

3901

Chromalox[®]

Overtemperature Controller



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User's Manual
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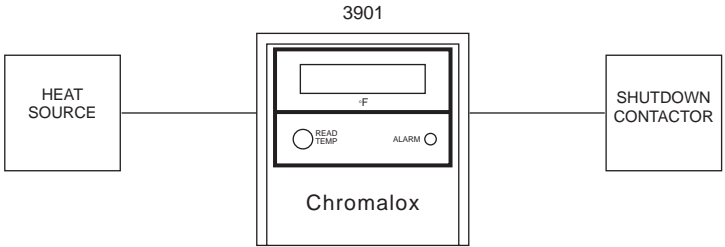
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Section 1

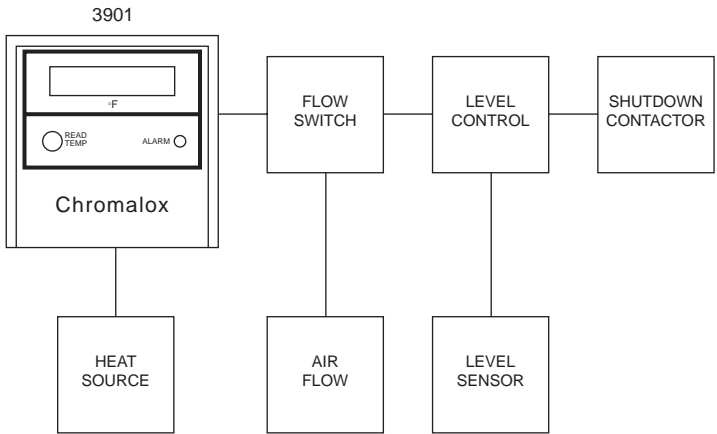
Introduction to the 3901 Controller

The Chromalox 3901 Overtemperature Controller gives you reliable and economical digital indicating, overtemperature control in a compact 1/4 DIN package. Figure 1.1 illustrates a typical overtemperature application.

Figure 1.1
Overtemperature Control Application



OVERTEMP FOR PROCESSOR HEATER SHEATH PROTECTOR



OVERTEMP APPLIED WITH OTHER CUTOUT DEVICES

Before You Install

Before proceeding with installation and operation of your controller, it is important that you identify the model you have purchased. This will determine how you install and wire the controller, and how you may apply it. Check the serial number tag on the inside front door flap of the controller to confirm your model number.

Figure 1.1
Model Identification Table

Model	Overtemperature Controller				
3901	Digital Indicating, UL Listed, FM Approved, Terminals for Remote Reset; 1/4 DIN Panel Cutout, 2.4 Inch Depth Behind Panel				
	Code	Control Output			
	1	Relay, up to 230 Vac, 20 amp resistive load, SPST Latching, Normally-Energized, Normally-Open Contact			
		Code	Terminations		
		1	Barrier Strip with Screw Terminals		
			Code	Instrument Power	
			1	120 Vac, +10%, -15%, 50/60 Hz	
			2	230 Vac, +10%, -15%, 50/60 Hz	
			Code	Input Type/Indication Range	
			04	Type J Thermocouple, 0-999°F	
			08	Type J Thermocouple, 0-500°C	
			12	Type K Thermocouple, 0-1999°F	
			18	Type K Thermocouple, 0-1100°C	
3901-	1	1	1	04	Typical Model Number

Section 2 Installation

Inspection & Unpacking On receipt of your 3901 controller, immediately make note of any visible damage to the shipment packaging and record this damage on the shipping documents. Unpack the controller and carefully inspect it for obvious damage due to shipment. If any damage has occurred, YOU must file a claim with the transporter, as they will not accept a claim from the shipper.

Storage If the controller will not be immediately installed and placed into operation, it should be stored in a cool, dry environment in its original protective packaging until time for installation and operation. Temperature extremes and excessive moisture can damage the instrument.

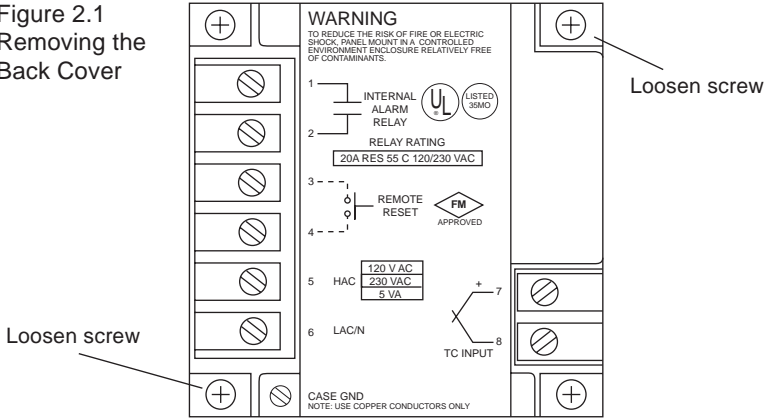
Installation Steps Installation of the 3901 controller requires 3 steps:
Step 1 - Accessing Internal Adjustments
Step 2 - Mounting
Step 3 - Wiring

Step 1
Accessing Internal Adjustments The back cover of the 3901 can be easily removed to access the following internal adjustment:
• Set Point Limit Potentiometer (page 11)

The page number referenced above describes this internal adjustment. **Although it is not necessary, it is easier to make this adjustment prior to mounting and wiring the controller.** If you want to establish a Set Point Limit for your controller, read the page referenced above **before** mounting and wiring the 3901.

To remove the back cover, loosen the two back cover screws shown in Figure 2.1 and lift the cover off of the controller chassis.

Figure 2.1
Removing the
Back Cover



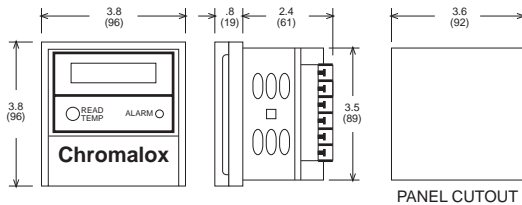
After completing the internal adjustment(s), replace the cover and re-secure the two screws.

Step 2 Mounting

The controller should be mounted in a location free from excessive dust, oil accumulations and moisture. It may be mounted in any position at ambient temperatures of 30°F to 130°F (0°C to 55°C).

Figure 2.2 gives the mounting dimensions for the controller.

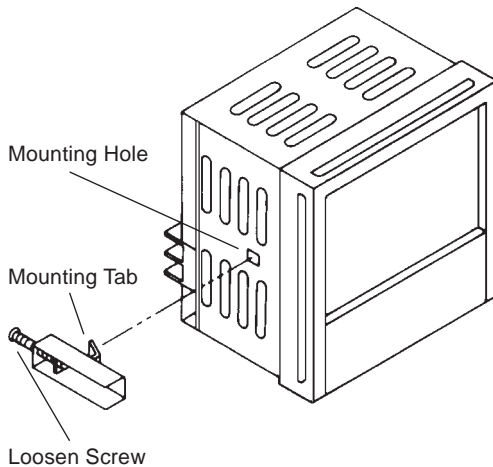
Figure 2.2
Mounting
Dimensions



Measurements are shown in inches.
Millimeters are shown in parenthesis.

1. Cut a square mounting hole (3.6" x 3.6") in the panel or mounting surface and place the controller through the cutout.
2. Two mounting brackets are provided to secure the controller in the cutout. Loosen the screws on the two brackets. Place the mounting tabs into the mounting holes located on the sides of the controller.
3. From the rear of the controller, tighten the screws until the brackets are tight against the panel, securing the controller in the panel cutout.
4. For other mounting configurations, the mounting bracket tabs may be placed in the controller casing vent slots.

Figure 2.3
Mounting
Diagram



Important
Wiring
Information

To insure that the 3901 controller performs optimally, it is imperative that you read this section and become familiar with “Good Wiring Practices” critical to eliminating electrical noise. Failure to follow good wiring practices can result in poor temperature measurement and ineffective high limit control.

Snubbers

Snubbers should be used to protect the controller from electrical noise generated by inductive loads such as motors, solenoids, coils and relays operating near the 3901 controller. The recommended snubber is a .1uf capacitor (600 Vdc rating) in series with a 100 ohm resistor and is available from Chromalox (PCN 314448). The wiring diagram in this manual illustrates the snubber connection.

Good
Wiring
Practice

Read and follow these Good Wiring Practices when connecting this and any other controller:

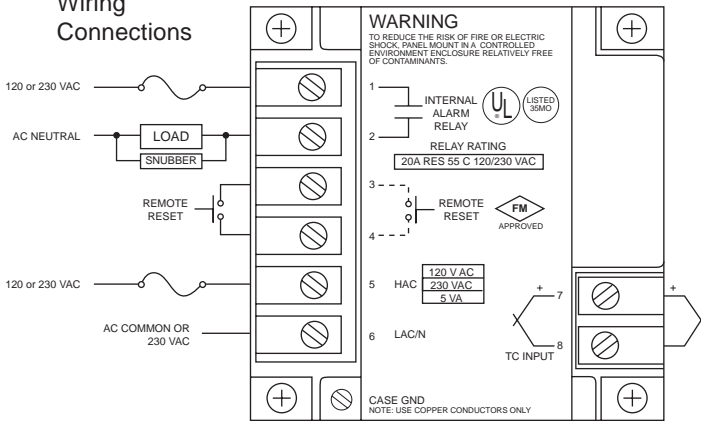
1. Do not run sensor leadwires and power leads together in the same conduit or wire tray.
2. When planning the system wiring, be sure to consider the importance of separating wiring into functionally similar bundles—i.e. power leads, sensor leads, output signal lines, etc. If the power leads and sensor leads must cross, they should cross at a 90° angle to each other (perpendicular).
3. Locate all sources of noise in your system—motors, contacts, solenoids, etc. Then design your system such that wiring is separated as far as possible from these noise sources.
4. Shielded, twisted wire should be used for the control circuit signals if they are run in parallel with other control circuit signal wires, or if they are run distances greater than 2-3 feet.
5. To protect against noise, use shielded cables for all low power signal lines.
6. Additional information on good wiring practices is available from IEEE, 345 East 47th St., NY, NY 10017. Request IEEE Standard No. 5128-1982.

Step 3 Wiring

Make all electrical wiring connections on the back of the controller **before** power is applied to the unit.

All wiring must comply with local codes, regulations and ordinances. This instrument is intended for panel mounting and the terminals must be enclosed with a panel. Use National Electric Code (NEC) Class 1 wiring for all terminals except the sensor terminals.

Figure 2.4
Wiring
Connections



Instrument Power Connections

Check the serial number tag located inside the door flap to confirm the model number of your controller. The model number identifies the instrument power of your controller.

Instrument Power	3901 - **1**	120 Vac
	3901 - **2**	230 Vac

Make the instrument power connections for your controller type (120 Vac or 230 Vac) as shown in Figure 2.4.

Sensor Input Connections

The thermocouple input is connected at terminals 7 (+) and 8 (-) as indicated by the wiring decal on the back of the controller. The table below shows typical color coding for the thermocouples used with this controller:

<u>T/C Type</u>	<u>Material</u>	<u>Plus(+)</u>	<u>Minus (-)</u>
J	Iron/Constantan	White	Red
K	Chromel/Alumel	Yellow	Red

If shielded thermocouple wire is used, the shield must be grounded at one end only, preferably at the case ground (CASE GND) of the controller.

If thermocouple extension wire is required, it must be the same type of extension wire as the thermocouple (for example, if the thermocouple is Type J, the extension wire must be Type J).

Alarm Output Connection

The alarm relay output connections are made at terminals 1 and 2. Make the wiring connections as shown in Figure 2.4, using the recommended snubber circuit as discussed on page 6.

Remote Alarm Reset Connection

Terminals 3 and 4 are provided for connection of a remote, normally-open reset switch. Make the reset switch connection as shown in Figure 2.4.

Section 3 Operation

Before applying power to the controller and proceeding with Operation, verify that all wiring is correct.

In this section you will learn how to make the following selections and adjustments:

Set Point

Alarm Reset

Remote Alarm Reset

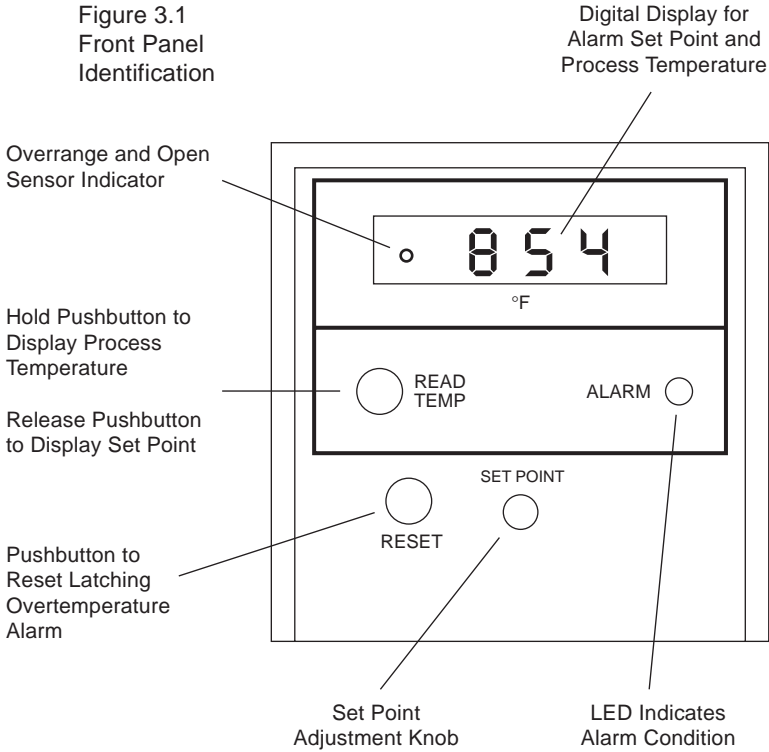
Set Point Limit

Initial Power-Up

When power is applied to the 3901, it will begin operating using the factory-set alarm set point shown in the digital display. The process temperature measured by the thermocouple can be selected for display by pushing the “READ TEMP” pushbutton. The ALARM LED will be illuminated only if the process temperature is at or above the set point temperature, or if the thermocouple is open.

The 3901’s front panel displays and indications, and the RESET pushbutton and Set Point adjustment knob located behind the front door flap are shown in Figure 3.1. Familiarize yourself with the front panel before proceeding in this section.

Figure 3.1
Front Panel
Identification



Alarm Set Point

Adjust Set Point—To adjust the alarm set point, locate the SET POINT adjustment behind the front door flap. Insert a screwdriver in the hole in the knob, and turn the SET POINT knob until the desired set point appears in the digital display.

Alarm Reset

To reset the latching alarm relay, press the RESET switch located behind the front door flap. If you attempt to reset the alarm before the process temperature has reached a normal state (below set point), the RESET pushbutton will be ineffective.

Remote Alarm Reset The Remote Alarm Reset works exactly like the Alarm Reset function described above, except that the relay is reset by pushing a remote momentary switch that has been connected to terminals 3 and 4 (see page 7 for wiring).

Set Point Limit **Adjust Set Point Limit**—The 3901 has a set point limit feature that allows you to preset an upper limit for the set point adjustment. The set point limit can be used to prevent an operator from selecting a set point which could damage the process, product or equipment.

The set point Limit is set at 100% of sensor span when shipped from the factory (i.e. 1000°F for Type J thermocouples and 2000°F for Type K thermocouples). An internal potentiometer allows you to adjust the set point limit from a range of 100% to 20% of sensor span. To adjust the set point limit, remove the back cover of the 3901 as described on page 4. Locate the set point limit potentiometer shown in Figure 3.2.

USE EXTREME CAUTION: The set point limit can be set with the instrument power to the controller either off or on. If the power is left on, the limit must be adjusted only by a qualified electronic technician at a test bench, using an insulated screwdriver.



CAUTION:
LINE VOLTAGE WILL BE EXPOSED!

Section 4 Calibration



The 3901 controller has been calibrated and tested at the factory prior to shipment. Calibration on receipt is not necessary.

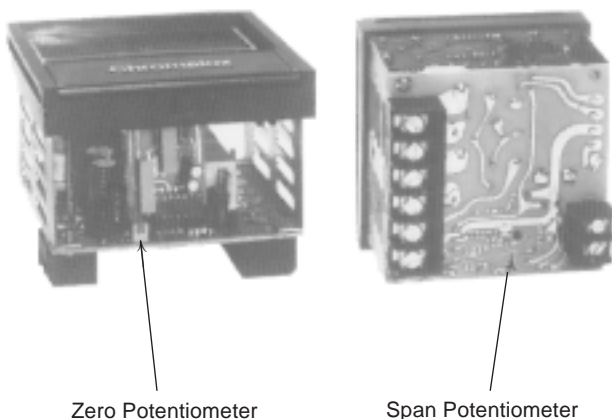
Equipment Required

A precision thermocouple simulator and a small instrument screwdriver are necessary to calibrate the controller.

Locating Calibration Adjustments

Remove the back cover from the controller as described on page 4. Figure 4.1 identifies the zero and span calibration potentiometers.

Figure 4.1
Zero and Span
Calibration
Potentiometers



Calibration Procedure

1. Connect the sensor simulator to terminals 7 and 8, making sure to connect the (+) to 7 and (-) to 8.
2. Set the sensor simulator to a minimum value (200°F for J T/C, 350°F for K T/C). While pressing the "READ TEMP" pushbutton, adjust the zero potentiometer until the digital display equals the sensor input value (200°F or 350°F).

(continued on next page)

**Calibration
Procedure
(continued)**

3. Set the sensor simulator to a maximum (900°F for J T/C, 1600°F for K T/C). While pressing the “READ TEMP” pushbutton, adjust the span potentiometer until the digital display equals the sensor input value (900°F or 1600°F).
4. Repeat steps 2 and 3 as many times as necessary until both displays equal their respective sensor input values.
5. Calibration complete.

Section 5 Specifications

Alarm Output

Alarm Relay	Normally-open, normally-energized, SPST, latching relay (contacts open on alarm & when no power is applied to controller - failsafe)
	Rating at 120 or 240 Vac (resistive load): 20 amps, 150,000 operations 15 amps, 200,000 operations 5 amps, 800,000 operations Mechanical life, 10 million operations
Repeatability	+/- 1°F or 1°C
Reset Differential	5°F or 3°C, nominal

Input Specifications

Type J Thermocouple	0 to 999°F, 0 to 500°C
Type K Thermocouple	0 to 1999°F, 0 to 1100°C
Input Loop Resistance	Up to 150 ohms
Cold Junction Compensation	Automatic, typically less than 0.1°F per 1°F over ambient 50 to 120°F

Indications

Open Sensor Indications	Red LED lamp for J thermocouple input, “1” illuminates for K thermocouple input Upscale burnout, alarm indication, contacts open
Accuracy of Indication	+/- 0.5% of span over mid-80% of scale
Resolution	1°F or 1°C
Repeatability	1°F or 1°C
Alarm Output	Red “ALARM” LED

General

Instrument Power	120 or 230 Vac, +10%, -15%, 50/60 Hz, 10 VA nominal power consumption
Operating Environment	30 to 130°F with relative humidity less than 95% non-condensing
Dimensions	Requires 3.6" x 3.6" (92 mm x 92mm) panel cutout Depth behind panel of 2.4" (61 mm) Projection at front of panel 0.8" (20 mm)
Mounting	Two screw-in mounting brackets to secure controller in panel
Influence of Line Voltage Variation	Maximum change of +/- 1°F for +/- 10% nominal line voltage change

Noise Rejection

Common Mode	Less than 2°F with 230 Vac, 60 Hz applied from sensor input to instrument case
Series Mode	Less than 2°F with 100 mV, peak to peak series mode noise

Section 6 Warranty and Return

The warranty complies with the Federal Law applicable to products manufactured after December 31, 1976. This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

Warranty	Chromalox Instruments and Controls' products are warranted against defects in workmanship and materials. No other express warranty, written or oral, applies with the exception of a written statement from an officer of Chromalox Instruments and Controls, Wiegand Industrial Division, Emerson Electric Co.
Warranty Period	This warranty extends for twelve months from the date of shipment from the factory or an authorized distributor.
Limitations	Products must be installed and maintained in accordance with Chromalox instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from corrosion, misapplication, improper specification or other operating conditions beyond our control. Claims against carriers for damage in transit must be filed by the buyer.
Returns	<p>Items returned to Chromalox Instruments and Controls must be accompanied by a Return Authorization Number. This number may be obtained from Chromalox Instruments and Controls, Customer Service Department, Telephone Number (615) 793-3900. It should appear on the exterior of the shipping carton and on the shipping documents. Defective items will be repaired or replaced at our option, at no charge.</p> <p>Return the defective part or product, freight prepaid, to:</p> <p style="padding-left: 40px;">Chromalox Instruments and Controls 1382 Heil-Quaker Blvd. LaVergne, TN 37086-3536</p>

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