TECMount™

285

USER'S MANUAL

HIGH POWER MOUNT

arroyo instruments

Table of Contents

Introduction

Thank you for choosing the **285-01 TECMount** from Arroyo Instruments. The **285-01 TECMount** is designed for high performance and long term use.

The **285-01 TECMount** integrates a high power Peltier cooler for precise control and substantial heating and cooling capacity for your powerful devices. The standard **285-01 TECMount** has an operating range of -10°C to +85°C, and a high temperature option (**285-01-150**) with operation to +150°C is available. Operation below the dew point requires a nitrogen-purged environment.

The **285-01 TECMount** also offers all the features you would expect from a modern diode fixture, including:

- Hard nickel over copper thermal plate
- Edge accessible on three sides
- Designed to be quickly integrated with Arroyo's **TECSource** instruments.
- Industry-standard D-sub connector and pin-outs allow for quick integration into existing laser applications.
- External sensor input for easy injection of on-board device sensor as sensor feedback.

Recommended Temperature Controller

In many applications, the 60W/5A/12V output of a **5305** or **6300** temperature controller will provide sufficient power to operate the mount across most of its usable range.

For performance to the full 50W specification, or across broader temperature ranges, a **5310** (for **285-01**) or **5300-08-24** (for **285-01-150**) **TECSource** is required.

Installation and Use

Connecting to the TEC Controller:

First, connect the **285-01 TECMount** to your temperature controller. Make sure the temperature controller's current limit is set to a maximum value of no more than 7 Amps. Where possible, we recommend the use of Arroyo Instruments TEC cables.

NOTE

Arroyo Instruments offers TEC cables designed to connect directly between our **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.

NOTE

Earth Grounding Considerations
If your application requires that the cold plate be earth grounded, you should directly wire the cold plate to earth ground.

Mounting Plate

The **285-01 TECMount** has a bread board configuration with M3 holes on 10mm centers. Optional blank adapter plates are available in several sizes (3.2", 4.2", and 5.2" square) to allow for custom mounting patterns or larger mounting surfaces. See mechanical information below.

Connector Pin-Outs

DB-15 Pin	Description
1, 2 & 9	TE (+)
3, 4 & 10	TE (–)
7 & 14	Thermistor or RTD / Sensor+
8 & 15	Thermistor or RTD / Sensor–
11, 12 & 13	FAN (+)

DB-15 Connector Pin-Out

Phoenix Pin	Description
1	EXT (+)
2	EXT (–)

Phoenix 2-Pin Connector Pin-Out

Sensor Polarity and 4-Wire Connections

While the thermistor and RTD inputs are not polarized, when using a 4-wire RTD connection from the mount, it is important to properly connect the polarity of the sense wires to the sensor. Pins 7 and 14 should be one polarity (+) and pins 8 and 15 should be the opposite polarity (–). If polarities are not matched, the instrument will indicate a sensor error.

EXT Input and SENSOR Switch

The **285-01** features a SENSOR switch to quickly switch between internal and external temperature sensors. With the SENSOR switch in the INT position, the internal thermistor or RTD embedded in the cold plate is used to provide the feedback for the temperature controller. With the SENSOR switch in the EXT position, the EXT+ and EXT- inputs on the Phoenix connector are connected to pins 7 & 14 Sensor+) and 8 & 15 (Sensor–).

The **285-01** comes with one Phoenix 2-pin plug. Additional plugs can be ordered online at www.mouser.com or www.digikey.com, Phoenix part number 1803578.

Technical Specifications

285-01 and 285-01-150 TECMount	
TEMPERATURE CONTROL	
Standard Model (285-01)	
Temperature Range (°C)	-5 to +85, non-condensing
Sensor Type	10kΩ Thermistor
High Temp Model (285-01-150)	
Temperature Range (°C)	-5 to +150, non-condensing
Sensor Type	100Ω Platinum RTD
TE Module (at 25°C)[1]	Imax = 12 Amp[2] (recommend 8 Amp ITE limit) Vmax = 20 Volt
CONNECTORS / INTERFACES	
Temperature Controller	DB-15, male
External Sensor	Phoenix 2-Pin (plug p/n 1803578)
GENERAL	
Max Housing Temperature (°C)	60
Size (H x W x D) [in(mm)]	2.68 (68.1) x 4 (101.6) x 6 (152.4)

Maximum Operating Current

Thermoelectric cooler (TEC) devices are wear items, which means that they will slowly degrade even under normal use and over time eventually fail. This is generally caused by material migration in the P-N junctions that slowly results in higher module impedance and lower performance but can also be caused by catastrophic junction failure usually caused by stressing the module.

In most applications, that failure point may be tens of thousands of operating hours or more, effectively eliminating it from consideration. However, when the TEC is being used near its limits and/or in thermal cycling applications, the wear-out process is greatly accelerated. In these conditions, TEC life can be shorted to a matter of months or even weeks.

Because of this, it is recommended that the current limit of the TEC is set to approximately 2/3 (two-thirds) of the maximum current rating of the TEC. While it will not eliminate the wear-out process, it will significantly extend the life of the TEC. For more information on TEC wear, contact the factory.

[1] See *Operating at High Temperatures*, below, for additional requirements at high temperatures
[2] See *Maximum Operating Current* for additional information on choosing a maximum current

Configuring the Temperature Controller

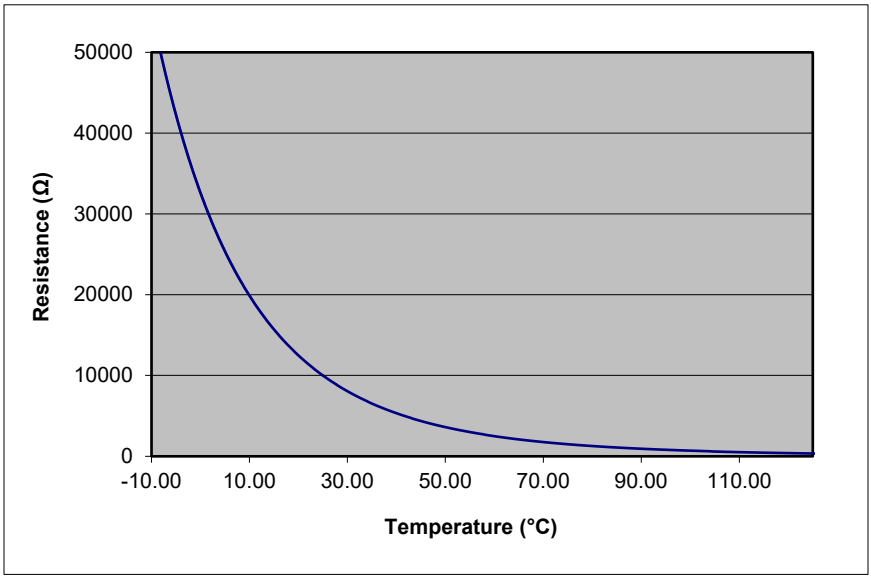
When using an Arroyo Instruments temperature controller, the easiest method for configuring the controller to operate with the mount is to change the **Mount** setting in the menu by selecting the ***285*** or ***285-150***, depending This will change the sensor settings and current limit to be appropriate for this mount.

If you will be using a non-Arroyo controller, or an older Arroyo controller that does not include this mount as an option, simply to adjust the limits and sensor settings appropriately to ensure proper and safe operation of the mount.

Using the Thermistor on Standard Versions

The **285-01** 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 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 = 1.12924×10^{-3}
B = 2.34108×10^{-4}
C = 0.87755×10^{-7}

These are the default coefficients for Arroyo Instruments temperature controllers, but can be changed in the **Sensor** menu, or by selecting the appropriate **285-01** mount from the **Mount** menu setting.

Using the RTD on 150°C Versions

The **285-01-150** TECMount is a high temperature version configured for up to 150°C operation. To support this high temperature operation, a RTD sensor with a 0.00385 Ω / Ω / °C sensitivity is used. 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.

You can identify a 150°C configured **285-01** by its part number: a "-150" will be added to the end, for example, **285-01-150**.

According to 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 **285-01-150**) 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.

Not all Arroyo Instruments temperature controllers support RTD operation. Check with the factory for the recommended controller. In most cases, the **5310** is the recommended controller for the **285-01-150**, although less powerful controllers may be used, depending on the thermal load capability required.

For the Arroyo Instruments controllers that support RTD sensors, the default coefficients are not correct for this mount. They must be changed to use the 0.00385 Ω / Ω / °C curve, which has the following coefficients:

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

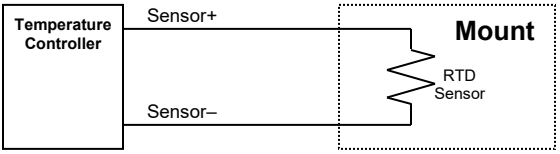
These coefficients can be changed in the Sensor menu, or by selecting the appropriate ***285-01-150*** mount from the **Mount** menu setting.

2-Wire versus 4-Wire Measurements

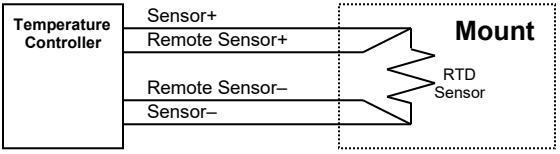
One concern in using RTDs are their relatively low resistance (typically 100Ω at 0°C), and small Ω/°C. Because of these two factors, the resistance of the cable used to connect to the sensor can become a significant error in the sensor measurement. Most Arroyo Instruments controllers offer two RTD measurement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

When using 4-wire measurement mode, you must select 'RTD (4-wire)' as the sensor type, and then connect the Sensor+ and Remote Sensor+ at one side of the RTD, and Sensor– and Remote Sensor– to the other side of the RTD. Make these connections as close to the sensor as possible.

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 **1262B TECSource** cable carries this connection through to the mount, but the **1260B** cable does not.

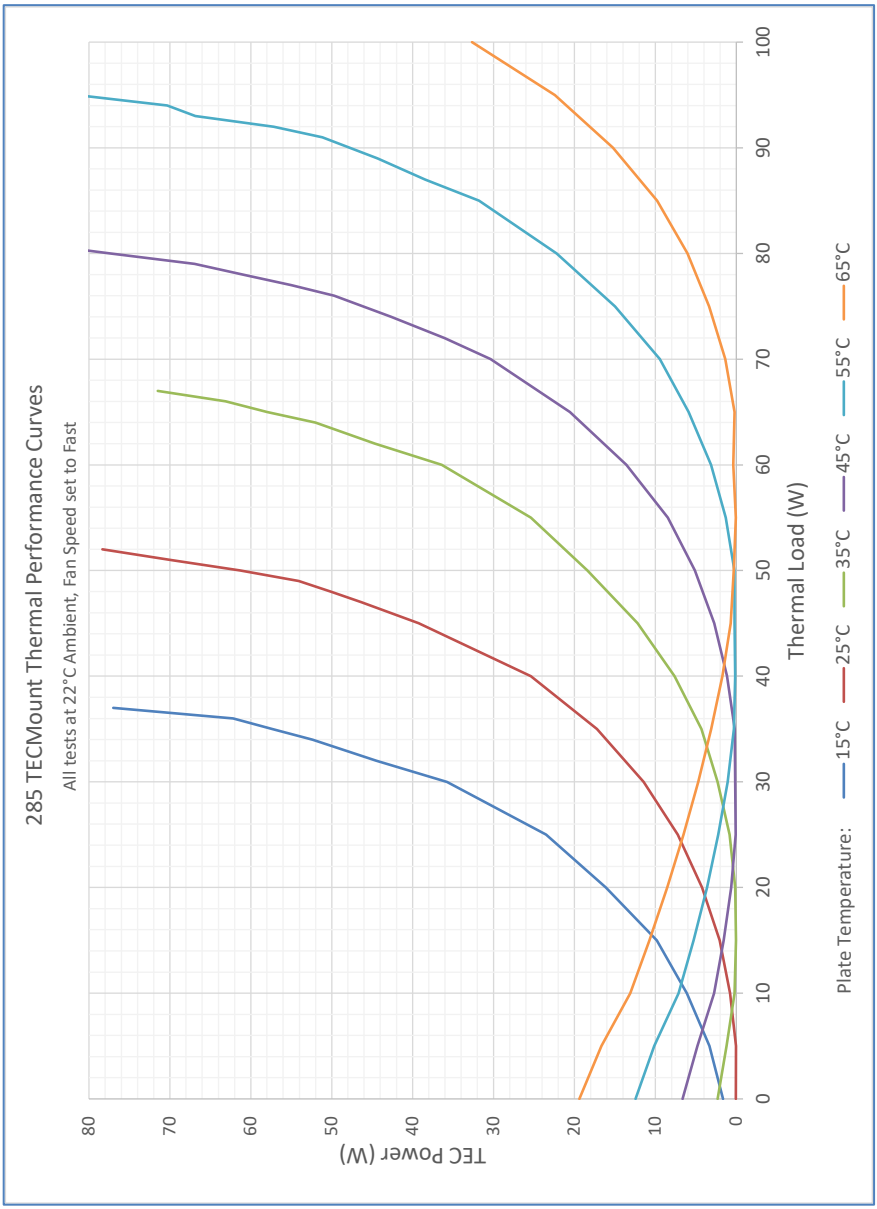


RTD 2-wire Measurement



RTD 4-wire Measurement

Thermal Performance Curves



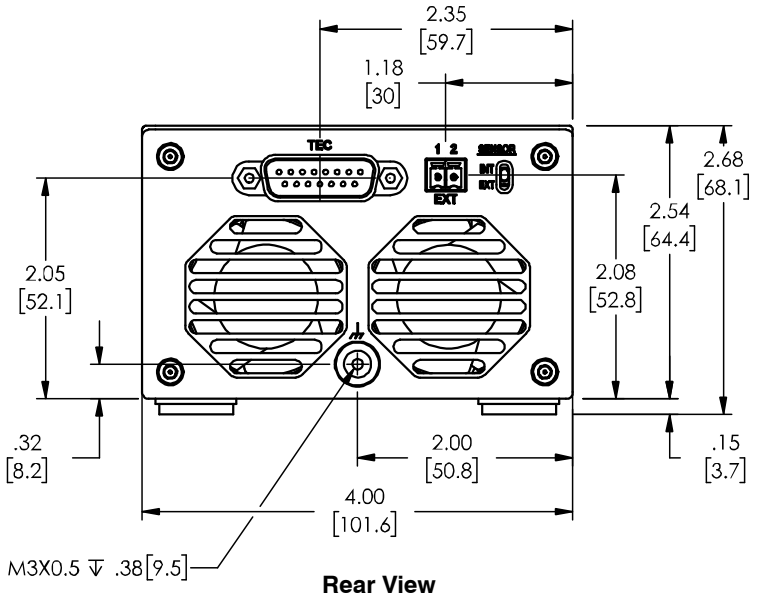
arroyo instruments

Operating at High Temperatures

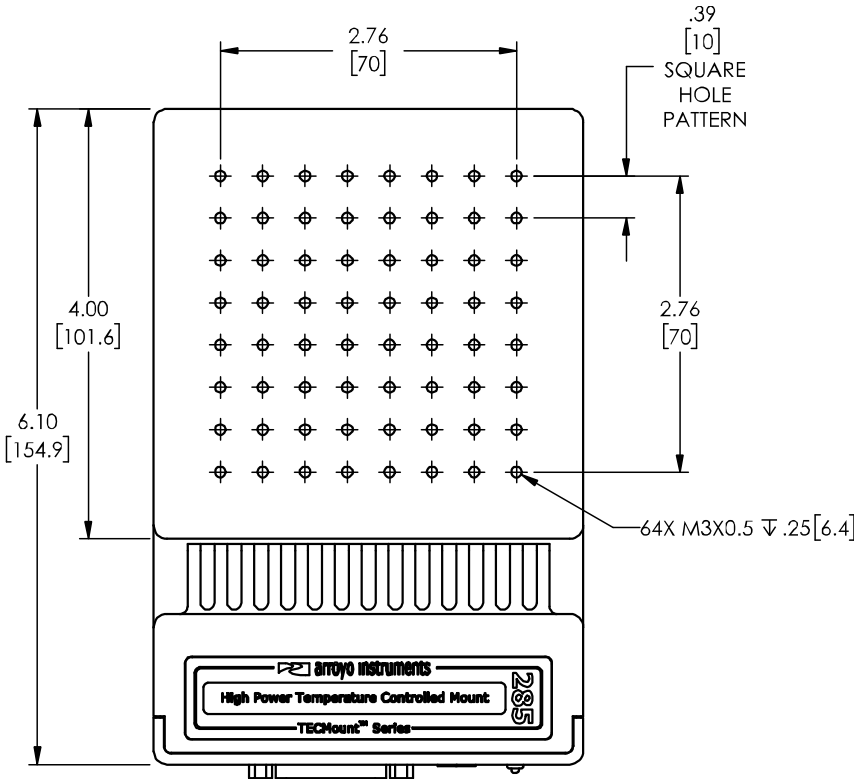
The **285-01-150** (150°C-capable version) has additional requirements that should be considered when operating in the upper temperature range:

1. The voltage requirements of the TEC increase significantly when operating at the higher temperatures, so much so that the standard **5305**, **5310** or **6300 Series** controllers will be voltage limited when controlling the mount. To gain the maximum performance of the **285-01-150**, the recommended controller is a **5300-08-24**, which has an 8A / 24V output, or the **5400-15-28**, which has a 15A / 28V output. Contact the factory for more details.
2. When operating at high temperatures, turn off the fan, or set the fan mode to Cool Only, so that the fan only operates when the mount is cooling. By lowering the temperature difference between body of the fixture and the plate temperature, the TEC will not work as hard, and provide better plate uniformity as well as not requiring as much power to operate the TEC .

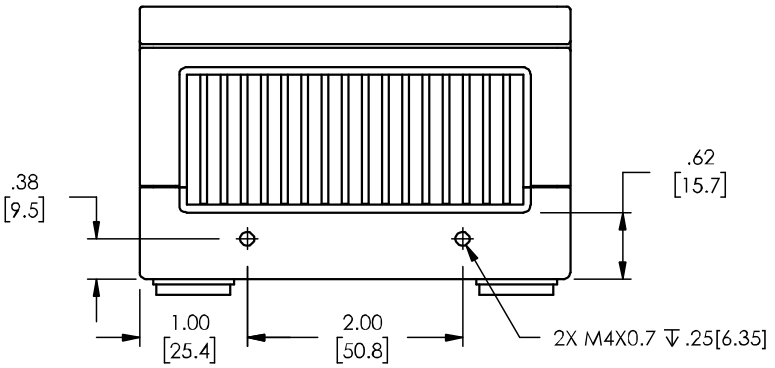
Mechanical Drawings



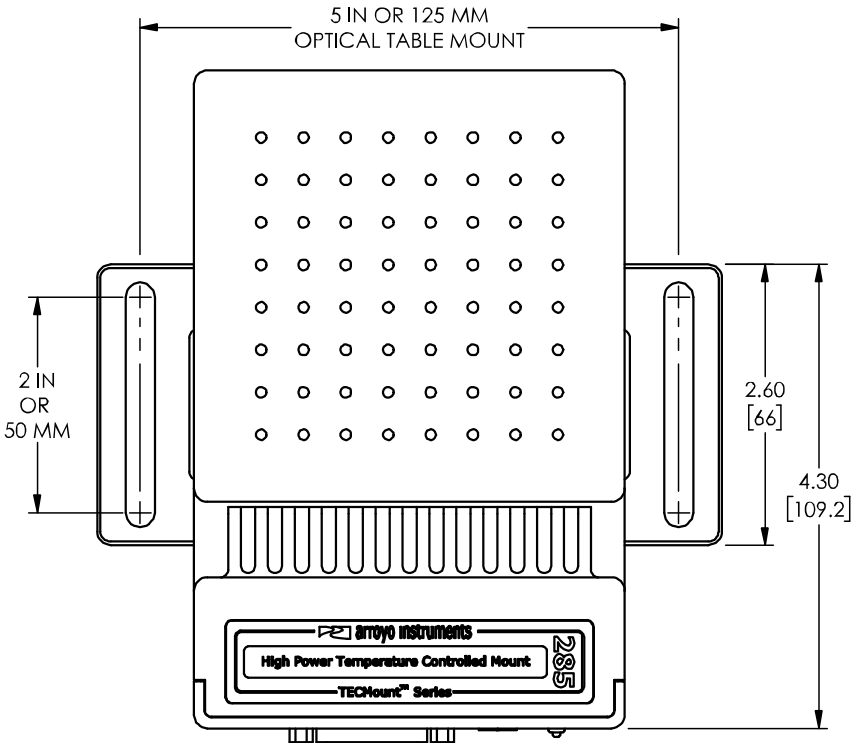
Rear View



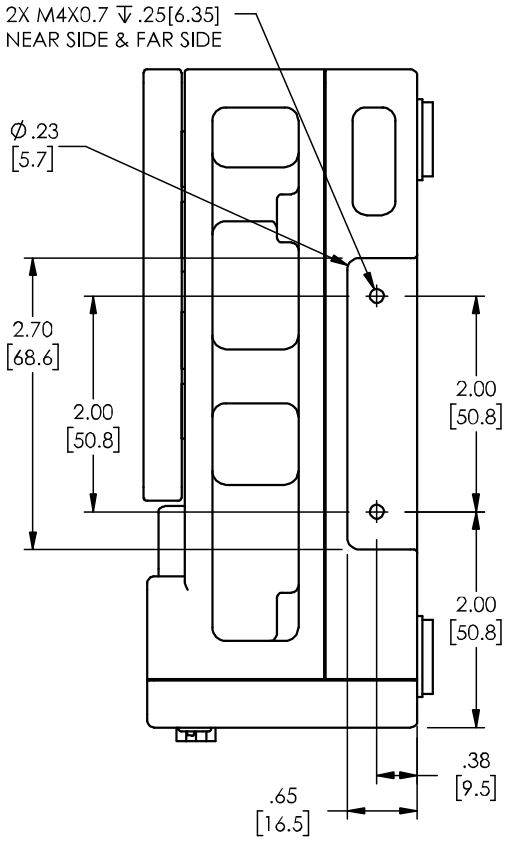
Top View



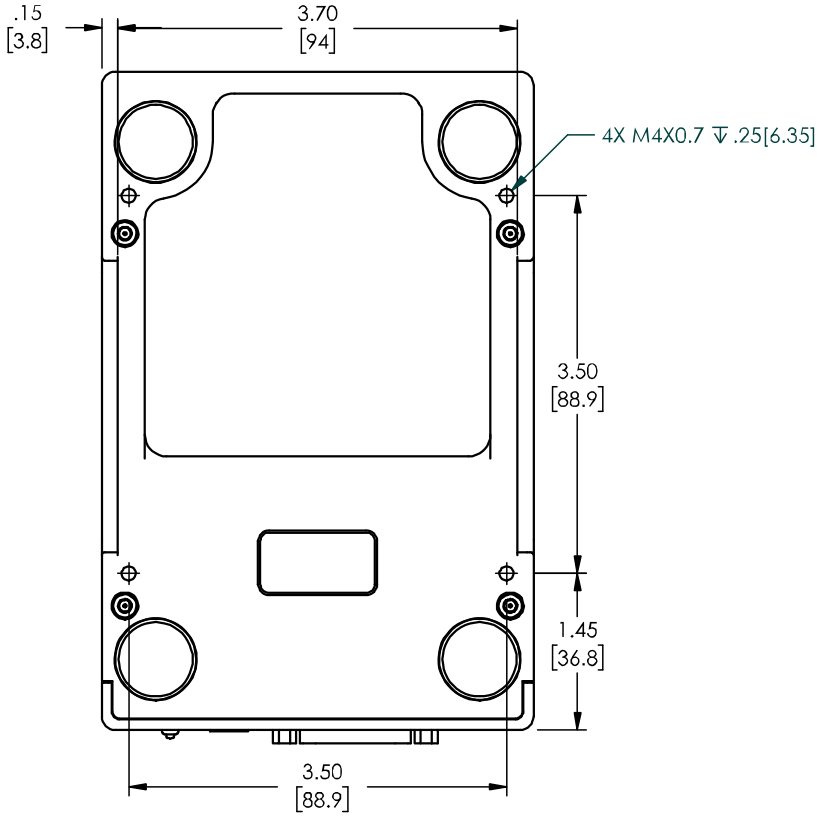
Front View



Top View, with Mounting Brackets

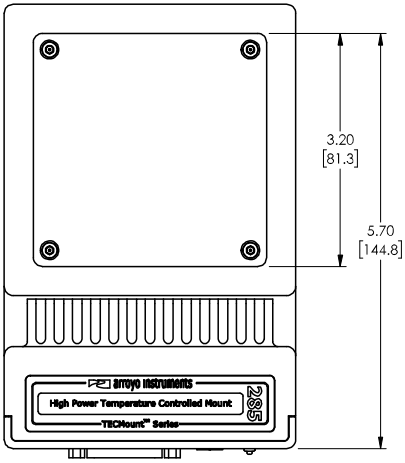

2X M4X0.7 ↧ .25[6.35]
NEAR SIDE & FAR SIDE
Ø .23
[5.7]
2.70
[68.6]
2.00
[50.8]
2.00
[50.8]
2.00
[50.8]
.38
[9.5]
.65
[16.5]

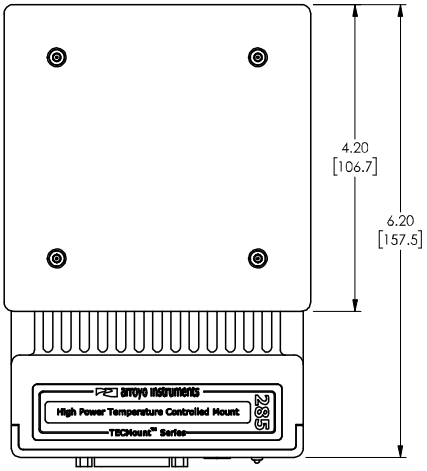
Side View

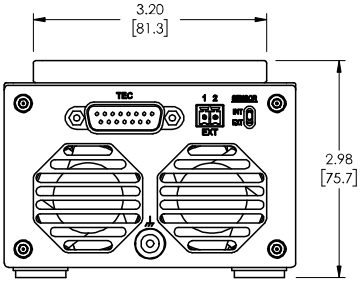


Bottom View

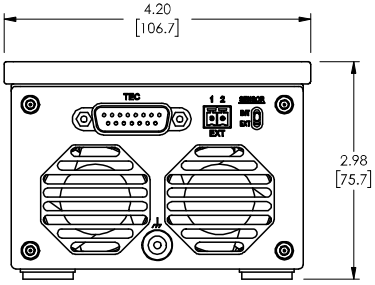
Optional Adapter Plates:



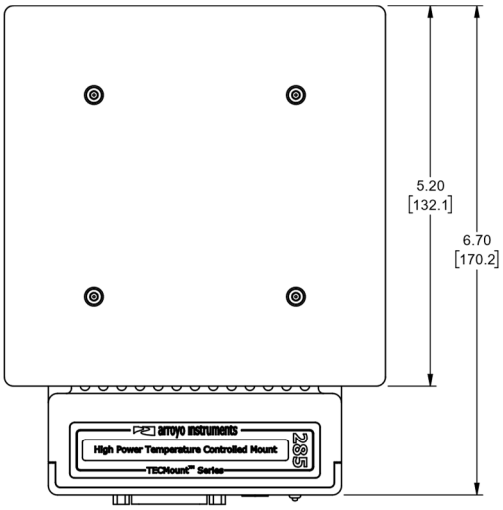


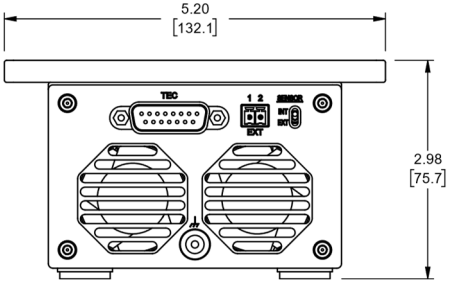


3.2" Adapter Plate, Top View (p/n AP-01-3.2)



4.2" Adapter Plate, Top View (p/n AP-01-4.2)





5.2" Adapter Plate, Top View
(p/n AP-01-5.2)

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' option.

This warranty does not cover a failed TEC module if it is found to be damaged due to overdriving or harsh operation of the TEC.

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

The **285-01 TECMount** contains no user-serviceable parts.

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

Telephone: +1 (805) 543-1302
Facsimile: +1 (805) 543-1303
Email: support@arroyoinstruments.com
Web: http://www.arroyoinstruments.com
Address: 1201 Prospect Street
San Luis Obispo, CA 93401
USA

1201 Prospect Street, San Luis Obispo, CA 93401

Tel: (805) 543-1302 Fax: (805) 543-1303

sales@arroyoinstruments.com

www.arroyoinstruments.com

P/N 530-1056 Rev B