LaserMount™

207

USER'S MANUAL

TEC MOUNT

arroyo instruments

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Introduction

Thank you for choosing the **207 LaserMount** from Arroyo Instruments. The **LaserMount** is designed for high performance and long term use, with innovative features not found in other mounts. With the integrated fan, selectable thermistor input, and quick disconnect interface, the **207** is an excellent choice for medium power laser and LED applications.

The **207** is a smaller version of the more powerful **264 LaserMount**. With 12W of thermal capacity, the **207** works well with many fiber pigtailed lasers operating in the 5W to 10W optical power range. The standard cold plate accepts lasers from several different manufacturers, including JDSU, Alfalight, Lumics, and others, and custom mounting options are available.

The **207** also works with **200-TRAY** fiber management tray and **200-C** cover. The fiber management tray provides an elegant solution for managing excess fiber without the use of clips or ties, while the cover improves the thermal stability of the system by insulating the device and cold plate from air drafts.

Connecting your device is easy through the use of a pluggable interface, allowing you to permanently connect the laser and TEC cables to the mount, and use a simple quick-disconnect fitting to make the connection to the device.

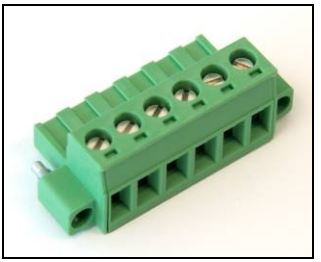
The **LaserMount** also offers all the features you would expect from a modern laser diode fixture, including:

- 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.
- Optional fiber management tray (p/n **200-TRAY**) for managing excess fiber pigtail(s).
- Optional cover (p/n **200-COVER**), when improves the temperature stability of the system.
- Additional quick disconnect plugs (p/n **1202**).

Installation and Use

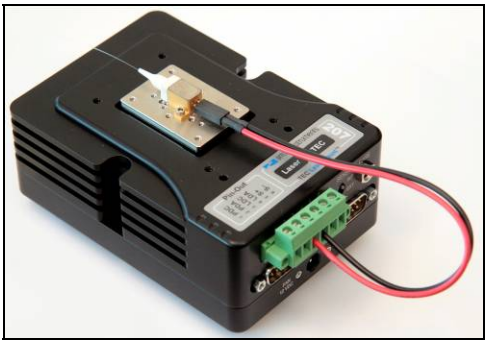
Wiring the connector to your device

The **207** uses a removable connector to make the connection between your device and the mount. Depending on the type of connections you have for your device, you many use some or all of the terminals.



Quick Disconnect Plug

The **207** comes with one plug. Additional plugs are available from Arroyo Instruments (part number 1202), and we also offer pre-wired connector assemblies for many common lasers.



Wired for JDSU L4 Laser

Arroyo Instruments offers several different wiring harnesses for many popular lasers from JDSU, LaserTel, Alfalight, Lumics, and others. Contact Arroyo Instruments for assistance in selecting the appropriate wire harness.

The quick disconnect plug has screw terminals for each position. Simply strip off about ¼" of each wire's insulation, insert into the appropriate position, and tighten the screw.

Devices with Internal Temperature Sensors

Some lasers include an internal temperature sensor (typically a thermistor). It is possible to use the device's internal sensor rather than the sensor in the **207**, which will typically provide a higher degree of accuracy and stability. On the back of the mount, there is a SENSOR switch with two positions: INT and EXT. The INT position selects the thermistor in the **207**, while the EXT position selects the sensor wired to the S+ and S- connections of the quick disconnect interface.

NOTE

Earth Grounding Considerations

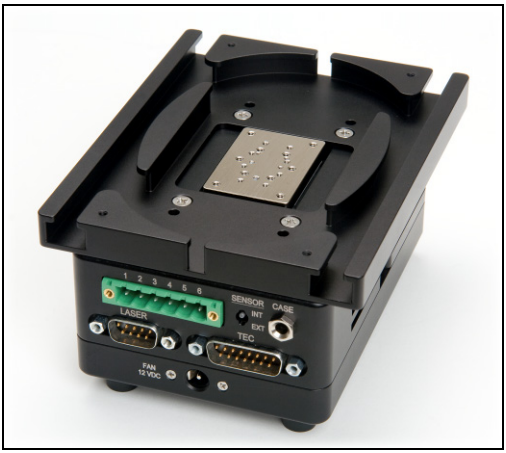
The DB-9 and DB-15 connectors are electrically connected to the housing and 8mm banana jack. Depending on the wiring of your cables and instruments, this may or may not provide earth grounding of the fixture. Make sure the cable shell is earth grounded on both ends of the cable, and that the instrument makes connection from its connector to earth ground. If in doubt, you can also use a grounding strap from the 8mm banana jack directly to earth ground.

Powering the Fan

If you will be using the **5300 Series TECSource** temperature controller to power the fan, make sure to use 1260B or 1262 cable, which has the additional connections for the fan power supply. Otherwise, you can use a 12V DC external power supply with a 2.1mm round DC power jack (center positive). It is possible to operate the fan as low as 6.5V if you would like to reduce the fan noise or vibration, but low fan speeds will reduce the thermal capacity of the mount. For lower power lasers, the fan may not even be required.

Using the Optional Fiber Management Tray

The **207** supports an optional fiber management tray (p/n 200-TRAY), which makes managing excess fiber much simpler by providing a protected area to coil the fiber. Unlike other solutions that use ties to retain the fiber, our fiber tray has an upper lip that catches the fiber, retaining it gently without needing any ties. To install the tray, simply use the provided screws. Note that if you will be using the cover and screwing it down, you will need to install only the front two screws, as the socket head screws that come with the cover will use the rear two threaded holes.



Mount with Fiber Tray Installed

Using the Optional Cover

For applications that demand the best in thermal stability, a cover is available for the **207** that insulates both the device and cold plate from air currents that can otherwise cause instability. Two alignment pins locate the cover on the mount and prevent it from sliding around when the screws are not installed. For more permanent installations, two socket head screws are provided that can bolt the cover to the mount to prevent removal and also add additional protection for the device. The cover can be used in conjunction with the fiber tray.

Mount with Cover and Fiber Tray Installed

Connecting to the Laser Diode Driver and TEC Controller

Next, connect the **207** to your laser diode driver and temperature controller.

NOTE

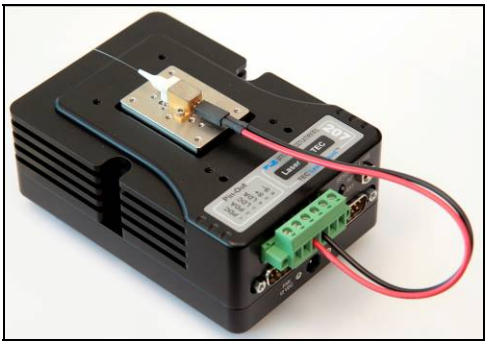
Arroyo Instruments offers Laser and TEC cables designed to connect directly between our **LaserSource** and **TECSource** products. If you use your own cables, ensure the connections are properly made between the instrument and the mount, and that proper grounding techniques are used. The pin-out of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

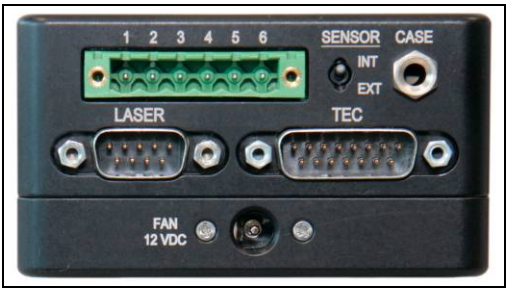
Mounting your device

The cold plate often supports multiple laser hole patterns, so first locate the holes appropriate for your laser. Thread sizes will typically be 0-80, 2-56, or 4-40, and screws included with your mount, but if in doubt, consult the mechanical drawing for the cold plate or contact Arroyo Instruments. Using improper screws can permanently damage the threads. When you screw in the mounting screws, ***do not over tighten, as you can strip the threads in the mounting plate***.



Device Loaded

Connector Pin-Outs



207 LaserMount Connectors

Pin	Description
1	PDC, Photodiode cathode
2	PDA, Photodiode anode
3	LDC, Laser cathode
4	LDA, Laser anode
5	S+, Temperature sensor positive
6	S–, Temperature sensor negative

Quick Disconnect Pin-Out

DB-9 Pin	Description
1 – 3	No connection
4 & 5	Laser cathode
6	Photodiode cathode
7	Photodiode anode
8 & 9	Laser anode

Laser DB-9 Connector Pin-Out

DB-15 Pin	Description
1, 2, 9	TE (+)
3, 4, 10	TE (–)
7	Thermistor
8	Thermistor
11	Fan+
12	Fan–
5, 6, 13 - 15	No connection

TEC DB-15 Connector Pin-Out

Fan Power Connection

The fan base can be powered either through a 2.1mm round DC jack (center positive) located on the rear of the fan base, or via pins 11 & 12 on the TEC DB-15 connector (see above). Using the DC jack will disconnect the TEC DB-15 power connection, preventing simultaneous connection of two power supplies to the fan.

SENSOR Switch

The SENSOR switch is used to select which sensor input will be connected to the TEC DB-15 connector. Selecting the INT position will connect the **207**'s built-in thermistor, while selecting the EXT position will connect the S+/S– terminals on the quick disconnect plug.

Technical Specifications

207 TEC LaserMount	
LASER PACKAGE SUPPORTED	
Packages	Standard plate support: JDSU L3 & L4, Alfalight AM6, various Lumics, STAR LEDs, standard butterfly, Q Photonics SP, Sheaumann SP-940, IPG iPLD-9, others. *Custom mounting available*
TEMPERATURE CONTROL	
Standard Version	
Temperature Range (°C)	+15 to +85
Sensor Type	BetaTHERM 10K3A1IA
Sensitivity	10kΩ @ 25°C
TE Module (at 25°C)	5.6A / 8.2V
Recommended Controller	5240 TECSource or 485-04-08 TECPak
High Temperature Version	
Temperature Range (°C)	+15 to +150
Sensor Type	Platinum RTD
Sensitivity	100Ω @ 0°C, 0.00385 Ω / Ω / °C
TE Module (at 25°C)	2.5A / 14V Max
Recommended Controller	5300-2.5-24 TECSource, 2.5A/24V
INPUT CONNECTOR	
Laser	DB-9, male
TEC	DB-15, male
DEVICE CONNECTOR	
Maximum Current	10A
Part Number	Arroyo Instruments p/n 1202 Phoenix Contact p/n 1778027
FAN POWER	
Connector	2.1mm round, center positive
Voltage / Current	12V DC, 150mA
Thermal Capacity[1]	12W at 25°C, see graph
Size (H x W x D) [in(mm)]	2.44(62) x 3.50(89) x 5.00(127)
Weight [lbs (kg)]	1.6 [0.7]
Fixture Mounting Holes	¼-20 through-hole, 3" on center (x2)
Device Mounting Screws	0-80 x 1/8" stainless steel socket head (x4) 2-56 x 1/8" stainless steel socket head (x4) 4-40 x 1/8" stainless steel socket head (x6)

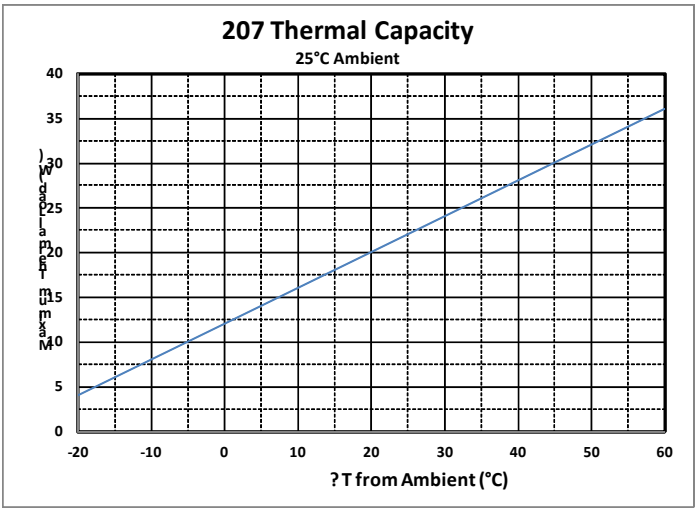
[1] At 25° ambient, fan running at 12VDC

Thermal Capacity

Thermal capacity is the ability of the mount to remove a given amount of heat. When considering thermal capacity, both the operating and ambient temperatures must be considered. Higher ambient temperatures lower the thermal capacity of the mount, as does lower operating temperatures. Often a device may work fine at 25°C, but not be able to reach 15°C or 20°C because of the amount of heat given off by the device.

In many applications, the absolute temperature is not critical, so when using devices with high thermal loads, you may need to operate the device towards the upper end of the operating temperature range. Make sure to consult the specifications to ensure you do not exceed the temperature range of the device.

To determine the thermal capacity, determine how far above (positive) or below (negative) the ambient temperature you will be operating, then consult the graph below, which shows the capacity of the mount in terms of °C away from the ambient temperature, at a nominal 25°C ambient. As an example, assume your lab is at 20°C, and you will be operating the mount at 25°C, then the operating point is 5°C *above* the ambient temperature, and the thermal capacity would be 14W (the +5°C point on the x-axis).

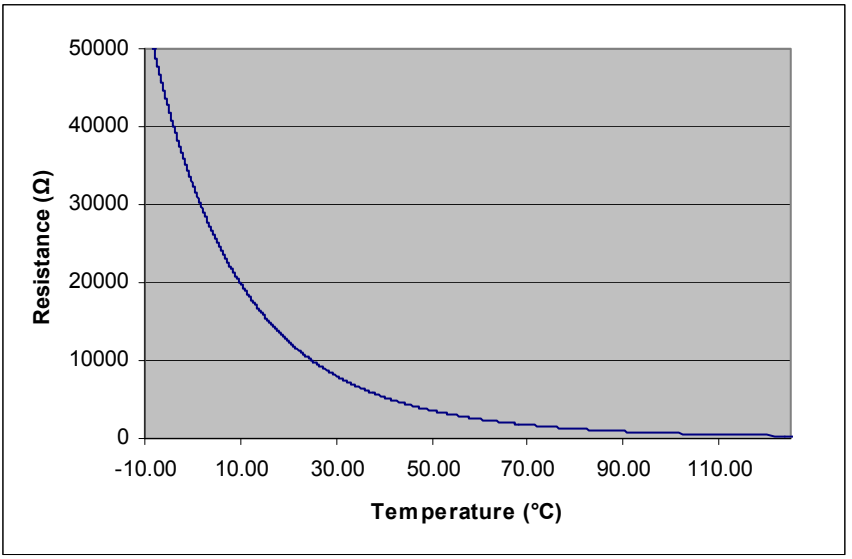


The graph assumes the fan is operational. The capacity of the mount without the fan will be significantly less. Also, when ambient temperature is significantly away from 25°C, the actual capacity will be slightly different.

Using the Thermistor on Standard Versions

The standard version of the **207 LaserMount** is equipped with a 10kΩ 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:



Resistance vs. Temperature Graph

As can be seen be 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 = 1.12924×10^{-3}
B = 2.34108×10^{-4}
C = 0.87755×10^{-7}

These are the default coefficients for Arroyo Instruments temperature controllers.

Using the RTD on 150°C Versions

The **207-150 LaserMount** is equipped with a RTD sensor with a 0.00385 Ω / Ω / °C sensitivity. Like thermistors, RTDs also function by converting temperature into resistance, but unlike thermistors, RTDs increase in resistance as temperature increases. RTDs are also a fairly linear device, meaning they can be used across a much broader temperature control range.

As per IEC751, the resistance/temperature relationship is determined using one of two equations, dependent on the temperature or resistance value being measured. For resistances above the R_0 value (resistance at 0°C, typically 100Ω, as is the case with the RTD used in the **207-150**) of the RTD, the following equation is used:

$$R = R_0(1 + AT + BT^2)$$

Below R_0, an additional term is added to the equation:

$$R = R_0[1 + AT + BT^2 + C(T - 100)T^3]$$

In both of these equations, R_0 is the resistance of the RTD at 0°C, and A, B, and C are the coefficients as defined by IEC751, through regression analysis, or by using the Callendar-van Dusen method.

For the Arroyo Instruments controllers that support RTD sensors, the default coefficients are different for this mount. They must be changed to use the 0.00385 Ω / Ω / °C curve, which has the following coefficients:

$A = 3.9080 \times 10^{-3}$
$B = -0.58019 \times 10^{-6}$
$C = -4.2735 \times 10^{-12}$
$R_0 = 100$

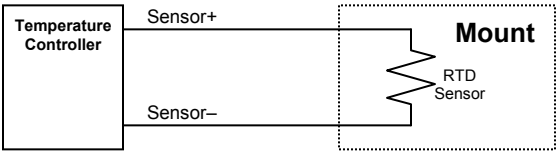
These coefficients can be changed in the Sensor menu.

2-Wire versus 4-Wire Measurements

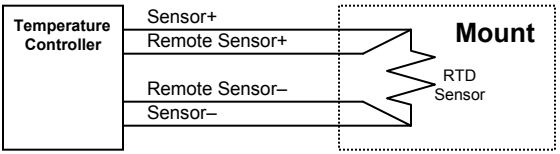
One concern in using RTDs are their relatively low resistance (typically 100Ω at 0°C), and small Ω/°C. Because of these two factors, the resistance of the cable used to connect to the sensor can create significant absolute error in the sensor measurement. Most Arroyo Instruments controllers offer two RTD measurement modes: a conventional two wire measurement mode, which is subject to this error, and a four wire measurement mode that uses separate sense and source lines to remotely sense the actual resistance of the RTD and eliminate the cable and connector resistances.

In the **207-150 LaserMount**, the 4-wire connection is made inside the mount. To use this measurement mode, you must select 'RTD (4-wire)' as the sensor type.

The drawings below illustrate how 2-wire and 4-wire connections work. Note that 4-wire measurements require all four wires to be brought through the cable to the mount. The **1262 TECSource** cables carry these connections through to the mount, but the **1260B** cable does not.

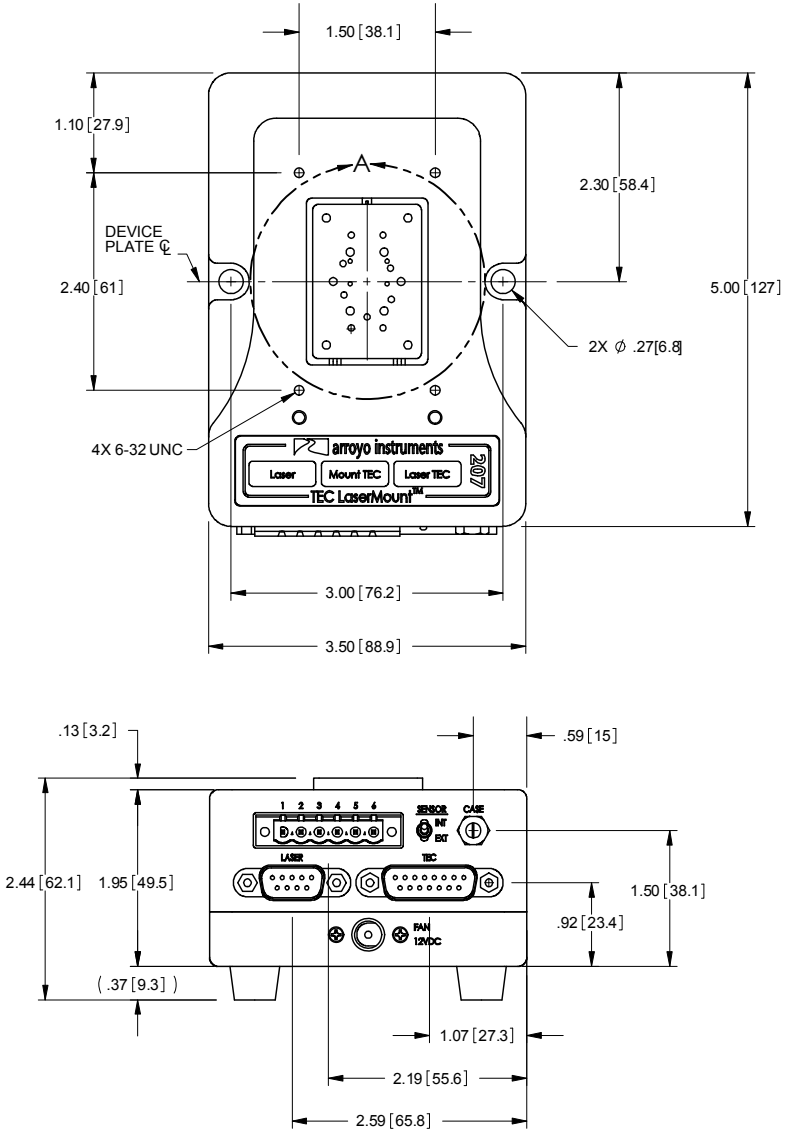


RTD 2-wire Measurement

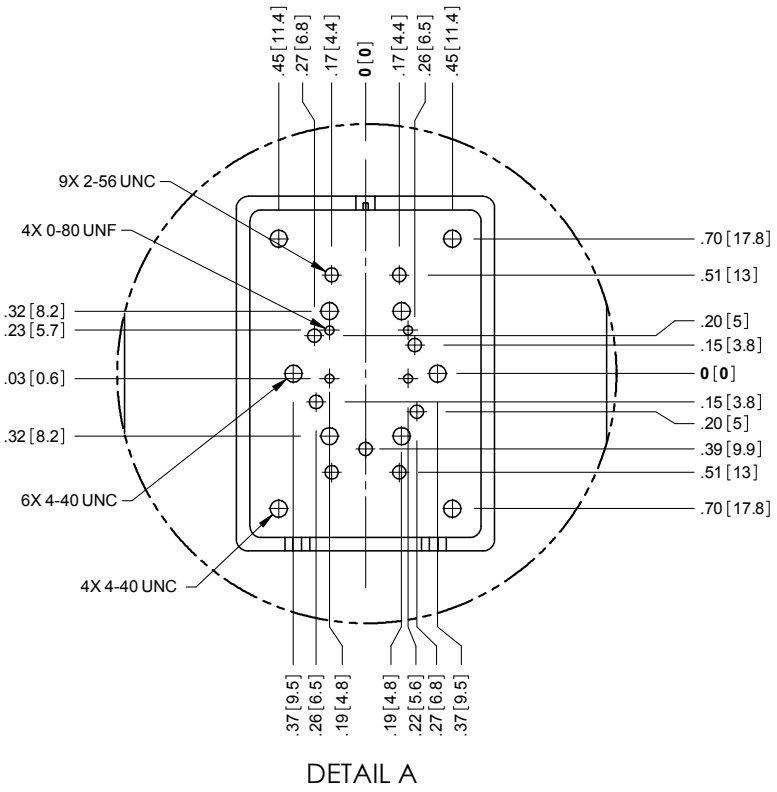


RTD 4-wire Measurement

Mechanical Specifications

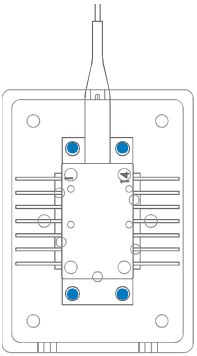


207 Top and Rear Views

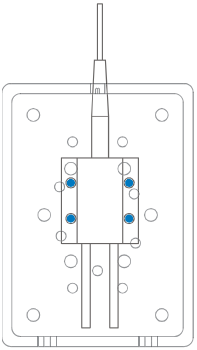


Detail View of Mounting Hole Pattern

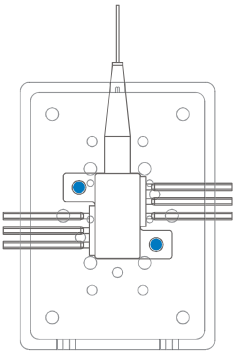
Mounting Locations for Standard Plate



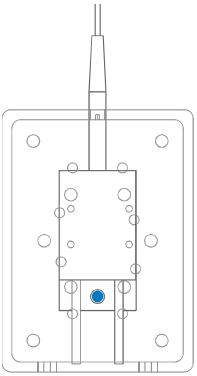
Butterfly
2-56 screws x 4



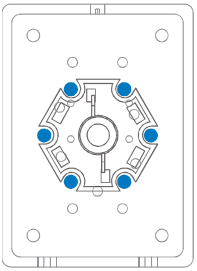
SP package
0-80 screws x 4



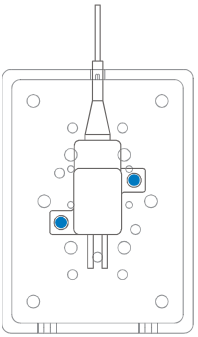
Alfalight AM6 package
2-56 screws x 4



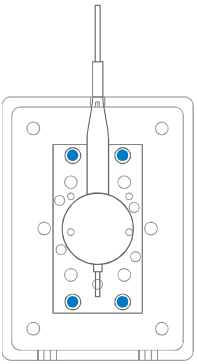
Lumics TO package
2-56 screws x 1



STAR LED
4-40 screws x 6



JDSU L4, 4900
2-56 screws x 2



JDSU L3
2-56 screws x 4

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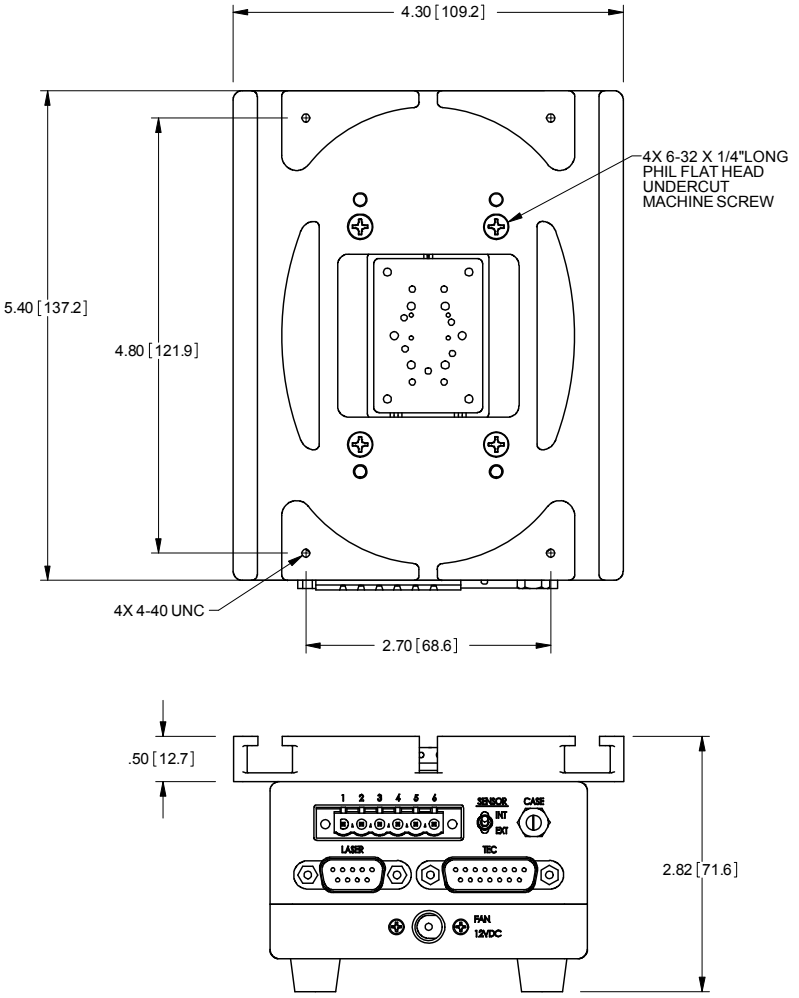
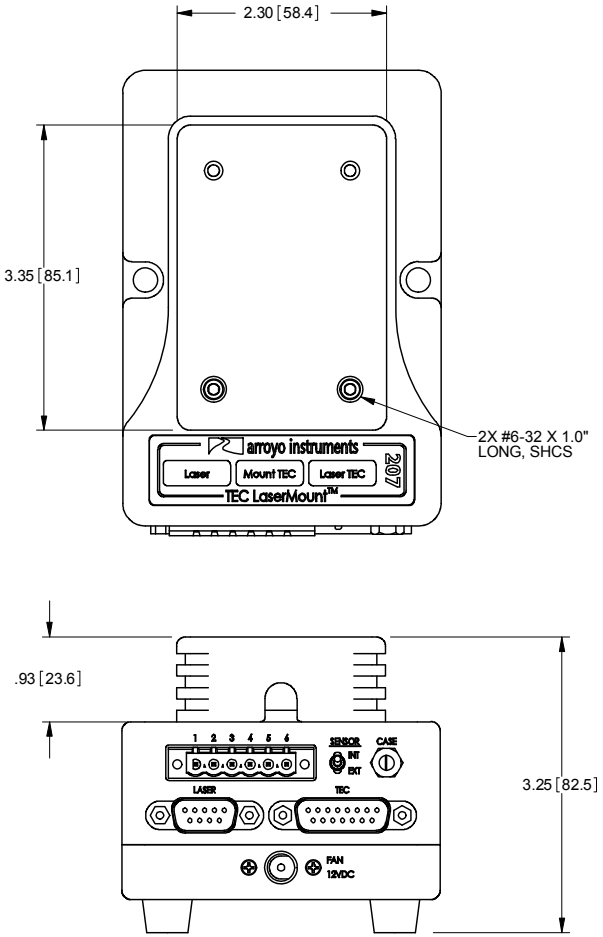


207 with Fiber Tray



207 with Cover

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.

For additional ESD protection, adding 3.5µH (Mouser P/N 542-FB73-287) ferrite beads as close to the laser diode as possible is recommended. One ferrite bead should be used on each laser diode and photodiode diode anode and cathode, with the wire going through the bead at least twice (two turns).

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.

Service and Support

For service and support, contact your local distributor or Arroyo Instruments.

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