Controller

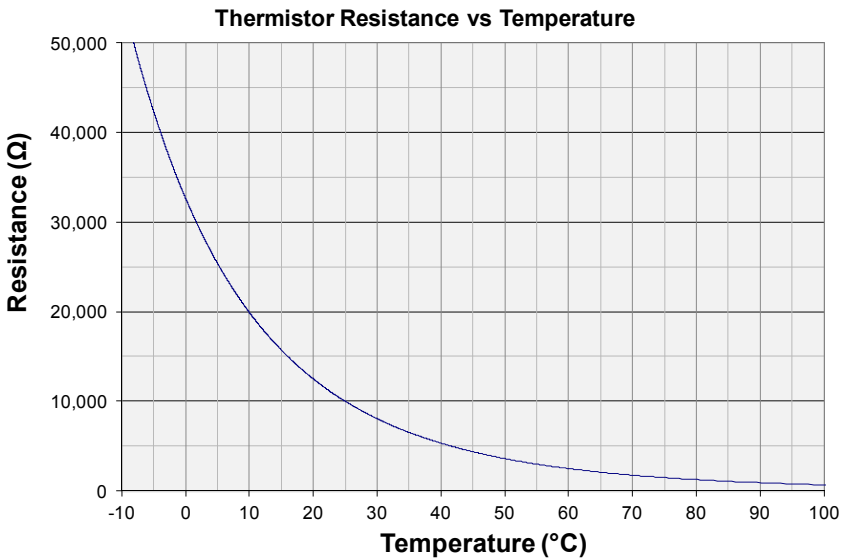
The Arroyo Instruments **5305 TECSource** or **5240 TECSource** are the recommended temperature controllers for this mount. When using an Arroyo Instruments temperature controller, the easiest method for configuring the controller to operate with the mount is to change the **Mount** setting in the menu to **234**. This will change the sensor settings, current limit, and fan settings to be appropriate for this mount. If you have an older Arroyo Instruments temperature controller that does not have this selection, there may be an upgrade available for your instrument, check with the factory for more information, or simply adjust the current limit to no more than the maximum current of the **234**.

If you will be using a non-Arroyo controller, make sure to adjust the limits and sensor settings appropriately to ensure proper and safe operation of the mount.

Working with Thermistors

The **234** is equipped with a 10k Ω negative temperature coefficient (NTC) thermistor, specifically, the BetaTHERM 10K3A1. A thermistor works by translating temperature into resistance, with resistance decreasing as temperature increases (hence the 'negative coefficient').

Below is the response curve of the thermistor:



As can be seen by the graph, the resistance of the thermistor drops very quickly. In the typical control range (0°C to 40°C), typical 10K thermistors offer good sensitivity to changes in temperature, and this is the range in which most 10K thermistors are typically used. 10K thermistors can be used at much higher temperatures, but will suffer poorer temperature stability performance because of the lower sensitivity.

All Arroyo temperature controllers support operation using a 10μA or 100μA thermistor bias, which limits the upper control range to 450kΩ or 45kΩ, respectively. To minimize noise and maximize stability, you should select highest current while still allowing you full operation across your required temperature range. The typical setting is 100μA, but your application will determine the actual needs.

The Steinhart-Hart Equation

As can be seen from the temperature versus resistance graph above, resistance varies inversely with temperature in a non-linear fashion. This relationship can be accurately modeled by polynomial equations, and one such being the Steinhart-Hart equation:

$$\frac{1}{T} = A + B * \ln(R) + C * \ln(R)^3$$

The coefficients for the BetaTHERM 10K3A1 thermistor are:

$$A = 1.12924 \times 10^{-3}$$

$$B = 2.34108 \times 10^{-4}$$

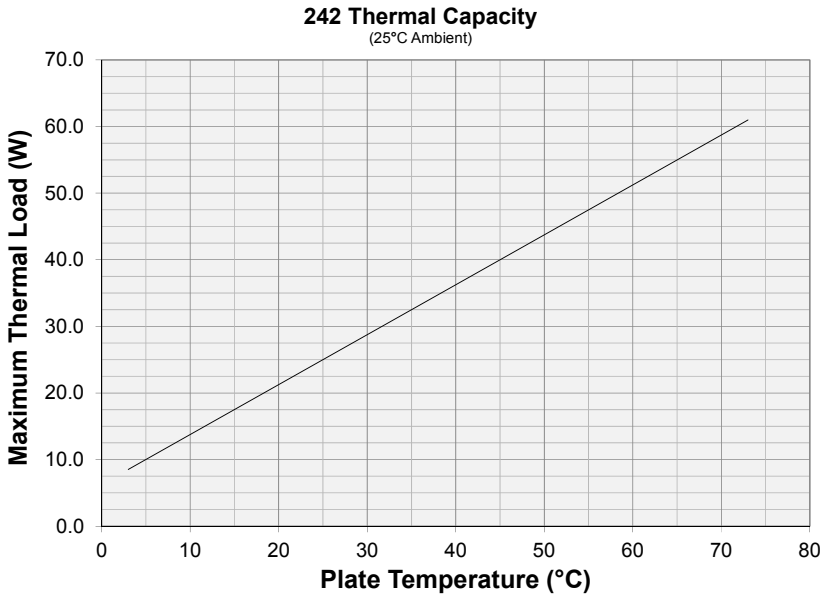
$$C = 0.87755 \times 10^{-7}$$

These are the default coefficients for Arroyo Instruments temperature controllers, but can be changed in the **Sensor** menu, or by selecting the appropriate **242** mount from the **Mount** menu setting.

Thermal Capacity

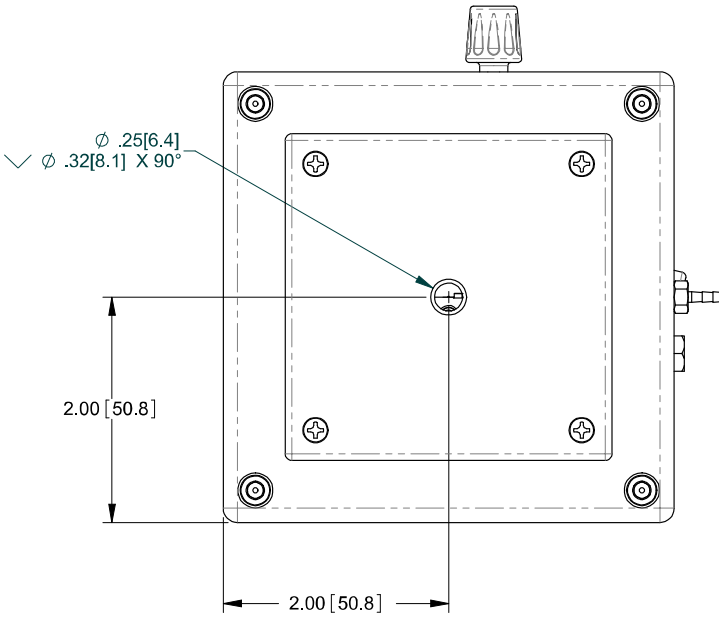
The maximum thermal load supported by the **242** depends on the ambient temperature and cold plate temperature, as shown by the graph below.

The performance is based on an ambient temperature of 25°C, and actual performance will be improved or degraded if the ambient temperature is lower or higher, respectively.

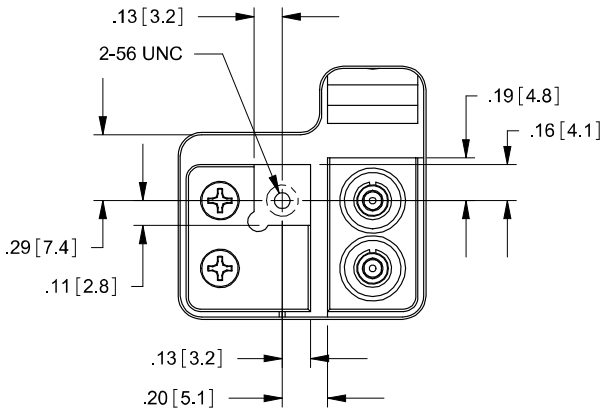


When operating at temperatures that cause condensation (below the dew point), the fixture must be purged with nitrogen to prevent the condensation of moisture for two reasons:

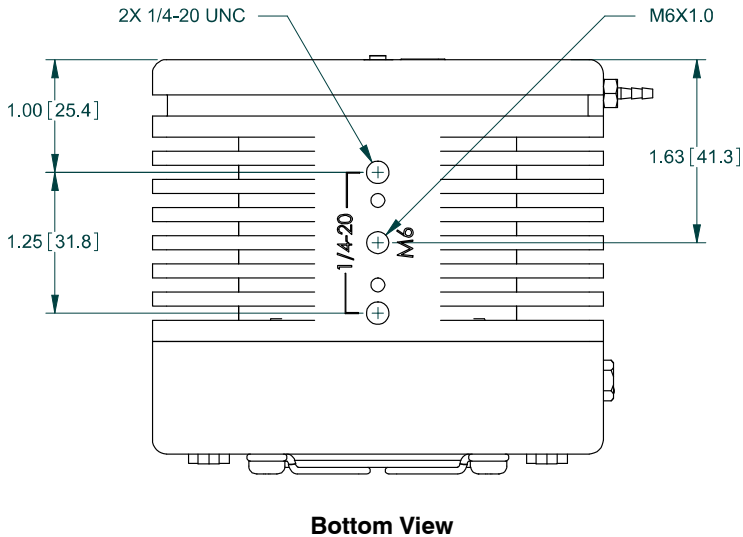
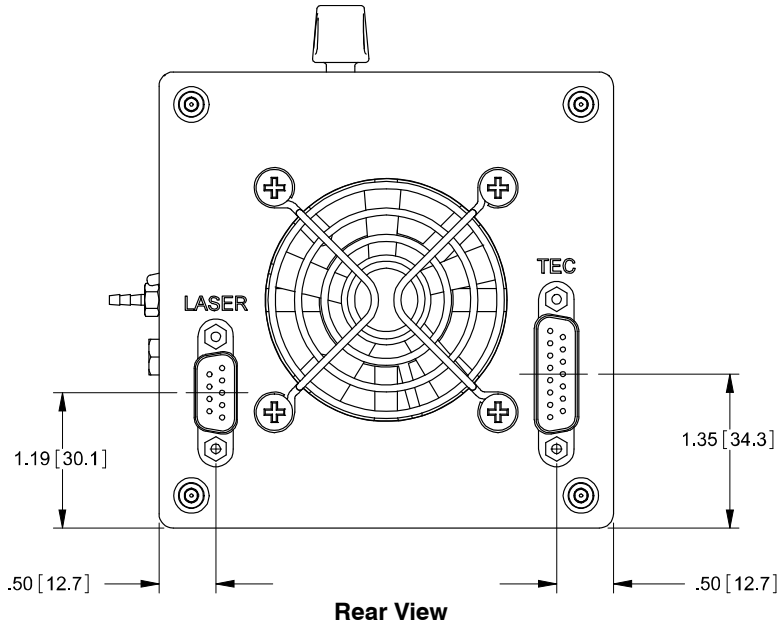
1. The energy required to condense the moisture from the air will significantly degrade the performance of the fixture; and
2. Condensation can lead to an accumulation of water inside the fixture, which, over time, can cause corrosion and interfere with the proper operation of the mount.

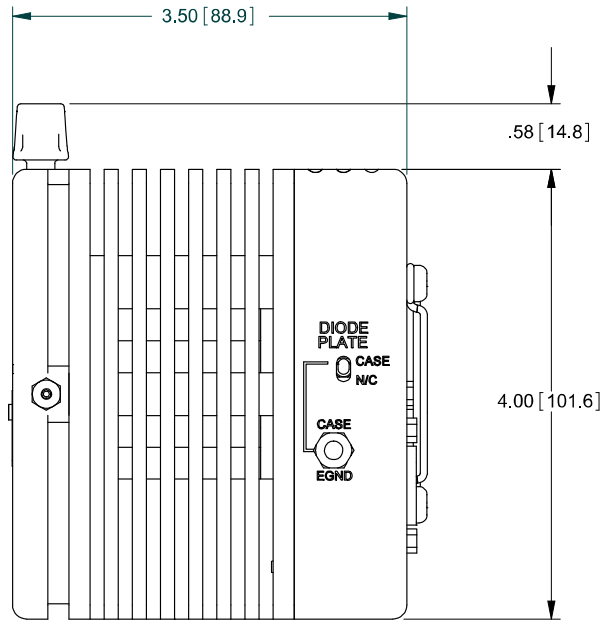


Front View with Cover

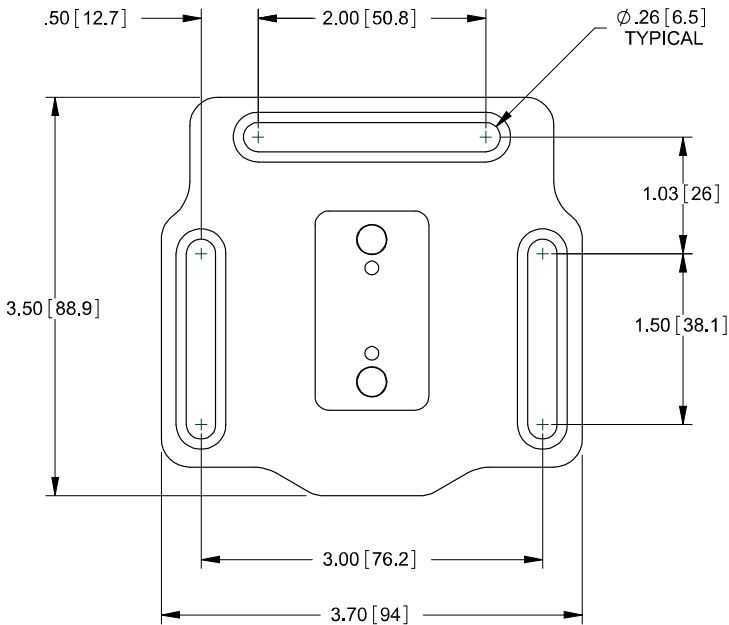


Detailed View of Device Load Area

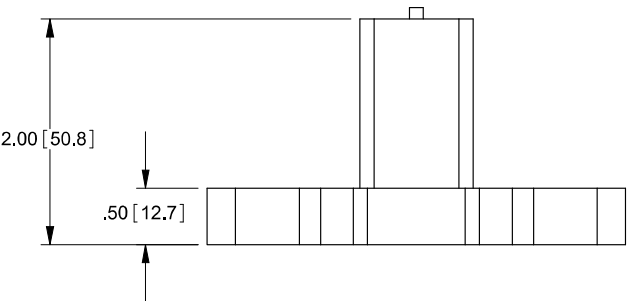




Right Side View



Base & Pedestal, Top View



Base & Pedestal, Front View

Laser Diode Protection

Electrostatic discharge and current spikes can be a significant cause of damage to laser diodes, but when proper precautions are taken, these risks can be greatly reduced or eliminated. Arroyo Instruments' controllers offer state-of-art laser diode protection, but no instrument can fully shield the laser from damage. Please take these considerations into account when operating your laser:

1. Always set the current limit at or below the maximum current your laser can handle. This prevents the device from accidentally driving the current too high, either via the set point or from the modulation port. This also provides additional current limiting protection from ESD.
2. Always work in an ESD safe operating environment, including the use of wrist straps, ESD grounded work surfaces and floors, and ESD-safe tools.
3. Where the AC power to the laser driver to temperature controller may be noisy, use isolation transformers or uninterruptible power supplies that provide isolation.
4. Make sure all cables are securely connected and fastening screws are screwed in tight.
5. Do not route power cords or other cables in parallel with the laser or temperature controller cables, as coupling may occur between the cables and inject noise into the laser diode.
6. While it is not possible to create a ground loop through the LaserSource because of it's isolation of all inputs, it is possible when using other equipment. Ensure that any other equipment is properly isolated to avoid any ground loop problems.

Warranty

Arroyo Instruments warrants this product to be free from defects in material and workmanship under normal use and service for a period of one (1) year from date of shipment. It does not apply when the product has been misused, altered or damaged by accident or abnormal conditions of operation. If found to be defective during the warranty period, the product will either be repaired or replaced at Arroyo Instruments's option.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. ARROYO INSTRUMENTS SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE PURCHASE OR USE OF ITS PRODUCTS.

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