



## Series 472 Digital Thermocouple Thermometer

### Specifications and Operating Instructions



#### Specifications

**Probe types:** Type J and K Thermocouples

**Probe Connection:** ANSI female mini-connector

**Input Protection:** 50V rms

**Temperature:** Range: J: -350 to 2192°F (-210 to 1200°C)

K: -418 to 2500°F (-250 to 1372°C)

Accuracy: 0.1% of reading  $\pm 0.7^\circ\text{F}/0.4^\circ\text{C}$  ( $> -150^\circ\text{C}$ )

0.1% of reading  $\pm 2^\circ\text{F}/1^\circ\text{C}$  ( $< -150^\circ\text{C}$ )

Resolution: 0.1° (below 1999°)

**Linearization:** Conforms to NIST monograph 175 revised to ITS-90.

**Operating Conditions:** Stated accuracy: 64 to 82°F (18 to 28°C)

Useful Range: 14 to 104°F (-10 to 40°C)

Storage Temperature: -40 to 176°F (-40 to 80°C)

**Display:** Dual 42 digit

**Battery:** 9 Volt alkaline

**Battery Life:** 200 Hours (typical)

**Memory:** 25 Samples (Normal or  $\Delta T$  mode)

## Operating Instructions & Specifications

### Introduction

The Series 472 Digital Thermocouple Thermometer is a precision general purpose thermometer designed for use with Type J or Type K thermocouples. The unit incorporates a variety of features in an easy to use format that make it useful in a wide variety of applications. The following summarizes the key features:

- High accuracy temperature measurement using type J and type K thermocouples.
- Standard ANSI thermocouple connector allowing the use of a wide variety of probe styles.
- Measurement in either degrees Fahrenheit or degrees Celsius.
- Selectable resolution for readings in degrees or in 0.1 degree increments.
- Differential or relative temperature measurement using the  $\Delta T$  mode.
- Recording and displaying minimum and maximum temperature readings.
- Storage and recall of up to 25 temperature measurements in either normal or  $\Delta T$  mode.
- Capability for field calibration of type J and type K thermocouples.
- Display backlighting for dark or low light conditions.
- 20 minute auto power off to conserve battery with a disable function where longer measurements are needed.

### DANGER

Do not connect the thermocouple to any hazardous voltage above the specified 50 V rms as this may result in shock or personal injury. In addition, the input circuitry is designed to accept only the low-level signals produced by standard thermocouples. Exceeding the specified input voltage may damage the instrument.

### NOTE

Inaccurate temperature readings will result if the unit is not set to read the thermocouple type connected to the unit. The ANSI thermocouple connector is color coded for each thermocouple type. Type J thermocouples use a black connector. Type K thermocouples use a yellow connector. Other colors signify other types of thermocouples not supported by this instrument.

## INSTRUCTIONS

### Connecting A Thermocouple

Use either a type J or type K thermocouple with this instrument and select the proper type using the J/K key as explained in the

section "Thermocouple Type". Using the incorrect thermocouple or selecting the wrong type will result in significant measurement errors. The North American ANSI Color Code identifies thermocouples as follows:

Type J	Black
Type K	Yellow

Thermocouple connectors are polarized to ensure proper connection. The connectors have a wide pin and a narrow pin. Match these with the mating connector holes on the top end cap of the unit and carefully insert the connector. Do not force the connector. If the temperature readings are negative or decrease as the temperature increases, the thermocouple may be connected in reverse. Thermocouple wire uses a red wire to indicate the negative lead.

### Battery Installation

Remove the two screws holding the bottom endcap in place and remove it. Connect the battery to the enclosed battery clip, observing correct polarity. Insert the battery in the case. Be careful not to trap the wires between the case or foam pad, which retains the battery. This could make it difficult to install the battery or remove it later for replacement. Be sure the rubber gasket is properly seated in the gasket channel and replace the endcap. Note that the endcap will only fit one way because the holes are slightly off-center. Place the "Z" shaped wrist strap clip in one of the screw recesses and replace the screws. Do not overtighten. Attach the wrist strap to the clip.

Use only 9 Volt alkaline type batteries such as a Duracell® MN1604, or Eveready® 522 or equivalent. Zinc-carbon types, often labeled Heavy-Duty are not recommended because of their shorter life and an increased potential for leakage. Alkaline batteries are a better value because they typically last up to three times longer in this device.

### On-Off Operation

The on-off control is a toggle function. Press the ON/OFF key once to turn the unit on; again to turn it off. If the unit is left on with no activity for approximately 20 minutes, it will turn itself off to conserve the battery. Each time a key is pressed, the timeout will be reset to 20 minutes. The timeout function may be disabled by holding both the ON/OFF and the J/K key down while turning the unit on. The "ALARM 2" annunciator will be illuminated to indicate the timeout was disabled. The unit must then be manually turned off.

### Display Backlight

The Series 472 includes a display backlight to allow use in the dark or in poor lighting conditions. The unit must be off before this feature can be activated. Press and hold the ON/OFF key. After about 1 second the backlight will come on and remain lighted for approximately 2 minutes after which it will turn itself off to conserve the battery.

### Thermocouple Type

To change the thermocouple type, press the "J/K" key. The "J" and the "K" annunciators will be alternately illuminated to indicate which thermocouple type is selected. The selected type will be stored in nonvolatile memory. Remember to select the correct setting for the thermocouple being used. Incorrect selection will result in significant errors in the temperature reading. Type J thermocouples are supplied with a black connector. Type K thermocouples are supplied with a yellow connector.

### Selecting Temperature Units

The temperature readings may be displayed in either °F or °C. For each units type, you may choose whether to display tenths of a degree or suppress it. To change the units, press the UNITS/LOC key. The sequence will be 0.0°F, 0°F, 0.0°C, 0°C. Above 1999.9° the unit will automatically switch to display whole degrees only. The selected units will remain in memory even when the power is shut off. This way, your preference will always be displayed after the initial selection.

### Display Hold

Pressing then releasing the HOLD-ΔT/MEM key, will freeze the display and illuminate the "HOLD" annunciator. Pressing the Hold-ΔT/Mem key again will extinguish the "HOLD" annunciator and the display will again be updated.

### Relative Temperature Measurement Using The ΔT Function

The ΔT function displays the difference between a reference temperature and the measured temperature. To enable the ΔT function, first measure the reference temperature then press "HOLD", then press "MIN/ΔT". The reference temperature will be displayed in the lower left display, the differential temperature will be displayed on the main display, and the unit will exit the Hold state and continue normal operation. To disable the ΔT function, press "HOLD", then press the "MIN/ΔT" key. The unit will begin normal operation. The ΔT function will also be canceled when the unit is turned off.

### Min/Max Function

The unit provides the ability to save the minimum and maximum temperature values over a period of time. Two keys are provided for this function, one marked MIN and one marked MAX. Pressing MIN will display the minimum value for temperature. Pressing MAX will display the maximum value for temperature. Pressing both MIN and MAX simultaneously will clear the MIN and MAX memory. Min and Max values are stored in nonvolatile memory and will be retained even when the power is off.

### Memory Function

A memory function is provided that allows you to store up to 25 temperature readings. The samples are stored in nonvolatile memory so the samples are retained even when the power is off. If the unit is in the ΔT mode, both the reference temperature and the differential temperature will be stored.

### Entering Memory Mode

To enter memory mode, press and hold the HOLD-ΔT/MEMORY key until the MEM indicator appears in the display. The key can then be released. The active memory location will be displayed in the lower left display, starting initially with "01". When recording readings in the ΔT mode, the reference temperature is displayed in the lower left display. In this case the memory location will be briefly displayed in the lower left display, then it will switch to the reference temperature.

### Storing Readings

To store a reading, press the J/K/STORE key. The readings will be stored in the previously indicated memory location and a beep will sound to indicate the reading has been saved. As each reading is saved, the memory location is advanced to the next location and displayed in the lower left display. When 25 readings have been stored the memory location will begin at "01" again.

### Viewing Stored Readings

To view the contents of memory, the unit must be in the memory mode. To enter the view mode, press the UNITS/LOC key. The HOLD indicator will then be displayed with the MEM indicator to indicate that the memory values are being displayed rather than the current readings, and the location number will be briefly displayed. Each time the UNITS/LOC key is pressed the memory location is advanced, and the new location will be dis-

played. If the key is held down, the location will automatically increment until the key is released. This operation may be used to select a particular memory location to store the next reading. To resume temperature measurements, press the HOLD-ΔT/MEMORY key. The HOLD indicator will disappear and the display will resume displaying the current measurements. The last viewed memory location will remain as the location in which the next sample will be stored.

### Clearing Memory

The memory may be cleared of all previously stored values by pressing and holding the J/K/STORE key, then simultaneously pressing the ON/OFF key. During the clearing operation, "----" will be displayed. When the memory is cleared, the current readings will be displayed and the memory location will be set to "01".

### Exiting Memory Mode

To exit memory mode, press the HOLD-ΔT/MEMORY key. The memory indicator will disappear. All values stored in memory will be retained for later viewing.

### Low Battery Indicator

A weak battery may cause improper operation or inaccurate measurements. A low battery indicator is provided on the display to show when the battery needs to be replaced. Although the unit may appear to function and read properly, the accuracy of the readings cannot be guaranteed when the "LOW BAT" indicator is illuminated. Replace the battery with a fresh one. Do not leave an exhausted battery in the unit due to potential battery leakage.

### Field Calibrate Function

The calibration function allows setting a custom ice point. A separate calibration may be done for either the type J or type K thermocouple types. The following procedure is used:

1. Prepare a mixture of crushed ice made with distilled water and distilled water and place it in a suitable container preferably an insulated container such as a dewar flask or thermos bottle but an insulated container such as a Styrofoam cup will suffice.
2. Place the test thermocouple into the mixture and allow it to stabilize.
3. With the unit off, press and hold the "MAX/CAL" key then the "ON/OFF" key. Release the keys when the "CAL" indication is illuminated in the lower left display.
4. When the reading is stable, press and hold the "MAX/CAL" key. The "CAL" indicator will be removed and the "C" annunciator will be illuminated. The new calibration point will be stored in nonvolatile memory until it is manually cleared. The reference temperature must be within ±10°C of 0°C. "Err" will be displayed if you attempt to calibrate outside this range and the calibration point will not be accepted.

To cancel the field calibration, with the unit off, press and hold the "MAX/CAL" key then press the "ON/OFF" key to turn the unit on. This will enter the CAL mode with the "CAL" annunciator displayed. Press and the "MAX/CAL" key. The "C" and the "CAL" annunciators have been shut off and the unit will now resume measurement using the factory calibration.

### Maintenance

The series 472 Thermometer requires no routine maintenance. If recalibration or repair is required, the unit may be returned to Dwyer Instruments by sending the packaged instrument, freight prepaid, to the address below. Be sure to include a clear description of the problem plus any application information available.

Dwyer Instruments, Inc.  
Attn: Repair Department  
102 Indiana Highway 212  
Michigan City, IN 46360

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