General Description

The Series 340 is a single or dual channel, open board limit control available in any combination of high or low limits. The 340 uses a single thermocouple for each channel to sense process temperature. A relay output removes power from the load when a limit condition exists. The output will remain latched in the de-energized state until it is manually reset. Manual reset of the device is accomplished by activation of a customer-supplied normally open momentary switch.

Specifications

Control Mode
• High or low latching limit on either channel.
• Latch reset by customer-supplied contacts.

Operator Interface
• LED indication of limit condition.

Set Point, Remote
• 3" (7.6 cm) dial scale calibrated to compensate for sensor nonlinearities.
• Dual °F & °C scales.

Setpoint, Integral
• 2.6" (6.6 cm) dial scale calibrated to compensate for sensor nonlinearities.
• Dual °F & °C scales.

Input
• Thermocouple with automatic cold junction compensation.
• Sensor break protection: open sensor initiates appropriate limit condition action to protect system.
• Sensors may be isolated or grounded.
• Lead resistance effect: 100 ft of 20ga extension wire will cause less than 1°C (2°F) error for thermocouple Types J, K and T.

Output
• Relay 5A, SPDT, plug-in, one per channel: 5A @ 120VAC, 5A @ 240VAC, 5A @ 28VDC, 1/6 hp @ 120/240VAC.

Accuracy
• Calibration Accuracy and Sensor Conformity:
  ±1% of span, at 77°F ± 5°F (25°C ± 3°C) ambient & rated line voltage ± 1%.
• Set Point Assy: ± 2% of dial scale.
• Accuracy Span: 1000°F or 540°C minimum.
• Temperature Stability: Typically ±10μV/°F (18μV/°C) ambient referred to the input.
• Voltage Stability: ± 0.01% of span/% of rated line voltage.

Terminals
• #6 screws on barrier strips.

Power
• 120/240VAC ± 10%, 50/60Hz.
• Less than 5VA.

Power-Loss Output Reset Option
Operating status when power is restored, if temperature not beyond set point:
• Automatic: Output relay automatically re-energized.
• Manual: Manual reset required to re-energize output relay.

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

Weight
• Control
  • 1.7 lb. or 0.78 kg.
• Set Point Assembly (24 in leads)
  • 0.2 lb. or 0.1 kg.
To order, complete the Model Number on the right with the information below.

Category and Details

Control
Series 340 = Dual channel temperature limit unit, latching, t/c input, 5A relay, 120/240VAC, compact open board.

Output Mode
A = Single channel high
B = Single channel low
C = Dual channel high/high
D = Dual channel high/low
E = Dual channel low/low

Power-Loss Output Reset
1 = Manual
2 = Automatic

Input & Range

<table>
<thead>
<tr>
<th>Thermocouple</th>
<th>Setpoint Assembly</th>
<th>Thermocouple</th>
<th>Setpoint Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 = J</td>
<td>0 to 250°F</td>
<td>601 = J</td>
<td>0 to 500°F</td>
</tr>
<tr>
<td></td>
<td>-20 to 120°C</td>
<td></td>
<td>-20 to 260°C</td>
</tr>
<tr>
<td>602 = J</td>
<td>0 to 1000°F</td>
<td>603 = K</td>
<td>0 to 2000°F</td>
</tr>
<tr>
<td></td>
<td>-20 to 540°C</td>
<td></td>
<td>-20 to 1100°C</td>
</tr>
<tr>
<td>604 = J</td>
<td>200 to 600°F</td>
<td>605 = T</td>
<td>-200 to 600°F</td>
</tr>
<tr>
<td></td>
<td>100 to 310°C</td>
<td></td>
<td>-100 to 300°C</td>
</tr>
<tr>
<td>606 = T</td>
<td>-125 to 425°F</td>
<td>607 = T</td>
<td>-75 to 215°C</td>
</tr>
<tr>
<td></td>
<td>-125 to 425°F</td>
<td></td>
<td>-75 to 215°C</td>
</tr>
<tr>
<td>608 = K</td>
<td>0 to 250°F</td>
<td>609 = J</td>
<td>-40 to 50°F</td>
</tr>
<tr>
<td></td>
<td>0 to 1350°C</td>
<td></td>
<td>-40 to 10°C</td>
</tr>
<tr>
<td>611 = J</td>
<td>50 to 1550°F</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 to 850°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Set Point
1 = Integral
2 = Remote assembly (order separately)
3 = One integral & one remote assembly (order separately)

Related Devices
Output Relay: 0003-0052-0000
Remote Setpot Knob: 0821-0064-0000
Remote Setpot Dial Scale - Specify Range: 0026-XXXX-0000
**Dimensions**

![Diagram with dimensions and labels]

**Figure 1: Setpot and Dimensional Mounting Configurations**

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**Installation**

**For Units with Remote Setpot**

1. Drill four 0.156" diameter mounting holes in the desired mounting location for the Series 340 limit control. See Figure 1.
2. Mount the unit with 4-40 screws.
3. Drill a 2.000" diameter hole at desired remote setpot assembly location. See Figure 1.
4. Using the dial scale as a location template, center and mark all four mounting holes on the dial scale with a center punch.
5. For a bolted dial scale assembly, drill four 0.125" diameter clearance holes. If you are using a screw assembly, use a tap drill. Tap drill sizes used are:

<table>
<thead>
<tr>
<th>Tap Drill Size</th>
<th>Screw/thread Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>#44-0.086 dia.</td>
<td>#4-36</td>
</tr>
<tr>
<td>#43-0.089 dia.</td>
<td>#4-40</td>
</tr>
<tr>
<td>#42-0.093 dia.</td>
<td>#4-48</td>
</tr>
</tbody>
</table>

6. Connect the sensor, load and remote setpot assembly per Electrical Connection Diagram. See Figures 2 through 5.

**For Units with Integral Set Point**

1. Drill four 0.156" diameter holes in the desired panel location. See Figure 1.
2. Mount the unit with 4-40 screws.
3. Connect the thermocouple, load and line wires per Electrical Connection Diagram. See Figures 2 through 5.

**Remote Setpot Alignment to Mechanical Zero**

1. Turn the dial scale knob completely counterclockwise (to mechanical zero).
2. If the "Indicator" line on the setpot knob skirt, and "Mechanical Zero" (represented by a small line beyond the low end of the scale) are not aligned, loosen both set screws on the setpot knob, and rotate the knob until both lines meet.
3. Tighten both set screws.
Figure 2 - 120VAC Power Wiring

Figure 3 - 240VAC Power Wiring

WARNING
To avoid potential 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 and to any locally applicable codes also.

Figure 4 - Sensor, Remote Setpot and Reset Switch Wiring

Channel 1 - Hi Limit, Integral Pot

CAUTION
Extension wires for thermocouples must be of the same alloy as the thermocouple to reduce errors.
Wiring Con’t.

Figure 5 - Output Wiring

<table>
<thead>
<tr>
<th>Limit Selection</th>
<th>CH-1</th>
<th>CH-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Limit</td>
<td>Low Limit</td>
<td>High Limit</td>
</tr>
<tr>
<td>W27, W28 Installed</td>
<td>W29, W30 Installed</td>
<td>W86, W87 Installed</td>
</tr>
<tr>
<td>W29, W30 Removed</td>
<td>W27, W28 Removed</td>
<td>W88, W89 Removed</td>
</tr>
<tr>
<td>R113 = Not Used</td>
<td>R113 = 20KΩ, 5%, 1/4W</td>
<td>R114 = Not Used</td>
</tr>
<tr>
<td>R6 = Not Used</td>
<td>R6 = 22MΩ, 5%, 1/4W</td>
<td>R61 = Not Used</td>
</tr>
</tbody>
</table>

Table 1 - Limit Condition Component Selection

Table 1 shows high/low limit jumper and resistor jumper configurations for the Series 340. Use the correct value resistors for R113 and R6, or R114 and R61. Changing the jumpers from the factory configuration will change the unit’s model number; see Page 3.

Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Probable Cause</th>
<th>Action</th>
</tr>
</thead>
</table>
| Control will not operate | A. C. input | Check fuses & circuit breakers  
Check power at control terminals  
Check power to load |
| Relay will not energize | Sensor wiring | Check sensor location, connection and sensor element  
If sensor wiring is not OK  
Incorrect placement of High/Low limit jumpers | |
| Controller is out of calibration | Sensor is not measuring actual temperature  
Unit is out of calibration | Check sensor element location  
for proper temperature response  
Calibrate the unit per field calibration procedure see Page 7 |
| Break protection not functioning properly | Incorrect placement of sensor break protection resistors | Place resistors per Table 1 above |
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.

**Equipment Required**

A. Precision millivolt source.
B. Appropriate thermocouple type reference compensator with reference junction at 0°C or 32°F.
C. Watlow hand-held digital indicator Series 64 and calibration leads may be used in place of millivolt source and reference compensator for Type J or K t/c input.
   For Type J: Series 64 #6406-00C1-0601 and Calibration Leads #A001-0050.
   For Type K: Series 64 #6406-00C1-0602 and Calibration Leads #A001-0064.

**Procedure**

Use Table 2 below to determine calibration values for your input type. Calibrate Channel 1, then repeat the procedure for Channel 2.

1. Connect the millivolt source to the reference compensator and the compensator leads to TC-1 for CH-1 (TC-2 for CH-2). For the Series 64, connect the sensor output to the t/c input on the control. Place a jumper wire across RESET-1 for CH-1 (RESET-2 for CH-2) terminals. Connect line voltage to the control and allow it to stabilize for a few minutes.

2. Set the millivolt source to Low mV. Turn the appropriate setpot to Low °F or °C Temp. Adjust ZERO ADJUST-1 for CH-1 (ZERO ADJUST-2 for CH-2) until LED 43 (LED 106 for CH-2) just energizes for a high limit (just de-energizes for a low limit).

3. Set the millivolt source to High mV. Turn the appropriate setpot to High °F or °C Temp. Adjust SP HI-1 for CH-1 (SP HI-2 for CH-2) until LED 43 (LED 106 for CH-2) just energizes for a high limit (just de-energizes for a low limit).

4. Repeat Steps 2 and 3 until proper relay operation is achieved at both points with no further calibration.

5. Set the mV source to Mid mV. Turn the appropriate setpot to Mid °F or °C Temp. The appropriate relay should switch ± one minor scale division.

6. Set the mV source to Mid mV. Turn the setpot to 25°F above (for a high limit, below for a low limit) the mid-point on the temperature scale. Remove the jumper wire across the RESET terminals. Move the setpot through the mid-point setting on the dial scale. LED 43 for CH-1 (LED 106 for CH-2) should energize at this time. Move the setpot back through the mid-point; the LED should not change state. Temporarily place a jumper wire across the RESET terminals and the LED should de-energize.

7. Open the channel’s t/c input; the relay should de-energize and the LEDs should turn ON. When this occurs, the channel is correctly calibrated.

<table>
<thead>
<tr>
<th>Code</th>
<th>Range</th>
<th>Low/High</th>
<th>Type</th>
<th>Low mV</th>
<th>Low Temp</th>
<th>MId mV</th>
<th>MId Temp</th>
<th>High mV</th>
<th>High Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>0 to 250°F</td>
<td>J</td>
<td>-0.20mV</td>
<td>25°F</td>
<td>2.67mV</td>
<td>125°F</td>
<td>5.66mV</td>
<td>225°F</td>
<td></td>
</tr>
<tr>
<td>601</td>
<td>0 to 500°F</td>
<td>J</td>
<td>0.51mV</td>
<td>50°F</td>
<td>6.42mV</td>
<td>25°F</td>
<td>12.57mV</td>
<td>450°F</td>
<td></td>
</tr>
<tr>
<td>602</td>
<td>0 to 1000°F</td>
<td>J</td>
<td>1.94mV</td>
<td>100°F</td>
<td>14.11mV</td>
<td>50°F</td>
<td>26.40mV</td>
<td>900°F</td>
<td></td>
</tr>
<tr>
<td>603</td>
<td>0 to 2000°F</td>
<td>K</td>
<td>3.82mV</td>
<td>200°F</td>
<td>22.29mV</td>
<td>100°F</td>
<td>40.58mV</td>
<td>1800°F</td>
<td></td>
</tr>
<tr>
<td>604</td>
<td>200 to 500°F</td>
<td>J</td>
<td>5.51mV</td>
<td>220°F</td>
<td>11.02mV</td>
<td>400°F</td>
<td>16.57mV</td>
<td>580°F</td>
<td></td>
</tr>
<tr>
<td>605</td>
<td>200 to 600°F</td>
<td>T</td>
<td>-3.41mV</td>
<td>-150°F</td>
<td>6.65mV</td>
<td>300°F</td>
<td>14.15mV</td>
<td>550°F</td>
<td></td>
</tr>
<tr>
<td>606</td>
<td>-25 to 425°F</td>
<td>T</td>
<td>-1.67mV</td>
<td>-50°F</td>
<td>3.98mV</td>
<td>200°F</td>
<td>9.52mV</td>
<td>400°F</td>
<td></td>
</tr>
<tr>
<td>607</td>
<td>-30 to 70°C</td>
<td>T</td>
<td>-0.78mV</td>
<td>-20°C</td>
<td>0.79mV</td>
<td>20°C</td>
<td>2.47mV</td>
<td>60°C</td>
<td></td>
</tr>
<tr>
<td>608</td>
<td>0 to 2500°F</td>
<td>K</td>
<td>1.52mV</td>
<td>100°F</td>
<td>28.15mV</td>
<td>1250°F</td>
<td>52.94mV</td>
<td>2400°F</td>
<td></td>
</tr>
<tr>
<td>609</td>
<td>-40 to +10°C</td>
<td>J</td>
<td>-1.72mV</td>
<td>-35°C</td>
<td>-0.75mV</td>
<td>-15°C</td>
<td>0.25mV</td>
<td>5°C</td>
<td></td>
</tr>
<tr>
<td>611</td>
<td>0 to 850°C</td>
<td>J</td>
<td>5.27mV</td>
<td>100°C</td>
<td>27.39mV</td>
<td>500°C</td>
<td>42.28mV</td>
<td>750°C</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 - Calibration Values Per Input Code

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Warranty

The Watlow Series 340 is warranted to be free of defects in material and workmanship for 18 months after delivery to the first purchaser for use, providing that the unit has not been misapplied.

Watlow cannot guarantee against failure, since Watlow has no control over use, and sometimes misuse. Watlow's obligations hereunder, at Watlow's option, are limited to replacement, repair, or refund of purchase price, on any 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.

Returning Merchandise

The following procedure applies for any products returned 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
   - P.O. number
   - Name and phone number of person returning the material
   - Symptoms and/or special instructions
   We will not accept a return without an RMA number. The number must appear on the outside of the carton(s) and on all paperwork. Carton(s) 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 examine it to determine the cause for your action.

4. In cases of manufacturing defect, we will enter a repair order, replacement order or issue credit for material.

5. If the unit is unrepairable, we will return it to you with a letter of explanation. Repair costs will not exceed 50 percent of the original cost.

Shipping Claims

When you receive your Watlow control, examine the package for any signs of external damage it may have sustained enroute. If there is apparent damage either outside the box or to its contents, make a claim with the shipper immediately. Save the original shipping carton and the packing material.

Watlow Controls

Watlow Controls is a division of Watlow Electric Manufacturing Company of St. Louis, Missouri. Watlow is an established manufacturer of industrial electric heating products, in business since 1922. Watlow boasts the ability to begin with a full set of specifications and to complete an industrial product that is manufactured totally in-house, in the U.S.A. Products designed and manufactured by Watlow are electric heating elements, sensors, electronic temperature controls and power switching devices.

The Winona operation has been designing solid state electronic control devices since 1962, and has earned the reputation as an excellent supplier to original equipment manufacturers. These OEMs depend upon Watlow Controls to provide compatibly engineered controls which they can incorporate into their products with confidence.

Watlow Controls resides in a 100,000 square foot Marketing, Engineering and Manufacturing facility in Winona, Minnesota.

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