Quick Start Guide

240 Series Cryogenic Sensor Input Module



Lake Shore CRYOTRONICS

Safety Precautions

Observe these general safety precautions during all phases of instrument operation, service, and repair. Failure to comply with these precautions or with specific warnings in the user's manual violates safety standards of design, manufacture, and intended instrument use. Lake Shore Cryotronics, Inc. assumes no liability for customer failure to comply with these requirements.

The 240 Series input module protects the operator and surrounding area from electric shock or burn, mechanical hazards, excessive temperature, and spread of fire from the instrument. Environmental conditions outside of the conditions below may pose a hazard to the operator and surrounding area.

- Indoor use
- Altitude to 2000 m
- Temperature for safe operation: -20 °C to 50 °C
- Maximum relative humidity: 95% non-condensing
- Power supply voltage fluctuations not to exceed ±10% of the nominal voltage
- Overvoltage category II
- Pollution degree 2
- IP20: not protected against harmful ingress of water

Ground the instrument
To minimize shock hazard, the instrument is equipped with a grounded connection to the DIN rail. Connect the DIN rail to an electrical ground.

Do not operate in an explosive atmosphere
Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not substitute parts or modify instrument
Do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an authorized Lake Shore Cryotronics, Inc. representative for service and repair to ensure that safety features are maintained.

Cleaning
Do not submerge instrument. Clean only with a damp cloth, exterior only.

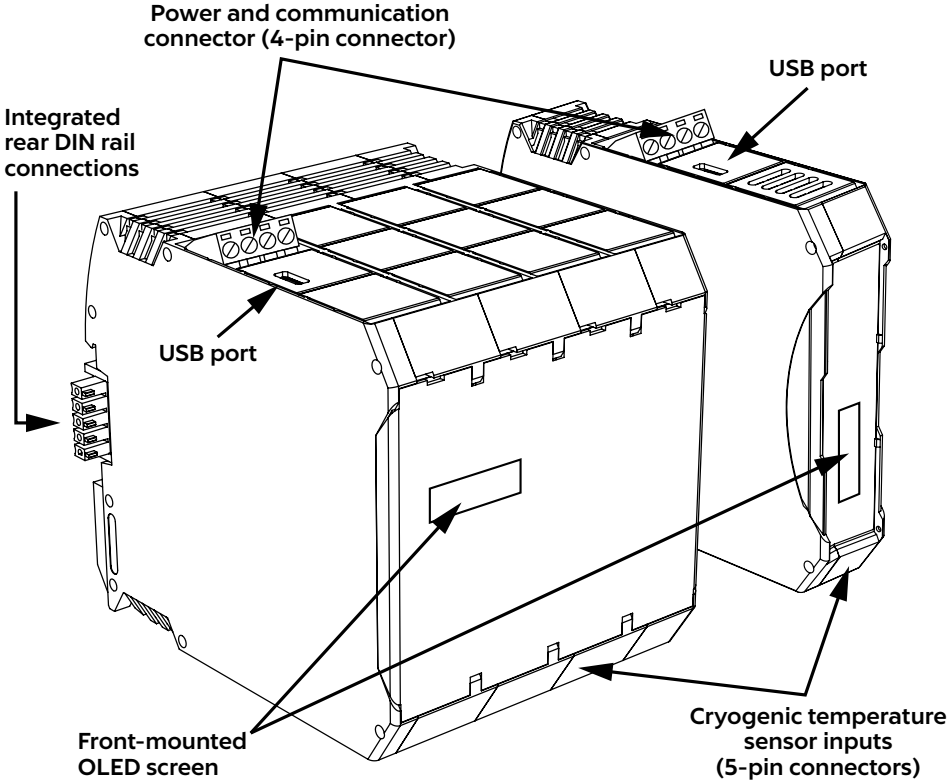
Installation
When installing the instrument, ensure it is mounted securely on the DIN rail.

Improper Use
If the instrument is used in a manner that is not specified by Lake Shore, the safety protections provided by the instrument are no longer guaranteed, and may be impaired.

For more safety information, refer to the Model 240 user's manual: https://www.lakeshore.com/240manual.

Introduction

This guide provides basic information for getting started with your input modules. For further information, please see the Model 240 user's manual.



Unpacking

1. Inspect shipping containers for external damage before opening them.
2. Photograph any container that has significant damage before opening it.
3. Inspect all items for both visible and hidden damage that occurred during shipment. If there is visible damage to the contents of the container, contact the shipping company and Lake Shore immediately.
   NOTE: Procedures vary slightly with shipping companies. Keep all damaged shipping materials and contents until instructed to either return or discard them.
4. Open the shipping container and keep the container and shipping materials until all contents have been accounted for.

Packing list

Items included with Model 240 input module:

- 240 Series input module
- 2 or 8 sensor input connectors, 5-pin terminal plug connectors
- 1 power and communication connector, 4-pin terminal plug connector
- 1 or 4 DIN rail backplane connector, 5-pin 35 mm DIN rail connectors

  NOTE: For further information, see section 3.2.1 of the Model 240 user's manual.

Power/Communication Connection

To minimize shock hazard, the instrument is equipped with a grounded connection to the DIN rail. Connect the DIN rail to an electrical ground.

Power

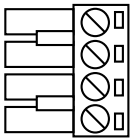
The typical power supply is 24 VDC, but can range from 21.6 VDC to 26.4 VDC. The power supply should be capable of supplying at least 100 mA per module.

RS-485/PROFIBUS interface

The RS-485/PROFIBUS-DP communication integrates with distributed PLC-based control architectures.

For non-PROFIBUS operation, the polarity of the A and B terminals should follow the plus and minus sign conventions of the host controller RS-485 port connection. Disregard the A/B letter designations, which are a PROFIBUS-specific notation.





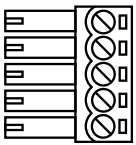
PWR+	DC power supply positive
PWR-	DC power supply return
B+	PROFIBUS signal
A-	PROFIBUS signal

Sensor Input Connection

For best results, voltage leads (V+ and V-) and current leads (I+ and I-) should be twisted together. The twisted pairs of voltage and current leads should then be covered with a braided or foil shield that is connected to the shield pin of the instrument. This type of cable is available through local electronics suppliers. Instrument specifications are given assuming 3 m (10 ft) of sensor cable. Longer cables can be used, but environmental conditions may degrade accuracy and noise specifications.

The sensor inputs are isolated from earth ground to reduce noise pickup. The shield should not be connected to earth ground at the modules. One shield should be connected to an earth ground near the sensors. Connecting at more than one point will cause a ground loop, which adds noise to the measurement.





I+	Positive current
V+	Positive voltage
SH	Shield
V-	Negative voltage
I-	Negative current

NOTE: Make sure to properly seat connectors. When removing a sensor, use a screwdriver to gently remove the connector.

USB Connection

MeasureLINK™ utility

Lake Shore provides a utility called MeasureLINK™, which makes loading temperature curves into the Model 240 a very simple process. The program configures the module and copies curves from formatted files into the Model 240.

Configure the USB/PC connection

The Model 240 is fully-configurable through direct USB connection.
NOTE: After configuring the USB, disconnect it from the computer before beginning PLC communication.

Physical Installation

The 240 Series input module has been specifically designed to mount on a DIN rail. To minimize shock hazard, the instrument is equipped with a grounded connection to the DIN rail. Mount the input module vertically, and connect the DIN rail to an electrical ground. If the input module is mounted in an equipment rack or enclosure, ensure that the ambient temperature does not exceed the instrument rating.
NOTE: For best noise and accuracy performance, install the input module in a grounded metallic enclosure.

Power and RS-485 connections may be shared between modules by using the optional backplane connectors supplied with the module.

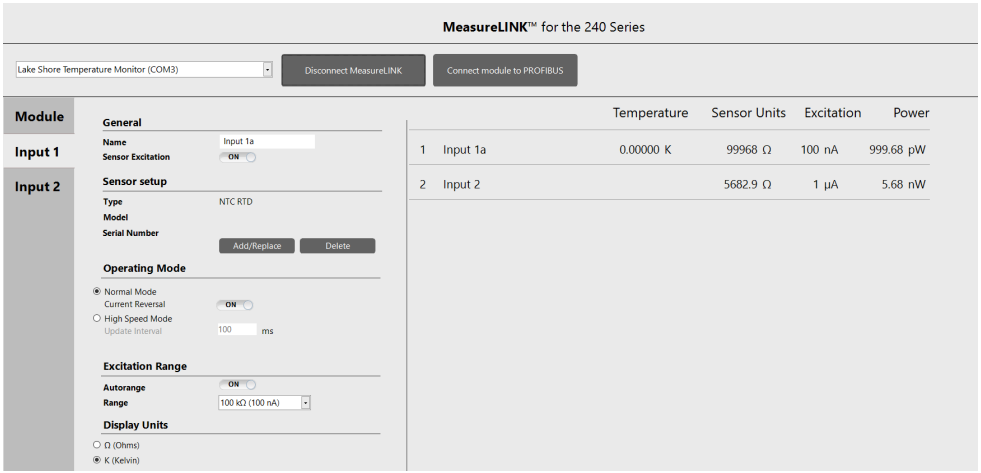


Startup

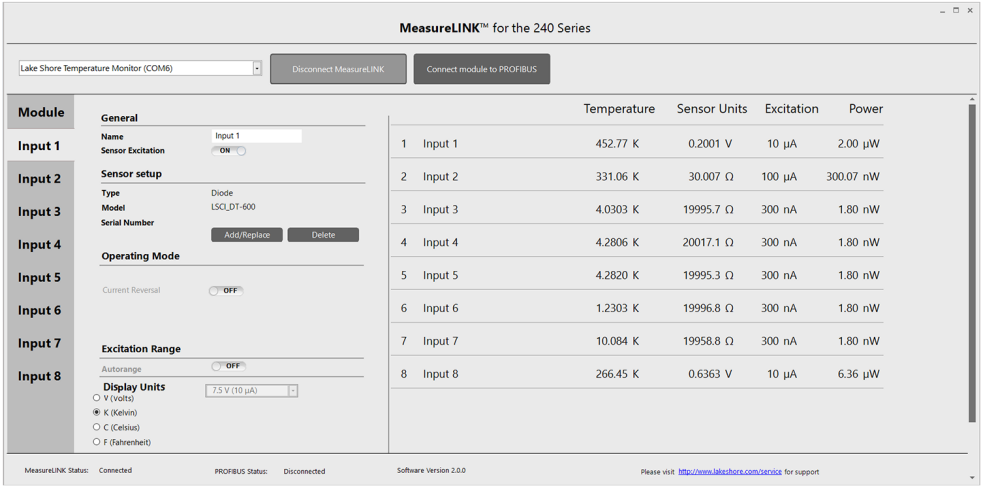
Once you have placed the Model 240 in its intended location, you can begin setting up the instrument. The steps that follow will take you through to displaying measurements. This is just the beginning of what is possible with the Model 240. For additional features, please see the Model 240 user's manual.

Basic operation

1. Connect a power adapter to the input module.
2. Connect the USB connector to the computer using a USB cable.
3. Install and run the MeasureLINK™ utility.
4. Select the input module from the drop down menu and click **Connect**.
5. Click the Input at the left of the screen to configure the sensor settings.



6. Turn Sensor Excitation **ON**. (Turn Sensor Excitation off to disable any unused inputs.)
7. Load the sensor calibration file (under Sensor setup) that matches the sensor by navigating to the appropriate file.



- If you have a custom calibration curve to load, choose Custom Curve and load your file (the Model 240 supports the .340 file format).
- If a sensor with a standard curve is connected, choose Standard Curve and select the curve from the drop down menu.
- If you aren't using a curve, the module will continue to monitor sensor units.

	Type of sensor
Custom curve	Cernox®
Standard curve	Platinum/Diode
No curve	Simulated

8. Once the curve is loaded, rename the Input Label (if desired).
9. Under Operating mode, select High accuracy or High speed.
   NOTE: The Current Reversal option is available if a resistive sensor is connected, and the High accuracy mode is selected.
   NOTE: High speed ID is only available for the Model 240-2P.
10. Under Reporting units, select either Sensor units or a temperature unit.
11. Live readings from your connected sensors should now be displayed at the right of the screen, as well as on the front OLED display of the 240 Series input module.
12. Click **Module** to go to the Module Settings screen, and set the PROFIBUS address.
    NOTE: For further information on communication settings, see section 4.3.3.2 of the Model 240 user's manual.
13. Your module should now be configured to respond to PROFIBUS requests, and you may disconnect the Model 240 by clicking the **Disconnect** button.

Evaluation Kit

The evaluation kit includes two unique accessories for the 240 Series input module that will help simulate a live sensor connection if one is not readily available for your evaluation testing, which are described below:

- Sensor simulator
- Fixed resistor board



Sensor simulator

A box containing a trimpot (variable resistor) that is similar to the Cernox® temperature range, to be used as a rough approximation of these sensors. This product can be useful if you'd like to see how the 240 Series input module handles communicating and displaying a particular temperature range, or if you'd like to see how the 240 Series input module autoranges. Follow these steps to use the sensor simulator:

1. Connect the sensor simulator to the desired input of the 240 Series input module using the pluggable connector.
2. In MeasureLINK™, choose the correct input.
3. Under Sensor setup, select Standard Curve and pick Sensor Simulator – NTC from the drop down list.
4. Make any other changes to the input configuration needed for your application, and then disconnect from MeasureLINK™.
5. Adjust the dial to change the temperature to coincide with the markings on the sensor simulator box.

NOTE: The accuracy rating of the trimpot is 10%, so the measured resistance and temperature value may not align exactly with the markings on the dial. Please do not use the sensor simulator as a method for verifying accuracy of the 240 Series input module.

Fixed resistor board

A small PCB containing two different fixed resistors that correspond with an arbitrary Cernox® sensor at approximately 1.8 K and a 100 Ω platinum sensor at approximately 65 K. The evaluation kit contains enough of these boards for both the 2 and 8 input modules included in the kit so that valid readings can be easily obtained on all inputs. Follow these steps to use the fixed resistor board:

1. Insert one of the fixed resistor boards into one of the 5-pin sensor input connectors provided with the 240 Series input module. Locate the board so that the switch is on the same side as the screw heads on the terminal connector.
2. Screw down the terminal connections so that the terminals contact the metal traces on the fingers of the fixed resistor board.
   NOTE: The fingers can be fragile. Please handle the assembled set by the terminal connector when connecting and disconnecting to the 240 Series input module.
3. Plug the terminal connector into the desired input of the 240 Series input module. The switch should face toward the front of the module.
4. In MeasureLINK™, choose the correct input.
5. Under Sensor Setup, select the sensor you wish to simulate from the drop down list under Standard Curve:
   - For Cernox® reading 1.8K, choose Sensor Simulator – NTC
   - For Platinum reading 65 K, choose LSCI PT-100
6. Make any other changes to the input configuration needed for your application, and then disconnect from MeasureLINK™.
7. Set the switch on the fixed resistor board to CERNOX if you loaded the Sensor Simulator – NTC temperature curve. Set the switch to PLATINUM if you selected the LSCI PT-100 curve instead.
   NOTE: If the switch is set to PLATINUM when the Sensor Simulator – NTC curve is loaded, the temperature displayed will be approximately 400 K. If the switch is set to CERNOX when the LSCI PT-100 curve is loaded, the input module will report an S.Over error since the resistance value is greater than the 1 kW limit for a PTC sensor.

Contacting Lake Shore

The Lake Shore Technical Support Department is staffed Monday through Friday between the hours of 8:00 a.m. and 5:00 p.m. EST, excluding holidays and company shut down days: https://www.lakeshore.com/support/.

The Lake Shore Forum is also a great place to look for solutions, to post issues, and to share successes: https://forums.lakeshore.com/

For further documentation and information, please see https://www.lakeshore.com/240.

Lake Shore Technical Support

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