

ALTEK

THERMOCOUPLE CALIBRATOR MODEL 222

DATA SHEET 222

- **TEMPERATURE INPUT & OUTPUT**
Reads directly in degrees
- **"QUIK-CHEK"™ SWITCH**
Instant HI, LO and SET
- **MULTI-SPEED DIGITAL POT**
Fast, accurate setting
- **0.04% ACCURACY**
Field selectable F or C
- **CALIBRATES PYROMETERS**
Drives up to 8 mA
- **LINEAR MILLIVOLT MODEL**
10 μ V Resolution



ALTEK Series 222 Digital Thermocouple Calibrators give you continuous INPUT and OUTPUT function over the entire industrial temperature range. Measure and simulate thermocouples for indicators, pyrometers, transmitters, recorders, controllers, alarms, data acquisition and computer systems. Each Model 222 is dedicated to a particular thermocouple type for error-free use.

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. Fuseless protection guards the Model 222 against mis-connection to 120 volts AC or DC, in any mode.

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

ALTEK INDUSTRIES CORP

GENERAL DESCRIPTION

"OUT" MODE SIMULATES WIDE THERMOCOUPLE RANGE

Thermocouple output adjusts with a unique multi-speed rotary-to-digital "potentiometer." Rotate the pot continuously in either direction to set any value quickly and accurately. Up to 8 mA output current is delivered to the receiver, enough to drive most pyrometers.

The Altek Model 222 sources key temperatures for repetitive calibrations. The "QUIK-CHEK" stores THREE output temperatures for real convenience. Store any temperature in either "HI" or "LO" registers. Test above or below stored values—just turn the knob up and down to check trip points, control action or hysteresis. Memory is retained even when power is off.

PYROMETER COMPATIBLE

The 8 mA current capability and low output impedance of the Model 222 make it ideal for calibrating meter movement pyrometers.

"IN" MODE READS THERMOCOUPLES DIRECTLY

The digital indicator gives you fast, accurate temperature measurement



with 0.1 and 1 degree resolution. High input impedance assures accuracy in long thermocouple runs or with fine T/C wires. Burned out or abnormally high resistance thermocouples are detected by a low energy pulse. Two readings per second track fast moving temperatures.

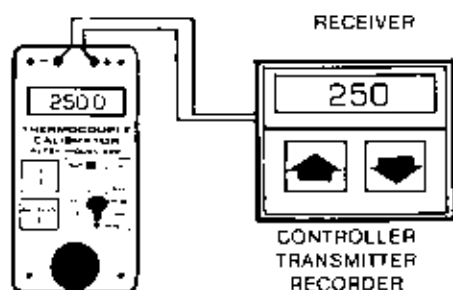
"MAX" and "MIN" memories are continuously updated from turn-on or whenever the "RESET" button is pressed. The Model 222 gives you a handy tool to monitor temperatures for drift or control deviation. Just flip the toggle switch to display the minimum and maximum temperature measured since reset.

The Model 222-MV provides continuous INPUT and OUTPUT function with 10 μ V and 100 μ V resolution. Measure and simulate millivolts for analyzers, loggers, strain gauges, data acquisition and computer systems. Special thermocouple types may also be measured and simulated with the addition of an external cold junction compensator. Built-in leads are terminated in alligator clips for fast and easy connections. Fuseless protection guards the Model 222-MV against misconnection to 120 Volts AC or DC, in any mode.

OPERATING INSTRUCTIONS

OUT - SOURCE MODE

- OUT**
- OUT**  OFF
- STORE**  **RESET**
- 1) Select the correct ALTEK MODEL 222 for the thermocouple type and scale
 - 2) Disconnect one or both input wires from the device to be calibrated or checked
 - 3) **RANGE**
1 Degree Resolution
Move the 222 power switch from OFF to OUT
0.1 Degree Resolution (T/C types E, J, K, T, L)
Press & hold the STORE pushbutton while moving the power switch to OUT
 - 4) Adjust the digital pot to the desired output value
 - 5) Connect the Model 222 to the device to be calibrated, being careful to observe polarity





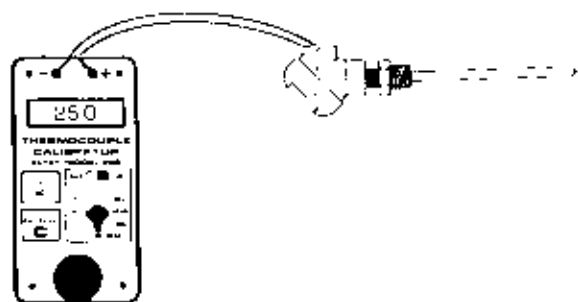
- OUTPUT**
- To change the output value, turn the speed sensitive digital pot. Turning the pot slowly will cause a gradual change in the output (2 to 4 clicks of the pot to change one digit). A faster change will occur when the pot is turned faster. A filter circuit limits response when the pot is turned too fast. 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 STORE
- If a value is in the SET position and you want that value in HI or LO, press and hold the STORE button while moving the switch to HI or LO. This lets you store a new temperature with 0.1 or 1 resolution where a temperature with the other resolution was stored.

- "QUIK-CHEK"**
- Any time you need a stored value just throw the "QUIK-CHEK" switch. Any value in the thermocouple range may be stored in HI & LO in either 0.1 and 1 resolution. The Model 222 remembers the HI, LO and SET values for you with the power on or off.

IN - READ MODE

- IN**
- IN**  OFF
- STORE**  **RESET**
- 1) Select the ALTEK MODEL 222 for the correct thermocouple type and scale
 - 2) **RANGE**
1 Degree Resolution
Move the 222 power switch from OFF to IN
0.1 Degree Resolution (T/C types E, J, K, T, N, L)
Press & hold the STORE pushbutton while moving the power switch to IN
 - 3) Connect the thermocouple or probe to be measured to the leads of the Model 222, being careful to observe polarity
 - 4) Display the present reading, Maximum or Minimum temperatures



- INPUT**
- The Model 222 can measure temperatures in two ranges with resolutions of 0.1 and 1. The display is updated twice per second to continuously track fast moving temperatures. The high input impedance provides accurate readings in long thermocouple runs or with fine T/C wires.

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

- OPEN THERMOCOUPLES**
- The Model 222 checks for open or high resistance thermocouples. Open or burned out thermocouples are indicated by " — — — — — " on the display.

OPERATING INSTRUCTIONS

PYROMETER CALIBRATION

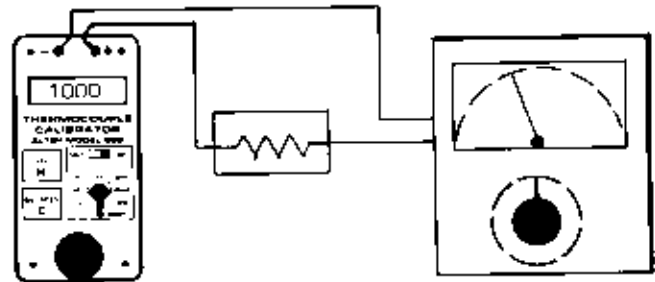
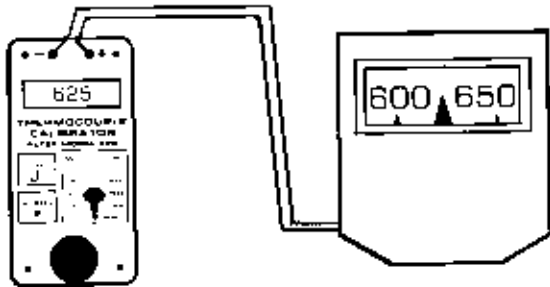
Some thermocouple input pyrometers and controllers operate on the D'Arsonval meter movement principle. Millivolts from the thermocouple input drive a low resistance coil directly. For example, a coil may have a typical resistance of 80 ohms. Since the pyrometer resistance is so low, resistance of the input thermocouple leads must be taken into account. Pyrometers of this type have fixed or adjustable series resistors which correct for lead length resistance.

To use the Model 222 to drive low resistance loads:

- 1) Disconnect the sensing thermocouple leads at the thermocouple head.
- 2) Connect the leads of the Model 222 to the extension wires going to the pyrometer, using the screw connectors in the head. If the sensing thermocouple sheath is within $\frac{1}{4}$ to 2 times the length of the Model 222 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. The output may need to be re-adjusted due to the loading effect of the pyrometer.

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 same colored leads of the Model 222 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.

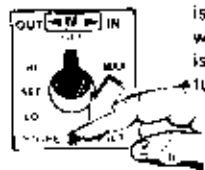


222-MV

The Model 222-MV measures from -500.0 to 999.9 millivolts with $100\mu\text{V}$ resolution and from -50.00 to 99.99 millivolts with $10\mu\text{V}$ resolution. The display is updated twice per second to track rapidly changing values.

SELECTING $100\mu\text{V}$ OR $10\mu\text{V}$ RESOLUTION

Resolution is selected whenever the Model 222-MV is turned on. If the Model 222-MV is turned on without holding the STORE button, $100\mu\text{V}$ resolution is selected. If the STORE button is held down while turning the unit on, $10\mu\text{V}$ resolution is selected.



GENERAL

SELECTING 1 OR 0.1 RESOLUTION



Resolution is selected for T/C types E, J, K, T, N or L whenever the Model 222 is turned on. If the Model 222 is turned on without holding the STORE button, 1" is selected. If the STORE button is held while turning the unit on, 0.1 resolution is selected.

Note: The "QUIK-CHEK" HI and LO temperatures will remain in the resolution in which they were stored until a new value is transferred from the SET position. The SET position will be in the resolution selected at turn-on.

SELECTING °F OR °C

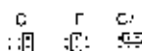


The Model 222 may be jumper configured in one of three modes. The first two modes are for full time use in °F or full time use in °C. The third mode allows front panel selection of °F or °C each time the unit is turned on. If your facility is completely in °F or °C, connect the internal jumper of the 222 to operate as a dedicated °F or dedicated °C instrument.

CHANGING MODE JUMPERS



- 1) Remove the 4 corner screws and lift faceplate assembly out of the case.
- 2) Remove TAG from the faceplate and rearrange it to show the °F, °C or °F/°C instructions on top.
- 3) Move the MODE JUMPER to the °F, °C or the °F/°C position.



The LCD will display the scale selected when the Model 222 is operating. Be sure that the TAG shows the proper scale before replacing the corner screws.

USING F/C MODE



In F/C mode the temperature scale is selected by setting the "QUIK-CHEK" switch before turning the unit on. Place the switch to HI/MAX to select °F or LO/MIN to select °C. If the unit is turned on with the switch in the SET/READ position the temperature scale most recently used will be displayed.

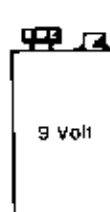
Hint: The Model 222 will automatically convert the temperatures in memory between °F and °C. For example, if 212°F is stored in HI and the Model 222 is switched to °C, 100°C will be displayed.

OVER RANGE/UNDER RANGE



Out-of-range temperatures are indicated by Or and Ur on the display. (If the decimal point is present, then the Model 222 is set for 0.1" resolution.) During OUT mode, re-adjust the output by turning the knob or selecting the 1" resolution range. Check for proper polarity, thermocouple type and range if out-of-range is displayed during IN mode.

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 222 shuts itself down. 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.

Hint: If the new battery is installed within 30 seconds of removing the old battery the "QUIK-CHEK" values will remain in memory.

SPECIFICATIONS

(Unless otherwise specified, specifications are in $\pm\%$ of Span in degrees, @ 25 Degrees C)

GENERAL

ACCURACY: 0.04% \pm 10 microvolts
COLD JUNCTION COMPENSATION: Built-in for specified thermocouple type, characterized to T/C curve
COLD JUNCTION TEMPERATURE EFFECT: Within 0.25 Degrees \pm 0.05 microvolts per degree 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: 5 seconds to rated accuracy
OVL LOAD PROTECTION: 120 volts AC/DC for 30 seconds on connecting leads, in any mode
BATTERY LIFE: 9 Volt Alkaline: 50 hours
LOW BATTERY "BAT": Indicator on LCD at 7 volts nominal approximately 10 hours left

OVL HALL SIZE: 2 1/2 x 2 3/4 x 5 1/2 inches (63.5 x 66.7 x 130 mm)
WEIGHT: 11.5 oz. (0.33 kg)
CARRYING CASE: Included, zippered with belt loop

SOURCE MODE

OUTPUT IMPEDANCE: 0.1 ohms, nominal
SOURCE CURRENT: Up to 8 mA
OUTPUT NOISE: < 4 microvolts p-p for frequencies of 10 Hz or below

READ MODE

INPUT IMPEDANCE: > 10 Megohms
OPEN THERMOCOUPLE DETECTION: 10 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

RANGES

Type	Degrees C	Degrees F	Resolution
J	-210 to 1200	-346 to 2192	1 Degree
	-100.0 to 330.0	-148.0 to 626.0	0.1 Degree
K	-230 to 1372	-382 to 2502	1 Degree
	100.0 to 430.0	-148.0 to 806.0	0.1 Degree
T	-260 to 400	-436 to 752	1 Degree
	-100.0 to 200.0	-148.0 to 392.0	0.1 Degree
E	240 to 1000	-400 to 1832	1 Degree
	-100.0 to 300.0	-148.0 to 572.0	0.1 Degree
N	-196 to 1300	-320 to 2372	1 Degree
	-100.0 to 426.0	-148.0 to 800.0	0.1 Degree
L (J-DIN)	-200 to 750	-328 to 1382	1 Degree
	-100.0 to 330.0	-148.0 to 626.0	0.1 Degree
R	93 to 1768	200 to 3214	1 Degree
S	93 to 1768	200 to 3214	1 Degree
B	400 to 1820	752 to 3308	1 Degree
C	0 to 1800	32 to 3275	1 Degree
MV	-500.0mV to 999.9mV		100 μ V
	-50.00mV to 99.99mV		10 μ V

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, incident 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.

ORDERING INFORMATION

SPECIFY A T/C TYPE AND SCALE: T/C TYPE
J, K, T, E, R, S, B,
N, C, L (J-DIN) SCALE
(Field Changeable)
F, C, F/C

Model 222
 or
 Model 222-MV

Included: Carrying Case (09 3781)
NIST Certificate

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AVAILABLE FROM: