CRYO-TORR® TEMPERATURE INDICATOR

Overview

These instructions describe the installation and operation of the Cryo-Torr Temperature Indicator.

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Introduction

The Cryo-Torr Vacuum-Pump Temperature Indicator, part number 8043459G001 shown in Figure 1 on the following page, is used with Cryo-Torr high-vacuum pumps, to monitor cryopump operating temperatures. In cryopumps provided with a silicon diode sensor, the indicator is easily connected to the cryopump with an electrical cable. The digital readout is in Kelvin (K), with a system range from 9K to 320K. The indicator has two set points that are adjustable over this range. When the vacuum pump temperature reaches either setpoint, electrical contacts in the in-line 6-pin male connector on the rear panel can be used to activate indicators or to operate solenoid valves for controlling temperature-related functions. A pair of switches on the front panel permits momentary display of the two setpoints.

The Temperature Indicator can be used on a desktop or installed in an electronics rack using customer-supplied mounting hardware.

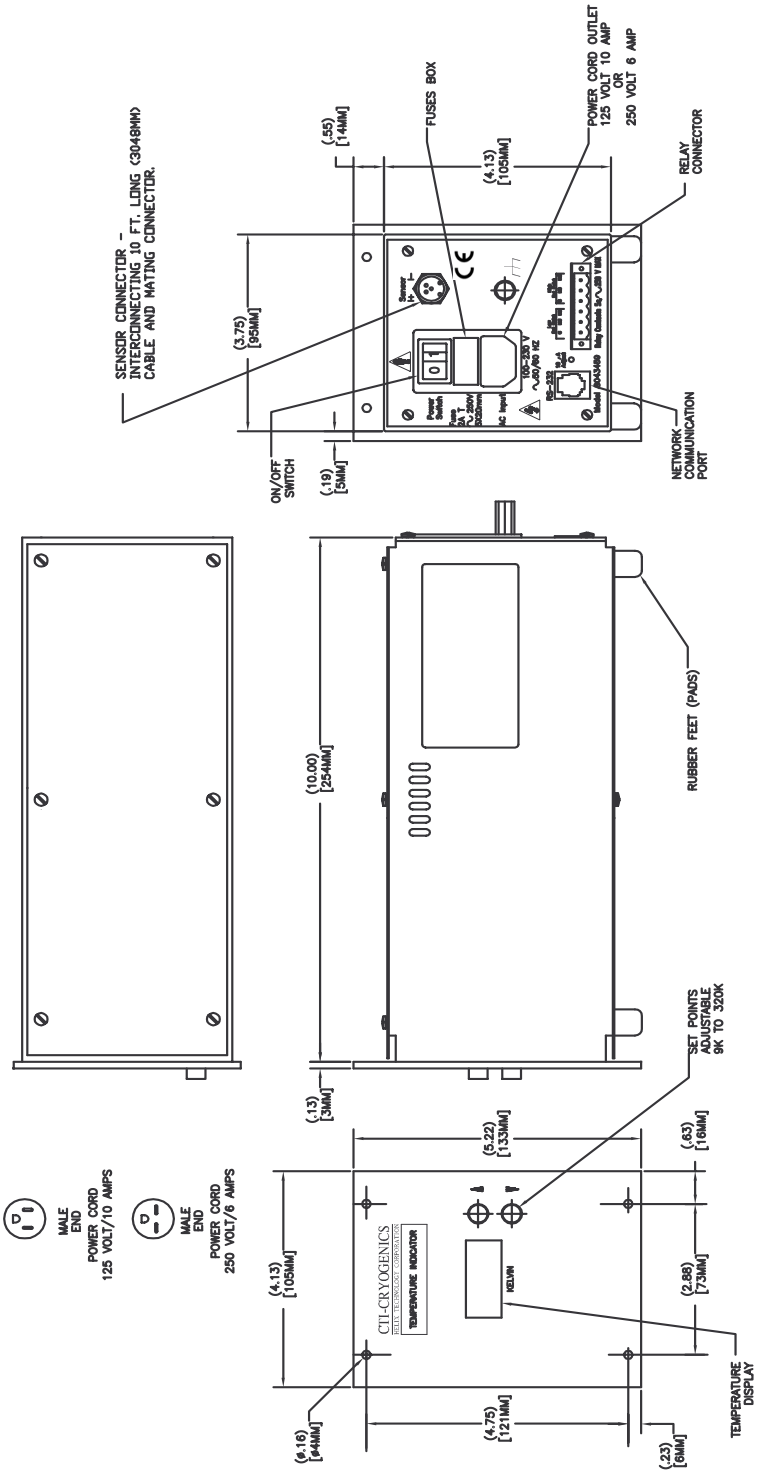

Figure 1: Cryo-Torr Temperature Indicator and Dimensions

Each Temperature Indicator is packaged with:

- 115VAC power cord - 7 ft. (2.13 m)
- 230VAC power cord - 7 ft. (2.13 m)
- Sensor cable (pump-to-temperature-indicator) - 10 ft. (3 m)
- Fuses (2)
- I/O communication cable (DB9 TO RJ11) - 7 ft. (2.13 m)
- Snap-on ferrite beads (2)
- Relay connector (In-line 6-pin female)
- Temperature indicator
- Copy of these instructions

Specifications

Electrical

100 - 230V, single phase (1ϕ), 50/60Hz (Nominal)

Two (2) 2A 250VAC fuses in the **POWER INPUT MODULE** on rear panel

Constant Current Output to Diode

10.0 - microampere (µA)

System Accuracy

10 - 27K: ± 2.5K

27 - 80K: ± 3.5K

80 - 90K: ± 4.5K

90 - 100K: ± 5.5K

100 - 320K: ± 2.5K

Readout Meter

Digital panel meter with temperature scale in Kelvin (K), range 9K to 320K, 100 microampere (µA) full scale.

Analog temperature readout is:

$$T_{C\ KELVIN} = 0.1125 \times V(mVDC)$$

Resolution

0.1K from 9 to 99.9K

1.0K from 100 to 450K

Alarm

Setpoints – Two (2) setpoints adjustable over 9K to 320K range, via front panel switches.

Output – Two relays - SPDT with 5.0A / 250V (max) (C, NO, NC) contacts.

RS-232 Interface

Output of temperature

External setting of alarm setpoints

Shipping Weight

5 pounds (11 Kg)

Input/Output Connections

- Sensor Connector (5-pin round female connector)

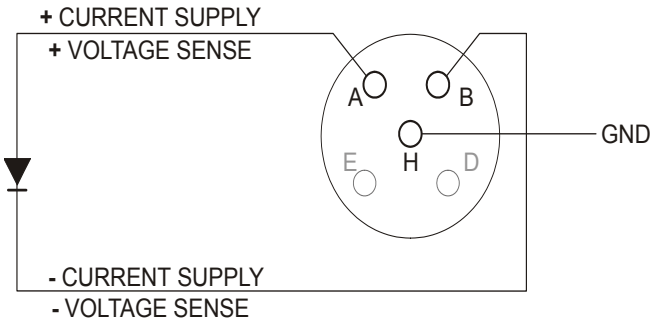

Figure 2: Sensor Connection Pinout

- RS-232 Communication Connector (RJ-11 connector)

Table 1: RS-232 Connections

BLK - Ground	GRN - Receive (In)
RED - Transmit (out)	YEL - (No Connection)

- Relay Alarm Output Connector (inline 6-pin male connector)

Table 2: Relay Connector Pin Assignments

Pin Number	Low Setpoint Relay 1	Pin Number	High Setpoint Relay 2
1	Common	4	Common
2	Normally Open (NO)	5	Normally Open (NO)
3	Normally Closed (NC)	6	Normally Closed (NC)

Installation

See Figure 3 for reference.

To install the electronics rack, do the following:

1. Remove the four pads from the bottom of the Temperature Indicator using a Phillips screwdriver.

2. Install the Temperature Indicator into the electronics rack using customer-supplied mounting hardware.

To install and connect the Temperature Indicator, do the following:

1. Connect the cryopump to the Temperature Indicator's **SENSOR** connector using the 10 ft. (3 m) interconnecting cord supplied with the indicator. If the supplied cord is too short, contact CTI-Cryogenics to order a longer cord.

2. Connect the Temperature Indicator to an appropriate power receptacle, using the correct power cord.

   Both 115V and 230V power cords are supplied with the unit, in the box. The unit has a universal power supply capable of operation from 85 to 264VAC, 50/60Hz, 5Watts. No switching is required to change the power cord.

3. Connect the ground stud on the Temperature Indicator to a suitable connection.

NOTE: *Perform Step 3 only when the power cord is connected to an ungrounded power supply.*

4. Wire the inline 6-pin female connector, supplied in the box, as shown in Step 3 of Input/Output Connections, to either the indicators or the solenoid valves as required.

5. Insert the inline 6-pin female connector into the male connector at the rear of the Temperature Indicator.

To use a remote connection:

- Connect an RS-232 cable (I/O communication cable) between the RS-232 connector on the Temperature Indicator and the host computer, using the cable supplied. See Figure 4 a picture of the cable. See Table 3 for the cable connection point.

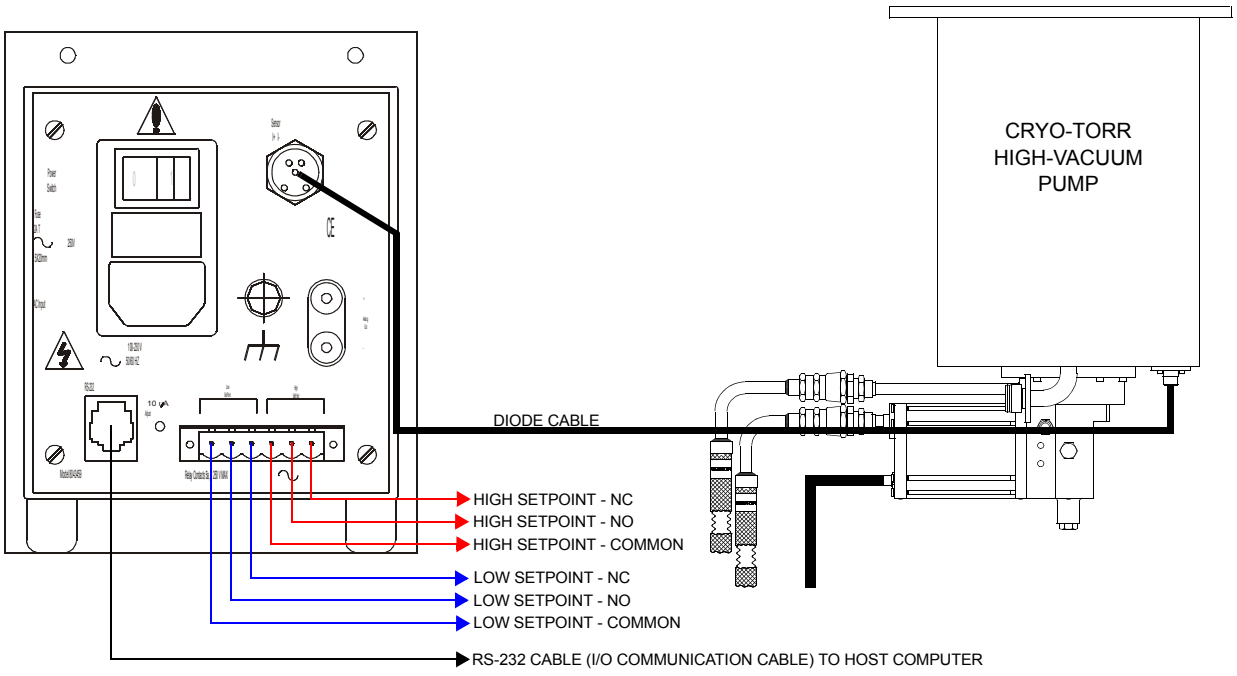

Figure 3: Temperature Indicator Installation

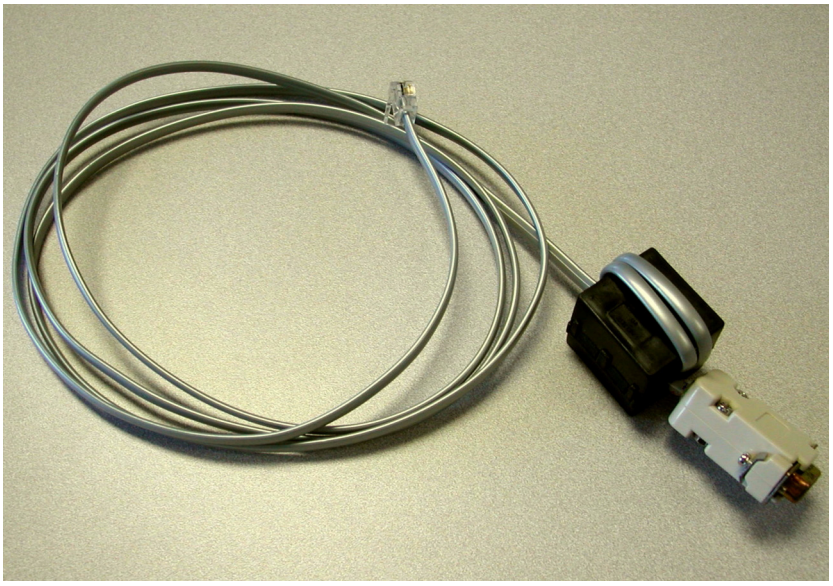

Figure 4: I/O Communication Cable for Remote Connections

Operation

To turn the power on:

- Set the main power rocker switch of the power module on the rear panel to (I) ON. The panel meter will display temperature in Kelvin.

Establishing Temperature Setpoints

Temperature setpoints control the operation of the relays within the Temperature Indicator. When the sensing diode inside the Cryo-Torr High-Vacuum Pump senses the temperature falls below the LOW setpoint temperature, power will be applied to the LOW SETPOINT RELAY. If the temperature is at or above the HIGH setpoint, power will be applied to the HIGH SETPOINT RELAY.

To set the temperature setpoints:

1. Press and release the UP arrow button to display the HIGH setpoint or press the DOWN arrow button to display the LOW setpoint.

2. Press and hold both UP and DOWN arrow buttons. The digital display flashes.

NOTE: *Pressing and holding the UP or DOWN arrow button causes the digital display value to change rapidly.*

3. Press the UP or DOWN arrow buttons to increase/decrease the temperature setpoint.
4. Release the arrow button after displaying the setpoint temperature.
5. Three seconds after you set the new setpoint, the setpoint is stored and displayed for two additional seconds. After the setpoint appears, the normal Cryo-Torr High-Vacuum Pump temperature appears.

To check the setpoint readout:

1. Operate the push button switches located on the right side of the front panel.
2. Press the bottom switch to display the LO setpoint reading on the meter.

   Or press the top switch to display the HI setpoint reading on the meter.

NOTE: *A display of **00.0** indicates an open sensor, and a display of 55.5 indicates a shorted sensor. Contact Helix Technology Corporation with the information in Appendix A - Customer Support Information.*

About the Relay Function

The NC (normally closed) relay contacts of the LO setpoint relay remain closed until the temperature of the sensor drops below the LO setpoint.

The NC contacts of the HI setpoint relay remain closed until the temperature of the sensor rises above the HI setpoint. Refer to Table 3.

Table 3: Relay Contact Truth Table

Temperature	HI-NC	HI-NO	LO-NC	LO-NO
Above HI Setpoint	Open	Closed	Closed	Open
Between Setpoints	Closed	Open	Closed	Open
Below LO Setpoint	Closed	Open	Open	Closed

Using the RS-232 Function

1. Insert the cable assembly receptacle into the RS-232 port located at the extreme left-hand side of the rear panel.
2. Set the computer to a baud rate of 9600, no parity, 8 data bits and 1 stop bit. Hardware flow control is not needed.
3. Communicating data to/from the Temperature Indicator:

Temperature Data

The Temperature Indicator transmits the current temperature reading to the host computer when a 'T' and carriage return <CR> are received.

The instrument responds to both upper-case and lower-case keystrokes.

Transmitting Setpoint Data

The Temperature Indicator accepts a new alarm setpoint value for the selected relay when the host computer transmits the following code:

S1N <CR>

in which:

- S1 indicates that the setpoint is for relay #1 (use S2 for relay #2)

Table 4: Setpoint Designations

S1	High Setpoint
S2	Low Setpoint

- N is the temperature setpoint in Kelvin (to tenths-of-a-degree resolution), with the least significant digit being the tenth's digit.
- <CR> is a carriage return.

Example: A setpoint value of 12.3K for relay #2 is transmitted to the Temperature Indicator as:

S2123 <CR>

Since the maximum range of the system is 300K, the largest alarm setpoint value that will be correctly interpreted is 3000.

Table 5: Default Setpoints

Low	20K
High	290K

Querying Setpoint Data

The Temperature Indicator transmits the current setpoint value for the selected relay when the host computer transmits the following query code:

S1 <CR> or S2 <CR>

as applicable.

To access the diagnostic subroutine:

1. Before applying power, **PRESS AND HOLD** the **DOWN** switch. Apply power and release the **DOWN** switch. The instrument will now enter the diagnostic subroutine and all eight segments of all readout decades will be displayed.

2. Press the **DOWN** switch again. The instrument will display the version of software in the instrument.

3. Press the **DOWN** switch once more to return the instrument to its normal display of temperature.

Troubleshooting

CAUTION

Equipment Damage

When checking diode or connections to diode, do not use a multimeter which could subject the diode to more than five milliamperes forward current, or more than 200 volts reverse bias. Excess current or voltage will permanently damage the diode.

Table 6: Troubleshooting

Fault	Possible Cause	Corrective Action
Panel meter fails to indicate a reading.	Power switch is off.	Turn switch on.
	Power cord not plugged in.	Plug in power cord
	Fuse blown on rear panel of indicator.	Replace the fuse.
	No power coming from power source.	Check the service fuses, circuit breakers, and wiring associated with power source and repair as needed.
	Defective interconnecting cable.	Check continuity and replace, if needed.
	Connections to the diode sensor are loose or disconnected.	Check the continuity at the cryopump connections pins 3 and 4. Repairs must only be made by a qualified technician.
	Polarity of diode is incorrect.	Check the polarity.
Solenoid valves or indicator are not operating at proper temperature in accordance with Table 3.	Defective relays or electronics.	Check to see if the proper signal is being provided by the electronics. Repair as required by a qualified technician.
Panel Meter displays a reading of 555.	Temperature diode in cryopump is shorted.	Check diode circuit, replace the diode, and/or replace the cryopump.

Table 6: Troubleshooting

Fault	Possible Cause	Corrective Action
Panel Meter displays a reading of 000.	Temperature diode in cry-opump is open.	Check diode circuit, replace the diode, and/or replace the cryopump.

Appendix A - Customer Support Information

Customer Support Center Locations

To locate a Customer Support Center near you, please visit our website ***www.brooks.com*** on the world wide web and select *CONTACT* on the home page.

Guaranteed Up-Time Support (GUTS)

You can reach Brooks Global Customer Support Teams around the world. For 24 hour, 7 day per week Guaranteed Up-Time Support (GUTS) dial the appropriate number listed in Table 1.

Table 1: Global Customer Support Numbers

North America	1 800-FOR-GUTS (800-367-4887)
Germany France UK	+49 1804-CALL-GUTS (1804-2255-4887)
Japan Helix Technology K.K. Yaskawa Brooks Automation, Inc.	+81-3-5767-3412 +81-45-478-7373
China	+86-21-5131-7066
Taiwan	+886-3-5525225
Korea	+82-31-288-2500
Singapore	+65-6464-1481

Product Information

Please have the following information available when calling so that we may assist you:

- Product Part Number
- Product Serial Number
- Product Application
- Specific Problem Area

- Hours of Operation
- Equipment Type
- Vacuum System Brand/Model/Date of Manufacture

E-mail

For your convenience, you may also e-mail us at:

tscallcenter@brooks.com