TECMount™

274

USER'S MANUAL

WATER COOLED MOUNT

arroyo instruments

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Introduction

Thank you for choosing the **274 TECMount** from Arroyo Instruments. The **274 TECMount** is designed for high performance and long term use.

The **274 TECMount** integrates a high power Peltier cooler for precise control and substantial heating and cooling capacity for your powerful devices. The standard **274 TECMount** has an operating range of -25°C to +85°C. Operation below the dew point requires a nitrogen-purged environment.

The **274 TECMount** requires water cooling for proper operation. For maximum performance, a chiller rated for at least 400 Watts or greater is recommended, but smaller chillers can be used for lower power applications. The **5400-15-28 TECSource** temperature controller is a good match for the mount delivering maximum performance and complete control across the **274 TECMount** operating range.

The **274 TECMount** also offers all the features you would expect from a modern diode fixture, including:

- Hard nickel over copper thermal plate.
- 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.

Installation and Use

Connecting to the TEC Controller:

First, connect the **274 TECMount** to your temperature controller. Make sure the temperature controller's current limit is set to a maximum value of no more than 16 Amps. Where possible, we recommend the use of Arroyo Instruments TEC cables. If you are using an Arroyo Instruments **5300 Series TECSource** temperature controller, as **1262B TECSource** cable is the recommend interconnect between the mount and controller. For the **5400 Series** controllers, use the **1264-DB15** cable.

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.

Connecting the water supply:

The **274** comes with factory installed brass barbs suitable for 3/8" I.D. hose, but they can be replaced with any 1/8" NPT male fitting. It is recommended that when using the barbs, pipe clamps be used to secure the hose to the **274**.

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.

When not using the 274 for prolonged periods of time, it is recommended that the water be drained from the unit and allowed to air dry. A burst of compressed air is also beneficial to blow out any residual water inside the unit.

Mounting Plate

The **274** 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 **274** features a SENSOR switch to quickly switch between internal and external temperature sensors. With the SENSOR switch in the INT position, the internal thermistor 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 274 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

274 TECMount	
COLD PLATE	
Mounting Holes	M3
TEMPERATURE CONTROL	
Standard Model (+85°C)	
Temperature Range (°C)	-25 to +85, non-condensing
Sensor Type	10kΩ Thermistor
High Temp Model (+150°C)	
Temperature Range (°C)	-25 to +150, non-condensing
Sensor Type	100Ω Platinum RTD
TE Module (at 25°C)[1]	Imax = 16A Vmax = 33V
CONNECTORS / INTERFACES	
Temperature Controller	DB-15, male
External Sensor	Phoenix 2-Pin (plug p/n 1803578)
Coolant Inlet/Outlet	1/8" Female NPT with pre-installed brass hose barbs (3/8" I.D. hose)
GENERAL	
Recommended Coolant	Distilled Water
Max Water Pressure (psi)	80
Max Housing Temperature (°C)	60
Size (H x W x D) [in(mm)]	2.5 (63.5) x 4.8 (121.9) x 3.2 (81.3)
Weight (lbs [kg])	2.8 [1.27]

Wetted Materials

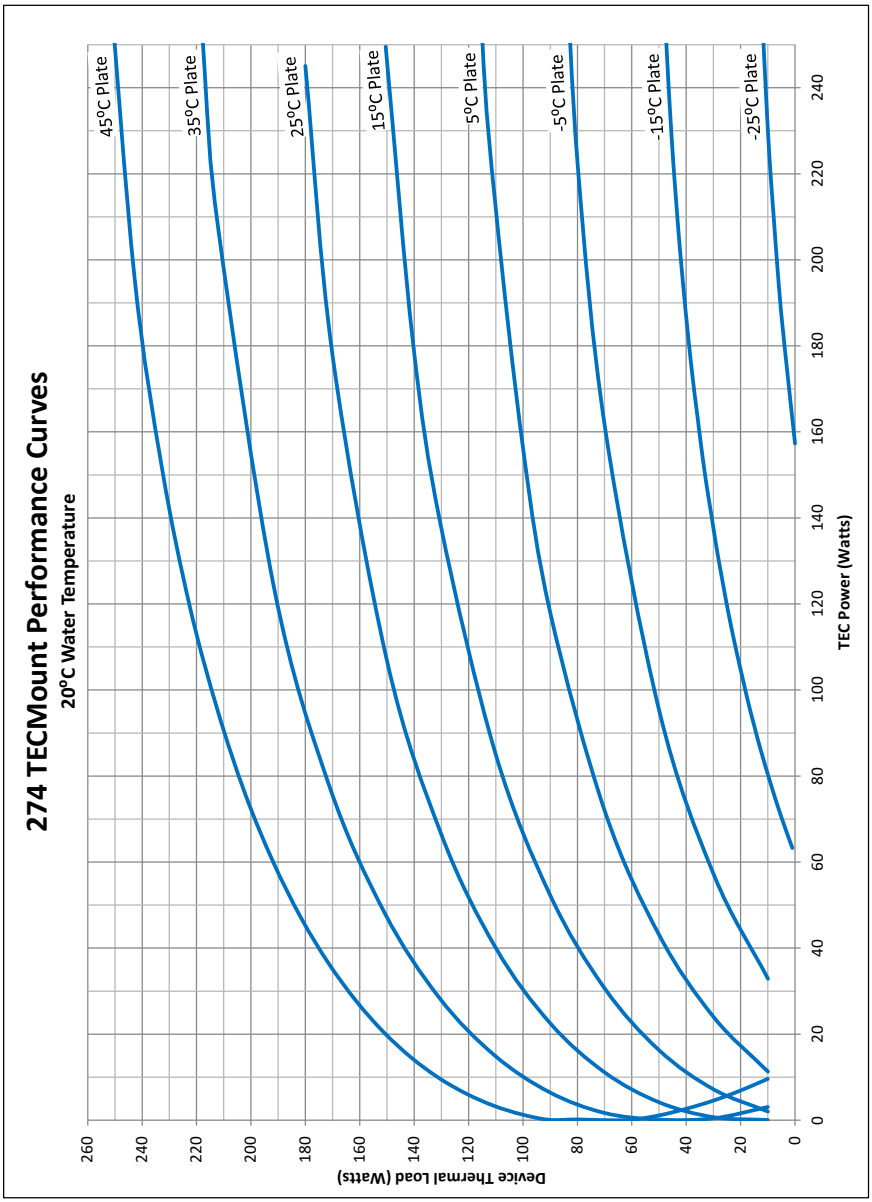
For purposes of evaluating galvanic corrosion, the following materials will make contact with the coolant:

- Housing: Anodized AL 6061-T6
- Fittings: UNS C36000 Brass
- O-ring: EPDM

When using pure water as a coolant, distilled water is typically recommended unless your application dictates a different fluid.

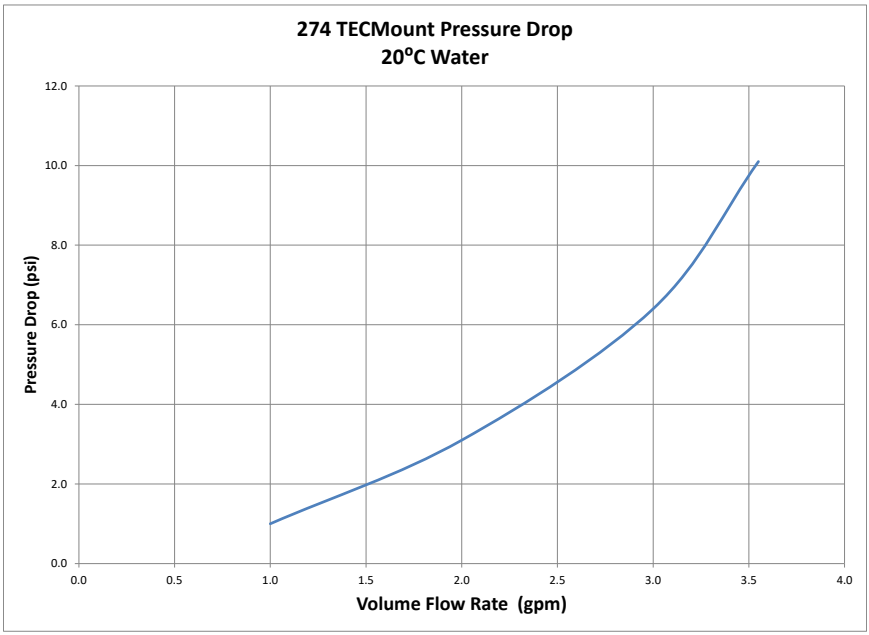
[1] See *Operating at High Temperatures*, below, for additional requirements at high temperatures

Thermal Performance Graph



** Graph represents typical performance, and will vary by flow rate and other conditions.*

Pressure Drop vs Flow Graph



** Graph represents typical performance, and will vary by flow rate and other conditions.*

Configuring the Temperature Controller

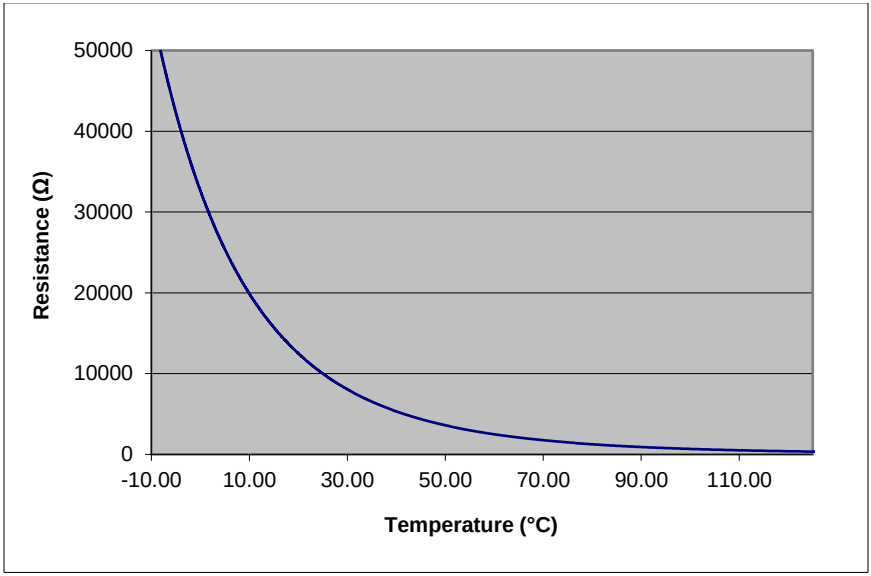
When using an Arroyo Instruments temperature controller, the easiest method for configuring the controller to operate with the mount is to change the **Mount** setting in the menu by selecting the **274** or **274-150**, depending This will change the sensor settings and current limit to be appropriate for this mount.

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

Using the Thermistor on Standard Versions

The **274 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 **274** mount from the **Mount** menu setting.

Using the RTD on 150°C Versions

The **274 TECMount** can optionally be 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 **274** by its part number: a "-150" will be added to the end, for example, **274-150**.

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 **274**) 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 **5400-15-28** is the recommended controller for the **274**, although lessor 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:

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

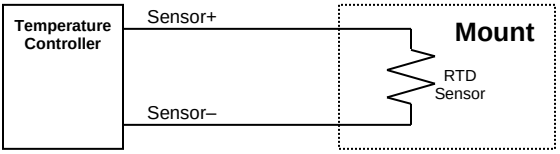
These coefficients can be changed in the Sensor menu, or by selecting the appropriate **274** mount from the **Mount** menu setting.

2-Wire versus 4-Wire Measurements

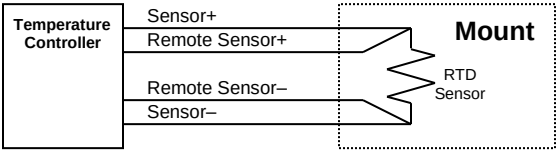
One concern in using RTDs are their relatively low resistance (typically 100Ω at 0°C), and small Ω/°C. Because of these two factors, the resistance of the cable used to connect to the sensor can become a significant error in the sensor measurement. Most Arroyo Instruments controllers offer two RTD measurement 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 **1262 TECSource** cable carries this connection through to the mount, but the **1260B** cable does not.



RTD 2-wire Measurement



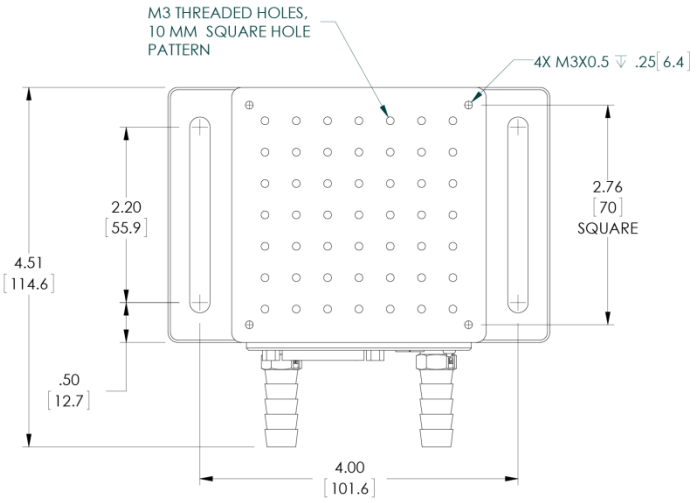
RTD 4-wire Measurement

Operating at High Temperatures

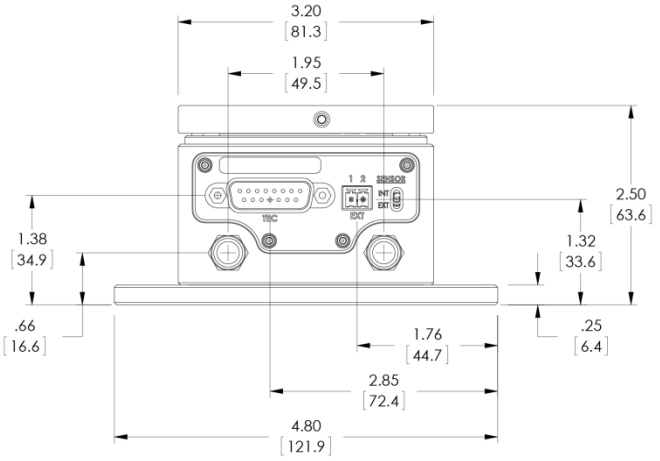
The **274-150** (150°C-capable version) has additional requirements that should be considered when operating in the upper temperature range:

1. The voltage requirements of the TEC increase significantly when operating at the higher temperatures, so much so that the standard **5305** or **6300 Series** controllers will be voltage limited when controlling the mount. To gain the maximum performance of the **274-150**, the recommended controller the **5400-15-28**, which has a 15A / 28V output. Contact the factory for more details.
2. If the mount is heating when at high temperatures, if possible, raise the water temperature. By lowering the temperature difference between the water temperature 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 .

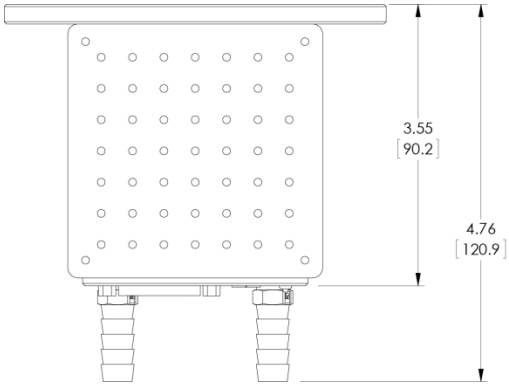
Mechanical Drawings



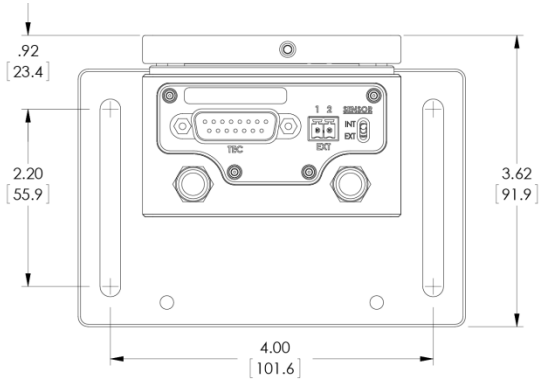
Top View



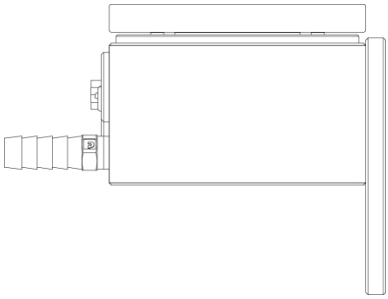
Rear View



Top View, Mount Plate on Front

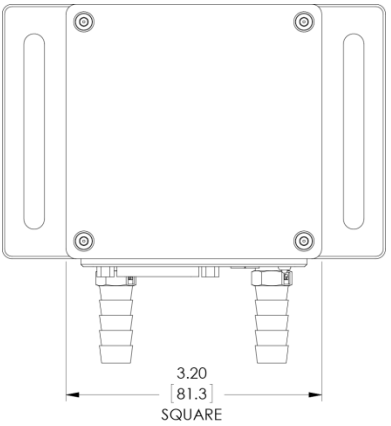


Rear View, Mount Plate on Front

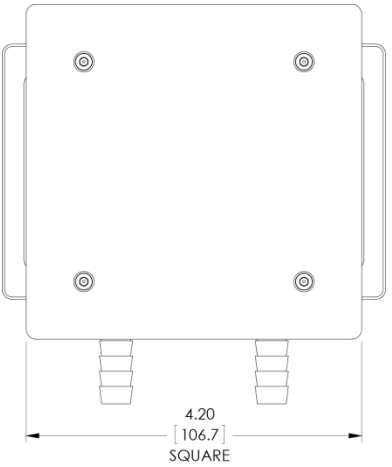


Side View, Mount Plate on Front

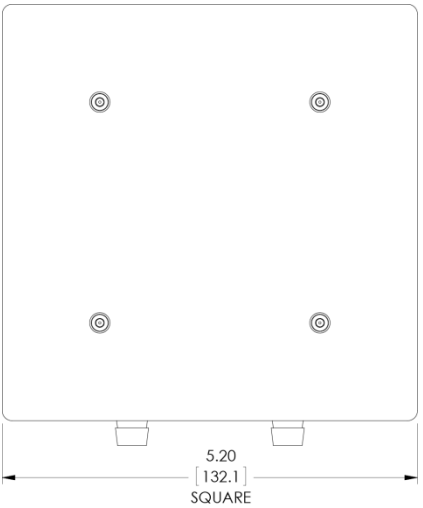
Optional Adapter Plates:



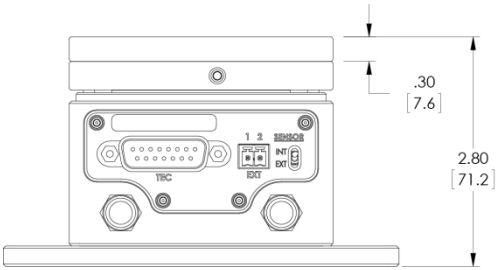
3.2" Adapter Plate, Top View
(p/n AP-01-3.2)



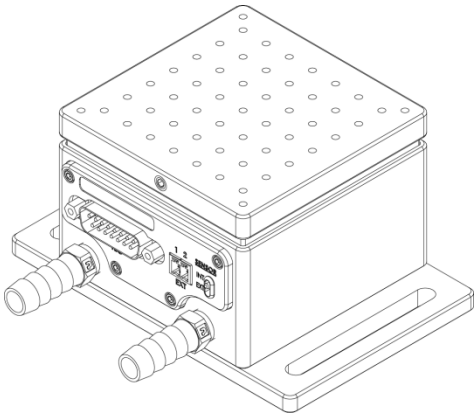
4.2" Adapter Plate, Top View
(p/n AP-01-4.2)



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



274 with Adapter Plate, Side View



274 Isometric View

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

The 274 contains no user-serviceable parts.

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

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