

1 Input Calibration

1.1 Overview

Introduction

This section describes the field calibration procedures for Input 1 and Input 2.

- Every UDC 2300 controller contains all input actuation ranges which are fully factory-calibrated and ready for configuration to range by the user.
- However, these procedures can be implemented if the factory calibration of the desired range is not within specification.

CAUTION

The field calibration will be lost if a change in input type configuration is implemented at a later time. The original factory calibration data remains available for later use after a field calibration is done. See subsection 1.8 if you want to restore factory calibration values.

What's in this section?

The following topics are covered in this section.

TOPIC	See Page
1.1 Overview	1
1.2 Minimum and Maximum Range Values	2
1.3 Preliminary Information	3
1.4 Input #1 Set Up Wiring	5
1.5 Input #1 Calibration Procedure	7
1.6 Input #2 Set Up Wiring	9
1.7 Input #2 Calibration Procedure	10
1.8 Restore Factory Calibration	11



WARNING—SHOCK HAZARD



INPUT CALIBRATION MAY REQUIRE ACCESS TO HAZARDOUS LIVE CIRCUITS, AND SHOULD ONLY BE PERFORMED BY QUALIFIED SERVICE PERSONNEL. MORE THAN ONE SWITCH MAY BE REQUIRED TO DE-ENERGIZE UNIT BEFORE CALIBRATION.

Calibration Steps

Use the following steps when calibrating an input.

Step	Action
1	Find the minimum and maximum range values for your PV input range from Table 1-1.
2	Disconnect the field wiring and find out what equipment you will need to calibrate.
3	Wire the calibrating device to your controller according to the set up wiring instructions for your particular input (Subsection 1.4 or 1.6).
4	Follow the calibration procedure given for Input #1 or Input #2 (Subsection 1.5 or 1.7).

1.2 Minimum and Maximum Range Values

Select the Range Values

You should calibrate the controller for the minimum (0%) and maximum (100%) range values of your particular controller. If you have a two input controller, calibrate each input separately.

Select the Voltage or Resistance equivalent for 0% and 100% range values from Table 1-1. Use these values when calibrating your controller.

Table 1-1 Voltage and Resistance Equivalents for Input 1 Range Values

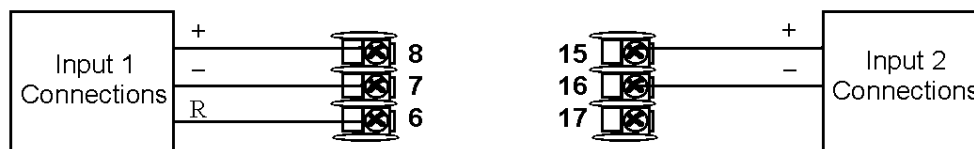
Sensor Type	PV Input Range		Range Values	
	°F	°C	0%	100%
Thermocouples				
B	0 to 3300	-18 to 1816	-0.100 mV	13.769 mV
E	-454 to 1832	-270 to 1000	-9.835 mV	76.373 mV
E (low)	-200 to 1100	-129 to 593	-6.472 mV	44.455 mV
J	0 to 1600	-18 to 871	-0.886 mV	50.060 mV
J (low)	20 to 770	-7 to 410	-0.334 mV	22.400 mV
K	0 to 2400	-18 to 1816	-0.692 mV	52.952 mV
K (low)	-20 to 1000	-29 to 538	-1.114 mV	22.255 mV
NiNiMoly (NNM68)	32 to 2500	0 to 1371	0.000 mV	71.330 mV
NiNiMoly (low)	32 to 1260	0 to 682	0.000 mV	31.820 mV
NiMo-NiCo (NM90)	32 to 2500	0 to 1371	0.000 mV	71.773 mV
NiMo-NiCo (low)	32 to 1260	0 to 682	0.000 mV	31.825 mV
Nicrosil Nisil (Nic)	0 to 2372	-18 to 1300	-0.461 mV	47.513 mV
R	0 to 3100	-18 to 1704	-0.090 mV	20.281 mV
S	0 to 3100	-18 to 1704	-0.092 mV	17.998 mV

Sensor Type	PV Input Range		Range Values	
	°F	°C	0%	100%
T	-300 to 700	-184 to 371	-5.341 mV	19.097 mV
T (low)	-200 to 500	-129 to 260	-4.149 mV	12.574 mV
W5W26	0 to 4200	-18 to 2315	-0.234 mV	37.075 mV
W5W26 (low)	0 to 2240	-18 to 1227	-0.234 mV	22.283 mV
Honeywell Radamatic Type RH Type RI	0 to 3400 0 to 3200	-18 to 1871 -18 to 1760	0.00 mV 0.00 mV	57.12 mV 60.08 mV
RTD (IEC Alpha=0.00385) 100 ohms 100 ohms (low) 200 ohms 500 ohms	-300 to 1200 -300 to 300 -300 to 900 -300 to 900	-184 to 649 -184 to 149 -184 to 482 -184 to 482	25.18 ohms 25.18 ohms 50.36 ohms 125.90 ohms	274.96 ohms 156.90 ohms 549.92 ohms 1374.80 ohms
Linear Milliamps (impedance – 249 Ω)	4 to 20 mA 0 to 20 mA		4.00 mA 0.00 mA	20.00 mA 20.00 mA
Millivolts	0 to 10 mV 0 to 50 mV 0 to 100 mV		0.00 mV 0.00 mV 0.00 mV	10.00 mV 50.00 mV 100.00 mV
Volts	1 to 5 Volts 0 to 2 Volts 0 to 5 Volts 0 to 10 Volts		1.00 Volts 0.00 Volts 0.00 Volts 0.00 Volts	5.00 Volts 2.00 Volts 5.00 Volts 10.00 Volts

1.3 Preliminary Information

Disconnect the Field Wiring

Tag and disconnect any field wiring connected to the input (#1 or #2) terminals on the rear of the controller.



24869

Figure 1-1 Input 1 and Input 2 Wiring Terminals

Check the Jumper for Input 1

Before you calibrate Input #1, check the internal jumper for Input 1 to make sure it is set for the correct input type. The jumper is located at position S101 on the printed wiring board. Figure 2-2 in the manual shows the location of the jumper and position selections.

Check the Jumper for Input 2

Before you calibrate Input #2, check the internal jumper for Input 2 to make sure it is set for the correct input type. The jumper is located at position S201 on the printed wiring board. Figure 2-2 in the manual shows the location of the jumper and position selections.

Equipment Needed

Table 1-2 lists the equipment you will need to calibrate the specific types of inputs that are listed in the table. You will need a screwdriver to connect these devices to your controller.

Table 1-2 Equipment Needed

Type of Input	Equipment Needed
Thermocouple Inputs (Ice Bath)	<ul style="list-style-type: none"> • A calibrating device with $\pm 0.02\%$ accuracy for use as a signal source such as a millivolt source. • Thermocouple extension wire that corresponds with the type of thermocouple that will be used with the controller input. • Two insulated copper leads for connecting the thermocouple extension wire from the ice baths to the mV source. • Two containers of crushed ice.
Thermocouple Inputs (T/C Source)	<ul style="list-style-type: none"> • A calibrating device with $\pm 0.02\%$ accuracy for use as a signal source such as a millivolt source. • Thermocouple extension wire that corresponds with the type of thermocouple that will be used with controller input.
RTD (Resistance Thermometer Device)	<ul style="list-style-type: none"> • A decade box, with $\pm 0.02\%$ accuracy, capable of providing stepped resistance values over a minimum range of 0 to 1400 ohms with a resolution of 0.1 ohm. • Three insulated copper leads of equal length for connecting the decade box to the controller.
Milliampere, Millivolt, Volts, and Radiamatic	<ul style="list-style-type: none"> • A calibrating device with $\pm 0.02\%$ accuracy for use as a signal source. • Two insulated copper leads for connecting the calibrator to the controller. • Place current source at zero before switching ON. • Do not switch current sources OFF/ON while connected to the UDC 2300 input. <p>ATTENTION: For radiamatic inputs only, set emissivity value to 1.0. See <i>Configuration Section</i> - Set Up prompt INPUT1, Function prompt EMISS.</p>

1.4 Input 1 Set Up Wiring

Thermocouple Inputs Using an Ice Bath

Refer to Figure 1-2 and wire the controller according to the procedure given in Table 1-3. Make sure the jumper at S101 is in the #1 position. See Figure 2-2 in the manual.

Table 1-3 Set Up Wiring Procedure for Thermocouple Inputs Using an Ice Bath

Step	Action
1	Connect the copper leads to the calibrator.
2	Connect a length of thermocouple extension wire to the end of each copper lead and insert the junction points into the ice bath.
3	Connect the thermocouple extension wires to the terminals for Input #1. See Figure 1-2.

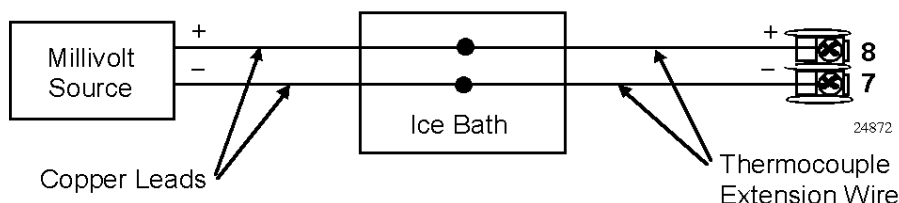


Figure 1-2 Wiring Connections for Thermocouple Inputs Using an Ice Bath

Thermocouple Inputs Using a Thermocouple Source

Refer to Figure 1-3 and wire the controller according to the procedure given in Table 1-4. Make sure the jumper at S101 is in the #1 position. See Figure 2-2 in the manual.

Table 1-4 Set Up Wiring Procedure for Thermocouple Inputs using Thermocouple Source

Step	Action
1	Connect the thermocouple extension wires to the terminals for Input #1 as shown in Figure 1-3.

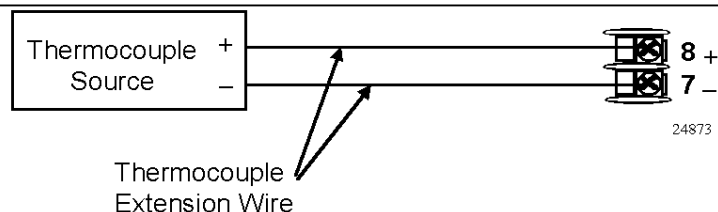


Figure 1-3 Wiring Connections for Thermocouple Inputs Using Thermocouple Source

RTD Inputs

Refer to Figure 1-4 and wire the controller according to the procedure given in Table 1-5. Make sure the jumper at S101 is in the #2 position. See Figure 2-2 in the manual.

Table 1-5 Set Up Wiring Procedure for RTD Inputs

Step	Action
1	Connect the copper leads from the calibrator to the Input #1 terminals as shown in Figure 1-4.
2	Place current source at zero before switching on.
3	Do not switch current sources ON/OFF while connected to the UDC 2300 input.

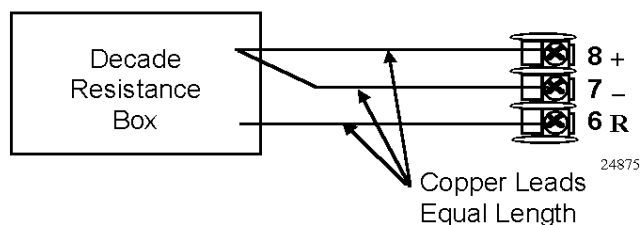


Figure 1-4 Wiring Connections for RTD (Resistance Thermometer Device)

Radiamatic, Millivolts, Milliampere, or Volts

Refer to Figure 1-5 and wire the controller according to the procedure given in Table 1-6. Make sure the jumper at S101 is in the #2 position for, mV, Volts, or the #4 position for mA. See Figure 2-2 in the manual.

Table 1-6 Set Up Wiring Procedure for Radiamatic, Milliampere, Millivolts, or Volts Inputs (Except 0-10 Volts)

Step	Action
1	Connect the copper leads from the calibrator to the Input #1 terminals as shown in Figure 1-5.
2	Place current source at zero before switching on.
3	Do not switch current sources ON/OFF while connected to the UDC 2300 input.

ATTENTION

For radiamatic inputs only, set emissivity value to 1.0. See *Configuration Section - Set Up* prompt INPUT1, function prompt EMISS.

Continued next page

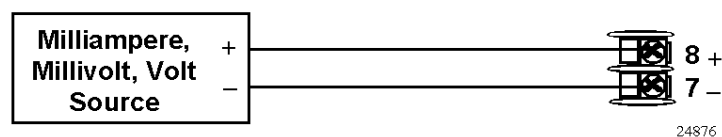


Figure 1-5 Wiring Connections for Radiamatic, Milliampere, Millivolts, or Volts (Except 0 to 10 Volts)

0 to 10 Volts

Refer to Figure 1-6 and wire the controller according to the procedure given in Table 1-7. Make sure the jumper at S101 is in parked position. See Figure 2-2 in the manual.

Table 1-7 Set Up Wiring Procedure for 0 to 10 Volts

Step	Action
1	Connect the copper leads from the calibrator to the Input #1 terminals as shown in Figure 1-6.
2	Place current source at zero before switching on.
3	Do not switch current sources ON/OFF while connected to the UDC 2300 input.

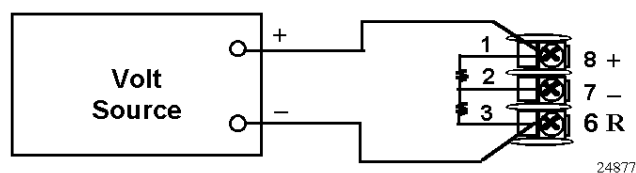


Figure 1-6 Wiring Connections for 0 to 10 Volts

1.5 Input 1 Calibration Procedure

Preliminary Steps

- Apply power and allow the controller to warm up for 30 minutes before you calibrate.
- Please read "*Section 1.4 – Input 1 Set Up Wiring*" before beginning the procedure.
- **Make sure you have LOCK set to NONE. See *Configuration section*.**
- See Table 1-1 for Voltage vs. Resistance equivalents or 0% and 100% range values.

CAUTION

For linear inputs, avoid step changes in inputs. Vary smoothly from initial value to final 100% value.

Procedure

The calibration procedure for Input #1 is listed in Table 1-8. The numeric codes are also listed.

Table 1-8 Input 1 Calibration Procedure (Numeric Code 10000)

Step	Operation	Press	Result						
1	Enter Calibration Mode	SET UP	Upper Display = CAL (- - - -) Lower Display = INPUT1 (10000)						
		until you see							
		FUNCTION	You will see: Upper Display = DIS (0) Lower Display = CALIN1 (10001)						
		▲	The calibration sequence is enabled and you will see: Upper Display = BEGN (1) Lower Display = CALIN1 (10001) At the completion of the sequence, the selection automatically reverts to disable.						
2	Calibrate 0%	FUNCTION	You will see: Upper Display = APLY (2) Lower Display = IN1ZRO (10002) <ul style="list-style-type: none"> Adjust your calibration device to an output signal equal to the 0% range value for your particular input sensor. See Table 1-1 for Voltage, Degrees, or Resistance equivalents for 0% range values. Wait 15 seconds, then go to the next step. 						
3	Calibrate 100%	FUNCTION	You will see: Upper Display = APLY (2) Lower Display = IN1SPN (10003) <ul style="list-style-type: none"> Adjust your calibration device to an output signal equal to the 100% range value for your particular input sensor. See Table 1-1 for Voltage, Degrees, or Resistance equivalents for 100% range values. Wait 15 seconds, and <table border="1" data-bbox="753 1471 1433 1624"> <tr> <td>If ...</td> <td>Then ...</td> </tr> <tr> <td>you are calibrating a Thermocouple input</td> <td>go to step 4</td> </tr> <tr> <td>you are calibrating other than a Thermocouple input</td> <td>go to step 5</td> </tr> </table>	If ...	Then ...	you are calibrating a Thermocouple input	go to step 4	you are calibrating other than a Thermocouple input	go to step 5
If ...	Then ...								
you are calibrating a Thermocouple input	go to step 4								
you are calibrating other than a Thermocouple input	go to step 5								

Continued next page

Step	Operation	Press	Result
4	Check the Cold Junction Temperature	FUNCTION	<p>The calculations for zero and span are now stored and you will see:</p> <p><i>Upper Display</i> = The cold junction temperature at the rear terminals <i>Lower Display</i> = CJTEMP (10004)</p> <p>The value in the upper display is in tenths of a degree. It is the current reading of the temperature as measured at the thermocouple terminals and recognized by the controller. You can change this value, if it is in error, using the [▲] [▼] keys.</p> <p>NOTE: The accuracy of the controller is directly affected by the accuracy of this value. Change this value only if the zero and span calibration procedures did not bring the controller within the specified accuracy requirements.</p>
5	Exit the Calibration Mode	FUNCTION then DISPLAY	The controller stores the calibration constants and exits the calibration mode.

1.6 Input 2 Set Up Wiring

0 to 20 mA or 4 to 20 mA Inputs

- Use the copper leads and connect the calibrator to the rear terminals of Input #2 (see Figure 1-7).
- Make sure jumper at S201 is set for mA (position 1). See Figure 2-2 in the manual.

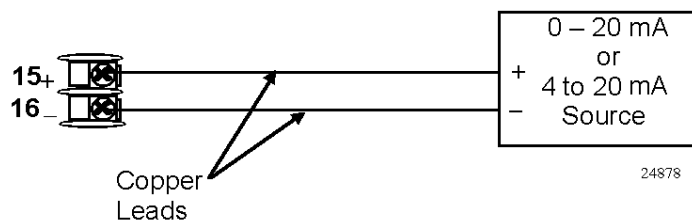


Figure 1-7 Wiring Connections for 4 to 20 mA Input – Input 2

0 to 2 Volts, 0 to 5 Volts, or 1 to 5 Volt Inputs

- Use the copper leads and connect the calibrator to the rear terminals of Input #2 (see Figure 1-8).
- Make sure the jumper of S201 is set for Volts (position 2). See Figure 2-2 in the manual.

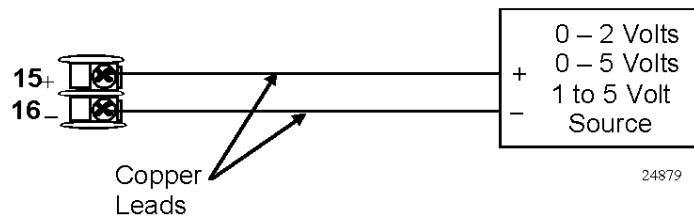


Figure 1-8 Wiring Connections for 1 to 5 Volt Input – Input 2

1.7 Input 2 Calibration Procedure

Preliminary Steps

- Apply power and allow the controller to warm up for 30 minutes before you calibrate.
- Please read *"Subsection 1.6–Input 2 Set Up Wiring"* before beginning the procedure.
- **Make sure you have LOCK set to NONE. See *Configuration Section*.**

Continued next page

Procedure

The calibration procedure for Input #2 is listed in Table 1-9. The numeric codes are also listed.

Table 1-9 Input 2 Calibration Procedure (Numeric Code 20000)

Step	Operation	Press	Result
1	Enter Calibration Mode	SET UP	Upper Display = CAL (- - - -) Lower Display = INPUT2 (20000)
		until you see	
		FUNCTION	You will see: Upper Display = DIS (0) Lower Display = CALIN2 (20001)
2	Calibrate 0%	▲	You will see: Upper Display = BEGN (1) Lower Display = CALIN2 (20001)
		FUNCTION	You will see: Upper Display = APLY (2) Lower Display = INZZRO (20002)
			<ul style="list-style-type: none"> Adjust your calibration device to an output signal equal to the 0% range value for your particular input sensor. Wait 15 seconds, then go to the next step.
3	Calibrate 100%	FUNCTION	You will see: Upper Display = APLY (2) Lower Display = IN2SPN (20003)
			<ul style="list-style-type: none"> Adjust your calibration device to an output signal equal to the 100% range value for your particular input sensor. Wait 15 seconds, then go to the next step.
4	Exit the Calibration Mode	FUNCTION	The controller stores the calibration constants.
		DISPLAY	To store the calibration constants and exit the calibration mode.

1.8 Restore Factory Calibration

Introduction

The factory calibration constants for all the input actuation types that can be used with the controller are stored in its nonvolatile memory. Thus, you can quickly restore the “Factory Calibration” for a given input actuation type by simply changing the actuation type to another type and then changing it back to the original type.

Refer to Table 1-10 Restore Factory Calibration for procedure.

ATTENTION: A restored factory calibration overwrites any previous field calibration done for the input and may change the High and Low Range Limits. Be sure to protect any field calibration from accidental overwrites by configuring the appropriate LOCKOUT selection after calibration. See the *Section - Configuration* for specific instructions to set the lockout.

Table 1-10 Restore Factory Calibration

Step	Operation	Press	Result
1	Set LOCKOUT to NONE	SET UP	until you see: <i>Upper Display</i> = SET UP <i>Lower Display</i> = TUNING
		FUNCTION	Until you see: <i>Upper Display</i> = one of the following: NONE – all parameters are read/write CAL – all parameters are read/write except Calibration CONF – configuration parameters are Read Only; no writes permitted VIEW – Tuning and Setpoint Ramp parameters are read/write. No other parameters can be viewed. ALL – Tuning and Setpoint Ramp parameters are available for read only. No other parameters can be viewed. <i>Lower Display</i> = LOCK
2	Enter INPUT 1 Setup Group	[▲] [▼]	Until NONE is in the upper display
		SET UP	until you see: <i>Upper Display</i> = SET UP <i>Lower Display</i> = INPUT 1 or 2
		FUNCTION	until you see: <i>Upper Display</i> = the current selection <i>Lower Display</i> = INxTYP
3	Scroll through Functions	[▲] [▼]	to change the current selection to another selection
		FUNCTION	until the lower display rolls through the rest of the functions and returns to: <i>Upper Display</i> = the new selection <i>Lower Display</i> = INxTYP
		[▲] [▼]	until you change the input selection in the upper display back to the proper selection. You will see: <i>Upper Display</i> = Original Input Selection that matches your type of sensor. <i>Lower Display</i> = INxTYP
4	Return to Normal Operation	DISPLAY	to return to Normal operating mode. The factory calibration will be restored. If the problem is not corrected, contact the Honeywell Technical Assistance Center. 1-800-423-9883 USA and Canada