

Model TC-1000

Temperature Controller

Instruction Manual

Read instructions carefully before operating this device.

- ❶ *This device is not to be used for Human Life Support applications.*
- ❷ *To avoid possible electrical shock, do not operate this device if is wet or has had liquids spilled onto it.*
- ❸ *Service or calibration procedures should only be performed by qualified personnel familiar with the electrical hazards of line-powered devices.*

CWE, Inc.

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STATEMENT OF WARRANTY

IF THIS INSTRUMENT FAILS WITHIN A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY OR INSTALLATION, CWE, INC. WILL, AT ITS OPTION, REPAIR OR REPLACE IT FREE OF CHARGE. THIS WARRANTY EXCLUDES DAMAGE INCURRED THROUGH MISUSE OR ACCIDENT. CWE, INC. DOES NOT ASSUME ANY LIABILITY FOR ANY CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THIS INSTRUMENT.

DEFECTIVE UNITS SHOULD BE RETURNED TO THE FACTORY ALONG WITH A NOTE DESCRIBING THE NATURE OF THE FAULT. THIS WARRANTY IS APPLICABLE TO THE ORIGINAL PURCHASER OF THE INSTRUMENT ONLY, AND IS NOT TRANSFERABLE.

FACTORY SERVICE

Out of warranty or damaged instruments may be returned to the factory freight prepaid for service at prevailing rates. Upon request, a written or verbal quotation for such service will be issued after examination of the unit but prior to commencing repairs or service. Address requests for service or technical information to:

CWE, Incorporated
Technical Support
124 Sibley Avenue,
Ardmore PA 19003
(610)642-7719

LIFE SUPPORT POLICY

Instruments manufactured by CWE, Incorporated are not authorized for use as critical components in human life support devices or systems. "Life support devices or systems", as used herein, are devices or systems whose failure to perform, whether through misuse, failure, or proper operation, can reasonably be expected to result in significant injury to the operator or subject persons.

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1.0 INTRODUCTION

The TC-1000 Temperature Controller is used to monitor and control body temperature over the range of 25 - 45°C. A linear proportional-integral-derivative (PID) controller smoothly adjusts DC current flow through the heating element, without the voltage transients associated with simple on/off controllers. It accepts thermistor temperature probes in the Yellow Springs Instruments (YSI) 400 series. A front panel LCD display shows the actual animal probe temperature, the set-point temperature, the alarm band hysteresis, and various status messages. The TC-1000 may be used for measuring and controlling body or bath temperature within the measurement range, using resistive heaters or heating pads. A range of suitable probes and heating blankets is available, including rectal probes and fast-response probes.



Front panel view of TC-1000 Temperature Controller

2.0 PROBE CONNECTION

Plug the thermistor probe into the **THERMISTOR PROBE** input jack. The probe should be one of the YSI Series 400 family, which are terminated with a ¼" phone plug. A variety of probes is available. See Ordering Information at the back of this manual for descriptions of the available probes.

3.0 TEMPERATURE MONITOR OUTPUT

The **TEMPERATURE MONITOR OUTPUT** jack provides an analog voltage corresponding to the displayed temperature measurement. This output can be monitored or recorded on an external instrument if desired. The scaling of this signal is 100mV/°C.

4.0 HEATER CONNECTION

The TC-1000 is intended for use with resistive-type heating elements in the range of approximately 4 - 20 ohms. This corresponds to the rodent-size and cat-size heating pads supplied by CWE, Inc. The maximum available heater power is approximately 12VDC at 3.5A. The lower the resistance of the heating element, the higher the heating current that can flow. The heating element is connected to the 5-pin **HEATING PAD** jack on the front panel.

CAUTION! Do not use heating elements with a resistance less than 4 ohms using the internal power supply. Lower resistance (i.e., higher current) heaters can be accommodated using an external power supply. See Section 8.0 for details.

5.0 SETTING THE TARGET TEMPERATURE AND ALARM BAND

The monitored temperature is shown on the first line of the LCD display panel. The second line shows the target (set-point) temperature and alarm hysteresis band:

SET (37.0°) <> (0.5)

The **SET** temperature is the desired body temperature that is to be maintained. Rotate the **SET TEMP** knob until the desired set-point is displayed.

The second number shown is the *alarm band hysteresis*. This is the deviation from the set-point that is allowable before the alarm will be activated. In the example above, the alarm band is set to 36.5° - 37.5°. The alarm band is always symmetrical around the set-point temperature. If the measured temperature goes outside these bounds, the temperature alarm will be activated.

To adjust the alarm band hysteresis, push in the **SET TEMP** knob while turning it, until the desired alarm band is displayed on the LCD. Both set-point temperature and alarm settings are saved in non-volatile memory, and will be restored when the unit is next used.

6.0 ALARMS AND FAULT CONDITION ALERTS

The TC-1000 is equipped with a user-adjustable temperature alarm, and additional fault condition monitors. The various conditions and operator messages are described below.

Temperature Alarm – This is a user-adjustable temperature band that is set up as described in Section 5.0. When triggered by an out-of-temperature condition, the **ALARM** pushbutton switch will be illuminated, and the third line of the LCD display will show the message **Temp Alarm!**

If the audible alarm is active, a short beep will sound every four seconds. To turn off this beep, press the **ALARM** pushbutton switch. The visible alarm light and LCD warning message will be displayed regardless of the audible alarm setting.

Probe Error - The message **Check Temp Probe** indicates that there is a problem with the thermistor probe: it is either unplugged from the TC-1000, broken, or out of the normal operating range. Be sure the probe is connected properly, or replace the probe if necessary. A short beep will sound every 1.5 seconds to alert the user that this condition must be corrected. While this message is displayed, heating power is turned off to avoid overheating of the animal.

Probe-Animal Error - The message **Check Animal/Probe** is displayed if the TC-1000 has been heating the animal for some time (15 minutes), but the animal temperature remains at least 6°C below the desired set point. The most common cause of this condition is that the probe has become disconnected from the animal. A short beep will sound every five seconds to alert the operator to correct this condition. When this message is displayed, heating power is turned off to avoid overheating of the animal.

NOTE: *After the probe/animal connection is re-established, if the animal's body temperature is 6°C or more below the set point, press the **ADJUST** knob momentarily to reset the alarm condition and re-start the heater. Normally, the animal's body temperature will be sufficient to reset the alarm condition.*

7.0 CONNECTING AN EXTERNAL POWER SUPPLY

The TC-1000 is designed for direct use with heating blankets or immersion heaters in the range of 4 – 20 ohms. Lower resistance heaters can be used, but require a higher current power source than is built into the TC-1000.

To use a higher power blanket or other heater (up to 10A, or resistance down to about 1 ohm), an external power supply should be connected to the rear panel binding posts, using the following procedure:

WARNING! Be sure power is turned OFF before connecting or disconnecting an external power supply!

1. Locate the three binding posts on the rear panel of the TC-1000.
2. Remove the jumper that connects the **INTERNAL** (red) and **EXTERNAL** (yellow) binding posts.
3. Connect a suitable power supply to the **EXTERNAL** (yellow) and **GROUND** (white) binding posts, observing correct polarity (positive to yellow, negative to white).

CAUTION: The external power supply or battery should be capable of supplying 12VDC, with a current rating consistent with the heating pad being used. Be sure to remove the jumper between the INTERNAL and EXTERNAL binding posts when using an external power supply. Do not connect any external power source to the INTERNAL (red) binding post!

4. Replace the **HTR POWER FUSE** with a 10A fuse. Be sure to replace this fuse with the original 4A fuse when again using the internal power supply.

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9.0 ORDERING INFORMATION

Part No.	Model	Description
08-13000	TC-1000 Mouse	Temperature controller with mouse probe and heating pad
08-13001	TC-1000 Rat	Temperature controller with rat probe and heating pad
08-13002	TC-1000 Cat	Temperature controller with cat/rabbit probe and heating pad
08-13099	TC-1000	Temperature controller, main unit only
08-13013	Heating Pad, Mouse	Flexible flat pad, 3 x 6" (7.6 x 15.2cm), MRI-compatible
08-13014	Heating Pad, Rat	Flexible flat pad, 5 x 7" (12.7 x 17.8cm), MRI-compatible
08-13015	Heating Pad, Cat	Flexible flat pad, 10 x 18" (25.4 x 45.7cm), MRI-compatible
08-13100	TC-1000/PS	External 13VDC power supply for high-current heaters, 120V/50Hz
10-09011	TH-2K	Mouse thermistor probe, 1mm dia.
10-09010	YSI-401	Thermistor probe, cat-size, 4.75mm dia.
10-09020	YSI-402	Thermistor probe, rat-size, 3mm dia.
10-09030	YSI-403	Thermistor probe, stainless steel for immersion, 4mm dia.
10-09040	YSI-451	Thermistor probe, mouse-size, 1mm dia