



TI408
8-Channel Handheld Temperature Indicator
Operating Instructions



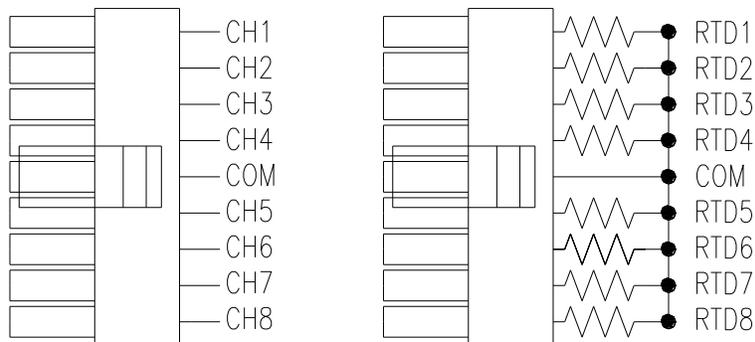
Description

Model TI408 is a handheld temperature indicator that accepts up to eight 2-wire temperature sensors. The indicator utilizes ultra-high precision components and a microprocessor to achieve a system accuracy of less than 0.2°C over a specified range. The indicator is factory calibrated at five temperature points to achieve this high accuracy. Through an integrated calibration menu, the user can re-calibrate the device and adjust a temperature offset to account for variations in sensor lead-length, contact resistance, and/or sensor tolerance.

Specifications

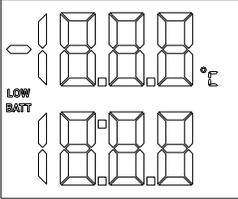
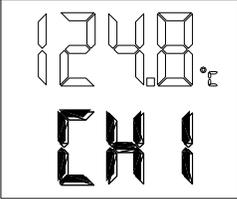
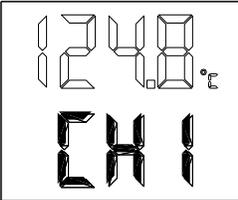
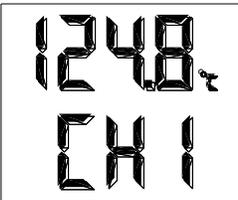
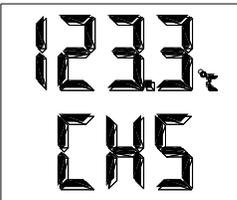
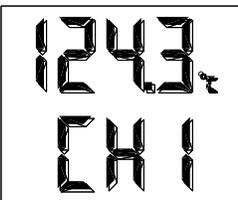
Display:	2 line, 3 ½ digit LCD (Liquid Crystal Display)
Indicating Range:	-40.0°C to 160.0°C
Sensing Elements:	1000Ω platinum RTD (TCR = .0385 Ω/Ω/°C, 1000 Ω @ 0°C) per channel
Sensor Input:	Indication of up to 8 RTD's.
Temperature Effect:	±0.001°C/°C from 10°C to 60°C
Operating Temperature:	10°C to 60°C.
Storage Temperature:	-20°C to 65°C, non-condensing.
Supply voltage:	Two AA alkaline batteries (supplied)
System Accuracy:	±0.2°C from 120°C to 135°C (when matched to RTD's)
Adjustments:	Channel offset calibration accessible through calibration menu.
Enclosure:	Black ABS plastic.
Weight:	5.7oz. (161g).
Standby Current (typical):	60 uA.
Operating Current (typical):	2.8 mA.
Stability Indication:	Variation of less than 0.5°C for 10 seconds over all channels.

Sensor Connection



Input Connection Diagram and Typical Application

Temperature Indicator Functionality

Keypad	Display	Description / Functionality
 <p>Press and hold > 500mS</p>	 	<p>On/Off button must be pressed and held for more than 500mS to turn the device on. The display will start-up showing all characters as a confirmation that the device is on and running.</p>
	 <p>Flashing (Not Stable)</p>  <p>Stable</p>	<p>After the first reading of the channel indicated, the temperature will be displayed and flashing. The display will continue to flash for at least 10 seconds or until the device has reached stability. Stability is defined as no more than 0.5°C variation between the min and max values over 10 seconds on a per channel basis. A deadband will require three consecutive readings of stable/unstable to change state. The indicated channel may be changed during this period.</p>
  <p>Standard Key Press</p>	 	<p>The indicated channel may be changed using either the up or down arrow keys. If the channel indicated is currently "CH1" and the up arrow is pressed, the channel will change to "CH2". When the channel is indicating "CH8" and the up arrow is pressed, the indicated channel will change to "CH1". At any time during normal operation, the device may return to the "non-stable" state as every cycle the stability conditions will be verified. The temperature displayed is always a moving average of 8 readings.</p>
 <p>Press and hold for 2 seconds. Display will turn off indicating the user to release the power button.</p>	 	<p>To turn off the device, press and hold the power button until the display becomes blank. This should take about 2 seconds. If the power button is released before the display becomes blank, the device will not power off and resume normal operation. If the power button is pressed during calibration mode, the device will exit calibration mode without saving any further information. If changes have already been confirmed in the yes/no confirmation screen, those changes will remain as is with the new calibration values utilized.</p>

Temperature Indicator Calibration

Calibration of the temperature indicator can be done in a number of ways; comparison to another calibrated instrument, using decade box simulation, or in a controlled environment such as an oil bath. The TI408 series indicator incorporates a calibration menu to adjust the zero offset for each channel.

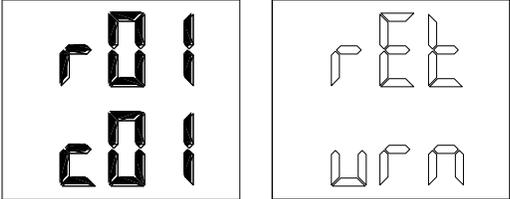
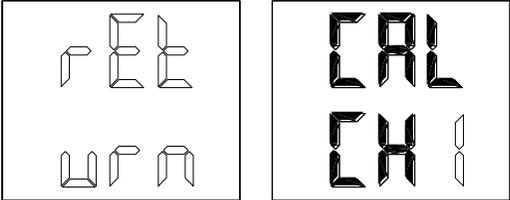
Controlled Environment / Comparison Method

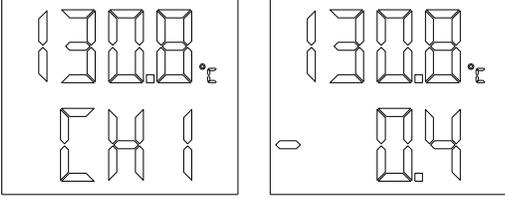
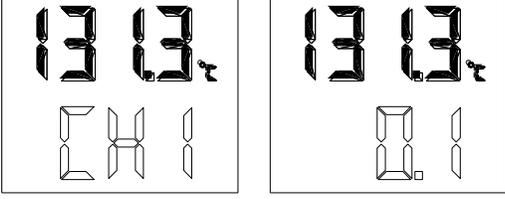
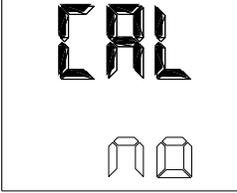
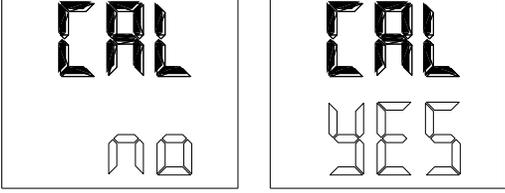
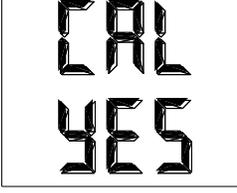
The most accurate method of re-calibrating the indicator / sensor system is to place the sensor(s) in a known environment such as an oil-bath or a calibration chamber and base all measurements off of a known standard. Calibration using this method will account for any lead-length or contact resistance, as well as any offset characteristics of the sensor. The environment should have an accurate sensor or instrument (standard) with an accuracy of less than or equal to 0.1°C from which all measurements will be based. To compare the calibration of the indicator to another calibrated instrument or sensor, both sensors should be within 1" of each other. Set the temperature of the environment to the mid-point of the desired measurement range. For example, if all measurements fall within the range of 120°C to 135°C, set the environment to 127.5°C. Wait for the indicator and standard to stabilize before proceeding. Once the system is stable, follow the calibration procedures below for each channel to calibrate the indicator.

Decade Box

Connect a resistance decade box with a resolution of at least .01 ohms to the desired input (CH1-CH8) of the indicator. If unsure or concerned about the decade box's accuracy, measure the desired set-point using an accurate 4-wire ohmmeter. Set the decade box resistance to simulate the mid-point of the desired measurement range. For example, if all measurements fall within the range of 120°C to 135°C, simulate the resistance for 127.5°C (1488.92 Ω for a PF type sensor). Follow the instructions below to calibrate the indicator for each channel.

Calibration Procedures:

Keypad	Display	Description / Functionality
<p>Step 1</p>  <p>Both buttons pressed within 500mS of each other, held between 3-8 seconds and released within 500mS of each other.</p>		<p>Calibration mode is entered by the following key combination. Press and hold the triangle and the up arrow within 500mS of each other. Continue to hold both keys until a decimal point appears on the screen. Release both keys within 500mS of each other. When entering calibration mode the display will show the software revision level as well as the amount of times that the calibration has been confirmed for 2 seconds. The display will then show "return". The triangle key will act as the enter button, therefore pressing the triangle button while the display reads "return" will exit the calibration mode.</p>
<p>Step 2</p>  <p>Standard Key Press</p>		<p>Pressing the up or down arrows will cycle through the calibration menu and allow the user the choice to calibrate channels 1-8 or return to the main screen.</p>

Keypad	Display	Description / Functionality
<p>Step 3</p>  <p>Standard Key Press</p>	 <p>Temperature flashes until 32 readings are collected. Channel indication and offset cycle at a rate of 1 time per second.</p>	<p>Pressing the triangle button will access the calibration for the channel chosen in the previous step. If "return" was selected, the device will exit the calibration mode and return to normal operation. When calibration for a specified channel is accessed, the user will see the current temperature measured (including the offset), a channel indication and the current offset. During this time, the user will notice that the displayed temperature is not steady. This is due to the fact that the device is collecting data over 32 consecutive readings for use in calibration. When 32 readings have been collected the temperature will stop flashing. The channel indicator and the offset will cycle every 1 second.</p>
<p>Step 4</p>   <p>Standard Key Press</p>		<p>The user should now have a steady reference of which to measure the actual temperature of the specified channel's sensor. Pressing the up and down arrows will adjust the offset, which will result in a shift in the indicated temperature.</p>
<p>Step 5</p>  <p>Standard Key Press</p>		<p>When the user determines that the indicated temperature reflects the actual temperature at the sensor, the triangle key should be pressed. The display will show "CAL" and a flashing "no".</p>
<p>Step 6</p>   <p>Standard Key Press</p>		<p>The up and down arrows will cycle the display between "CAL no" and "CAL yes". Select "CAL yes" to accept the calibration or "CAL no" to decline the calibration.</p>
<p>Step 7</p>  <p>Standard Key Press</p>	 <p>Flashing becomes solid for 1 sec.</p>	<p>Press the triangle button to accept. The display will stop flashing and become solid for 1 second as confirmation from the device. At this point the indicator will return to the calibration menu of step 2. The display will indicate the channel that was previously calibrated. If further calibration is required, repeat steps 2 through 7. If calibration is complete, use the arrow keys to select "rEturN" and press the triangle button to exit calibration.</p>

How to Order

TI408	Model Number: TI408 = 8-Channel Handheld Temperature Indicator
PF	Element Type: PF = 1000 Ω Platinum RTD (TCR = .0385 $\Omega/\Omega/^{\circ}\text{C}$, 1000 Ω at 0 $^{\circ}\text{C}$) (Default)
TI408PF ← Sample part number	

Warranty

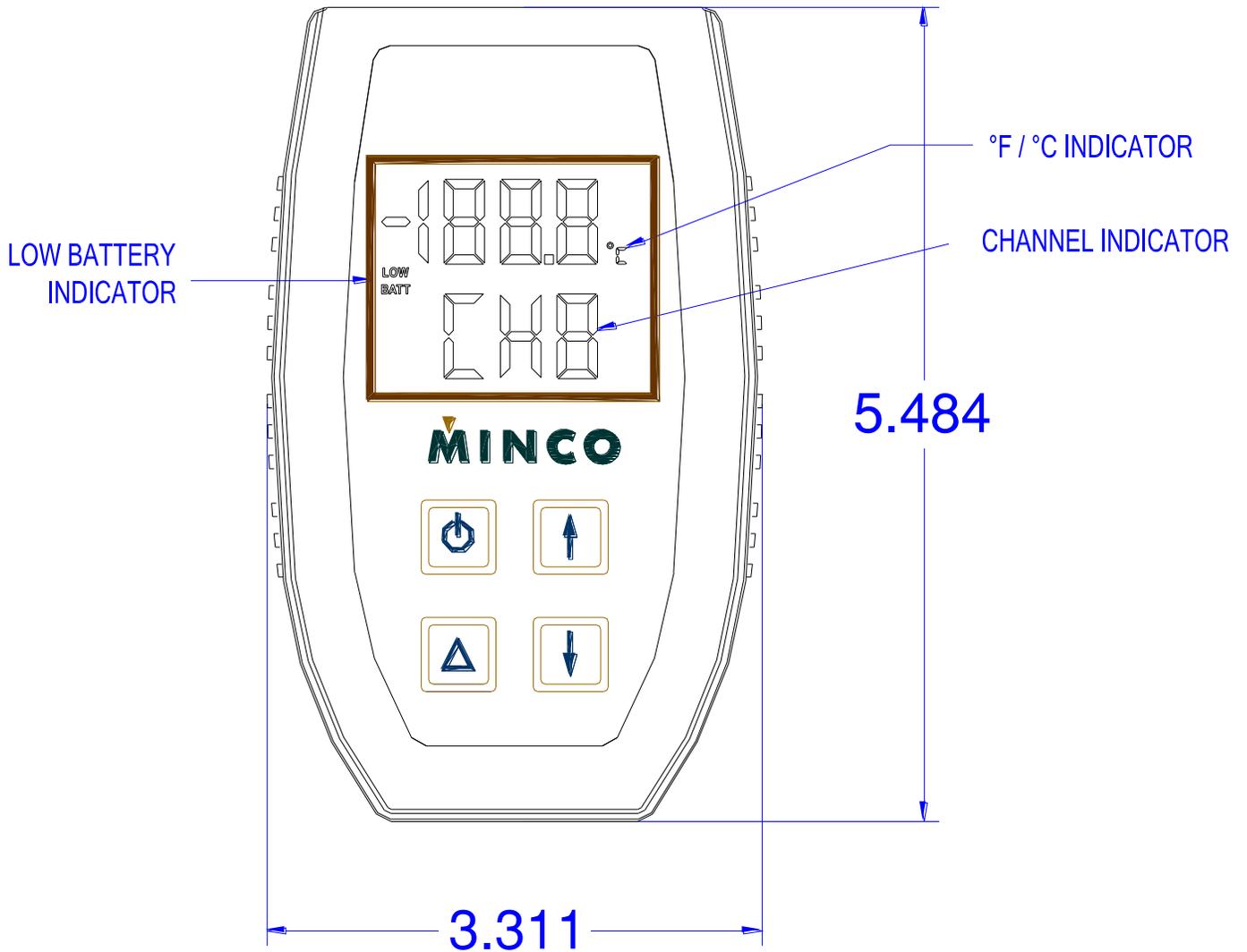
Items returned within one year from the date of sale, transportation prepaid, which Minco Products, Inc. (the "seller") reasonably determines to be faulty by reason of defective materials or faulty workmanship will be replaced or repaired at the seller's discretion, free of charge.

This remedy is to be the sole and exclusive remedy available to the buyer in the event of a breach by the seller. Items that show evidence of mishandling or misapplication may be returned by the seller at the customer's expense.

Furthermore, the seller is not to be held responsible for consequential damages caused by this product except as required under Minnesota Statutes, Section 336.1-719 (3).

This warranty is in lieu of any other expressed warranty or implied warranty of merchantability or fitness for a particular purpose, and of any other obligations or liability of the seller or its employees or agent.

Dimensions



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