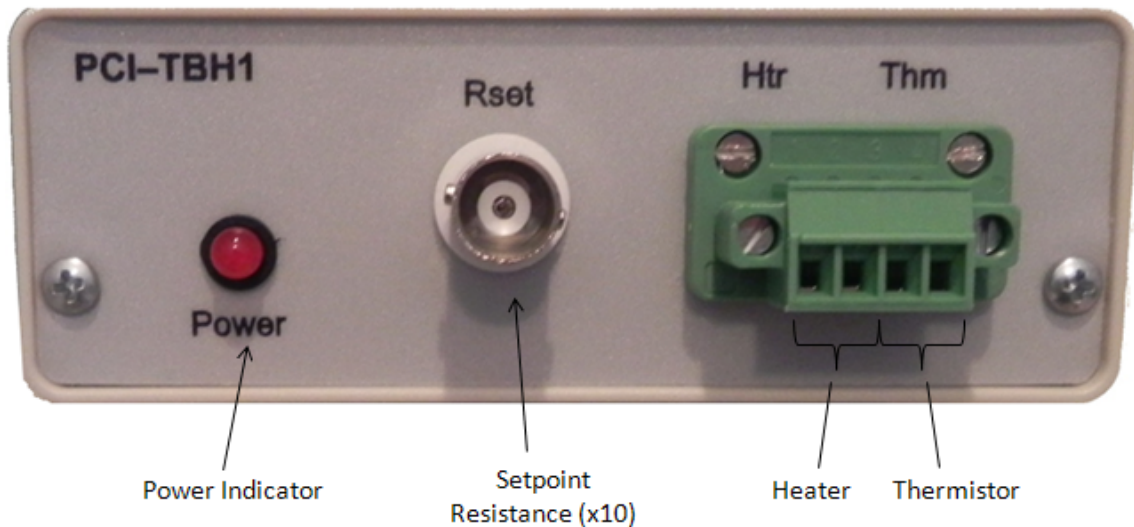


PCI-TBH1 Quick Start Guide

Package Contents: PCI-TBH1 Controller Unit (default factory set point = 35 °C)
24 VDC power supply and cord (U.S. 120 VAC)

PCI-TBH1 Heater Controller



Operation

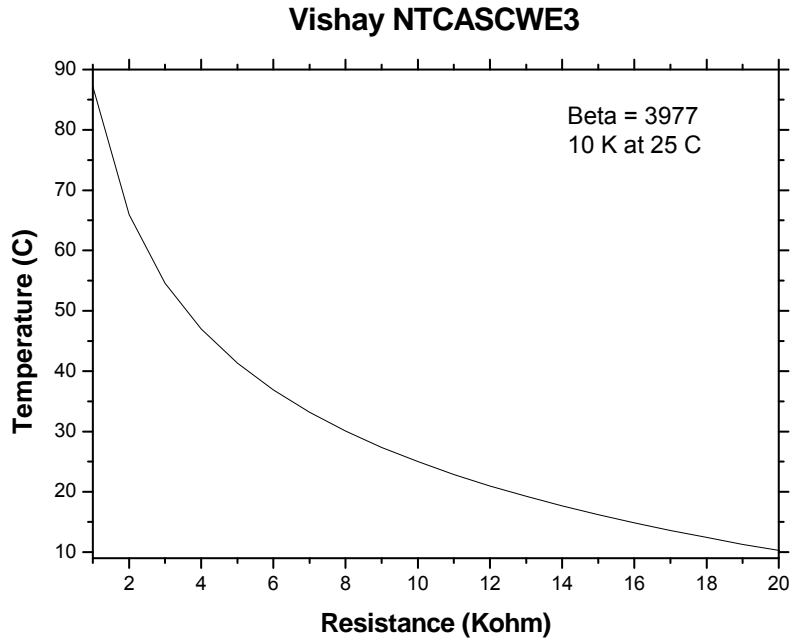
- 1) Supplied with the PCI-TBH1 is a 24 VDC power supply that plugs into a barrel jack on the rear panel, where the ON/OFF switch is also located. Use this power supply to power the controller, or any suitable 24 VDC power supply capable of at least 2.7A of DC current. The internal controller board is fused at 3A. Heater resistance should be no less than 9.5 ohm (maximum 60W heater power)!
- 2) Heater and thermistor (NPT type required) connections are via a front panel screw terminal block as shown in the photo above. Make sure to use the left two connection ports for the heater leads and the right two ports for the thermistor. Note that the screw terminal block can be removed from its base by loosening the retaining screws that hold it into the base, and pulling outward. Once connections are made, always ensure that the screw terminal is plugged securely back into the base, and tighten the retaining screws.
- 3) The central BNC connector is provided to measure the controller set point resistance. This BNC port provides a resistance that is 10x larger than the actual thermistor resistance (see detailed description below). The set point is adjusted via a potentiometer that is accessed via a hole in the top of the unit. Clockwise increases the set point (lower resistance), and counterclockwise reduces the set point (higher resistance).
- 4) To set the controller set point, power the unit off and disconnect the heater and thermistor connections. The set point cannot be adjusted properly if power is on, or if the heater and thermistor are connected. The relationship between the resistance measured at the front panel BNC connector (R_{SET}) and the resistance of the thermistor (R_t) at the set point is:

$$R_{SET} = R_t * 10$$

That is, the resistance measured at the front panel BNC is ten times the value of the thermistor resistance at the set point. For example, if a cell set point of 45C is desired the thermistor R vs T table below gives a value for Rt of 4.3 Kohm. Therefore, adjust R_{SET} to 4.3 x 10 = 43 Kohm. Again, make sure power is off and the heater/thermistor inputs are disconnected before adjusting the set point using R_{SET}.

The thermistors supplied with the system are Vishay part number NTCASCWE3103J, 10 Kohm resistance at 25C (available from Digikey as part number BC2389-ND). The beta value (B25/85) is 3977. Below is a table and graph of temperature vs. the thermistor resistance for this thermistor.

<u>R(K)</u>	<u>T(C)</u>
1.0	87.21
2.0	65.91
3.0	54.58
4.0	46.99
5.0	41.34
6.0	36.87
7.0	33.19
8.0	30.07
9.0	27.37
10.0	25.00
11.0	22.88
12.0	20.98
13.0	19.25
14.0	17.66
15.0	16.20
16.0	14.85
17.0	13.59
18.0	12.42
19.0	11.31
20.0	10.27



For more detailed conversions use the following relationship between thermistor resistance (Rt) and temperature:

$$T(K) = [(1/\beta)\ln(Rt/Rto) + 1/To]^{-1}$$

$$T(C) = T(K) - 273.15$$

where $\beta = 3977$, $Rto = 10$, $To = 298.15$ (K and C are Kelvin and Centigrade, respectively). Note that Rt and Rto must use the same units (either Kohm or ohm), but as they only appear as a ratio either unit can be used. If alternate thermistors are installed, use the appropriate relationship between the thermistor resistance and temperature to determine the set point.

Stabilization time depends on the set point temperature relative to ambient temperature, thermal conductivity of the load, heater power, and insulation characteristics. For the PCI-HC10m Herriott cell and a set point of 40C relative to ambient of 20C, using the standard 60W heater and 1/4" Si foam insulation, stabilization time is typically 8-10 minutes to $\pm 1C$, and 10-15 minutes to $\pm 0.15C$. Two thermistors are provided with the PCI-HC10m Herriott cell so that one can be monitored independently of the one used by the heater controller.

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