

USER GUIDE

Laboratory Series High Precision Temperature Controller — with IntelliTune®



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ORDERING INFORMATION

PART NO	DESCRIPTION
TC5 LAB	5 A, 15 V Temperature Controller Instrument
TC10 LAB	10 A, 15 V Temperature Controller Instrument
TC15 LAB	15 A, 20 V Temperature Controller Instrument
TC/SENSOR MATING D-SUB	One included with each instrument
RCKMT-LAB SNGL	19" Single Unit Rack Mount Kit
RCKMT-LAB DUAL	19" Dual Unit Rack Mount Kit
THERMISTORS	Various Thermistors Available
CKT-203	Status/Enable Male DB-9 Connector Kit
CKT-204	TE/RH/Sensor Male DB 15+2 Connector Kit
WCB405	Status/Enable DB-9 Cable Assembly
WCB406	TE/RH/Sensor DB 15+2 Cable Assembly



Applies to Product Revision A, firmware version 1.7 and above

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GENERAL OVERVIEW

- Three models: 5A, 10A, and 15A output current
- Compliance voltages of 15 V (TC5 & TC10) and 20 V (TC15)
- Stability better than 0.0009°C with thermistor
- Compatible with a variety of sensors
 - » Thermistors
 - » 2, 3, or 4-wire RTDs
 - » Linear voltage sensors
 - » Linear current sensors
- Touchscreen with intuitive user interface
- Safety features protect your research
 - » Adjustable current limit, with Brick-Wall Never-Exceed circuitry
 - » Password protection available to lock out a selectable control set
 - » Over-temperature protection circuit
 - » Temperature limits on the load
 - » Shutdown signal to the QCL/laser driver load to protect against over or under temperature situations.
- IntelliTune sets ideal PID control parameters for optimal time to temperature or fast disturbance rejection
- Complete command set for remote control from computer
- LabVIEW® Virtual Instrument, USB and Ethernet interfaces
- Auxiliary input for heatsink sensor
- Feature-rich for research projects
- Auto temperature scan function
- Data collection using a computer or USB flash drive
- Field upgradeable firmware
- Sophisticated error handling
- Save and recall functions for specific set ups
- CE compliant
- All instrument documentation and software are provided on a USB flash drive
- Optional rack mount kit: 2 U height, ½ rack width
- AC input, auto detect, 100-240VAC, +/-15%, 50-60Hz power-line frequency

LabVIEW is a trademark of National Instruments.

ULTRA-STABLE TEMPERATURE CONTROLLER

The TC LAB series of temperature controllers integrates high-end Digital Control with a precision output current drive stage to offer the best stability temperature control instrument commercially available today. Many different sensors can be used in the feedback loop including thermistors, RTDs, linear current and voltage sensors, and Wavelength's newest addition – the IR remote temperature sensor for monitoring the temperature of liquids and solids remotely, avoiding contact or contamination with the sample.

Three models are available driving 5A, 10A, or 15A maximum with 15 V (20 V for TC15) compliance to the thermoelectric or resistive heater.

Safety features protect the thermoelectric [TE] and its load. Over and under temperature limits as well as positive and negative current limits can be set. If the sensor signal is lost or a short is detected at the TE, output current is disabled. If temperature limits are exceeded, TE current is disabled and a signal to the active load can be sent to disable its current. For example, connect the LD Shutdown BNC output to the Active Lock input on Wavelength's QCL LAB driver and the QCL current will shut down if temperature limits are exceeded. An Auxiliary Sensor can be used to monitor the temperature of the system heatsink.

INTUITIVE USER INTERFACE AND SUPERIOR REMOTE CONTROL

With Wavelength's plug and play instrument, you have the ability to quickly set the controls using either the instrument touchscreen or a remote computer.

INTELLITUNE: INTELLIGENT AUTOTUNE

Wavelength's proprietary IntelliTune algorithm characterizes the TE/sensor system's response to the controller and determines the optimal PID control coefficients. **It then automatically adjusts the PID control values as setpoint, tuning mode, or bias current change.**

Run IntelliTune easily just off ambient and watch it change PID settings for a much higher or lower setpoint. After a single scan, explore either optimized Setpoint Response or Disturbance Rejection performance with your load to see which works best. Add or remove the D term to see if noise is an issue. IntelliTune lets you skip the manual characterization and it's smart enough to really work—very little adjustment is needed after you have stored a successful characterization scan. See Application Note [AN-TC13](#) for an in depth exploration.

APPLICATIONS

The advanced and reliable circuitry of the TC LAB Series instruments achieve better than 0.0009°C temperature stability with thermistors.

The ultra-stable temperature controller instruments are particularly reliable for diverse fields such as medical, defense, communications and manufacturing. Applications include particle and droplet measurement, communications, manufacturing test, and medical systems. Additionally, our products are designed for use with electro-optical systems, airborne instrumentation, spectroscopic monitors, and medical diagnostic equipment.

ELECTRICAL SPECIFICATIONS

OUTPUT	MIN	TYP	MAX	UNITS	NOTES
Output Current	5, 10, or 15			A	5A for TC5, 10A for TC10, 15A for TC15
Short Term Stability, 1 hour, Off Ambient ^{1, 2}	0.0002	0.0006		°C	25°C ambient
Short Term Stability, 1 hour, On Ambient ^{1, 2}	0.0003	0.0009		°C	25°C ambient
Long Term Stability, 24 hour, Off Ambient ^{1, 2}	0.00067	0.002		°C	25°C ambient
Temperature Coefficient	5	10	18	ppm / °C	
Compliance Voltage Range	0 - 15 or 0-20			V	≤15V for TC5 & TC10. ≤20V for TC15.

SENSOR COMPATIBILITY	VALUE	NOTES
NTC Thermistor Sensor Range Voltage	0 - 10 V	
NTC Thermistor Bias Current Range	10 µA - 10 mA	Auto-ranging bias current
2,3,4 Wire RTD Sensor Range	100 Ω - 1 kΩ	Auto-ranging bias current
IR Temperature Sensor	0 - 5 V	
Linear Voltage or Current Sensors	Supported	Comparable to LM335 and AD590
Bias Current Accuracy	0.004%	
Bias Current Temperature Coefficient	10 ppm/°C	

POWER SUPPLY REQUIREMENTS	VALUE	NOTES
AC Power Supply and Line Frequency	100-240 VAC (+/- 10%), 3 A, 50-60 Hz	
Fuse for 100-240 V	3.15 A 250 AC Fast Blow (3.15 AH 250 V 5x20mm)	Replacement fuse: Littelfuse 02163.15 HXP
Max AC Line Power	200W	

FEEDBACK LOOP: Proportional / Integrator / Derivative (PID)

GENERAL SPECIFICATIONS	VALUE	NOTES
Warm-up Time	1 Hour	
Remote Interface	USB, Ethernet	
Warranty	One (1) Year	
Safety Tested To	IEC 61000-3-2 IEC 61000-3-3 IEC 61000-4-2 IEC 61000-4-3 IEC 61000-4-4	IEC 61000-4-5 IEC 61000-4-6 IEC 61000-4-8 IEC 61010-1 EN61010-2-30 European Council Directive 2004/108/EC & European Council Directive 2006/95/EC

ABSOLUTE MAXIMUM RATINGS	VALUE	UNIT	NOTES
Case Operating Temperature Range	0 to 40	°C	
Weight	7.4 (3.36)	lbs (kg)	
Size	3.47 x 8.86 x 17.72 (89 x 226 x 450)	inches (mm)	
Case Storage Temperature	-40 to 70	°C	
Humidity	80	%	Relative humidity at 30°C, non-condensing

¹ This specification assumes a steady-state operation with a tuned system using a 10 kΩ thermistor. Minimum Stability achieved by measuring 1 standard deviation (1σ) away from the mean. Typical Stability achieved by measuring 3 standard deviations (3σ) away from the mean. For more detail, see [TN-TC02](#). Stability typical for a 14 pin butterfly package laser diode.

Best stability achieved with a thermistor (10kΩ) was 0.0002°C.

Best stability achieved with a 1kΩ two-wire RTD was 0.005°C.

This is due to the different sensitivities in the detectors at the setpoint. The 10kΩ thermistor has sensitivity about 2 orders of magnitude greater than the RTD at the stability testing setpoint.

² When using resistive heaters, stability can only be consistently achieved when setpoint temperatures are 10°C or more over ambient.