

Cryogenic Temperature Monitor

Model 18C

Eight input channels with Ethernet connectivity

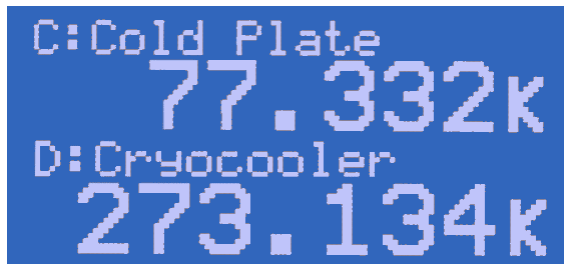
The Model 18C is the most compact and flexible eight channel cryogenic temperature monitor on the market. Virtually any cryogenic temperature sensor from any manufacturer can be selected by a single setting of the front panel. Additionally, custom or specially calibrated sensors require only a simple setup procedure. Unique features include: Low cost per channel, Power-over-Ethernet, Internal Data Logging, Ethernet connectivity, a large easy to read display and extensive applications software.



- Eight multipurpose input channels support Diode, Platinum RTD and most cryogenic NTC temperature sensors. Thermocouple inputs are optional.
- Operation from 250mK to over 1500K with an appropriate sensor. Constant-Voltage, AC excitation of resistive sensors minimizes errors and extends their useful temperature range.
- Continuous data logging into internal Non-Volatile memory.
- Two dry-contact relay outputs.
- Flexible input power: Power-Over-Ethernet or 7.5-24V AC/DC.
- Built-in web server. Temperature monitoring and instrument configuration can be performed using any web browser.
- Ethernet TCP and UDP servers for complete control using a simple remote command language.
- SMTP interface sends e-mail on a selected alarm condition.
- Remote interfaces include 100/10 Ethernet and RS-232. USB 2.0 and IEEE-488.2 (GPIB) are optional. LabView™ drivers available for all interfaces.



Easy to use: The Model 18C front panel consists of a large, bright TFT-LCD display and a 4-key keypad. Most features and functions can be accessed via this simple and intuitive menu driven interface.



All eight temperature readings can be displayed simultaneously or two channels with large easy to read fonts.

The status of built-in alarms and relays is indicated by LEDs located below the display.

Flexible Inputs

The Model 18C has eight identical and independent input channels, each of which is capable of supporting a wide range of sensor types.

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 **Rhodium-Iron** RTDs use constant-current, AC excitation. Platinum RTD sensors have built-in DIN standard calibration curves that have been extended to 14K for cryogenic use. Lower temperature use is possible with custom calibrations.

Auto-ranged, 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, Germanium** and several others.

Thermocouple sensors are supported by using an optional dual thermocouple module. This module plugs into any of the Model 18C's input channels. It is powered by the instrument to provide amplification, cold-junction compensation and connection to copper. Up to eight thermocouples can be connected to a single instrument.

Conversion of a sensor reading into temperature is performed by using a **cubic spline interpolation** algorithm. In addition to providing higher accuracy than conventional linear interpolation, the spline function eliminates discontinuities during temperature ramps or sweeps.

Model 18C Supported Sensors		
	Temperature Range	Example Sensors
Diode	1.4 - 500K	Cryo-con S900, S800 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
Germanium	250mK - 100K	Lakeshore GR-200A
Carbon Glass	1.4 - 325K	Lakeshore CGR-1-500
Cernox™	250mK - 325K	Lakeshore, all types
Carbon-Ceramic	250mK - 300K	TMi-A1
Ruthenium Oxide	250mK - 200K	Cryo-con R400 Cryo-con R500
Thermocouple	1.4 to 1500K	All thermocouple types.

Input Specifications					
	Diode sensors	PTC resistor sensors	NTC Resistor Sensors Constant-Current	NTC resistor sensors Constant-Voltage	Thermocouples (optional)
Input Configuration	Constant-Current DC	Constant-Current AC	Constant-Current DC Resistance Bridge	Autoranging Constant-Voltage AC Resistance Bridge	DC voltage
Input Range	0.1V - 2.25V	1.0mA: 0.1 - 750Ω 100μA: 1.0 - 7.5KΩ 10μA: 10 - 75KΩ	100K - 225KΩ	Minimum: 0.5Ω Maximum: 2.0MΩ	± 70mV
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%	0.05%
Resolution: % Range	10μV	0.0003%	0.00004%	0.0003%	0.0003%
Excitation	10μA DC	1.0mA, 100μA, 10μA	10μA DC	100mV, 10mV 2.5mA to 150nA continuously variable	N/A

Input Power The Model 18C 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 18C 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.

Data logging is performed by continuously recording temperature and status to an internal circular 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. The Model 18C will log 800 samples. Each sample includes readings for all eight channels.

Alarms and Relays

Two 5A dry-contact relay outputs are available that can be asserted based on temperature setpoints from user selected input channels. These relays are large enough to switch most cryogenic valves.

The Model 18C supports visual, remote and audible alarms. Each may be programmed to assert or clear based on temperature setpoints.

Remote Control

Standard Remote Interfaces include 100/10 Ethernet and RS-232. IEEE-488.2 (GPIB) and USB are optional.

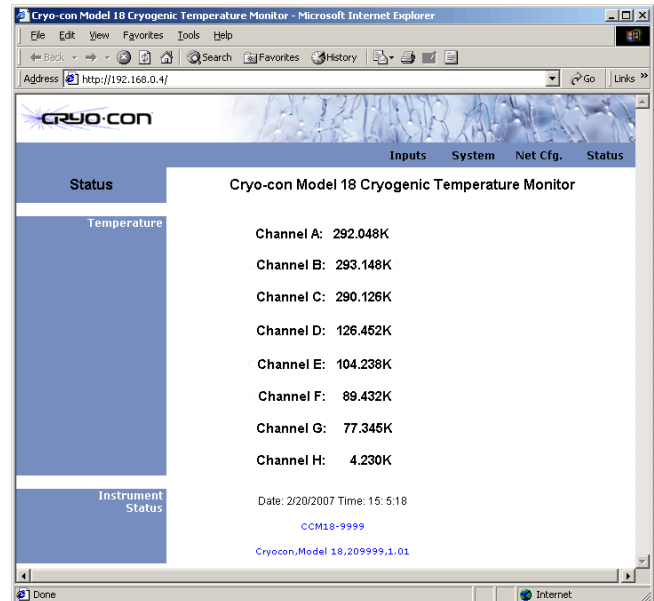
The Model 18C connects directly to any **100/10 Ethernet Local-Area-Network (LAN)**.

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

Using the **SMTP** protocol, the monitor will send e-mail based on selected alarm conditions. E-mail is completely configured by using the web page interface.

An **IEEE-488.2 GPIB** interface is optional and may be field installed at any time. The option consists of an external module that is configured by the Model 18C. A USB 2.0 serial port emulator option is also available.

Using the Ethernet **HTTP** protocol, the monitor's **embedded web server** allows the instrument to be viewed and configured from any web browser.



Remote interfaces implement an IEEE-488.2 SCPI compliant remote command language that is easy to learn and easy to read. This language is identical across all Cryo-con products to ensure that your investment in system software is always protected.

LabView™ drivers are available for all remote interfaces.

Firmware updates

Full instrument firmware updates may be installed by using the Ethernet connection. Updates are free of charge and generally include enhancements and new features.

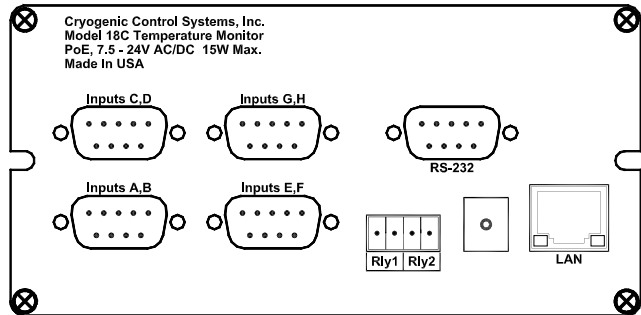
Utility Software: Utility software is provided that connects any Windows based personal computer to the Model 18C via any of its remote interfaces. This software provides a graphical control panel that greatly simplifies instrument setup and configuration.

Ordering Information

Part Number	Description
Model 18C	Eight-channel monitor. Includes 12VDC external power supply.
4039-005	Dual thermocouple Input Module. Field installable. Supports all thermocouple types.
4001-003	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. Also used for thermocouple option connection.
- **LAN:** Standard RJ-45 Ethernet connector with built-in connection and activity LEDs. 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

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.

Input Channels

There are eight input channels, each of which may be independently configured for any of the supported sensor types.

- Sensor Connection:** 4-wire differential. DB9 Connectors.
- Thermocouple Connection:** External option. Field installable.
- 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 and 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:** 15ppm/°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.

Data Logging

Time stamped temperature data can be logged into an internal 800 entry circular buffer. Buffer memory is non-volatile and will retain valid data during loss of power. All eight input channel temperatures are recorded.

Status Outputs

- Audible and Visual Alarms:** Independent audible remote and visual alarms.
- Relays:** Two dry-contact relays. Both N.C. and N.O. contacts available. Contact ratings are 30VDC @ 1.0A.

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 based on alarm conditions.
- 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. **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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