Series 873

1/8 DIN Digital Indicator

User's Manual

WATLOW

Watlow Controls, 1241 Bundy Blvd., Winona, MN 55987 507/454-5300, Fax: 507/452-4507

W873-DA20-8935
August, 1989
Supersedes:
W873-DA10-8907

$5.00

Printed on Recycled Paper
General Description

The Watlow Series 873 is a 1/8 DIN LED digital temperature indicator featuring either single or 10 channel selection sensor inputs including T/C, RTD, or electrical process. A millivolt output signal is available for interface to other instrumentation.

Specifications

Operator Interface

- 1/2" (12.7mm) LEDs.
- 10 position switch selects which of 10 inputs to display.
- °F or °C selection, external jumper.

Input

- Thermocouple, RTD, or electrical process input available.
- Automatic cold junction compensation for thermocouple.
- RTD input 2 or 3 wire, platinum, 100 ohms @ 0°C calibrated for either of two curves: #3916(JIS): 0.003916 Ω/Ω°C.
  #3850 (DIN): 0.003850 Ω/Ω°C.
- MV process input, 5mV/digit for 3 digit temperature ranges 2mV/digit for 3-1/2 and 3-3/4 digit temperature ranges.
- Sensors may be isolated or grounded.
- Lead resistance effect for "J" type thermocouple input: 200Ω of lead resistance will cause less than 1°F error. Refer to the lead wire manufacturer's specification on ohms per double foot for the type and gauge of wire used.

- Open Sensor Indication

<table>
<thead>
<tr>
<th>3 Digit</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1/2 Digit</td>
<td>*MSD Lit</td>
<td>MSD Lit</td>
</tr>
<tr>
<td>3-3/4 Digit</td>
<td>OFL</td>
<td>000</td>
</tr>
</tbody>
</table>

*Most Significant Digit Lit

- Display Capacity Definition:
  3 Digit -99 to 999 @ 5mv/LSD*
  3-1/2 Digit -1999 to 1999 @ 2mv/LSD
  3-3/4 Digit 000 to 3999 @ 2mv/LSD

*Least Significant Digit

- Input Isolation:
  T/C input to line: DC resistance 10¹⁰ ohms. 50pf capacitance.
  RTD input to line: Isolated.

Auxiliary Output

- MV signal output, linearized, 5mV/digit for 3 digit ranges, 2mV/digit for 3-1/2 and 3-3/4 digit ranges.

Accuracy

- Calibration Accuracy and Sensor Conformity:
  ± 0.25% of span, ± 1 digit at 77°F ± 5°F (25°C ±3°C) ambient & rated line voltage ±1%.
- Accuracy Span: 1000°F or 540°C minimum.
- Temperature Stability: ± 5µV/°F (7.75µV/°C) ambient.
- Voltage Stability: ± 0.01% of span % of rated line voltage.

Terminals

- Screw clamp strip.
- Solder terminals.

Power

- 120/240VAC ±10%, 50/60Hz.
- 6 VA.

Operating Environment

- 30 to 130°F/0 to 55°C.
- 0 to 90% RH, non-condensing.

Dimensions

- Height: 1.9 in. (48.26 mm)
- Width: 3.8 in. (96.52 mm)
- Overall depth: 5.5 in. (139.7 mm)
- Behind panel depth: 4.7 in. (119.38 mm)
- Weight: 1.3 lb. (0.6 kg)
Control
Series 873 = Digital temperature indicator,
LED 10 channel option, 1/8 DIN.

Unit Modifications
A = Single-channel, solder terminals
B = Single-channel, screw terminals
C = Ten-channel, solder terminals
D = Ten-channel, screw terminals

<table>
<thead>
<tr>
<th>Input &amp; Range</th>
<th>RTD</th>
</tr>
</thead>
</table>
| 100 = #3916   | -9.9 to 99.9°F or
|               | -9.9 to 99.9°C |
| 101 = #3916   | -99 to 999°F or
|               | -99 to 500°C   |
| 102 = #3916   | -199.9 to 199.9°F or
|               | -199.9 to 199.9°C |
| 104 = #3916   | 0 to 399.9°F or
|               | 0 to 399.9°C   |
| 120 = #3850   | -9.9 to 99.9°F or
|               | -9.9 to 99.9°C |
| 121 = #3850   | -99 to 999°F or
|               | -99 to 500°C   |
| 122 = #3850   | -199.9 to 199.9°F or
|               | -199.9 to 199.9°C |
| 124 = #3850   | 0 to 399.9°F or
|               | 0 to 399.9°C   |

<table>
<thead>
<tr>
<th>Thermocouples</th>
</tr>
</thead>
</table>
| 600 = K       | 0 to 999°F or
|               | 0 to 999°C   |
| 601 = K       | 32 to 2480°F or
|               | 0 to 1360°C   |
| 602 = J       | 32 to 1560°F or
|               | 0 to 850°C   |
| 603 = J       | 0 to 999°F or
|               | 0 to 540°C   |
| 604 = J       | -99 to 570°F or
|               | -99 to 300°C   |
| 605 = T       | -99 to 570°F or
|               | -99 to 300°C   |

<table>
<thead>
<tr>
<th>DC Millivolts</th>
</tr>
</thead>
<tbody>
<tr>
<td>700 = 5mV/LSD</td>
</tr>
<tr>
<td>701 = 2mV/LSD</td>
</tr>
<tr>
<td>703 = 5mV/LSD</td>
</tr>
<tr>
<td>704 = 2mV/LSD</td>
</tr>
<tr>
<td>709 = 5mV/LSD</td>
</tr>
<tr>
<td>710 = 5mV/LSD</td>
</tr>
</tbody>
</table>

Related Devices:
- Extender card: A007-1022-0000
Installation and Dimensions

Figure 1 shows the standard case dimensions with solder terminals and Figure 2 shows the case with screw terminals for the Series 873. Figure 3 on Page 5 shows the panel cutout for mounting, and 4 shows the front panel dimensions.

1. To install, turn the installation screws out to the edge of the PC edge connector. See Figure 1 or 2.

2. Carefully insert the unit into the panel cutout. See Figure 3.

3. Slide the mounting bracket back to allow the ears to spring free.

4. Tighten the installation screws to secure the unit in place.

5. To remove the unit from its enclosure, pop the lens out by inserting a small object into the lens notch and prying up. See Figure 4 on Page 5.

   The interior of the unit is held in place by the PC edge connector.

   Behind the lens is a black lever or "extractor" fastened to the lower PC board of the 873.

   By prying this out, first by fingernail, then by finger; the leverage will force the unit out of its enclosure.

6. To re-install the unit, swing the "extractor" to the left so it is flush with the PC board.

   Slide the unit into the enclosure and press firmly on the edge of the PC board until the unit is held firmly by the connector.

   Replace the lens by inserting the top in first and press in on the bottom.

Figure 1 - Series 873 Case Dimensions (Solder Terminals)

Figure 2 - Series 873 Screw Terminals
Dimensions and Mounting

Figure 3 - Series 873 Panel Cutout

Panel Cutout
Maximum Panel Thickness,
0.156
(4.0mm)
1.77 +0.02, -0.00
(45.0mm +0.6mm)
3.62 +0.03, -0.00
(92.0mm + 0.8mm)

Figure 4 - Series 873 Front Panel Dimensions

Channel Adjustment Knob

Lens Notch

1.90
(48.5mm)

3.80
(96.5mm)
LINE VOLTAGE

WARNING:
To avoid potential electric shock, use National Electric Code safety practices when wiring and connecting this unit to a power source and to electrical sensors or peripheral devices.

All wiring and fusing should conform to the National Electric Code NFPA 70 and to any locally applicable codes also.

Figure 5 - 120 VAC Power Wiring

Figure 6 - 240 VAC Power Wiring
Wire your unit according to the figures showing the correct input.

**NOTE:**
You must use an isolated or ungrounded thermocouple if using a chart recorder. Circuit common is not isolated from earth ground. Extension wire for thermocouples must be of the same alloy as the thermocouple itself to limit errors.

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**1 Channel Solder Terminals (8A45-0080-06XX)**

**10 Channel Solder Terminals (8C45-0080-06XX)**

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**1 Channel Screw Terminals (8B45-0080-06XX)**

**10 Channel Screw Terminals (8D45-0080-06XX)**

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**Figure 7 - Thermocouple Input**

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**RTD Input Wiring**

**NOTE:**
On single channel controls, connect S2 to S3 for a two wire sensor.

![1 Channel Solder Terminals (8A45-0080-01XX)](image1)

![10 Channel Solder Terminals (8C45-0080-01XX)](image2)

![1 Channel Screw Terminals (8B45-0080-01XX)](image3)

![10 Channel Screw Terminals (8D45-0080-01XX)](image4)

**Figure 8 - RTD Input**

**NOTE:**
Long RTD lead lengths create electrical resistance. There will be approximately +2°C input error for every 1Ω of lead length resistance, when using a two wire RTD. That resistance, when added to the resistance of the RTD element, can result in erroneous input to the instrument. To overcome this problem, use a three wire RTD sensor, which compensates for lead length resistance. When extension wire is used for a three wire RTD, all three extension wires must have the same electrical resistance. (i.e. same gauge, copper stranded wire).
Millivolt Input Wiring

1 Channel Solder Terminals (8A45-0080-07XX)

1 Channel Screw Terminals (8B45-0080-07XX)

Figure 9 - Millivolt Input

Chart Recorder Output

Scaled 5mV/LSD for 3 digit ranges
Scaled 2mV/LSD for 4 digit ranges

1/10 Channel Solder Terminals (8X45-0080-0XXX)

Output

mV(+) (-)mV

1 Channel Screw Terminals (8B45-0080-0XXX)

10 Channel Screw Terminals (8D45-0080-07XX)

Figure 10 - Chart Recorder
C/F Selection

1 or 10 Channel Solder Terminals (8X45-0080-XXXX)

1 Channel Screw Terminals (8D45-0080-XXXX)

10 Channel Screw Terminals (8D45-0080-XXXX)

Figure 11 - °C Selection

Figure 12 - °F Selection
1. **Closed Loop** - Control system that has a sensing device for process variable feedback.

2. **Cold Junction** - Point of connection between thermocouple metals and the electronic instrument.

3. **Cold Junction Compensation** - Electronic means used to compensate for the effect of temperature at the cold junction.

4. **DIN** - Deutsche Industrial Norms, a widely recognized German standard for engineering units.

5. **ON/OFF** - The output is turned full ON below set point and stays turned on until the process temperature reaches set point, then the controller turns the output full OFF. At this point depending on the design of the thermal system, the process temperature will overshoot the set point temperature by some degree.


7. **Set Point** - Intended value of the process variable.

8. **Switching Sensitivity or Differential** - The output will de-energize when the actual temperature reaches the set point temperature. The switching sensitivity or differential is the change in temperature (°F/°C) required to re-energize the output.

9. **Thermal System** - A regulated environment consisting of a heat source, heat transfer medium, sensing device and a process variable control instrument.

10. **Thermocouple** - Temperature sensing device that is constructed of two dissimilar metals wherein a measurable, predictable voltage is generated corresponding to temperature.

11. **Thermocouple Break Protection** - Fail-safe operation that assures output shutdown upon an open thermocouple condition.

12. ♫ or ♫ - Musical Notes are used to alert you to important details.

13. 🚦 - The Stop Sign alerts you to a "WARNING," a safety hazard which could affect you and the equipment.

14. 🦌 - The Deer Crossing Sign alerts you to a "CAUTION," a safety or functional hazard which could affect your equipment or its performance.
### T/C Field Calibration Procedure

**Note:**
This calibration information is provided as a service. Proper field calibration can be achieved by following this procedure. If your control is in warranty, that warranty will be void if this field calibration is performed improperly.

**Note:**
All millivolt values given are referenced to 0°C for °C range and 32°F for °F ranges.

**Thermocouple Input**
**Equipment Required:**
- Precision Millivolt Source.
- 3 - 1/2 digit, Digital Voltmeter (DVM).
- Reference compensator with reference junction at 32°F/0°C.
- Extender board may be used for ease of servicing, Watlow P/N A007-1022-0000.

**Procedure:**
Refer to Table 1 for the values that apply to your unit's range code. Refer to Figure 14 on Page 15 for potentiometer locations.

1. Connect the millivolt source to the reference compensator, and the compensator leads to the T/C inputs, Terminals 2 (+) and B (-). Jumper Terminals P to N for °C operation. Connect the DVM to Terminals 12 (-) and N (+).

   Install the extender board, if one is in possession, into the case, and the control into the extender board.

2. Connect power to the control. Let the control stabilize before calibration begins.

3. Set the millivolt source to _____ Lo °C mV. Adjust the °C Lo pot for _____ Lo °C volts on the DVM.

4. Set the millivolt source to _____ Hi °C mV. Adjust the °C Hi pot for _____ Hi °C volts on the DVM.

5. Repeat Steps 3 and 4 until all of the readings are correct with no further adjustment necessary for °C.

6. Remove power from the control. Remove the jumper from Terminals P and N and apply it across Terminals 13 and N for °F operation. Re-apply power to the control.

7. Set the millivolt source to _____ Lo °F mV. Adjust the °F Lo pot for _____ Lo °F on the DVM.

8. Set the millivolt source to _____ Hi °F mV. Adjust the °F Hi pot for _____ Hi °F volts on the DVM.

9. Repeat Steps 7 and 8 until all of the readings are correct with no further adjustment necessary.

For units with 602 range code, do Steps 11 and 13 only.

10. Set the millivolt source to _____ Lo °F mV. Adjust the Zero pot for _____ Zero Temp.

11. Set the millivolt source to Hi °F mV. Adjust the FS pot for ____ FS Temp.

12. Repeat Steps 9 and 10 until all of the readings are correct with no further adjustment necessary.

13. Check the midpoint calibration by setting the mV source to mid mV. The display should read _____ mid temperature ± 0.25% of span.

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**Table 1 - Thermocouple Input Calibration Ranges**

<table>
<thead>
<tr>
<th>Range Code</th>
<th>Low/High</th>
<th>TC Type</th>
<th>Lo °C mV</th>
<th>Lo °C Volts</th>
<th>Hi °C mV</th>
<th>Hi °C Volts</th>
<th>Lo °F mV</th>
<th>Lo °F Volts</th>
<th>Hi °F mV</th>
<th>Hi °F Volts</th>
<th>Zero Temp</th>
<th>FS Temp</th>
<th>Mid mV</th>
<th>Mid Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>0 - 999°F</td>
<td>K</td>
<td>0.000</td>
<td>0.00</td>
<td>40.88</td>
<td>990°C</td>
<td>4.95</td>
<td>0.000</td>
<td>22.01</td>
<td>990°F</td>
<td>10.56</td>
<td>500°F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 999°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>601</td>
<td>32 - 2480°F</td>
<td>K</td>
<td>0.397</td>
<td>0.02</td>
<td>52.40</td>
<td>1300°C</td>
<td>2.60</td>
<td>0.397</td>
<td>52.40</td>
<td>2372°F</td>
<td>22.77</td>
<td>1022°F</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 - 1360°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>602</td>
<td>32 - 1560°F</td>
<td>J</td>
<td>0.507</td>
<td>0.02</td>
<td>28.22</td>
<td>750°C</td>
<td>1.50</td>
<td>0.507</td>
<td>42.28</td>
<td>1382°F</td>
<td>23.28</td>
<td>799°F</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 - 850°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>603</td>
<td>0 - 999°F</td>
<td>J</td>
<td>0.000</td>
<td>0.00</td>
<td>29.20</td>
<td>532°C</td>
<td>2.66</td>
<td>0.000</td>
<td>29.20</td>
<td>990°F</td>
<td>14.11</td>
<td>500°F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 540°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

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**WATLOW Series 673 User's Manual**
RTD Field Calibration Procedure

NOTE:
This calibration information is provided as a service.
Proper field calibration can be achieved by following
this procedure. If your control is in warranty, that
warranty will be void if this field calibration is performed
Improperly.

Platinum RTD Input
Equipment Required:
• 100Ω decade resistance box.
• 3 - 1/2 digit Digital Voltmeter (DVM).
• Extender board may be used for ease of servicing.
  Watlow P/N A007-1022-0000.

Procedure:
See Table 2 on the next page for values that apply to
your unit's range code. Refer to Figure 14 on the next
page for potentiometer locations.

1. Connect the decade resistance box to the input on
   Terminals S1 and S2, with S2 and S3 jumpered at
   the control and the decade box. Jumper Termi-
   nals P to N for °C operation. Connect the DVM
   Negative (-) to Terminal 12 and DVM Positive (+)
   to Terminal N. Refer to Page 8 for input wiring.
   Install the extender board into the case, if one is in
   possession; install the control into the extender
   board.

2. Connect power to the control. Let the control
   stabilize before calibration begins.

3. Set the decade box to ____°C ohms. Adjust
   the °C Lo pot for ____°C volts on the DVM.

4. Set the decade box to ____Hi °C ohms. Adjust
   the °C Hi pot for ____Hi °C volts on the DVM.

5. Repeat Steps 3 and 4 until all readings are correct
   with no further adjustment necessary for °C.

6. Remove power from the control. Remove the
   jumper from Terminals P to N and apply it across
   Terminals 13 and N for °F operation. Apply power
   to the control.

7. Set the decade box to ____ Lo °F ohms. Adjust
   the °F Lo pot for ____ Lo °F volts on the DVM.

8. Set the decade box to ____ Hi °F ohms. Adjust
   the °F Hi pot for ____ Hi °F volts on the DVM.

9. Repeat Steps 7 and 8 until all of the readings are
   correct with no further adjustment necessary.

For units with 104 and 124 range codes, do steps 10
through 13. For all other units do steps 11 and 13
only.

10. Set the decade box to ____ Lo °F ohms adjust the
    Zero pot for ____ Zero Temp.

11. Set the decade box to ____ Hi °F ohms. Adjust
    the FS pot for ____ FS Temp.

12. Repeat Steps 10 and 11 until all readings are
    correct with no further adjustments necessary.

13. Check the midpoint calibration by setting the
    decade box to ____ Mid °F ohms. The display
    should read ____ Mid Temp ± 0.25% of span.
**RTD Field Calibration Procedure**

### Table 2 - RTD Input Calibration Values

#### Temperature Curve #3916 (JIS)

<table>
<thead>
<tr>
<th>Code</th>
<th>Range</th>
<th>Lo °C Ohms</th>
<th>Lo °C Volts</th>
<th>Hi °C Ohms</th>
<th>Hi °C Volts</th>
<th>Lo °F Ohms</th>
<th>Lo °F Volts</th>
<th>Hi °F Ohms</th>
<th>Hi °F Volts</th>
<th>Zero Temp</th>
<th>FS Temp</th>
<th>Mid °F Ohms</th>
<th>Mid °F Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>-9.9 - 99.9°F / -9.9 - 99.9°C</td>
<td>100.00</td>
<td>0.00</td>
<td>135.30 / 90.0°C</td>
<td>4.50</td>
<td>92.93 / 0°F</td>
<td>0.00</td>
<td>112.75 / 90.0°F</td>
<td>4.50</td>
<td>N/A</td>
<td>90.0</td>
<td>103.97</td>
<td>50.0</td>
</tr>
<tr>
<td>101</td>
<td>-99 - 999°F / -99 - 500°C</td>
<td>100.00</td>
<td>0.00</td>
<td>294.91 / 500°C</td>
<td>2.66</td>
<td>100.00 / 32°F</td>
<td>0.16</td>
<td>294.91 / 990°F</td>
<td>4.95</td>
<td>N/A</td>
<td>990</td>
<td>199.37</td>
<td>500</td>
</tr>
<tr>
<td>102</td>
<td>-199.9 - 199.9°F / -199.9 - 199.9°C</td>
<td>100.00</td>
<td>0.00</td>
<td>173.40 / 190.0°C</td>
<td>3.80</td>
<td>100.00 / 32°F</td>
<td>0.64</td>
<td>134.44 / 190.0°F</td>
<td>3.80</td>
<td>N/A</td>
<td>190.0</td>
<td>110.56</td>
<td>80.0</td>
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<tr>
<td>104</td>
<td>0 - 399.9°F / 0 - 399.9°C</td>
<td>100.00</td>
<td>0.00</td>
<td>246.08 / 390.0°C</td>
<td>7.80</td>
<td>100.00 / 32°F</td>
<td>0.64</td>
<td>176.73 / 390.0°F</td>
<td>7.80</td>
<td>32.0°F / 390.0°F</td>
<td>136.59</td>
<td>200.0</td>
<td></td>
</tr>
</tbody>
</table>

#### Temperature Curve #3850 (DIN)

<table>
<thead>
<tr>
<th>Code</th>
<th>Range</th>
<th>Lo °C Ohms</th>
<th>Lo °C Volts</th>
<th>Hi °C Ohms</th>
<th>Hi °C Volts</th>
<th>Lo °F Ohms</th>
<th>Lo °F Volts</th>
<th>Hi °F Ohms</th>
<th>Hi °F Volts</th>
<th>Zero Temp</th>
<th>FS Temp</th>
<th>Mid °F Ohms</th>
<th>Mid °F Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>-9.9 - 99.9°F / -99 - 99.9°C</td>
<td>100.00</td>
<td>0.00</td>
<td>134.70 / 90.0°C</td>
<td>4.50</td>
<td>93.03 / 0°F</td>
<td>0.00</td>
<td>112.53 / 90.0°F</td>
<td>4.50</td>
<td>N/A</td>
<td>90.0</td>
<td>103.90</td>
<td>50.0</td>
</tr>
<tr>
<td>121</td>
<td>-99 - 999°F / -99 - 500°C</td>
<td>100.00</td>
<td>0.00</td>
<td>291.56 / 500°C</td>
<td>2.66</td>
<td>100.00 / 32°F</td>
<td>0.16</td>
<td>291.56 / 990°F</td>
<td>4.95</td>
<td>N/A</td>
<td>990</td>
<td>197.69</td>
<td>500</td>
</tr>
<tr>
<td>122</td>
<td>-199.9 - 1999°F / -199.9 - 999°C</td>
<td>100.00</td>
<td>0.00</td>
<td>172.16 / 190.0°C</td>
<td>3.80</td>
<td>100.00 / 32°F</td>
<td>0.64</td>
<td>133.86 / 190.0°F</td>
<td>3.80</td>
<td>N/A</td>
<td>190.0</td>
<td>110.38</td>
<td>80.0</td>
</tr>
<tr>
<td>124</td>
<td>0 - 399.9°F / 0 - 399.9°C</td>
<td>100.00</td>
<td>0.00</td>
<td>243.59 / 390.0°C</td>
<td>7.80</td>
<td>93.03 / 32.0°F</td>
<td>0.64</td>
<td>175.43 / 390.0°F</td>
<td>7.80</td>
<td>32.0°F / 390.0°F</td>
<td>135.97</td>
<td>200.0</td>
<td></td>
</tr>
</tbody>
</table>

### Calibration Offset

![Calibration Offset Diagram](diagram)

**Note:**

Depending on your unit, you may not have a top board or a four-digit display. This figure shows all possible potentiometer locations.

---

**Figure 14 - Series 873 Potentiometer Locations**

1. To adjust the Zero pot, remove the lens from the unit.
2. Turn the Zero pot clockwise (CW) to increase the display temperature.
3. Turn the Zero pot counter-clockwise (CCW) to decrease the display temperature. Replace the lens by inserting the top in first and press in on the bottom.
Millivolt Field Calibration Procedure

NOTE:
This calibration information is provided as a service. Proper field calibration can be achieved by following this procedure. If your control is in warranty, that warranty will be void if this field calibration procedure is performed improperly.

Millivolt Signal Input

Equipment Required:
- Precision millivolt source.
- Digital voltmeter (DVM).

Procedure:

1. Connect the millivolt source to input terminals 2 (+) and B (-). Connect power to the control.

2. Set the millivolt source to ____ V. Adjust the Zero pot for ____ on the display of the control. See Page 15 for potentiometer locations.

3. Set the millivolt source to ____ V. Adjust the FS pot to ____ on the display of the control.

4. Repeat Steps 2 and 3 until all of the readings are correct with no further adjustments necessary.

5. Set the millivolt source to ____ V. The display should read ____.

Table 1 - Millivolt Input Calibration Ranges

<table>
<thead>
<tr>
<th>Code</th>
<th>Range</th>
<th>Input Scaling</th>
<th>Lo Volts</th>
<th>Mid Volts</th>
<th>Hi Volts</th>
<th>Low Display</th>
<th>Mid Display</th>
<th>High Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>-99 to 999 units</td>
<td>5mV/LSD</td>
<td>0.00</td>
<td>2.50</td>
<td>4.95</td>
<td>000</td>
<td>500 ± 2</td>
<td>990</td>
</tr>
<tr>
<td>701</td>
<td>-1999 to 1999 units</td>
<td>2mV/LSD</td>
<td>0.00</td>
<td>2.000</td>
<td>3.900</td>
<td>0000</td>
<td>1000 ± 5</td>
<td>1950</td>
</tr>
<tr>
<td>703</td>
<td>-9.9 to 99.9 units</td>
<td>5mV/LSD</td>
<td>0.00</td>
<td>2.50</td>
<td>4.95</td>
<td>00.0</td>
<td>50.0 ± 0.2</td>
<td>99.0</td>
</tr>
<tr>
<td>704</td>
<td>-199.9 to 199.9 units</td>
<td>2mV/LSD</td>
<td>0.000</td>
<td>2.000</td>
<td>3.900</td>
<td>000.0</td>
<td>100.0 ± 0.5</td>
<td>195.0</td>
</tr>
<tr>
<td>709</td>
<td>-1999 to 1999 units</td>
<td>5mV/LSD</td>
<td>0.000</td>
<td>5.00</td>
<td>9.95</td>
<td>0000</td>
<td>1000 ± 5</td>
<td>1990</td>
</tr>
<tr>
<td>710</td>
<td>-199.9 to 199.9 units</td>
<td>5mV/LSD</td>
<td>0.000</td>
<td>5.00</td>
<td>9.95</td>
<td>000.0</td>
<td>100.0 ± 0.5</td>
<td>199.0</td>
</tr>
<tr>
<td>Problem</td>
<td>Probable Cause</td>
<td>Action</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No display.</td>
<td>Check for presence or proper connection of AC input.</td>
<td>Connect per Line Voltage. See Page 6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. If not present or proper ...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. If present and proper ...</td>
<td>Contact the factory.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A display error.</td>
<td>1. Check for °C/°F jumper. If not present ...</td>
<td>Connect per °C/°F Selection. See Page 10, Figures 11 &amp; 12.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. If °C/°F jumper present, check sensor connection. If not connected properly</td>
<td>Connect per Input Wiring. See Pages 7 - 9. Observe TC type and polarity.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. If sensor is connected properly, check for a faulty sensor ...</td>
<td>A. Thermocouple - Place jumper wire across TC terminals. If display indicates room temperature, indicator is functioning properly.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>B. RTD - Place 100Ω resistor across sensor terminals. If display indicates approximately 32°F/0°C, indicator is functioning properly.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. If the indication problem is not resolved ...</td>
<td>Check the sensor location, connections, and the sensing element. Repair or replace the sensor as required.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Returns**

The following procedure must be used on any returns of product to the factory:

1. You must call Watlow Customer Service, 507/454-5300, for a Return Material Authorization (RMA) number before returning any item for repair. We need this information:
   - Ship to address
   - Bill to address
   - Contact name
   - Phone number
   - Ship via
   - Your P.O. number
   - Symptoms and/or special instructions
   - Name and phone number of person returning the material.

   We will not accept a return without an RMA number. The RMA number must appear on the outside of the carton and on all paperwork. Cartons without RMA numbers will be returned. Ship on a freight prepaid basis.

2. You need prior approval and an RMA number from the Customer Service Department when you are returning an unused product for credit. Also, we must apply a 20 percent restocking charge for all returned stock controls and accessories.

3. After we receive your return, we will enter a repair order, replacement order, or issue credit for material.

4. In cases of manufacturing defect, we will return it to you with a letter of explanation. Repair costs will not exceed 50 percent of the original cost.

**Warranty**

The Watlow Series 873 is warranted to be free of defects in material and workmanship for 24 months after delivery to the first purchaser for use, providing that the units have not been misapplied.

Since Watlow has no control over their use, and sometimes misuse, we cannot guarantee against failure. Watlow's obligations hereunder, at Watlow's option, are limited to replacement, repair or refund of purchase price, and parts which upon examination prove to be defective within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse or abuse.

Watlow Controls, 1241 Bundy Blvd., Winona, MN 55987. 507/454-5300, Fax: 507/454-4517