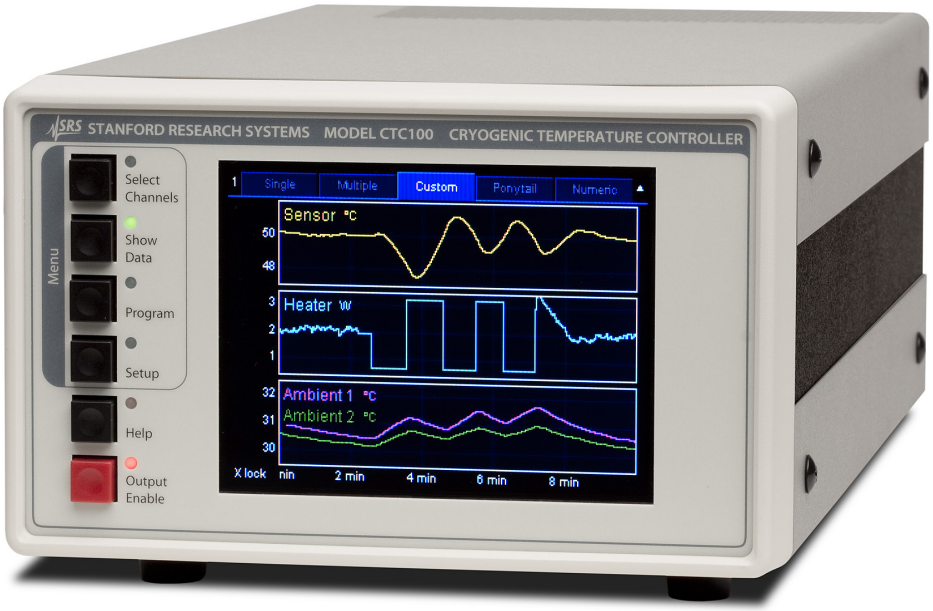
Temperature Controllers

CTC100 — Cryogenic temperature controller



CTC100 Temperature Controller

- 4 temperature sensor inputs
- 2 powered & 4 analog voltage outputs
- Up to 6 feedback control loops
- 4 analog & 8 digital I/O channels
- Graphical touchscreen display
- Data logging
- User programs (macros)
- USB, Ethernet, RS-232 & GPIB (opt.)

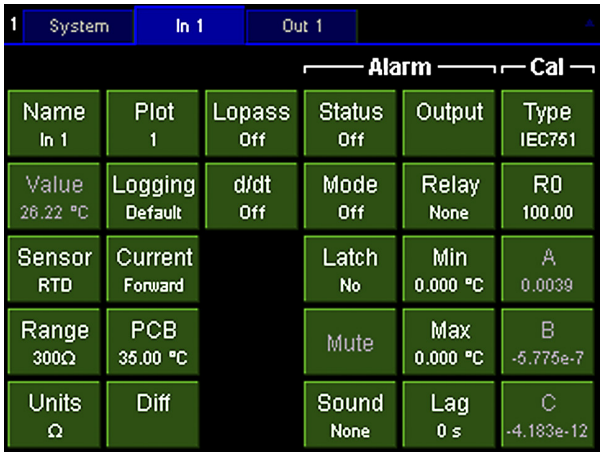
Introducing the new CTC100 Cryogenic Temperature Controller — a high performance instrument that can monitor and control temperatures with millikelvin resolution.

The CTC100 Cryogenic Temperature Controller is configured to suit a wide range of research and industrial applications. The system consists of four sensor inputs, two powered and four analog voltage outputs, and up to six feedback control loops. Four general purpose analog and eight digital I/Os are available, along with autotuning functions for setting PID parameters automatically.

Sensor Inputs

The CTC100 offers four temperature inputs that can read RTDs, thermistors, and diodes. Each temperature input channel has its own 24-bit ADC with eleven input ranges, and is equipped with its own independent excitation current source.

Standard calibration curves for a variety of sensors are included, and custom calibration curves of up to 200 points each can be entered. Each sensor input has high and low level or rate-of-change alarms. Sensor inputs can be lowpass-filtered to reduce noise, and/or differenced with another channel.



Channel setup menu

Powered and Unpowered Outputs

The CTC100 has two heater outputs that can each deliver up to 100 W of power to a 25 Ω heater. In addition, four analog voltage I/O channels can be used to drive heaters with the help of an external amplifier.

PID Feedback Control

With up to six feedback control loops available, the CTC100 can provide precise temperature control of each of its heater outputs by continually adjusting the heater power. Any of the CTC100's channels can be selected as the input for each feedback loop. Feedback time constants can be adjusted between 200 ms and 10 hrs.

Up to ten sets of PID parameters can be stored for each channel. Setpoints can be ramped at a fixed rate (or with a user program), set from an analog input.

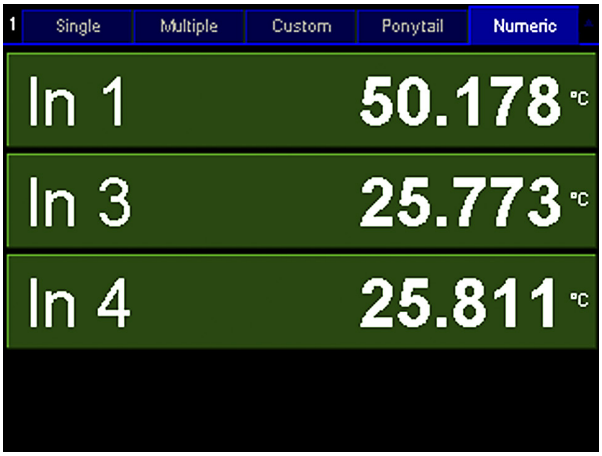
Analog and Digital I/Os

The CTC100 comes with four general-purpose ±10 V voltage I/O channels read by a 24-bit ADC. It also has eight digital I/O channels that can interact with user programs.

Four 5 A relays can be used for process control. Three virtual channels, not connected to any physical input, allow calculated values (such as the difference between two channels, or a value calculated by a user program) to be displayed, graphed, and logged.

Numeric and Graphical Display

The CTC100's color LCD display can show any combination of temperature measurements and heater outputs on graphs or numeric displays. Up to eight channels can be plotted either on a single graph with a common Y axis, or on separate graphs with independent Y axes. Touchscreen operation makes the instrument versatile and easy to use.

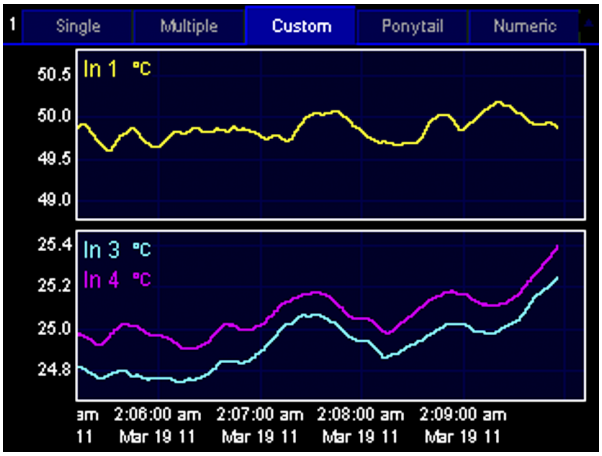


Numeric display

Data Logging

Up to 4096 readings per channel can be logged to the CTC100's internal memory. For longer-term storage, data can be logged to standard USB memory sticks or hard drives.

Data logged to USB devices can be transferred to a computer by plugging the USB device into a PC. Windows applications are included to graph CTC100 log files and to convert them to various ASCII text formats.

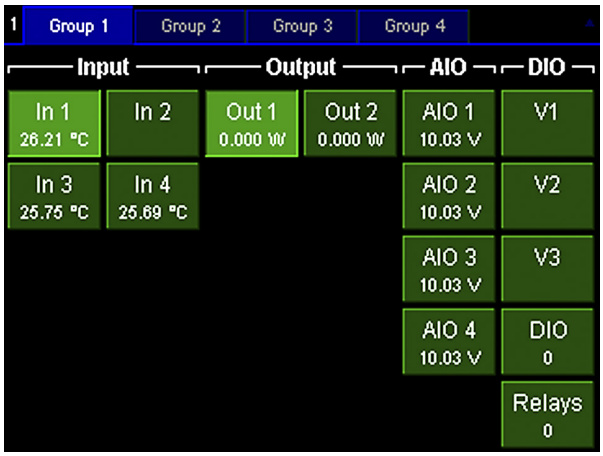


Graphical display

Computer Communications

Each of the CTC100's front-panel controls has a corresponding text command that can be sent over USB, Ethernet, and either RS-232 or an optional GPIB interface.

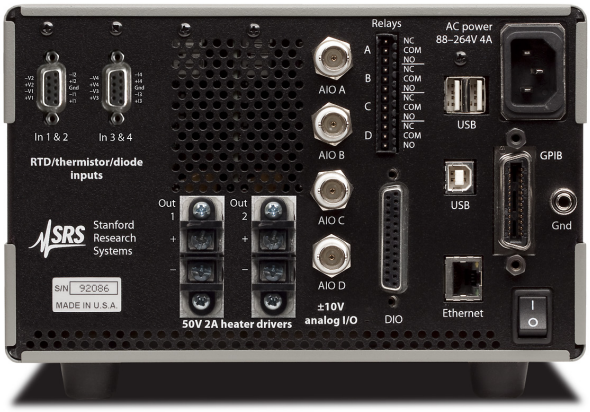
When the USB interface is used, the CTC100 appears on the computer as a standard COM port and can be controlled by any software that is compatible with an RS-232 port.



Select menu

User Programs

User programs (macros), consisting of one or more remote commands, can be uploaded to the CTC100. This is done by either sending them through one of the communications ports or by saving them as text files on a USB memory device and then plugging the device into the CTC100. Program macros can also be entered and edited from the front panel.



CTC100 rear panel

Specifications

Temperature Controller

Min. sampling rate	1 Hz
Max. sampling rate	50 or 60 Hz (depending on AC line frequency)
Data logging rate	10 samples/second/channel to 1 sample/hour/channel (can be set independently for each channel or globally for all channels)
Display resolution	0.001 °C, °F, K, V, A, W, etc. if –1000 < displayed value < 1000; 6 significant figures otherwise
PID autotuning	Single step response or relay tuning with conservative, moderate, and aggressive response targets
Display	320 × 240 pixel color touchscreen; numeric and graphical data displays.
Alarms	Upper and lower temperature limits or rate-of-change limits can be set on each channel.
Computer interface	USB, Ethernet, and RS-232; GPIB (IEEE488.2) optional
Power	10 A, 88 to 132 VAC or 176 to 264 VAC, 47 to 63 Hz or DC
Dimensions	8.5" × 5" × 16" (WHL)
Weight	13 lbs.
Warranty	One years parts and labor on defects in material and workmanship

Analog I/O

Inputs/outputs	4 voltage I/O channels, independently configurable as inputs or outputs
Connector	4 BNC jacks
Range	±10 V
Resolution	24-bit input, 16-bit output
ADC noise	30 µVrms (at 10 samples/s)

Digital I/O

Inputs/outputs	8 optoisolated TTL lines, configurable as either 8 inputs or 8 outputs
Connector	One DB-25F

Relays

Outputs	4 independent SPDT relays

100 W DC outputs

Output	Two unipolar DC current sources
Connector	#6 screw terminals
Range	50 V 2 A, 50 V 0.6 A, 50 V 0.2 A, 20 V 2 A, 20 V 0.6 A, 20 V 0.2 A

Output resolution	16 bit
Accuracy	±1 mA (2 A range)
	±0.5 mA (0.6 A range)
	±0.2 mA (0.2 A range)
Noise (rms)	(25 Ω load, DC to 10 Hz)
	5 µA (2 A range)
	1.5 µA (0.6 A range)
	0.5 µA (0.2 A range)

Diodes, Thermistors and RTD inputs

Inputs	Four inputs for 2-wire or 4-wire thermistor, diode, or RTD
Socket	Two DB9 (female)

	Input Range	*Excitation Current*	*Initial Accuracy*	*Temp. Drift (typ.)* *(at midrange)*	*Noise (rms)* *(at midrange)*
Diodes	0 to 2.5 V	10 µA	10 µV + 0.01 % of rdg	±5 ppm/°C	3 µV
RTDs	0 to 10 Ω	3 mA	±0.005 Ω	±0.0001 Ω/°C	0.0001 Ω
	0 to 30 Ω	3 mA	±0.005 Ω	±0.0001 Ω/°C	0.0001 Ω
	0 to 100 Ω	2 mA	±0.008 Ω	±0.0002 Ω/°C	0.0002 Ω
	0 to 300 Ω	1 mA	±0.015 Ω	±0.0004 Ω/°C	0.0003 Ω
	0 to 1 kΩ	500 µA	±0.05 Ω	±0.001 Ω/°C	0.0007 Ω
	0 to 3 kΩ	200 µA	±0.1 Ω	±0.003 Ω/°C	0.002 Ω
	0 to 10 kΩ	50 µA	±0.25 Ω	±0.01 Ω/°C	0.007 Ω
	0 to 30 kΩ	50 µA	±1 Ω	±0.02 Ω/°C	0.008 Ω
	0 to 100 kΩ	5 µA	±4 Ω	±1 Ω/°C	0.12 Ω
	0 to 300 kΩ	5 µA	±13 Ω	±2 Ω/°C	0.2 Ω
	0 to 2.5 MΩ	1 µA	±3 kΩ	±50 Ω/°C	10 Ω
Thermistors	0 to 10 Ω	1 mA	±0.007 Ω	±0.0002 Ω/°C	0.0003 Ω
	0 to 30 Ω	300 µA	±0.03 Ω	±0.0004 Ω/°C	0.001 Ω
	0 to 100 Ω	100 µA	±0.07 Ω	±0.002 Ω/°C	0.002 Ω
	0 to 300 Ω	30 µA	±0.25 Ω	±0.004 Ω/°C	0.006 Ω
	0 to 1 kΩ	10 µA	±0.6 Ω	±0.01 Ω/°C	0.02 Ω
	0 to 3 kΩ	3 µA	±2 Ω	±0.06 Ω/°C	0.06 Ω
	0 to 10 kΩ	1 µA	±6 Ω	±0.2 Ω/°C	0.2 Ω
	0 to 30 kΩ	300 nA	±25 Ω	±1 Ω/°C	1.0 Ω
	0 to 100 kΩ	100 nA	±150 Ω	±3 Ω/°C	6 Ω
	0 to 300 kΩ	30 nA	±1 kΩ	±20 Ω/°C	40 Ω
	0 to 2.5 MΩ	1 µA	±3 kΩ	±30 Ω/°C	10 Ω

Ordering Information

CTC100	Cryogenic temperature controller
Option 01	GPIB interface (replaces RS-232)
O100CTRM	Rack mount tray