Innovative Solutions in Cryogenic Instrumentation

Temperature Monitor

Model 18-I

Eight input channels with Ethernet connectivity

The Cryo-con Model 18I monitor is the most compact and flexible temperature monitor on the market. Virtually any temperature sensor from any manufacturer can be selected by a single setting of the front panel. Additionally, custom or specially calibrated sensors require only a simple setup procedure. Unique features include: Industrial grade security, Modbus industrial protocol, User programmability, Power-over-Ethernet, Internal Data Logging, Ethernet connectivity and a large easy to read display.

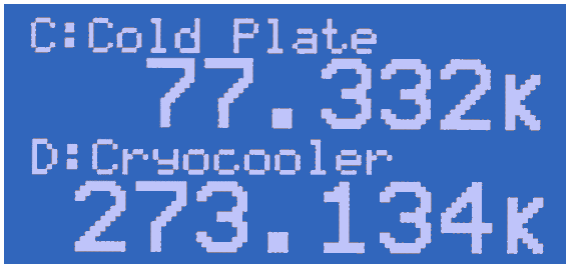
- **Eight multipurpose input channels support Diode, Platinum RTD and most cryogenic NTC temperature sensors.**
- **Operation from 2.0K to over 1500K with an appropriate sensor.**
- **Continuous data logging into internal 2GB Non-Volatile memory.**
- **Two large, dry-contact relay outputs.**
- **Flexible input power: Power-Over-Ethernet or 7.5-24V AC/DC.**
- **Industrial grade security: Configurable firewall, HTTPS encryption and authentication.**
- **Modbus industrial protocol supports direct connection to most PLCs.**
- **User programmable.**
- **Built-in web server.**
- **E-mail on a selected alarm conditions.**
- **Remote interfaces: 100/10 Ethernet and RS-232. Optional interfaces include GPIB and USB. LabView™ drivers available for all interfaces.**

Inputs

The Model 18I has eight identical, independent input channels. All are capable of supporting the same wide range of sensor types. Inputs are not scanned or multiplexed.

Easy to use

The monitor's front panel consists of a large, bright TFT-LCD display a 4-key keypad, an audio alarm and three status LEDs.



Several display formats may be selected. Up to eight temperature readings may be displayed simultaneously or two channels with input names and temperature shown in a large easy to read font. Additional screens include temperature readings along with relay and alarm status information.

A single key press takes the screen to a menu tree where most features and functions of the instrument can be configured.

Input Flexibility

Silicon Diode sensors are supported over their full temperature range by using 10uA constant-current DC excitation.

Positive Temperature Coefficient (PTC) resistor sensors including Platinum and CLTS RTDs use constant-current, AC excitation.

Automatic constant-voltage AC excitation is used to provide robust support for cryogenic Negative Temperature Coefficient (NTC) sensors including **Ruthenium-oxide**, **Carbon-Glass**, **Cernox™**, **Carbon-Ceramic** and several others.

Model 18I Supported Sensors		
	Temperature Range	**Example Sensors**
Diode	1.4 - 500K	Cryo-con S900 SI-440, 430, 410 Lakeshore DT-670, 470
Platinum RTD	14 - 1200K	Cryo-con CP-100 Cryo-con GP-100 Cryo-con XP-100 Cryo-con XP-1K
Rhodium-Iron	1.4 - 800K	Oxford PHZ 0002
Cernox™	1.0K - 325K	Lakeshore, all types
Carbon-Ceramic	1.0K - 300K	TMi-A1
CLTS	4K to 300K	Vishay CLTS-2B
Ruthenium Oxide	1.0K - 200K	Cryo-con R500

Input Power

The monitor is shipped with a 12VDC@1A external power supply but may be powered by any source providing 7.5 to 24 Volts AC or DC.

The IEEE 802.3af Power-over-Ethernet (PoE) specification is also supported, allowing the Model 18I to be powered by it's local area network connection. Since PoE provides both instrument power and data over a single cable, remote data acquisition and high channel count systems can be simplified. PoE requires the use of a powered hub or power injector. Ethernet cables up to 300 meters may then be used.

Input Specifications				
	Diode sensors	**PTC resistor sensors**	**NTC Resistor Sensors Constant-Current**	**NTC resistor sensors Constant-Voltage**
Input Configuration	Constant-Current DC	Constant-Current AC	Constant-Current DC Resistance Bridge	Autoranging Constant-Voltage AC Resistance Bridge
Input Range	0.1V - 2.25V	1.0mA: 0.1 - 750Ω 100µA: 1.0 - 7.5KΩ	100K - 225KΩ	Minimum: 0.5Ω Maximum: 1.0MΩ
Accuracy: % Rdg ± % Range	0.004% ± 80µV	0.01% + 0.0005%	0.005% ± 25Ω	14 to 30K: 0.05% + 0.05% 0.5 to 2M: 0.15% + 0.15%
Resolution: % Range	10µV	0.0003%	0.00004%	0.0003%
Excitation	10µA DC	1.0mA, 100µA	10µA DC	10mV 2.5mA to 150nA

Alarms and Relays

Two 10.0A dry-contact relay outputs are available that can be asserted based on temperature setpoints from user selected input channels.

Visual, remote and audible alarms are supported. Each may be programmed to assert or clear based on temperature setpoints.

Alarms may be latched. These are asserted on an alarm condition and will remain asserted until cleared by the user.

Remote Control

Standard Remote Interfaces include 100/10 Ethernet and RS-232.

Monitors connect directly to any **Ethernet Local-Area-Network** (LAN).

The **TCP** and **UDP** data port servers bring fast Ethernet connectivity to data acquisition software including LabView™.

Remote interfaces implement an IEEE-488.2 SCPI compliant remote command language that is easy read and learn.

LabView™ drivers are available for all remote interfaces.

Security

The Model 18I provides industrial grade security.

A built-in user configurable firewall protects the instrument from any unauthorized transactions.

HTTP Digest access authentication protects the built-in web server. HTTPS provides authenticated, encrypted communication.

Modbus

Modbus is an open industrial automation protocol that allows the Model 18I to interface directly to most Programmable Logic Controllers using the TCP or RS232 interface.

Enhanced Web Server

Using secure Ethernet **HTTPS** protocol, the monitor's **embedded web server** provides complete instrument control without the need for external software.

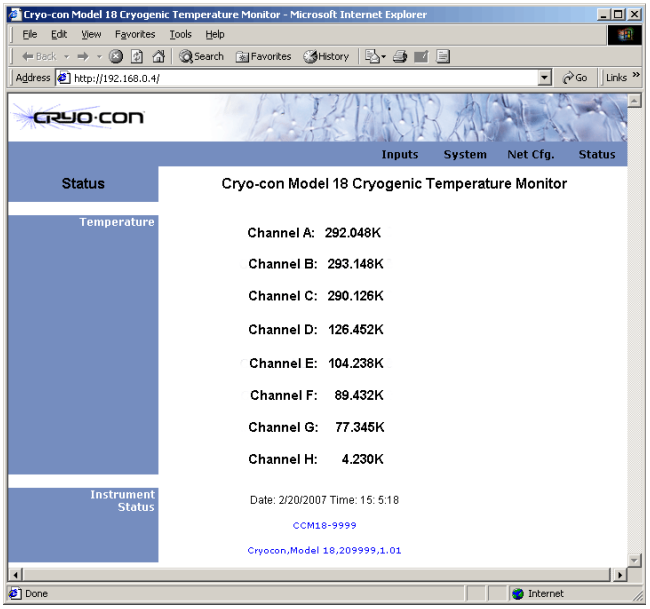
- Instrument status can be viewed and configured from any web browser.
- Custom sensor calibration tables and data-logging files may be uploaded or downloaded.
- Instrument firmware updates may be installed. Updates are free of charge and generally include enhancements and new features.
- User scripts may be entered, debugged and run within the web browser window.

User Programmable

The Model 18I can be programmed by the user using the Python scripting language.

All functions of the instrument are available to the programming interface and are executed as standard remote commands.

Python is a robust scripting language that includes conditional execution, loops and time delays. The full run-time library is available to the user.



Data logging

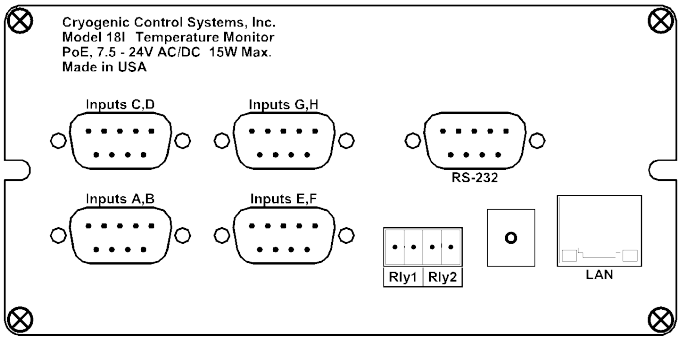
Data Logging is performed by continuously recording temperature and status to an internal 2-Gigabyte memory buffer. Data is time stamped so that the actual time of an event can be determined. Non-volatile memory is used so that data will survive a power failure.

Ordering Information

Part Number	Description
Model 18I	Eight-channel monitor. Includes 12VDC external power supply.
4001-003	Single Power-over-Ethernet Power injector.
4001-002	IEEE-488.2 (GPIB) Option. Field installable.
4001-001	USB 2.0 Option. Serial Port Emulation. Field installable.

Rear panel connections

- **Input Connectors:** Four DB-9 recepticals provide 4-wire measurement for two sensors each. The Model 18I has four connectors.
- **LAN**: Standard RJ-45 Ethernet connector. Power-over-Ethernet connection, GPIB Option.
- **Power input:** 7.5 to 24 V AC/DC.
- **RS-232:** DB9 plug. Also used for USB option connection.



Specifications

Input Channels

The Model 18I has eight input channels. All are identical and independent, each capable of supporting a wide range of sensor types.

Sensor Connection: 4-wire differential. DB9 Connectors.
Sensor Types: See Supported Sensor Table.
Sensor Selection: Front Panel or remote interface.
Input Configurations: See input specifications table.
Excitation Modes: Constant-Current or Constant-Voltage.
AC Excitation Frequency: 1.625Hz bipolar square wave.
Voltage Excitations: 100mV to 10mV. Minimum excitation current is 150nA, maximum is 2.5mA.
Sample Rate: 7.5Hz per channel.
Digital Resolution: 24 bits.
Measurement Accuracy: See input specifications table.
Measurement Drift: 25ppm/°C.
Isolation:Input channels are not isolated.
Measurement Filter: 0.5, 1, 2, 4, 8, 16, 32 and 64 Seconds.
Calibration Curves: Built-in curves for industry standard sensors plus eight user curves with up to 200 entries each. Interpolation is performed using a Cubic Spline.

User Interface

Display Type: Graphics TFT LCD, 4mm and 8mm character height.
Number of Inputs Displayed: Up to eight.
Keypad: Sealed Silicon Rubber.
Temperature Display: Six significant digits, autoranged.
Display Update Rate: 0.5 Seconds.
Display Units: K, C, F or native sensor units.
Display Resolution: Up to seven significant digits.

Data Logging

Time stamped temperature data can be logged into an internal 2-Gigabyte buffer. Memory is non-volatile and will retain valid data during loss of power. All eight input channel temperatures are recorded and time stamped.

Status Outputs

Audible and Visual Alarms: Independent audible, remote and visual alarms. Alarms can be latched.
Relays: Two dry-contact relays. N.O. contacts available. Contact ratings: 10A@125VAC or 5A@30VDC.

User Programs

The instrument is programmed using the Python 2.76 scripting language. Instrument interface implemented using standard SCPI remote commands. Language documentation available at python.org. Full python run-time library.

Remote Interfaces

Maximum reading rate for all interfaces is >40 rdg/s.

Ethernet: Connects to any 100/10 Ethernet Local Area Network. Electrically isolated. **TCP** and **UDP** servers provide remote control by using an ASCII command language. **HTTP** provides built-in web server. **SMTP** sends e-mail.
RS-232: Standard null modem. Data rates are 9600, 19,200, 38,400 and 57,200 Baud. Connector is a DB-9 plug.
IEEE-488.2 (GPIB): External Option, field installable.
USB 2.0: External option, field installable. Serial port emulation.
Programming Language: IEEE-488.2 SCPI compatible.
Modbus: Full implementation of the open Modbus industrial automation protocol.
LabVIEW™ drivers available for all interfaces.

General

Ambient Temperature: 25°C ± 5°C for specified accuracy.
Mechanical: 5.6"W x 2.9"H x 8.8"D.
Weight: 3.5 Lbs.
Power Requirement: IEEE-802.3at Power-Over-Ethernet (requires powered hub or injector) or 5 - 24V AC/DC. (External power supply included) 10VA.
AC Power Switch: Front panel.
Conformity: European CE certified.
Calibration: NIST traceable.

Contact Information

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