T°Sentry 4
Multi-Point Digital Alarm
Instruction Manual

Introduction

The T°Sentry4 (TS4) is a microprocessor-based temperature monitoring and alarm device with user programmable high-low alarm setpoints and alarm delay time. A maximum of four temperature probes are used.

A single pole double-throw relay contact, rated for 0.5 amps at 12 volts, allows hookup to normally-open or normally-closed external alarms. The relay goes to alarm state a specified time after the start of an alarm condition, or on loss of line power.

The internal 9-volt NiCad battery, with charger, allows keep-alive operation for approximately 100 hours. In battery mode the temperature display and most of the circuitry is turned off to conserve power. The alarm relay goes to the alarm state (drops out), and the unit periodically emits a short beep and LED flash to indicate that it is alive, but in a sleep mode. Pressing the red button fully activates the display for about 30 seconds.

Operating parameters, such as alarm limits, are stored in non-volatile memory, and are maintained even with power off.

Special options include thermocouple input; serial RS232 output to a host computer such as a CMS or Dataplex-32; small dedicated 2-color 40-column printer.

This manual covers only the standard TS4 - supplements for programming and use of the special options are shipped with the special units as needed.

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Table of Contents

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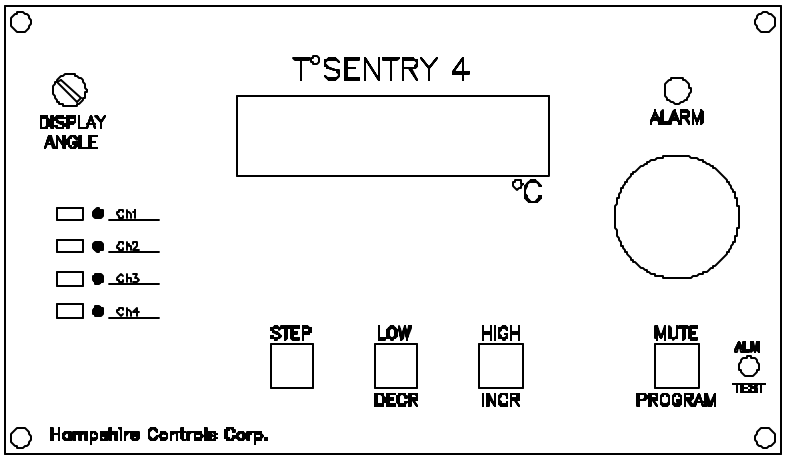

Panel

The °C Display is an 8-character alphanumeric liquid crystal display (LCD) with backlighting.

DISPLAY ANGLE is a screwdriver adjustment to optimize the display for viewing angle / contrast.

The bicolor indicator lights the immediate status of the four channels - green means normal and red means out-of-range. Each channel blinks off as it is sampled, indicating normal computer activity. Channel 1 is the top LED, 4 is the bottom.

There are four square pushbuttons, three black and one red: **STEP**, **LOW / DECR**, **HIGH / INCR** and **MUTE / PROGRAM**, for setting up the operating parameters for the unit, displaying the setpoints, and stepping through channels.

The small black **ALM TEST** pushbutton in the lower right of the panel interrupts line power, to test operation of the battery and the alarm relay.

Alarm condition is indicated by the bright red ALARM indicator LED and the beeper.

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Installation

The unit is normally shipped with probes connected and battery disabled. Remove the tagged screw in the side of the TS4 box to enable the battery. Assume the battery to be discharged, and allow to charge for at least 24 hours to ensure full capacity.

Channels/Probes

Probes are individually calibrated to +/- 0.1°C, by means of a small board carrying the calibration components - the probe and its associated board are coded by 3-digit serial numbers on the two-pin connectors, and must be interchanged only as sets.

The four channels of the TS4 are color coded, with the probe wire color matching the activity LED labels to help installation and tracing. These are the channel colors:

Channel #1 -- Red
Channel #2 -- Orange
Channel #3 -- Yellow
Channel #4 -- Green

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Basic Operation

In normal operation the display shows channel number and temperature, looking something like this : [1 25.5]
The upper (yellow) labels indicate the button functions to change the display as follows :

STEP to next channel	[2	3.6]
LOW setpoint display	[2L	1.0]
HIGH setpoint display	[2H	6.0]

The TS4 checks the temperature reading of each channel against the setpoints for out of range conditions, defined as "equal to or beyond the setpoint". If, for instance, the low setpoint is 0.0, then the reading is out of range for 0.0 and anything below. The bicolor activity LED for each channel blinks off as the channel is read, and its current state is indicated by green for normal, red for out-of-range.

An out-of-range condition must persist for a specified time (alarm delay), for an alarm condition to be declared. This time is individually set for each channel, and is intended to prevent transient nuisance alarms.

Once the alarm condition is reached, the beeper and LED will start. Pressing the MUTE button will stop the beeper for a preset mute period, changing the sound to short 'chirps'. (MUTE is also used to enter Program mode, page 5.)

The MUTE button only affects the current alarm condition, that is, for the channels in alarm at the time the button is pressed. If a new channel enters the alarm state, the beeper will start up again, even if the mute time is not completed. The MUTE is reset (turned off) when the alarm condition goes away, that is, there are no out-of-range readings for 30 seconds.

The alarm relay is activated a designated time after the beeper starts (relay-delay), and is in the alarm position until the alarm state is cleared. If the alarm condition does not last long enough for the relay-delay to time out, the relay will not go into its alarm position.

Relay status is not affected by mute or by the beeper or LED activity.

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Programming

The MUTE button is also used to exit the RUN mode for the PROGRAM mode. If the alarm is beeping, the first push of the red button will mute the beeper, the second will step to PROGRAM.

Programming of the TS4 is divided into three major sections: limits, delay times and setpoint test. Pressing the PROGRAM button moves the display from normal run mode through the three program sections, returning to the run mode.

Within each program section, pressing the STEP button brings up individual items, wrapping around from the last item to the first:

Limits sequence

1L (ch1 low) / 1H (ch1 high) / 2L / 2H / 3L / 3H / 4L / 4H / 1L / 1H / etc.
[press PROGRAM button to move to Times]

Times sequence

1D (ch1 delay-to-alarm) / 2D / 3D / RD (relay delay from alarm beeper) / MT (mute time) / 1D / 2D / etc.
[press PROGRAM button to move to Setpoint Test]

Setpoint Test sequence

1T (ch1 test display) / 2T / 3T / 4T / 1T / etc.
>>Note that the setpoint test does not change any stored parameters, merely acts during the test time.
[press PROGRAM button to move to Normal Run]

The DECR/INCR buttons are used to decrease / increase the program parameters.

Note that the displayed parameter values blink while in the program mode.

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Programming Details

Here is a more detailed description of the programming process:

On entering the program mode, the first parameters to be set are the alarm limits. The buttons, left to right, have these functions as indicated by the red lettering :

STEP to next parameter. The channel 1 low setpoint is the first to be displayed. Pushing STEP will cycle through the setpoints in this order :
1L 1H 2L 2H 3L 3H 4L 4H 1L 1H etc.

DECR (decrement) the value. A momentary push changes the value by -0.1, and a longer push changes the value by -1.0

INCR (increment) the value. A momentary push changes value by +0.1, and a longer push changes value by +1.0

PROGRAM to move on to next function : delay time set, setpoint test, return to RUN mode.

Press the PROGRAM button to move to the delay time program function.

The delay time program mode allows setting of the timers, the first being the channel 1 delay to alarm ; STEP sequence is channel 2, 3 and 4 delay to alarm, relay delay, mute, and back to delay to alarm.

Delay to Alarm - time in minutes from when a reading passes high or low setpoint to when beeper starts.
Range is 0-30 minutes, and each channel has its own value, designated as 1D, 2D, 3D and 4D.
(DECR/INCR steps are 1 and 10 for short/long.)
Typical display : [1D 1m]

Relay Delay - time in minutes from when the beeper starts to when the alarm relay drops out.
Range is 0-30 minutes. One value, designated RD, applies to all channels.
(DECR/INCR steps are 1 and 10 for short/long.)
Typical display : [RD 10m]

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Mute Time - time in minutes that the beeper is muted, from when the MUTE button is pressed.

Range is 5-120 minutes. One value, designated MT, applies to any/all channels out of range during the alarm.
(DECR/INCR steps are 1 and 10 for short/long.)
Typical display : [MT 15m]

Press the PROGRAM button to move to the setpoint test function.

Setpoint Test - adds a digital offset to the temperature reading for the selected channel. This simulates a falling or rising input to check the response of the unit to an alarm condition.

The setpoint test does not produce any changes in stored parameters.

Display designations are 1T, 2T, 3T, 4T, and the display is the actual reading plus the test offset. Use the STEP button to step through the channels; use the DECR/INCR buttons cause the offset to fall/rise. Pushing both DECR/INCR buttons resets the test offset to zero.

Press the PROGRAM button to move to the normal run mode.

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Special Functions

Software Version - displays the microprocessor software version number in this unit:

1. Press PROGRAM to enter the program mode.
2. Press and hold STEP; press DECR.

Reset/Alarm Test

Holding the red button for about three seconds will cause the unit to reset. This is provided for the rare situation when the computer might lock up, as might happen in the case of hooking up the battery while power is off. Reset is automatic at powering up.

The reset also activates the alarm condition, and can be used as a test of the beeper and alarm LED - use the red MUTE button to shut off the beeper and LED.

Note that use of the reset while in the program mode could result in improper parameter storage.

Power Failure Test

To simulate a power failure, press the small **ALM TEST** button next to the MUTE button to disconnect the primary AC line power supply. This will check that the battery is operational, and drop out the alarm relay to activate any remote alarms.

This is a standard feature, but can be deleted as a factory modification.

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Summary of Button Functions

Normal Display Mode

MUTE	If alarm is beeping, pushing the red button initiates the mute period.
PROGRAM	If alarm is still, pushing the red button brings up the program mode.
STEP	Step through the channels on display.
LOW	Display the low limit for channel on display.
HIGH	Display the high limit for channel on display.

Program Mode

PROGRAM	Move to next program section.
STEP	Step through items in section.
DECR	Decrease the displayed parameter.
INCR	Increase the displayed parameter.

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