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Find the *Altek Model 322-1* at our website: *Click HERE*

Altek

Multiple Thermocouple Calibrator
Model 322-1



- 4 T/C type plus mV
  J, K, T, E & mV
- Temperature input & output
  Reads directly in degrees
- "Quik-Chek™" switch
  Instantly recall three outputs; HI, LO & Set
- 15 output memories
  Three for each T/C type & mV
- Accuracy ±(0.008% of reading+0.006 mV)
  Typical accuracy of 0.3°C or 0.5°F
  Field selectable 0.1° or 1µV resolution

General description

Calibrate thermocouple instruments

Source and read T/C's over the entire industrial temperature range with Altek's Model 322 Thermocouple Calibrator. Use with transmitters, recorders, controllers, alarms, indicators, data acquisition and computer systems. Switch between four T/C types or millivolts.

High accuracy and stability is achieved through Altek's exclusive isothermal block. Make your connections directly with thermocouple wire or with miniature thermocouple connectors.

Field customize the Model 322 to lock-in 0.1° or 1° resolution, fixed °F or °C or front panel selectable °F/°C operation. A shrouded miniature thermocouple connector receptacle plus terminal screws allow for easy hookups. Built in protection guards the Model 322 against mis-connection to 120 Volts AC or DC, in any mode.

The Model 322 turns on to the T/C type last used. Other T/C types may be selected each time the unit is turned on. Other T/C types may be selected each time the unit is turned on. If you always use just one T/C type, lock in the selected T/C type with the internal DIP switch to prevent accidental change to an unwanted type.

Calibrate thermocouple inputs

Select resolution of 0.1° or 1° for the full listed range of all thermocouple types. Millivolts allows 1 microvolt resolution from -99.999 to 99.999mV. The Model 322 simulates key temperatures for repetitive calibrations. "Quik-Chek" function stores three output temperatures for each T/C type (15 total) for real convenience. Three memories are retained for each thermocouple type even when the power is off.

Turn the knob to check trip points, controller action or hysteresis. The fast response 322 sets quickly without overshoot but allows slow changes at your rate.

Measure thermocouple sensors

The Model 322 display gives you fast, accurate temperature measurement with 0.1 and 1 degree or with 0.001 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 322 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 322 is turned on, the LCD will display all segments for 1 second. It then displays the currently selected thermocouple type or mV for approximately 3 seconds. If °C/°F operation has been selected the currently selected temperature scale of °C or °F will display.

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General instructions

Initial setup

The Model 322 is internally configurable for ease of use. Simply remove the four corner screws, flip a few 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 type E and your instruments display to 1°C, set up the Model 322 to lock out T/C type selection, choose full time °C and display with 1° resolution.

Configuring temperature scales

°F
°C

The Model 322 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 Setting Operating Mode below).

Locking in 1º resolution

100.0°

100°

The Model 322 may be internally configured for 0.1° or 1° resolution. Select 1° resolution for less critical applications or 0.1° for increased resolution when necessary.

Changing T/C types

J K T E

To change T/C types:

1) Repeatedly press or press and hold the SCROLL pushbutton when switching the unit on or while a T/C type is displayed during the first three seconds after the unit is turned on.
2) Continue to hold the SCROLL pushbutton.The LCD will scroll through the list of T/C types & mV.
3) Release the SCROLL pushbutton when the desired T/C type is displayed.

Locking in a single T/C type:

An internal DIP switch may be used to disable the front panel selection to permantly lock in a single T/C type.

1) Change to the desire T/C type (as above).
2) Set DIP Switch 2 up (see Configuring Operating Modes below).

Over range/under range

OVER
UNDER

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.

Turn-on



K

°F

Each time the Model 322 is turned on, the LCD will display all segments for about 1 second. It then displays the currently selected thermocouple type for approximately 3 seconds. The currently selected temperature scale of °C or °F will then display for about 3 seconds. Depending on the configuration, from 1 to 4 T/C types, millivolts or °C or °F may be selected during the thermocouple turn-on mode.

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 T/C type for 3 seconds. Repeatedly press or press and hold the SCROLL pushbutton to change to the desired T/C type (based on configuration).
4) The display will indicate the selected temperature scale for 3 seconds. Press the SCROLL pushbutton to switch between °C & °F (based on configuration).

If a single T/C type, fixed °C or fixed °F have been selected, the user prompts for these selections will be skipped during turn-on.

The three “Quik-Chek” temperature values will be the same as previously stored. Each time a different T/C type is selected, the three “Quik-Chek” values for that type will be recalled.

Note: The Model 322 will automatically convert the temperatures in memory between °F and °C. For example, if 212.0°F is stored in HI and the Model 322 is switched to °C, 100.0°C will be displayed.

Changing the battery

9 Volt

Low battery is indicated by BAT on the LCD display. Approximately 10 hours of operation remain before the LCD goes blank and the Model 322 shuts itself down. Turn the 322 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.

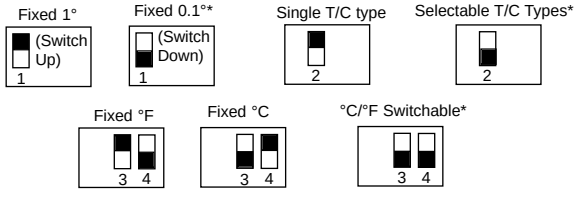
Connections

The Model 322 has connections for both miniature thermocouple connectors and for direct thermocouple wires. It is essential for accurate calibration that thermocouple wire is used to connect the Model 322 to the device being calibrated. Miniature or subminiature thermocouple connectors with thermocouple wire allow for the easiest connection. Different size thermocouple connectors may be used with an adaptor of the same thermocouple type. 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.

Setting operating mode

Setting DIP Switches

1) Turn the Model 322 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



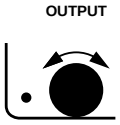
*Factory Settings (All switches down)

Simulate a thermocouple



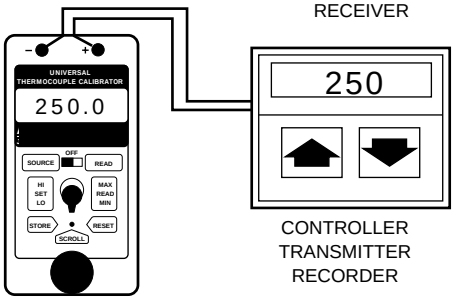
Source

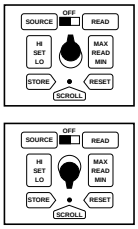
1) Set up the Model 322 for the correct T/C type and temperature scale (°C or °F).
2) Disconnect the input wires from the device to be calibrated or checked.
3) Connect the Model 322 to the device to be calibrated, being careful to observe proper polarity and T/C type
4) Adjust the digital pot to the desired output value.



Output

Whenever SOURCE mode is selected the word SOURCE will appear on the LCD. 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. 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. The LCD will flash once indicating that the value has been stored

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. The LCD will flash once indicating that the value has been stored. Release the STORE button.



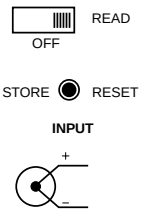
Instantly recall temperatures

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 322 remembers the HI, LO and SET values for for all T/C types (45 memories) and millivolts for you with the power on or off. Each time a different T/C type is selected the latest three "Quik-Chek" values for that type will be recalled.

Overload

The Model 322 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 10 mA.

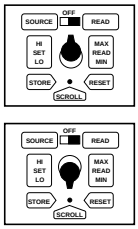
Read a thermocouple sensor



Read

1) Set up the Model 322 for the correct T/C type and temperature scale (°C or °F)
2) Disconnect the wires from the thermocouple to be read or checked.
3) Connect the Model 322 to the sensor, being careful to observe proper polarity & T/C type
4) Display present reading, Maximum or Minimum temperatures

Whenever READ mode is selected the word READ will appear on the LCD. The Model 322 can measure temperatures for all T/C types with resolutions of 0.1° and 1°. 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 322 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.

Read a thermocouple sensor

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 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 322 to drive low resistance loads:

1) Disconnect the sensing thermocouple leads at the head.
2) Connect leads from the Model 322 to the extension wires going to the pyrometer, using the screw connectors in the head. (If the sensing t/c sheath is within 1/4 to 2 times the length of the Model 322 leads, 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 322 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.

Specifications

(Unless otherwise Indicated, specifications are in % Span@ 23° C)

General

Accuracy: ±(0.008% of Reading + 0.006 mV)
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 the unit >3 months.

Ranges and accuracy

The following table was computed for each thermocouple type based on the accuracy of ±(0.008% of reading + 0.006 mV)

T/C TYPE	°C RANGE	°C ACCURACY	°F RANGE	°F ACCURACY	T/C MATERIAL	ISA/ANSI COLOR
	-210.0 TO -180.0	±0.3°	-346.0 to -292.0	±0.5°	+IRON	WHITE
J	-180.0 to -50.0	±0.2	-292.0 to -58.0	±0.4	-CONSTANTAN	RED
	50.0 to 500.0	±0.1	-58.0 to 932.0	±0.2	JACKET	BLACK
	500.0 to 1200.0	±0.2	932.0 to 2192.0	±0.4		
	-230.0 to -100.0	±0.6°	-382.0 to -148.0	±1.1°	+CHROMEL®	YELLOW
K	-100.0 to 1050.0	±0.2	-148.0 to 1922.0	±0.4	-ALUMEL®	RED
	1050.0 to 1371.1	±0.3	1922.0 to 2500.0	±0.5	JACKET	YELLOW
	-260.0 to -200.0	±1.0°	-436.0 to -328.0	±1.8°	+COPPER	BLUE
T	-200.0 to -50.0	±0.5	-328.0 to -58.0	±0.9	-CONSTANTAN	RED
	-50.0 to 0.0	±0.2	-58.0 to 32.0	±0.4	JACKET	BLUE
	0.0 to 400.0	±0.1	32.0 to 752.0	±0.2		
	-240.0 to -200.0	±0.4°	-400.0 to -328.0	±0.7°	+CHROMEL®	PURPLE
E	-200.0 to -100.0	±0.2	-328.0 to -148.0	±0.4	-CONSTANTAN	RED
	-100.0 to 850.0	±0.1	-148.0 to 1562.0	±0.2	JACKET	PURPLE
	850.0 to 1000.0	±0.2	1562.0 to 1832.0	±0.4		
mV	-99.999 to 99.999 mV	±(0.008% of Reading +0.006 millivolts)				

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A carrying case is included with each Model 322-1.

Reference drift: <10 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)

Thermocouple simulator (source)

Output impedance: <0.1 ohms
Source current: up to 8 mA (drives 80mV into 10 ohms)
Output noise: <4 microvolts p-p for frequencies of 10 Hz or below
Overload: Indicates OVER and blanks digits on the display

Read a thermocouple

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

Warranty

Altek products are warranted to be free from defects in material and workmanship (excluding fuses, batteries and leads) for a period of three years from the date of shipment. Warranty repairs can be obtained by returning the equipment prepaid to our factory. Products will be replaced, repaired, or adjusted at our option. *Altek gives no other warranties, including any implied warranty of fitness for a particular purpose.* Also, Altek shall not be liable for any special, indirect, incidental or consequential damages or losses arising from the sale or use of its products.

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