

# THERMOCOUPLE CALIBRATOR MODEL 222A

- **SELECT ONE OF 10 T/C TYPES OR MV**  
J, K, T, E, R, S, B, N, C, L, & mV
- **TEMPERATURE INPUT & OUTPUT**  
Reads directly in degrees
- **“QUIK-CHEK” SWITCH**  
Select HI, LO & SET
- **MULTI-SPEED DIGITAL POT**  
Fast, accurate setting
- **0.01% ACCURACY, °C or °F**  
Field selectable 0.1° or 1° resolution

Conforms to ITS-90 Temperature Scale using the latest Thermocouple Tables published by NIST in Monograph 175. This affects Types J, T, E, K, R, S, B&N.



## GENERAL DESCRIPTION

### THERMOCOUPLE CALIBRATOR

SOURCE and READ T/C's over the entire industrial temperature range with ALTEK's Model 222A Thermocouple Calibrator. Use with transmitters, recorders, controllers, alarms, indicators, data acquisition and computer systems. Each model 222A is dedicated to a particular T/C type for error free use.

High accuracy and stability is achieved through the use of low drift components and continuous monitoring of the cold junction temperature. Built-in flexible T/C leads let you connect directly, using the proper T/C materials. Automatic linearized cold junction compensation virtually eliminates temperature drift. Field customize the Model 222A to lock in 1° or provide autoranging from 0.1° to 1° with 0.1° resolution in the most used portion of the temperature range. You may also choose fixed °F or °C or front panel selectable °F/°C operation. Fuseless protection guards the Model 222A against mis-connection to 120 volts AC or DC, in any mode.

Select your Model 222A from thermocouple types J, K, T, E, R, S, B, C, N and L (J-DIN). Or choose the millivolt version, Model 222A-mV, to measure and simulate analyzer signals. Consult Altek for thermocouple types not listed.

#### “SOURCE” MODE SIMULATES A T/C SENSOR

Select autoranging 0.1%/1° or fixed 1° resolution for the full listed range of a single thermocouple type. Millivolt Model allows resolu-

tions of 10 microvolt from -999.90 to +999.90mV and 100 microvolt from -999.9 to +999.9mV. The ALTEK Model 222A simulates key temperatures for repetitive calibrations. “QUIK-CHEK” function stores THREE output temperatures for real convenience. Memory is retained even when the power is off.

Turn the knob to check trip points, controller action or hysteresis. The fast response 222A sets quickly without overshoot but allows slow changes at your own rate.

#### “READ” MODE MEASURES T/C'S DIRECTLY

The Model 222A display gives you fast, accurate temperature measurement with 0.1 and 1 degree or millivolts with 0.01 millivolt resolution. High resistance or open T/Cs and leads are detected and indicated on the LCD display. Two readings per second track fast moving temperatures.

“MAX” and “MIN” memories are continuously updated from turn-on or whenever the “RESET” pushbutton is pressed. The Model 222A gives you a handy tool to monitor temperatures for drift or control deviation. Just flip the “QUIK-CHEK” switch to display the MINimum and MAXimum temperature since reset.

#### TURN ON SEQUENCE

Each time the Model 222A is turned on, the LCD will display all segments for 1 second. If °C/°F operation has been selected the currently selected temperature scale of °C or °F will display.

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# OPERATING INSTRUCTIONS

## GENERAL

### INITIAL SETUP

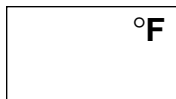
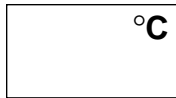
The Model 222A is internally configurable for ease of use. Simply remove the four corner screws, set the DIP switches and follow the simple instructions given below (a condensed guide is found within the calibrator housing). The choices are based on the type of instruments in your shop or plant. For instance if your plant has only instruments which display to 1°C, set up the Model 222A to choose full time °C and display with 1° resolution.

### TURN-ON

Each time the Model 222A is turned on, the LCD will display all segments for about 1 second. The currently selected temperature scale of °C or °F will then display for about 3 seconds. Depending on the configuration, °C or °F may be selected during turn-on.



- 1) Move the power switch to SOURCE or READ
- 2) All segments on the LCD are turned on during self test
- 3) The display will indicate the selected temperature scale for 3 seconds. Press the SCROLL pushbutton to switch between °C & °F (based on configuration).



If fixed °C or fixed °F has been selected, the user prompt for this selection will be skipped during turn-on.

The three "QUIK-CHEK" temperature values will be the same as previously stored.

Hint: The Model 222A will automatically convert the temperatures in memory between °F and °C. For example, if 212.0°F is stored in HI and the Model 222A is switched to °C, 100.0°C will be displayed.

### OVER RANGE/UNDER RANGE

Out-of-range temperatures are indicated by OVER and UNDER on the display. If out-of-range is displayed during READ mode check for proper connections and T/C type.

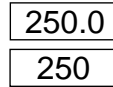


### CONFIGURING TEMPERATURE SCALES



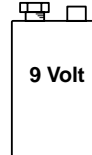
The Model 222A may be internally set-up for full time use of °C, full time use of °F or selectable °C/°F operation. The selectable mode lets you choose °C or °F each time the unit is turned on (see Configuring Operating Modes below).

### LOCKING IN 1° RESOLUTION



The Model 222A may be internally configured for autoranging 0.1°/1° or fixed 1° resolution. Select 1° resolution for less critical applications or autoranging for increased resolution when necessary.

### CHANGING BATTERY

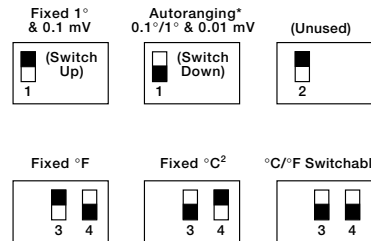


Low battery is indicated by BAT on the LCD Display. Approximately 10 Hours of operation remain before the LCD goes blank and the Model 222A shuts itself down. Turn the 222A off, remove the four corner screws and lift the unit out of the case. The battery is fastened to the bottom printed circuit board and is easily removed. Replace screws and turn on when ready to use.

### CONFIGURING OPERATING MODES (Setting DIP Switches)

- 1) Turn the Model 222A OFF
- 2) Remove the 4 corner screws and lift faceplate assembly out of the case
- 3) Set the DIP switches for your options as diagrammed below

Note: °C/°F selection is the default for shipments in the U.S.A. °C for all other countries.



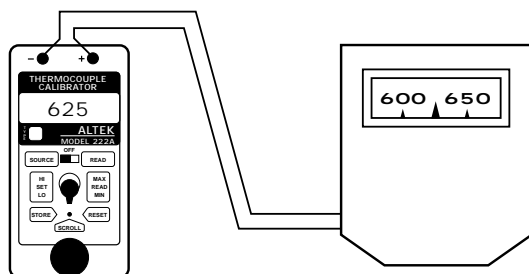
\*Factory Setting (Switch 1 Down)  
 ¹Factory Setting—USA  
 ²Factory Setting—All other countries

## PYROMETER CALIBRATION

Some thermocouple input pyrometers and controllers operate on the D'Arsonval meter movement principle. Millivolts from the thermocouple input drive a low resistance coil directly. For example, a coil may have a typical resistance of 60 ohms. Since the pyrometer resistance is so low, resistance of the input thermocouple leads must be taken into account. Pyrometers of this type have fixed or adjustable series resistance which corrects for lead length resistance.

### To use the Model 222A to drive low resistance loads:

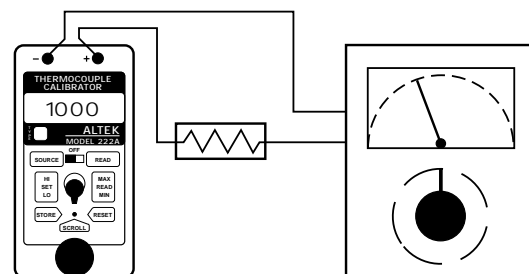
- 1) Disconnect the sensing thermocouple leads at the thermocouple head.
- 2) Connect leads from the Model 222A to the extension wires going to the pyrometer, using the screw connectors in the head. (If the sensing thermocouple sheath is within 1/4 to 2 times the length of the Model 222A lead length, the error due to resistance will be negligible).
- 3) Set the temperatures to be used for calibration per the recommendation of the pyrometer manufacturer.



### If the thermocouple head cannot be accessed:

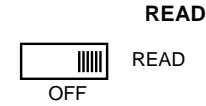
- 1) Determine the installed length of extension wire between the head and the pyrometer.
- 2) Select thermocouple extension wire of the same type, wire size and length as the installed wire between the head and the pyrometer to make up a calibrating wire.
- 3) Replace the active thermocouple extension wire with the calibrating wire at the pyrometer terminals.
- 4) Connect the other ends of the calibrating wire to the Model 222A and calibrate the pyrometer.

Note: A resistor of the same ohm value as the wire between the head and the pyrometer may be used in series with one lead instead of a length of calibrating wire. Make certain that both input and output leads to the resistor are the same temperature.



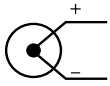
# OPERATING INSTRUCTIONS

## READ MODE (MEASURE THERMOCOUPLES)

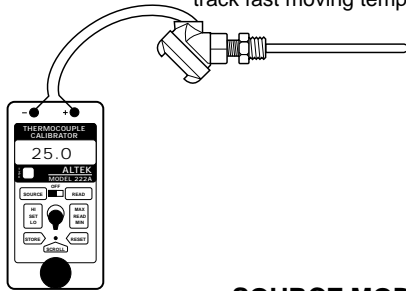


- 1) Set up the Model 222A for the correct temperature scale ( $^{\circ}\text{C}$  or  $^{\circ}\text{F}$ )
- 2) Disconnect the wires from the thermocouple to be read or checked.
- 3) Connect the Model 222A to the sensor, being careful to observe proper polarity & T/C type
- 4) Display present reading, Maximum or Minimum temperatures

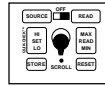
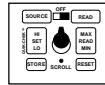
### INPUT



Whenever READ mode is selected, the word READ will appear on the LCD. The Model 222A can measure temperatures with resolution autoranging between  $0.1^{\circ}$  and  $1^{\circ}$  resolution or with fixed  $1^{\circ}$  resolution. The display is updated twice per second to continuously track fast moving temperatures.

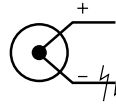


### MIN/MAX



To read the Maximum or Minimum temperature since INPUT mode was entered, simply switch to MAX or MIN. The value will appear on the LCD along with the word MAX or MIN. The MAX/MIN values are automatically updated and may be viewed at any time without disturbing the other values. Pressing the RESET/SCROLL pushbutton will transfer the present temperature into both MAX and MIN and will update them as the measured temperature changes.

### OPEN THERMOCOUPLES



The Model 222A checks for open or high resistance thermocouples. Open or burned out T/Cs are indicated by "— — — —" on the display. Temperatures out of range for the T/C TYPE selected will be indicated by OVER and UNDER on the display.

## SOURCE MODE (Millivolt output or Simulate T/C temperatures)

### SOURCE

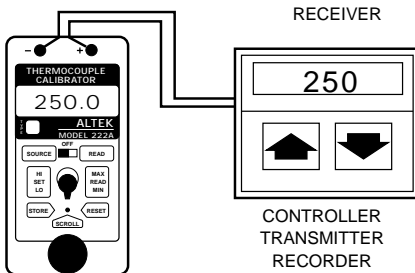


- 1) Set up the Model 222A for the correct temperature scale ( $^{\circ}\text{C}$  or  $^{\circ}\text{F}$ )
- 2) Disconnect the input wires from the device to be calibrated or checked
- 3) Connect the Model 222A to the device to be calibrated, being careful to observe proper polarity & T/C type
- 4) Adjust the digital pot to the desired output value

### OUTPUT



Whenever SOURCE mode is selected the word SOURCE will appear on the LCD display. To change the output value, turn the speed sensitive digital pot. Turning the pot slowly will cause a gradual change in the output. A faster change will occur when the pot is turned faster. This function operates in all three output positions (HI, SET & LO).



### STORE



- 1) Switch to HI or LO
- 2) Turn the digital pot to desired value
- 3) Press the STORE/SCROLL pushbutton. The LCD will flash once to show that the value was saved

If a value is in the SET position and you want that value stored in HI or LO, press and hold the STORE/SCROLL pushbutton while moving the switch to HI or LO. Then release the STORE button.

### "QUIK-CHEK"



Any time you need a stored value just throw the "QUIK-CHEK" switch. Any value in the T/C range may be stored in HI & LO. The Model 222A remembers the HI, LO and SET values for you with the power on or off.

### OVERLOAD

The Model 222A will indicate OVER and blank the digits on the display when the output leads have been shorted or when the device being calibrated requires more than 10mA.

## 222A-mV (Millivolt Model)

Source and Read millivolts to calibrate and checkout recorders, mV transmitters and other millivolt input instruments with the Model 222A-mV. Resolution is 10 microvolts from -999.90 to +999.90mV.

## CONNECTIONS

It is essential for accurate calibration that thermocouple wire is used to connect the Model 222A to the device being calibrated. Miniature or subminiature thermocouple connectors may be attached to the ends of the wire supplied with the Model 222A to allow for quick connections. Copper wires, Copper connectors or Copper adaptors are not recommended as they will cause errors in cold junction compensation. Copper is used only for millivolt applications.

# SPECIFICATIONS

(Unless otherwise indicated, specifications are in  $\pm\%$  of span @ 23°C)

## GENERAL

GENERAL ACCURACY:  $\pm(0.016\%$  of Reading +0.006 millivolts)  
 Thermocouple:  $\pm 0.012\%$  of 156 millivolt Span @ 23°C  
 Millivolt:  $\pm 0.0083\%$  of 2000 millivolt Span @ 23°C  
 COLD JUNCTION COMPENSATION: Built-in for specified thermocouple type, characterized to T/C curve  
 COLD JUNCTION TEMPERATURE EFFECT: Within 0.05° per °C change in ambient temperature over operating range  
 OPERATING TEMPERATURE RANGE: -5 to +140°F (-20 to +60°C)  
 STORAGE TEMPERATURE RANGE: -22 to +175°F (-30 to +80°C)  
 RELATIVE HUMIDITY: 10 to 90%, non-condensing  
 ZERO STABILITY: Included in Cold junction effect  
 WARM UP TIME: 1 Minute to full rated accuracy  
 OVERLOAD PROTECTION: 120 volts AC/DC for 30 seconds on connecting leads, in any mode  
 BATTERY LIFE: 9 Volt Alkaline: Nominal 40 hours  
 LOW BATTERY: "BAT" indication on LCD at 7 Volts nominal, approximately 10 hours left. Batteries should be removed when storing unit >3 months.

REFERENCE DRIFT: <20 PPM/°C  
 OVERALL SIZE: 2 1/2 x 2 5/8 x 5 1/8 inches (63.5 x 66.7 x 130 mm)  
 WEIGHT: 10.9 oz. (0.31kg)  
 CARRYING CASE: Included, zippered with belt loop and shoulder strap

## SOURCE MODE

OUTPUT IMPEDANCE: <0.1 ohms  
 SOURCE CURRENT: up to 8 mA (drives 80mV into 10 Ohms)  
 OUTPUT NOISE: <4 microvolts for frequencies of 10 Hz or below  
 OVERLOAD: Indicates OVER and blanks digits on the display

## READ MODE

INPUT IMPEDANCE: >10 Megohms  
 OPEN THERMOCOUPLE DETECTION: 450 millisecond check pulse. Nominal threshold, 10 K Ohms. Displays " — — — —" for open circuit  
 NORMAL MODE REJECTION: 50/60 Hz, 50 dB  
 COMMON MODE REJECTION: 50/60 Hz, 120 dB

Specifications subject to change without notice

# RANGES & ACCURACIES

Based on  $\pm(0.008\%$  of Reading + 0.006 millivolts)

T/C TYPE	°C RANGE	ACCURACY	°F RANGE	ACCURACY	T/C MATERIAL	ISA/ANSI COLOR	T/C TYPE	°C RANGE	ACCURACY	°F RANGE	ACCURACY	T/C MATERIAL	ISA/ANSI COLOR
<b>J</b>	360 TO 1200	$\pm 0.3$	680 TO 2192	$\pm 0.5^\circ$	+IRON	WHITE	<b>B</b>	-50 TO 0	$\pm 1.5^\circ$	-58 TO 32	$\pm 2.7$	+Pt/30Rh -Pt/6Rh JACKET	GREY
	-129.9 TO 359.9	$\pm 0.2$	-201.9 TO 679.9	$\pm 0.4$	-CONSTANTAN	RED		1100 TO 1820	$\pm 0.7$	2012 TO 3308	$\pm 1.3^\circ$		RED
	-210 TO -130	$\pm 0.4^\circ$	-346 TO -202	$\pm 0.7$	JACKET	BLACK		700 TO 1100	$\pm 1.0$	1292 TO 2012	$\pm 1.9$		GREY
<b>K</b>	500 TO 1371	$\pm 0.4$	932 TO 2500	$\pm 0.8^\circ$	+CHROMEL®	YELLOW	450 TO 700	$\pm 1.3$	842 TO 1292	$\pm 2.5$	+NICSIL -NISIL JACKET	ORANGE	
	-49.9 TO 499.9	$\pm 0.2$	-57.9 TO 931.9	$\pm 0.4$	-ALUMEL®	RED	350 TO 450	$\pm 1.7^\circ$	662 TO 842	$\pm 3.1$		ORANGE	
	-200 TO -50	$\pm 0.4$	-328 TO -58	$\pm 0.8$	JACKET	YELLOW	600 TO 1300	$\pm 0.4$	1112 TO 2372	$\pm 0.7^\circ$		RED	
<b>T</b>	-29.9 TO 400.0	$\pm 0.2$	-21.9 TO 752.0	$\pm 0.3^\circ$	+COPPER	BLUE	350.1 TO 599.9	$\pm 0.2$	662.1 TO 1111.9	$\pm 0.4$	-NISIL JACKET	ORANGE	
	-220 TO -30	$\pm 0.5$	-364 TO -22	$\pm 1.0$	-CONSTANTAN	RED	-50 TO 350	$\pm 0.2$	-58 TO 662	$\pm 0.4$		ORANGE	
	-260 TO -220	$\pm 1.8^\circ$	-436 TO -364	$\pm 3.2$	JACKET	BLUE	-180 TO -50	$\pm 0.5$	-292 TO -58	$\pm 1.0$			
<b>E</b>	280 TO 1000	$\pm 0.2$	536 TO 1832	$\pm 0.4^\circ$	+CHROMEL®	PURPLE	2100 TO 2320	$\pm 1.2$	3812 TO 4208	$\pm 2.1^\circ$	+W5/Re -W26/Re JACKET	WHITE	
	-149.9 TO 279.9	$\pm 0.2$	-237.9 TO 535.9	$\pm 0.3$	-CONSTANTAN	RED	1500 TO 2100	$\pm 1.0$	2732 TO 3812	$\pm 1.7$		RED	
	-230 TO -150	$\pm 0.5$	-382 TO -238	$\pm 0.8$	JACKET	PURPLE	900 TO 1500	$\pm 0.6$	1652 TO 2732	$\pm 1.1$		WHITE/RED	
<b>R</b>	150 TO 1768	$\pm 0.7$	302 TO 3214	$\pm 1.3^\circ$	+Pt/13Rh	BLACK	-1 TO 900	$\pm 0.4^\circ$	30 TO 1652	$\pm 0.8$	+IRON -CONSTANTAN JACKET	RED	
	0 TO 150	$\pm 1.1$	32 TO 302	$\pm 2.0$	-PLATINUM	RED	350 TO 750	$\pm 0.2$	662 TO 1382	$\pm 0.4^\circ$		BLUE	
	-50 TO 0	$\pm 1.6^\circ$	-58 TO 32	$\pm 2.9$	JACKET	GREEN	-99.9 TO 349.9	$\pm 0.2$	-147.9 TO 661.9	$\pm 0.3$		BLUE	
<b>S</b>	1650 TO 1768	$\pm 0.8$	3002 TO 3214	$\pm 1.5^\circ$	+Pt/10Rh	BLACK	J DIN	-200 TO -100	$\pm 0.2^\circ$	-328 TO -148	$\pm 0.4$	BLUE	
	200 TO 1650	$\pm 0.7$	392 TO 3002	$\pm 1.3$	-PLATINUM	RED	<b>mV</b>						
	0 TO 200	$\pm 1.1$	32 TO 392	$\pm 2.0$	JACKET	GREEN							

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## WARRANTY

Our equipment is guaranteed against defective material and workmanship (excluding batteries) for a period of three years from date of shipment. Claims under guarantee can be made by returning the equipment prepaid to our factory. The equipment will be replaced, repaired or adjusted at our option. The liability of Altek is restricted to that given under our guarantee. No responsibility is accepted for damage, loss or other expense incurred through sale or use of our equipment. Under no condition shall Altek be liable for any special, incidental or consequential damage.

## OTHER PRODUCTS

Altek designs and manufactures fast, accurate instruments for measurement, generation and simulation of virtually every process control signal. Consult our factory directly or contact your local stocking representative to order precise, low cost Milliamp Calibrators, Voltage Sources, Direct Thermocouple Sources, RTD Simulators and Frequency Sources. Altek also produces calibrators for custom ranges and unique applications. Additional models and ranges are frequently added to the Altek instrument family to meet all of your critical calibration requirements. Altek products are made in the USA.

## ORDERING INFORMATION

MODEL 222A -  \*

\*Select from T/C Types J, K, T, E, R, S, B, N, C, L, or mV  
 Contact factory for additional T/C Types

Included with each Model 222A are:

- Carrying Case (Part No. 09-3782)
- NIST Traceable Certificate and 3 Year Warranty

## AVAILABLE FROM: