4400 Series
Operators Manual

July 2000

INTRODUCTION

The Techne 4400 Series precision hand-held digital thermometers are rugged, field tested units which fit wide varieties of temperature measurement applications requiring ultra-high accuracy and high resolution at an economical price. These thermistor-based units have an instrument accuracy of up to 0.015°C (0.027°F), temperature measurement range from -20°C to +130°C (-4°F to +266°F), and have a resolution of 0.01°C (0.01°F)

The 4400 Series features display HOLD and °F/°C selection from the single front panel rubber rocker switch.

The LCD features a low battery indication and also rate of temperature change arrows which, flashing at different speeds, inform the operator of the rate at which the temperature is changing.

The 4400 Series have an internal jumper to disable the selection of °F or °C from the front panel and to enable display of either °F or °C only.

INTRODUCTION (continued)

An internal jumper is also present to select either auto or manual shutoff mode. In the auto shutoff mode, the units will automatically shut off 10 minutes after being turned on or 10 minutes after the last function key entry.

A flashing battery symbol informs the user when to replace the battery. The unit will continue to operate for one hour (running time) after the flashing symbol appears. After one hour, the numerical display is disabled to ensure that erroneous results are not displayed.

Each unit is supplied with a 9 VDC alkaline battery, NIST traceable calibration certificate, and complete operator's manual. Available accessories include an external power supply and standard and deluxe carrying cases.

Different versions of the 4400 thermometer can accept a variety of probe types. Check the model number on your thermometer to determine what type you have. Accuracy specifications are included in the back of this manual or on a separate sheet enclosed with the unit.

OPERATING INSTRUCTIONS:

1. Determine that a probe is connected to the unit.

2. Press the upper half of the rubber rocker switch marked "ON/OFF" to turn the unit ON. (Pressing this switch again will turn the unit OFF.)

With RS-232 versions, plug an RS-232 cable into the mating connector at the top of the thermometer. Plug the other end of the cable into the serial port on your PC. For additional information, see the RS-232 option page toward the back of the manual.

3. **READOUT:**

Display	**Explanation**
°C/°F symbols	Reading is displayed in degrees C or F
-20.00 to +130.00 (-4.00 to +266.00)	Actual temperature in degrees Celsius (Fahrenheit)

OPERATING INSTRUCTIONS: (continued)

3. READOUT: (continued)

Display	Explanation
"LO"	Temperature is below the low end of the range or a probe is not inserted.
"HI"	Temperature is above the high end of the range.
Up/Down arrows	Indicates rate of change. Faster flashing = faster change. Arrows off = stable reading.
Flashing battery symbol	Battery needs replacement. (1 hour of running time remaining)*

*To ensure that erroneous results are not displayed, the numerical segments are disabled (all turned on or all off) one hour, of running time after the battery symbol starts flashing.

OPERATING INSTRUCTIONS: (continued)

4. The thermometer can "freeze" or "hold" a reading shown on the display. Press the lower half of the rubber rocker switch momentarily, and the reading will "freeze" and the "HOLD" indicator will flash. Press momentarily again and the thermometer will return to normal readings.

5. To change the reading from degrees C to F or F to C, press the lower half of the rubber rocker switch down for approximately 4 seconds (the HOLD indicator will flash 4 times), and the °C/°F indicator will change.

6. In the auto shutoff mode, the thermometer will automatically shut itself off 10 minutes after being turned on or 10 minutes after the last function key entry. You may turn the unit off at any time by pressing the ON/OFF switch.

BATTERY REPLACEMENT:

1. Turn the unit off.

2. Turn the unit on its face. If the unit has connectors (probe, power, etc.) plugged into jacks on the case, unplug them.

3. If the unit has a battery door, unscrew the bottom two screws, lift off the door, and go to step 7.

4. If the unit does not have a battery door, unscrew the four Phillips head screws on the back and go to step 5.

5. If the unit does not have a probe jack protruding from the right side of the case, lift the back straight off and go to step 7.

6. If the unit has a probe jack, pick the unit up with the probe jack facing you. With one hand holding the front half of the case and the other hand holding the back half of the case, open the case up in a rotating motion with the jack side of the case being the center of rotation.

BATTERY REPLACEMENT: (continued)

7. Placing your thumb on the circuit board battery terminals, rotate and lift the battery away from the circuit board with your forefinger.

8. Place the new battery, 9 Volt alkaline battery (NEDA No. 1604A), on the circuit board with the battery terminals oriented to mate the terminals on the circuit board (battery + is towards the top of the unit). (The thermometer will not be damaged if you accidentally try to put the battery in backwards.)

9. Place your thumb against the terminals on the circuit board, and with your forefinger snap the battery into place.

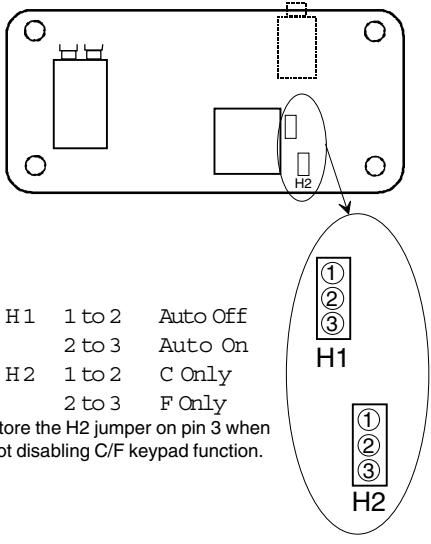
10. Route probe cable around upper screw post and press in place. Avoid pinching cable between screw post and circuit board.

11. Replace the back and screws.

SPECIAL FUNCTIONS:

The 4400 Series can be put into special configurations through proper placement of user-accessible jumpers on the inside of the unit.

If it is desired for the unit to stay on indefinitely and not turn off after 10 minutes, adjust the jumpers on "H1"; C/F front panel selectability can be defeated by adjusting the jumpers on "H2."



H1	1 to 2	Auto Off
	2 to 3	Auto On
H2	1 to 2	C Only
	2 to 3	F Only

Store the H2 jumper on pin 3 when not disabling C/F keypad function.

CARE & CLEANING

Many years of field use has proven this case to be rugged and reliable. It is splash resistant, but not water proof. Liquid can be spilled on the top of the case for a limited time. There are internal seals around the display and the switch. But, the case may not be submerged! Liquid will leak in and damage the unit!

DO NOT AUTOCLAVE THE UNIT! ! If it is necessary to decontaminate the thermometer, a weak chlorine solution may be gently wiped on to the case by a well rung out soft cloth. If your 4400 version has an open connector jack, do not let any liquid go into the case. Your readings would be affected.

The clear plastic LCD lens can be easily scratched and/or fogged by inappropriate cleaning products. Use only plastic approved lens cleaners. Alcohol, acetone, lacquer thinners and other harsh chemicals will fog the lens and damage the case and rubber key pad.

If your 4400 version has a detachable probe with a plug termination, periodically wipe off and clean the probe plug contacts. Dirty contacts will cause reading errors.

THERMOMETER RECALIBRATION

The Thermometer should be recalibrated at least once a year to maintain its accuracy. (Some 4400 versions may require a 6 month recalibration cycle. Check the Report of Calibration, which came with the unit, or the recalibration label on the front of the unit to determine the next recalibration date.) Recalibration should be performed at Techne. When the Thermometer requires recalibration, please call to receive an RMA number, then send postage paid to:

Techne Incorporated
3 Terri Lane, Suite 10
Burlington, NJ 08540
Phone: 609-589-2560
Fax: 609-589-2571

Contact Techne for current prices and include with the unit a purchase order, a ship to / bill to address, a phone number, and a contact name. Ship the unit in its original carrying case or box enclosed by a suitable shipping container.

REPAIR:

If the Thermometer fails, after receiving an RMA number, forward it, postage paid, to Techne. Include a description of the difficulty, place the Thermometer in its carrying case or box and pack the unit securely. Techne shall assume NO responsibility for damage in transit.

IN WARRANTY:

Instruments covered by the limited warranty will be promptly repaired or replaced, at Techne' option, and returned at no charge. SEE LIMITED WARRANTY, PAGE 12, FOR ITEMS COVERED AND COMPLETE WARRANTY TERMS. (Other manufacturer's probes are not included under Techne' warranty unless otherwise stated.)

OUT OF WARRANTY:

The Thermometer will be repaired and returned for a fixed fee. (Repairs needed because of abuse or accidental damage will be quoted.) Contact Techne for current prices.

TECHNE THERMOMETER
1 YEAR LIMITED WARRANTY

The thermometer manufacturer, Techne, warrants your thermometer to be free from defects in material and workmanship under normal use and service. The warranty period for the Thermometer is 1 YEAR from the date of purchase and DOES NOT apply to batteries, or when the instrument has been misused, altered or damaged by accident or abnormal conditions of operation.

For warranty service, send the instrument with a description of the difficulty, postage prepaid, to Techne. Techne assumes no risk for damage in transit. Techne will, at its option, repair or replace the defective instrument free of charge. However, if we determine that the failure was caused by misuse, alteration, accident, or abnormal condition of operation, you will be billed for the repair. The repaired instrument will be returned, transportation prepaid.

TECHNE MAKES NO WARRANTY INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, OTHER THAN THE WARRANTY STATED ABOVE. ALL WARRANTIES ARE LIMITED TO A PERIOD OF 1 YEAR FROM THE DATE OF PURCHASE. TECHNE SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT, OR OTHERWISE.

Note (U.S.A. only): Some states do not allow limitations of implied warranties, or exclusion of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may have other rights which vary from state to state.

GENERAL INSTRUMENT SPECIFICATIONS:
(Specifications for different models of Series 4400 thermometers may vary. If you have ordered a special version, see the special specification sheets in the following pages or packed with the unit.)

ENVIRONMENTAL CONDITIONS:

Operating:	
Temperature	0 - 45°C (32 to 113°F)
Humidity	0 - 85%
Storage:	
Temperature	0 - 60°C (32 to 140°F)
Humidity	0 - 70%

READING RATE: 2/sec. (one reading every 524msec)

DISPLAY: 4-1/2" digit LCD

POWER: 9 VDC battery, alkaline. Auto shutoff: 10 minutes from turn on or last press of function switch. Internal jumper can disable auto shut off. Optional 110VAC adapter.

BATTERY LIFE: 20 hours typical; batt symbol flashes when one hour of operation remains.

DIMENSIONS: 13.5" x 7.25" x 1.25"
(89mm x 184mm x 32mm)

WEIGHT: 12oz. (340g)

SPECIFICATIONS CONTINUED
ON THE NEXT PAGE

SPECIFICATIONS: (continued)

MODEL 4400-1.X.X METER ONLY

For use with standard 400 series probes. Add the appropriate Probe Tolerance (PT) to the indicated meter values to achieve total system performance.

THERMISTOR: ~2252 Ohms @25°C

PROBE CONNECTION: Phone Plug.

MEASUREMENT RANGE:
-20.00°C to +130.00°C
(-4.00°F to +266.00°F)

RESOLUTION: 0.01°C (0.01°F)

CALIBRATION PERIOD: Meter 12 months.

RANGE (±°C)	ACCURACY* *(±°C)	REPEAT-ABILITY (±°C)	ONE YEAR DRIFT (±°C)
0 to 50	0.015+PT	0.010+PD**	0.010
-20 to 70	0.020+PT	0.015+PD**	0.010
-20 to 100	0.050+PT	0.030+PD**	0.020
-20 to 130	0.125+PT	0.050+PD**	0.050

* Ambient temperature between 18°C and 28°C.
Traceable to NIST.
** PD = Probe Drift

SPECIFICATIONS: (continued)

MODEL 4400-2P.X.X System Specifications

THERMISTOR: ~10k Ohms @25°C

PROBE: Mid range, high accuracy micro probe.

MEASUREMENT RANGE:
-20.00°C to +50.00°C
(-4.00°F to +122.00°F)

RESOLUTION: 0.01°C (0.01°F)

CALIBRATION PERIOD: 12 months.

RANGE (±°C)	ACCURACY* (±°C)	REPEAT-ABILITY (±°C)	ONE YEAR DRIFT** (±°C)
0 to 50	0.025	0.010	0.020
-20 to 0	0.060	0.010	0.030

Accuracy* at cal points:

0°C:	±0.020°C	25°C:	±0.020°C
50°C:	±0.020°C		

* Ambient temperature between 18°C and 28°C.
Traceable to NIST.

** Probe not exposed to temperatures above 50°C.

SPECIFICATIONS: (continued)

MODEL 4400-2i.X.X System Specifications

THERMISTOR: ~22k Ohms @25°C

PROBE: Wide range, high repeatablity micro-probe.

MEASUREMENT RANGE:
-20.00°C to +125.00°C
(-4.00°F to +257.00°F)

RESOLUTION: 0.01°C (0.01°F)

CALIBRATION PERIOD: 12 months.

RANGE (±°C)	ACCURACY* (±°C)	REPEAT-ABILITY (±°C)	ONE YEAR DRIFT** (±°C)
0 to 70	0.050	0.010	0.020
0 to 100	0.050	0.010	0.020
-20 to 125	†	0.010	0.035

Accuracy* at cal points:

0°C:	±0.020°C	37°C:	±0.020°C
75°C:	±0.020°C	95°C:	±0.030°C

* Ambient temperature between 18°C and 28°C. Traceable to NIST.
** At or above 100°C for less than 50 hours/year
† Not specified outside 0 to 100°C

SPECIFICATIONS: (continued)

MODEL 4400-2Q.X.X System Specifications

THERMISTOR: ~22k Ohms @25°C

PROBE: Wide range, high accuracy microprobe.

MEASUREMENT RANGE:
-20.00°C to +130.00°C
(-4.00°F to +266.00°F)

RESOLUTION: 0.01°C (0.01°F)

CALIBRATION PERIOD: 12 months.

RANGE (±°C)	ACCURACY* (±°C)	REPEAT-ABILITY (±°C)	ONE YEAR DRIFT** (±°C)
0 to 70	0.025	0.010	0.020
0 to 100	0.030	0.015	0.020
-20 to 130	0.050	0.030	0.030

Accuracy* at cal points:

0°C:	±0.020°C	37°C:	±0.020°C
75°C:	±0.020°C	121°C:	±0.030°C

* Ambient temperature between 18°C and 28°C. Traceable to NIST.

** At or above 100°C for less than 50 hours/year

SPECIFICATIONS: (continued)

MODEL 4400-3NG.X.X System Specifications

THERMISTOR: ~30k Ohms @25°C

PROBE: Wide range, high accuracy general purpose stainless steel probe.

MEASUREMENT RANGE:
-20.00°C to +130.00°C
(-4.00°F to +266.00°F)

RESOLUTION: 0.01°C (0.01°F)

CALIBRATION PERIOD: 12 months.

RANGE (±°C)	ACCURACY* (±°C)	REPEAT-ABILITY (±°C)	ONE YEAR DRIFT** (±°C)
0 to 70	0.025	0.010	0.020
0 to 100	0.030	0.015	0.020
-20 to 130	0.050	0.030	0.030

Accuracy* at cal points:

0°C:	±0.020°C	37°C:	±0.020°C
75°C:	±0.020°C	121°C:	±0.030°C

* Ambient temperature between 18°C and 28°C. Traceable to NIST.

** At or above 100°C for less than 50 hours/year

- NOTES -

- NOTES -

RS-232 OPTION:

When purchased in high volume, an RS-232 PC interface version of the 4400 is available to O.E.M customers. If your 4400 is equipped with an RS-232 option you can communicate to the unit with a standard terminal program.

The 4400 enters the HOST mode when the RTS line becomes true. When the RTS line becomes false, the 4400 returns to the normal mode of operation. Baud rate: 9600, Data Length: 8 bits, Parity: None, Stop bits: 1. The 4400 will display H232 on the LCD when properly connected to an active RS-232 port. In a terminal program you will see a prompt >_ indicating that the 4400 and PC are communicating properly. You may need to hit enter a few times to synchronize the communication link. To see a list of the available commands type H on the keyboard followed by ENTER (carriage return). Follow the prompts given by the 4400 on the screen. The T command will continuously send temperature readings about every 1/2 second to the P.C. in the format of SXXX.XXX always in degrees Celsius. S = sign, a - is shown if a negative number is being displayed and no sign is shown if a positive number is being displayed. XXX.XXX = up to three significant whole digits with always three significant decimal places, i.e. 102.248 or -12.315. The 4400 will continue to send the temperature to the P.C. until the thermometer is turned off.

GLOSSARY:

ACCURACY: The degree of absolute conformity to a standard.

NIST: National Institute of Standards and Technology

PRECISION: The accuracy with which a number can be represented; sharply defined; conforming to a pattern; tolerance

REPEATABILITY: The ability of a probe or instrument to give the same output or reading under repeated identical conditions.

RESOLUTION: The least significant digits shown on a digital display.

RS-232: A standard computer interface protocol.

SENSOR SELF-HEATING: The internal heat generated in the sensor by passing a current through the sensor to measure its resistance.

TEMPERATURE STANDARD: An instrument who's calibration is directly traceable to the NIST.

STABILITY: The ability of a device to maintain a constant output with the application of a constant input.

SYSTEM ACCURACY: The total accuracy of the probe plus the accuracy of the thermometer.

SYSTEM CALIBRATION: Calibration of a thermometer and probe combination.

THERMISTOR: A temperature sensing element composed of semiconductor material whose resistance varies greatly, in a known manner, with the change of temperature. (The 4400 uses negative temperature coefficient thermistors - as temperature increases, resistance decreases).

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MODEL 4400-2P.X.X System Specifications

THERMISTOR: ~10k Ohms @25°C

PROBE: Mid range, high accuracy micro probe.

MEASUREMENT RANGE:
-20.00°C to +50.00°C
(-4.00°F to +122.00°F)

RESOLUTION: 0.01°C (0.01°F)

CALIBRATION PERIOD: 12 months.

RANGE (±°C)	ACCURACY* (±°C)	REPEATABILITY(±°C)	ONE YEAR DRIFT**(±°C)
0 to 50	0.025	0.010	0.020
-20 to 0	0.060	0.010	0.030

Accuracy* at cal points:
0°C: ±0.020°C 25°C: ±0.020°C
50°C: ±0.020°C

* Ambient temperature between 18°C and 28°C. Traceable to NIST.
** Probe not exposed to temperatures above 50°C.