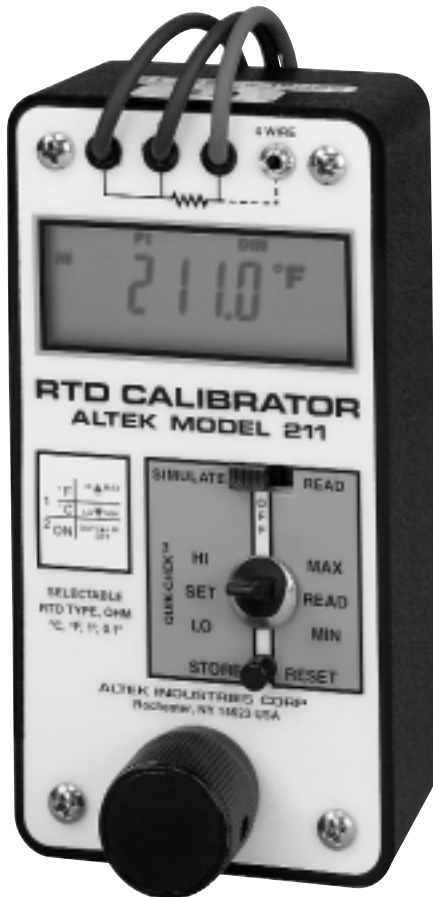




## RTD Calibrator Model 211



- 8 RTD types & ohms  
Select Pt, Cu, or Ni
- Temperature input & output  
Directly in degrees
- 0.025% accuracy  
Accurate to 0.25°F or 0.15°C
- 1° or 0.1° resolution  
Field Selectable °F or °C
- "Quik-Chek™" switch  
Instantly recall three outputs; HI, LO & Set

## General description

Altek's Model 211 RTD Calibrator lets you simulate and read RTDs over the entire industrial temperature range. Use with transmitters, single & dual channel recorders, controllers, alarms and indicators. Switch between four Pt 100, one Pt 1000, one Cu 10, two Ni RTD curves or ohms ranges from 0.00 to 410.00 and 0.0 to 2010.0.

Field customize the Model 211 to lock-in 1° resolution, fixed ° C or ° F or front selectable ° F/° C operation. Read and simulate 2-wire and automatically compensate for 3-wire RTDs with built-in leads. A plug-in lead is supplied for 4-wire RTD measurements. RTD types may be selected each time the unit is turned on. If you always use one RTD curve, lock-in the selected RTD type with the internal DIP switch to prevent accidental change to an unwanted RTD type.

Simulate an RTD sensor  
Resolution is 0.1° C or F simulating the full range of Pt 100 ohm RTDs into devices supplying a continuous excitation current of 0.09 to 1.1 mA. From 1.1 to 5.800 mA continuous excitation current the 111 resolution automatically adjusts to 1° C or F. Ohms range provides 0.01 ohm resolution from 0.00 to 410.00 ohms which automatically switches to 0.1 ohm resolution for continuous excitation currents above 1.1 mA.

Instantly recall three output temperatures  
"QUIK-CHEK" function stores three output temperatures for real convenience. The Model 211 simulates key temperatures for repetitive calibrations. Turn the knob to check trip points, controller action or hysteresis. The fast response 211 sets quickly without overshoot. Memory is retained even when power is off.

### Measure RTDs sensors

The Model 211 display gives you fast, accurate temperature measurement with 0.1 and 1 degree or with 0.01 and 0.1 ohm resolution. Two, three and four wire hookups assure accuracy in short or long cable runs. Open RTDs and leads are detected and indicated on the LCD display. Two readings per second track fast moving temperatures.

Recall maximum and minimum temperatures  
"MAX" and "MIN" memories are continuously updated from turn-on or whenever the "RESET" button is pressed. Model 211 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 measured since reset.

### Calibrating additional instruments

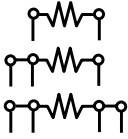
For multichannel recorders, data acquisition, computer systems and smart transmitters Altek recommends using the Model 311A RTD Calibrator in place of the 211. The Model 311A is designed to operate with many devices that use pulsed or intermittent excitation currents to read an RTD.

# General instructions



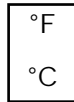
## Connections

The Model 211 accurately simulates and reads 2, 3, or 4 wire RTDs. It has three leads permanently attached and a socket for a fourth wire (supplied). The LCD indicates "4-WIRE" when the fourth wire is connected. The fourth wire must only be plugged in when simulating or reading 4-wire RTDs. All connecting wires must be the same length and of the same material running along the same path to insure maximum accuracy.



## Two, three or four wire

Two wire RTD measurements are less accurate than other RTD measurements because of the errors introduced by the resistance of the lead wires. The third wire in a three wire hookup provides the instrumentation with a reference connection for the lead wires. The measuring instrumentation uses this reference to infer the actual resistance of the RTD element without the leads. Four wire RTD measurements take into account all wires other than the RTD sensing element. This makes four wire RTDs best suited for precision measurements.



## Selecting °F or °C

The Model 211 may be internally 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, set the internal DIP switches of the 211 to operate as a dedicated °F or °C instrument (see Setting Operating Mode below).

## 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 (center) position the temperature scale most recently used will be displayed.

Note: The Model 211 will automatically convert the temperatures in memory between °F and °C. For example, if 212° F is stored in HI and the Model 211 is switched to °C, 100°C will be displayed.

## Selecting autoranging or 1° resolution

The Model 211 may be internally configured to autorange or to constantly display with fixed resolution. When autoranging is selected, the Model 211 will display temperatures with 0.1° or 1° and ohms with 0.0Ω or 0.1Ω resolution. When fixed range is selected, the Model 211 will display temperatures with 1° and ohms with 0.1Ω resolution.

Note: Some ranges are always displayed with 1° resolution.

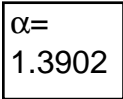
## Over range/under range

Out-of-range temperatures are indicated by - - - - and OVER or UNDER on the display during READ mode. If this occurs check for proper connections and RTD type selection. During SIMULATE mode excitation currents below 0.090mA are indicated by the word SIM flashing on the display. Excitation currents above 5.8mA are indicated by - - - - and SIM flashing on the display. Check for proper connections.

## 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 211 shuts itself down. Turn the Model 211 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.

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

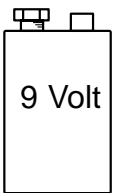
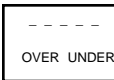
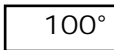
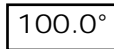


## Changing RTD types

Eight RTD types or ohms may be selected each time the Model 211 is turned on. An internal DIP switch may be used to disable the front panel selection to permanently lock in a single RTD type (see below). To change RTD types:

- 1) Press & hold the STORE pushbutton while switching the unit on or while α= is blinking during the first 3 seconds after the unit is turned on.
- 2) Continue to hold the STORE pushbutton. The LCD will scroll through the 8 RTD types and ohms, displaying the Sensor material and value for each RTD type.
- 3) Release the STORE pushbutton when the desired Metal and value are displayed.
- 4) After 2 seconds, the Model 211 will store the RTD type you selected and will begin Simulating or Reading RTD signals.
- 5) Each additional time the Model 211 is turned on without holding the STORE pushbutton, the newly selected RTD type will be displayed and used. If an incorrect type is selected, repeat steps 1 through 3.

Note: For Pt 100 ohm, α= 1.3850 the word DIN will appear on the LCD.



## Operating with intermittent excitation currents

Some transmitters, recorders and other RTD input devices use intermittent, or pulsed, excitation currents to measure the resistance of the RTD. The Model 211 may be internally configured to operate with both fixed excitation currents (default operation) and with some intermittent currents (see Setting Operating Mode below).

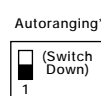
# Setting operating mode (DIP switches)

\*Factory Settings  
(All Switches Down)

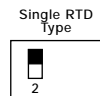


- 1) Turn the Model 211 OFF
- 2) Remove the 4 corner screws and lift faceplate assembly out of the case.
- 3) Set the DIP switches for your options as diagrammed below.

**AUTORANGING**  
Switches between autoranging 0.1°/1° (0.01Ω/0.1Ω) and fixed 1°(0.1Ω).



**FIXED RTD TYPE**  
Switches between a single RTD type and RTD type selection at turn on.



**TEMPERATURE SCALE**  
Switches between fixed °F, fixed °C or °C/°F selection at turn on.



**EXCITATION CURRENT**  
Switches between simulating with fixed excitation currents and excitation current selection at turn on.



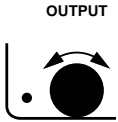
# Simulate RTD or resistance

## Simulate



- 1) Set up the Model 211 for the correct RTD type and temperature scale (°C or °F).
- 2) Disconnect the input wires from the device to be calibrated or checked.
- 3) Connect the Model 211 to the device to be calibrated, being careful to observe proper connections for 2, 3 or 4-wire hookups.
- 4) Adjust the digital pot to the desired output value.

## Output

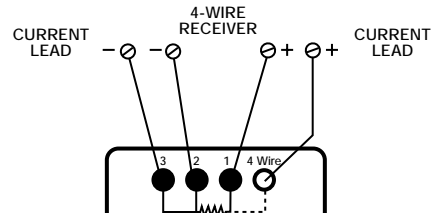
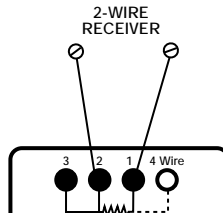
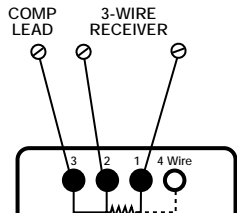


Whenever SIMULATE mode is selected the word SIM will appear on the LCD. SIM will flash when the Model 211 is measuring the external excitation current and will be steady when accurately simulating a resistance. To change the output value, turn the speed sensitive digital pot. Turning the pot slowly will 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).

Note: SIM flashing on the LCD indicates that the excitation current is missing, out of range or is intermittent. Check to see that the device being calibrated has operating power and that the 211 is properly connected. Also check the manual for the device to make sure that the excitation current is in the range of 0.090 to 5.800 milliamps.

Note: Some "smart" transmitters and scanning recorders or indicators use intermittent currents to measure RTD's. Try putting recorders into a calibrate mode or lock them into one channel. The Model 211 can be configured to accept intermittent excitation with minimum 125 msec fixed current at a minimum repetition rate of 1/sec (see Operating with intermittent currents).

Hookup —  
Simulate an  
RTD or  
resistance



## 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. When there is no excitation current or the current is less than 0.09 mA SIM will flash on the LCD. "QUIK-CHEK" values may be stored with SIM flashing.

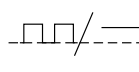
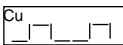


## Instantly recall temperatures

Any time you need a stored value just throw the "QUIK-CHEK" switch. Any value in the RTD range may be stored in HI & LO. The Model 211 remembers the HI, LO and SET values for you with the power on or off. The resolution of the stored value is based on the excitation from the receiver.

## Selecting fixed/intermittent current

Operation with fixed or intermittent currents may be chosen after the unit is turned on and the RTD type has been selected.

Fixed currents are indicated by  Intermittent currents are indicated by 

To keep the excitation selection: Wait 3 seconds To change the excitation selection: Press the STORE pushbutton Note: Cu indicates Current while selecting fixed or intermittent currents.

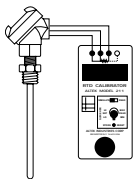
Hint: Choose intermittent excitation only when device to be calibrated uses intermittent currents. Most devices require that fixed current operation is selected.

# Read an RTD sensor

## Read



- 1) Set up the Model 211 for the RTD, Ohms and temperature scale (°C or °F).
- 2) Disconnect the wires from the resistance sensor to be read or checked.
- 3) Connect the Model 211 to the sensor to be measured, being careful to observe proper connections for 2, 3 or 4 wire hookups.
- 4) Display present reading, Maximum or Minimum temperature.

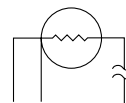


## Input

Whenever READ mode is selected the word READ will appear on the LCD. The Model 211 can measure temperatures in two ranges with resolution of 0.1° and 1°. The display is updated twice per second to continuously track fast moving temperatures. Using three or four wire hookups provides accurate readings in long cable runs.

## Open RTDS

The Model 211 checks for open or high resistance connections. Open or burned out RTDS are indicated by - - - - on the display. Temperatures out of range for the RTD selected will be indicated by OVER and UNDER on the display.

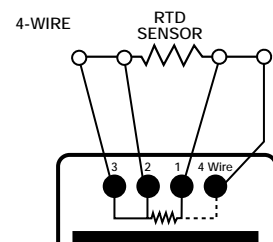
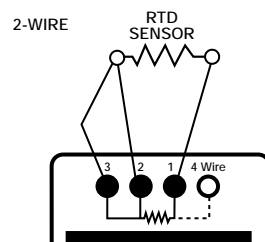
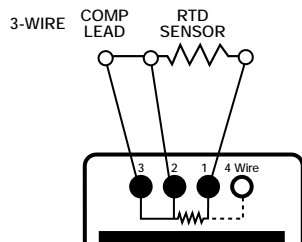


## MIN/MAX

To read the Maximum or Minimum temperature since READ 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. Press RESET and the Model 211 will flash the display once to indicate it has transferred the present temperature into both MAX and MIN and will update them as the measured temperature changes.



Hookup —  
Read an RTD  
or resistor



# Specifications

(Unless otherwise Indicated, specifications are in % of 400 Ohm Span at 1.0 mA excitation current @ 23° C)

## General

Accuracy:  $\pm 0.025\%$ ;  $\pm 0.013\%$  typical  
 Temperature drift:  $\pm 0.01\%$ /°C  
 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  
 Warm up time: 30 seconds to maximum accuracy  
 Overload protection: Electronically protected to 40 VDC between leads 1 & 2, fuse protected to 125 VAC, 5A between leads 2 & 3  
 Battery life: 9 Volt Alkaline: 50 hours  
 Low battery: "BAT" indication on LCD at 7 Volts nominal, approximately 10 hours left  
 Overall size: 2 1/2 x 2 5/8 x 5 1/8 inches (63.5 x 66.7 x 130 mm)  
 Leads: Approximately 18" (0.46m) terminated with spade lugs  
 Weight: 11.5 oz. (0.33 kg)  
 Carrying case: Included, zippered with belt loop

## Simulate RTD or resistance

Output resistance range: 0.00 to 2010.0 Ohms  
 Allowable external excitation current: 0.090 to 5.800mA, DC  
 Intermittent excitation current mode: Accepts intermittent excitation currents with minimum 125 msec fixed current at minimum repetition rate of 1/sec from 0.090 to 5.800mA

## Measuring RTD sensors

Excitation current supplied: 1 mA, nominal  
 Normal mode rejection: 50/60 Hz, 50 db  
 Common mode rejection: 50/60 Hz, 100 db

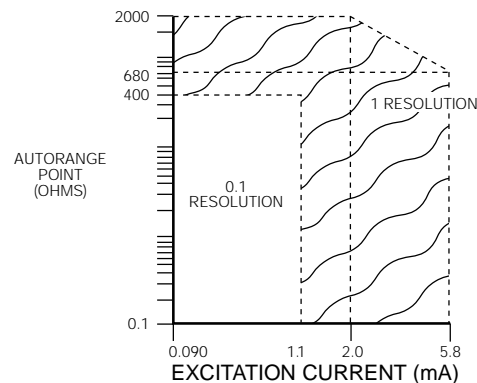
# Types, ranges, resolution and accuracy

RTD type	Alpha	Degrees C		Degrees F	
		Range	Typical Accuracy	Range	Typical Accuracy
Pt 100 (DIN/IEC/JIS 1989)	1.3850	-200.0 to 850.0°	$\pm 0.15^\circ$	-328.0 to 1562.0°	$\pm 0.25^\circ$
Pt 100 (Old JIS 1981)	1.3916	-200.0 to 648.9	0.15	-328.0 to 1200.0	0.25
Pt 100 (Burns)	1.3902	-195.6 to 648.9	0.15	-320.0 to 1200.0	0.25
Pt 100 (US Lab)	1.3926	-200.0 to 862.0	0.15	-328.0 to 1584.0	0.25
Pt 1000 (HVAC)*	1.3750	-184 to 275	0.10	-300 to 527	0.15
Cu 10 (Minco)*	1.4274	-200 to 260	1.10	-328 to 500	2.00
Ni 120 (Pure)	1.6720	-80.0 to 273.0	0.10	-112.0 to 524.0	0.15
		273 to 316	0.10	524 to 600	0.15
Ni 110 (Bristol 7 NA)	1.5801	-106.7 to 315.6	0.10	-160.0 to 600.0	0.20

\*These ranges have fixed 1° resolution

OHMs	Accuracy	Typical accuracy
0.00Ω to 410.00Ω	$\pm 0.10\Omega$	$\pm 0.05\Omega$
0.0Ω to 2010.0Ω	$\pm 0.50\Omega$	$\pm 0.25\Omega$

**Autorange point vs. excitation current  
Simulate Mode**



Note: Above ranges are for READ mode in which the Model 211 provides a 1 mA excitation current. SIMULATE mode operates in these ranges with external excitation currents between 0.090 and 1.1 mA. Resolution will be 1°, or 0.10Ω, in all ranges for excitation currents between 1.1 and 5.8mA

1000Ω RTDs: The maximum excitation current to source the full range of the Pt 1000 1.375 is 1 mA. Currents exceeding 1 mA will lower the maximum temperature.

The symbol Alpha ( $\alpha$ ) is used to identify the particular RTD curve. The value is derived by dividing the resistance of the sensor at 100°C by the resistance at 0°C ( $\alpha = R_{100^\circ C}/R_{0^\circ C}$ ). For Pt 100 DIN/IEC/JIS this is 138.50/100.00 = 1.3850 (which is also shown as 0.00385).

# 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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