

7.2 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 sensor. 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 7-1 and use these values when calibrating your controller.

Table 7-1 Voltage and Resistance Equivalents for 0% and 100% Range Values

Sensor Type	PV Input Range		Range Values	
	°F	°C	0%	100%
B Thermocouple	150 to 3300	66 to 1816	-0.009 mV	13.763 mV
E Thermocouple	-100 to 1832	-73 to 1000	-3.976 mV	76.358 mV
E (low) Thermocouple	-100 to 1100	-73 to 593	-3.976 mV	44.547 mV
J Thermocouple	0 to 1600	-18 to 871	-0.885 mV	50.059 mV
J (low) Thermocouple	0 to 900	-18 to 482	-0.885 mV	26.396 mV
K Thermocouple	0 to 2400	-18 to 1316	-0.692 mV	52.939 mV
K (low) Thermocouple	-20 to 1000	-29 to 538	-1.114 mV	22.251 mV
NINIMoly T/C	32 to 2500	0 to 1371	-0.001 mV	71.330 mV
NIC Nicrosil NiSi T/C	0 to 2372	-17.8 to 1300	-0.461 mV	47.502 mV
R Thermocouple	0 to 3100	-18 to 1704	-0.089 mV	20.275 mV
S Thermocouple	0 to 3100	-18 to 1704	-0.092 mV	17.993 mV
T Thermocouple	-300 to 700	-184 to 371	-5.341 mV	19.095 mV
T (low) Thermocouple	-80 to 500	-62 to 260	-2.225 mV	12.572 mV
W5W26 T/C	0 to 4200	-18 to 2316	-0.234 mV	37.066 mV
RTD (IEC=0.00385)				
100 Ohms	-300 to 900	-184 to 482	25.18 W	274.96 W
100 Ohms (low)	0 to 300	-18 to 149	93.03 W	156.90 W
Radiamatic (RH)	1400 to 3400	760 to 1871	0.99 mV	57.12 mV
Milliamps	4 to 20 mA		4 mA	20 mA
Millivolts	0 to 10 mV		0 mV	10 mV
	0 to 100 mV		0 mV	100 mV
Volts	0 to 1 Volt		0 Volt	1 Volt
	0 to 5 Volts		0 Volt	5 Volts
	0 to 10 Volts		0 Volt	10 Volts
	1 to 5 Volts		1 Volt	5 Volts

7.3 Preliminary Information, *Continued*

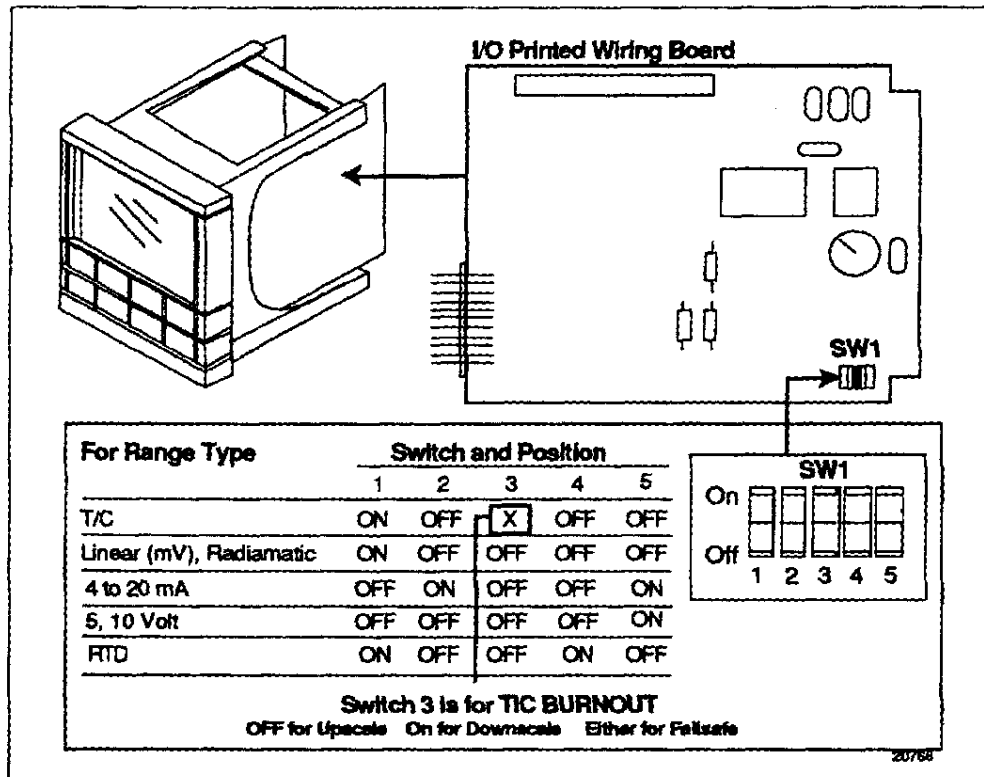
Set the DIP Switches For Input 1

Before you calibrate Input #1, you must check on internal DIP switch to make sure the switches are set for the correct input type:

- Thermocouples,
- Millivolts,
- Radiamatic,
- RTD,
- Milliamp, or
- Voltage.

The switches are located at position SW1 on the printed wiring board. Figure 7-2 shows the location of the switches and position selections.

Figure 7-2 DIP Switch Positions



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7.3 Preliminary Information, Continued

Equipment needed

Table 7-2 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 7-2 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 UDC2000 input. <p>ATTENTION For radiamatic inputs only, set emissivity value to 1.0. See <i>Section 3 - Configuration Set Up</i> prompt "INPUT 1", function prompt "EMISS."</p>

7.4 Input #1 Set Up Wiring

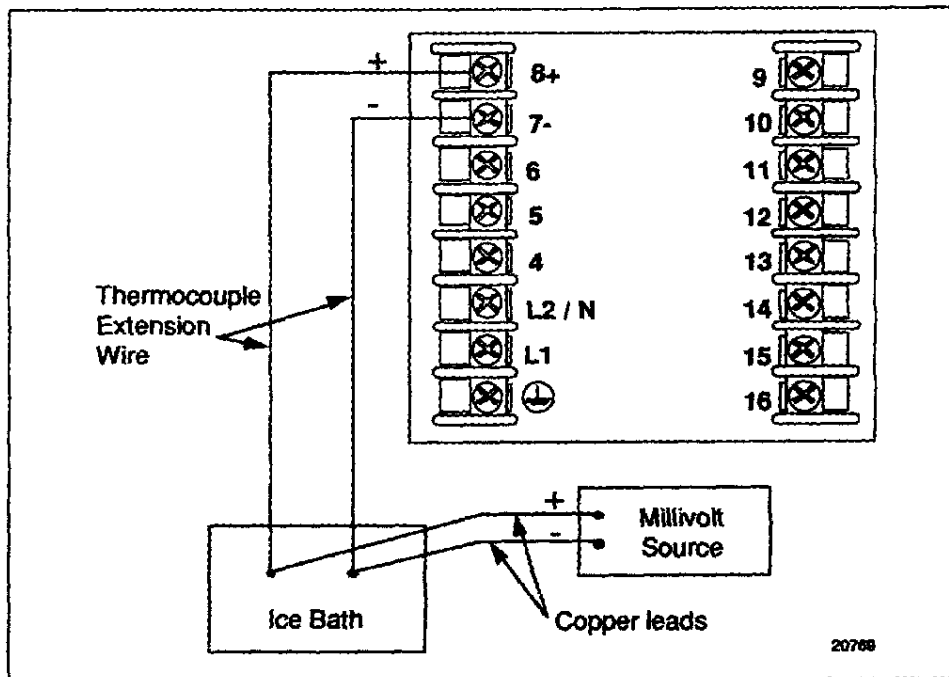
Thermocouple Inputs using an Ice Bath

Refer to Figure 7-3 and wire the controller according to the procedure given in Table 7-3.

Table 7-3 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 7-3.

Figure 7-3 Wiring Connections for Thermocouple Inputs Using an Ice Bath



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7.4 Input #1 Set Up Wiring, Continued

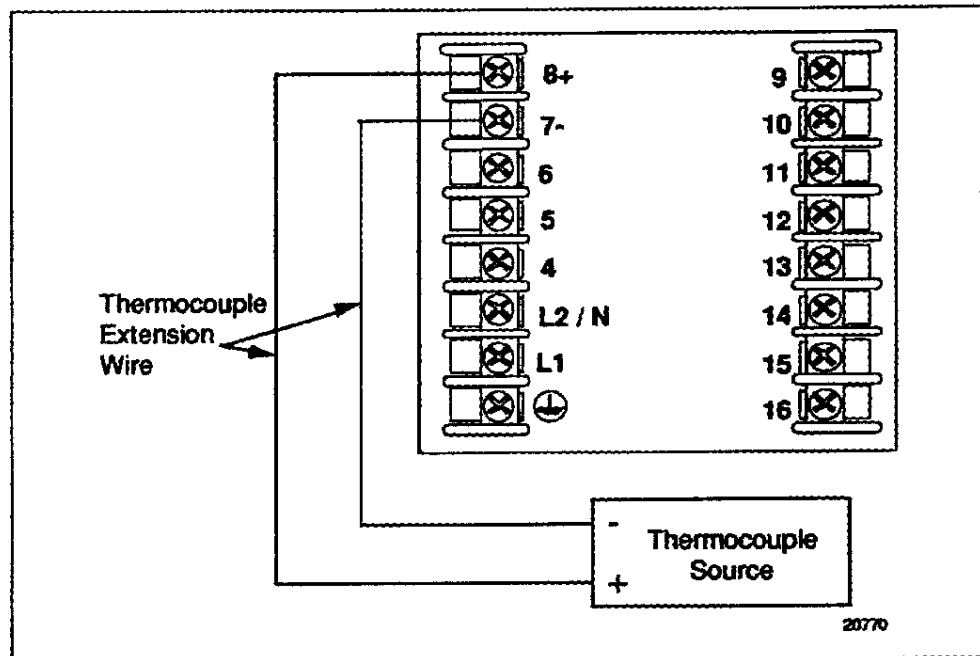
Thermocouple Inputs using a thermocouple source

Refer to Figure 7-4 and wire the controller according to the procedure given in Table 7-4.

Table 7-4 Set Up Wiring Procedure for Thermocouple Inputs Using T/C Source

Step	Action
1	Connect the thermocouple extension wire to the terminals for Input #1 as shown in Figure 7-4.

Figure 7-4 Wiring Connections for Thermocouple Inputs Using T/C Source



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7.4 Input #1 Set Up Wiring, *Continued*

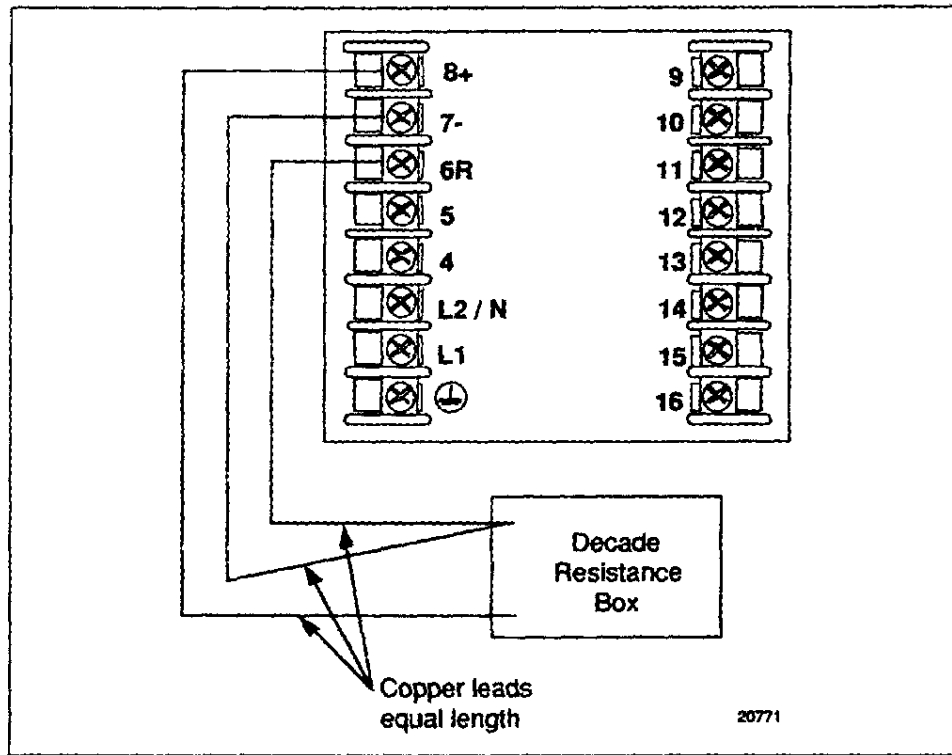
RTD Inputs

Refer to Figure 7-5 and wire the controller according to the procedure given in Table 7-5.

Table 7-5 Set Up Wiring for RTD Inputs

Step	Action
1	Connect the copper leads from the calibrator to the Input #1 terminals as shown in Figure 7-5.
2	Place current source at zero before switching on.
3	Do not switch current sources ON/OFF while connected to the UDC2000 input.

Figure 7-5 Wiring Connections for RTD (Resistance Thermometer Device)



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7.4 Input #1 Set Up Wiring, Continued

Radiamatic, millivolts, milliamperes, or volts

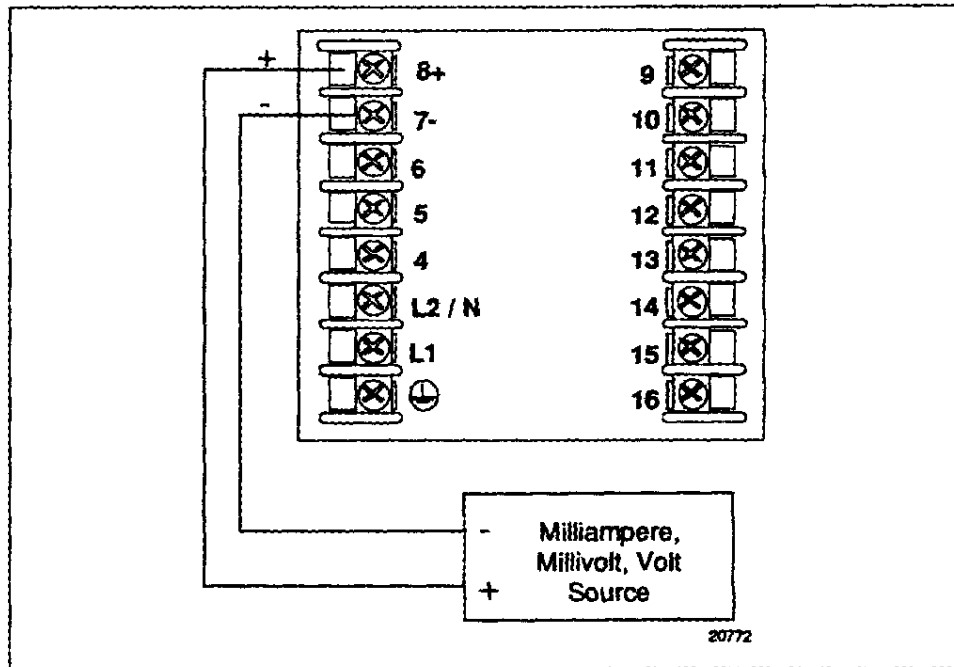
Refer to Figure 7-6 and wire the controller according to the procedure given in Table 7-6.

Table 7-6 Set Up Wiring for Radiamatic, Milliampere, Millivolts, or Volts Inputs

Step	Action
1	Connect the copper leads from the calibrator to the Input #1 terminals as shown in Figure 7-6.
2	Place current source at zero before switching on.
3	Do not switch current sources ON/OFF while connected to the UDC2000 input.

ATTENTION For radiamatic inputs only, set emissivity value to 1.0. See Section 3 - Configuration Set Up prompt "INPUT 1", function prompt "EMISS."

Figure 7-6 Wiring Connections for Radiamatic, Millivolts, or Volts (except 0 to 10 Volts)



7.5 Input #1 Calibration Procedure

Preliminary steps

- Apply power and allow the controller to warm up for 15 minutes before you calibrate.
- Please read “*Set Up Wiring*” before beginning the procedure.
- Make sure you have “LOCKOUT” set to “NONE.” See *Section 3 – Configuration*.
- See Table 7-1 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 7-7.

Table 7-7 Input #1 Calibration Procedure









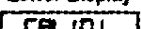


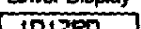

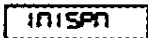


Step	Description	Press	Action
1	Enter Calibration Mode	 until you see	Upper Display  Lower Display 
			You will see: Upper Display  Lower Display 
			The calibration sequence is enabled and you will see: Upper Display  Lower Display  At the completion of the sequence, the selection automatically reverts to disable.
2	Calibrate 0%		You will see: Upper Display  Lower Display  <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 7-1 for Voltage, Degrees, or Resistance equivalents. • Wait 30 seconds, then go to the next step.

Table 7-7 is continued on next page

7.5 Input #1 Calibration Procedure, Continued

Procedure, continued

Table 7-7 Input #1 Calibration Procedure, Continued

Step	Description	Press	Action						
3	Calibrate 100 %	FUNCTION	<p>You will see:</p> <p>Upper Display </p> <p>Lower Display </p> <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 7-1 for Voltage, Degrees, or Resistance equivalents for 0% and 100% range values. Wait 30 seconds, and <table border="1"> <thead> <tr> <th>If...</th> <th>Then...</th> </tr> </thead> <tbody> <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> </tbody> </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								
4	<p>Check the Cold Junction Temperature</p> <p>ATTENTION 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>	FUNCTION	<p>The calculations for zero and span are now stored and you will see:</p> <p>Upper Display  ← The cold junction temperature at the rear terminals</p> <p>Lower Display </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 ▲ or ▼ key.</p>						
5	Exit the Calibration Mode	<p>FUNCTION</p> <p>then</p> <p>DISPLAY</p>	The controller stores the calibration constants and exits the calibration mode.						