

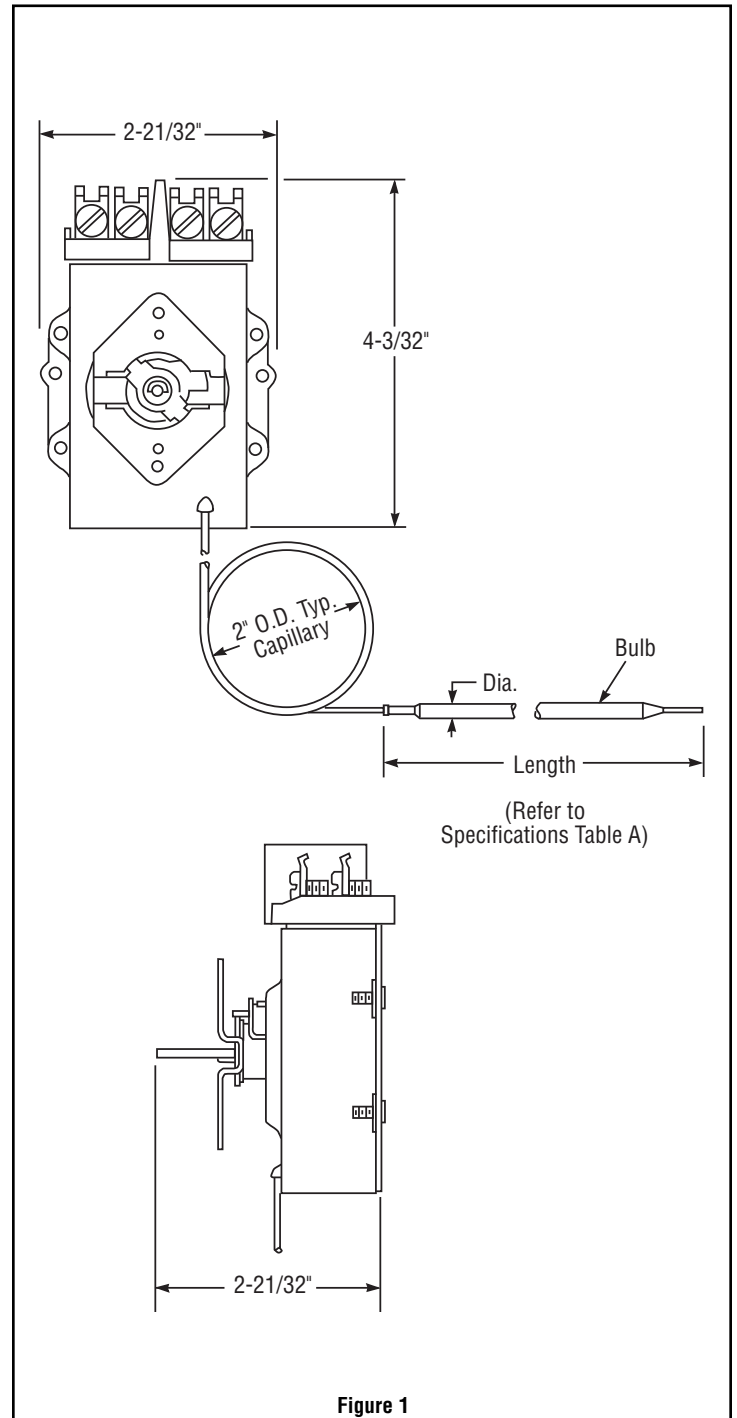
Chromalox®

Installation, Operation and RENEWAL PARTS IDENTIFICATION

SERVICE REFERENCE

DIVISION 4	SECTION AR
SALES REFERENCE (Supersedes PK407-3)	PK407-4
161-562793-001	
DATE	MARCH, 2004

Type AR Industrial Thermostat (Three Phase)



Specifications — Table A

Model*	Temperature Range (°F)	Sensing Bulb with 7' Standard Capillary			Max. A.C. Rating (Amps)
		Style	Dia. (In.)	Approx. Length (In.)	
AR-2153	60-250	5	3/8	4 1/4	30 Amps @ 277 Volts
AR-2193	60-250	9	3/16	10 3/4	
AR-5153	200-550	5	3/8	3 1/4	
AR-5193	200-550	9	3/16	9	

*Models equipped with Pilot Light are designated by the suffix "P" on the Model Number. Models equipped with Knob Cover are designated by the suffix (KC) on the Model Number. Models equipped with both a Pilot Light and a Knob Cover are designated by the suffix "PKC" on the Model Number.

Figure 1

GENERAL

NOTICE: Type AR Thermostats are designed for temperature control service only. Because they do not fail safe, they should not be used for temperature limiting duty.

⚠ WARNING

The system designer is responsible for the safety of this equipment and should install adequate back-up controls and safety devices with their electric heating equipment. Where the consequences of failure could result in personal injury or property damage, back-up controls are essential.

Principle of Operation — Control action of these thermostats is provided through the principle of liquid volume change. With a variation in temperature, the liquid in the sensing bulb expands or contracts, causing a bellows to actuate the switching mechanism.

Housing — The control housing and cover assembly is of heavy-gauge electrical grade plastic.

⚠ WARNING

FIRE/ELECTRIC SHOCK HAZARD. Use AC supply only. Thermostat is not DC rated.

Control Range — The following temperature ranges are available:
Fahrenheit
60° to 250° 200° to 550°

Process Temperature Differential — is variation in controlled process temperature between maximum, when thermostat turns OFF and minimum, when thermostat turns ON. This spread in temperature may be minimized by —

1. Making sure control is mounted to vertical surface (see Step 1, MOUNTING section).
2. Avoiding excess heating capacity (oversized heaters).
3. Locating control sensing bulb in optimum position between heat source and work.

In general, it is difficult to predict the actual operating differential of a given process. Temperature differential may be as low as 4°F for low range controls to as high as 17°F for higher range controls since the differential is a percentage function of the dial range.

Packing Glands — If a sealed or leak-proof connection is required at the point where the capillary enters the oven, tank, pipe or similar equipment, an appropriate packing gland is available as an optional part. (Model CCF-25A, CCF-25D or CCF-25E)

⚠ WARNING

FIRE/EXPLOSION HAZARD. This thermostat is not intended for use in hazardous atmospheres where flammable vapors, gases, liquids or other combustible atmospheres are present as defined in the National Electrical Code. Failure to comply can result in personal injury or property damage.

MOUNTING

Note: Do not mount thermostat where it will be subject to vibration, shock, grease, dust, lint or corrosive vapors. Do not mount adjacent to a large magnetic contactor, as vibration and shock will cause thermostat to interact erratically — resulting in chattering of the contactor.

The air temperature in and around the thermostat enclosure should be kept as near to normal room temperature as possible... never above 150°F.

1. Thermostat must be mounted in a vertical position only.
2. Use sheet metal or wood screws through the four $\frac{7}{32}$ " diameter mounting holes in baseplate to mount control (see Figure 2).
3. For controlling platen or die temperatures, insert entire sensing bulb into drilled holes selected for snug slip fit.

The longer, more sensitive Style 9 bulbs should be used for controlling air temperatures or pipe line heating.

4. NOTICE:

A. Bending or deforming sensing bulb will alter control calibration — requiring recalibration after installation. See CALIBRATION section, page 3. If necessary, Style 9 bulbs can be coiled to 1" I.D. (see Figure 3).

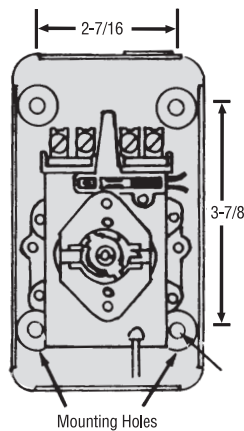


Figure 2

- B.** Do not kink capillary tube. The resulting constrictions in fluid flow can destroy control function or broaden temperature differential. Minimum capillary tube bending diameter is $\frac{1}{2}$ " I.D. (see Figure 4).
- C.** Any deformations of bulb or capillary that result in leakage of fluid from control renders control inoperative.

Figure 3
(Sensing Bulb)

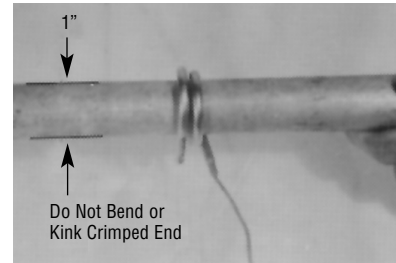


Figure 4
(Capillary Tube)



- D.** Avoid passing control capillary tube through zones whose temperature is in excess of controlled process temperature. Erratic control or destruction of control function may result.

WIRING

⚠ WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power to heater before installing or servicing thermostat. Failure to do so could result in personal injury or property damage. Thermostat must be installed by a qualified person in accordance with the National Electrical Code, NFPA 70.

1. Electric wiring to heater must be installed in accordance with local and National Electrical Codes.
2. Entrance for wiring is provided by two 1/2" conduit holes in end of base plate.
3. If control is a "KC" model (Knob Cover), remove knob cover as in Figure 5.
4. Set thermostat knob to OFF position and then remove knob by lifting knob from shaft. (See Figure 6)
5. Loosen two screws from end of base plate and remove thermostat cover (see Figure 7).

CAUTION: Use copper conductors only.

6. Connect wires according to wiring diagrams (Figures 8 thru 12). **Note:** Electrical connections should be made with generous loops of wire — approximately 6" per lead.
7. Replace cover, tighten screws, replace dial knob and dial knob cover.
8. **Note:** If load amperage or voltage rating exceeds switch rating, a contactor must be used. Contactor and wiring to be supplied by customer.

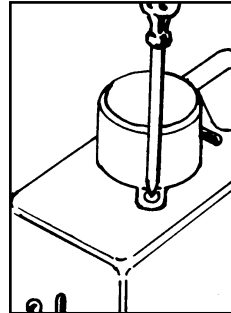


Figure 5

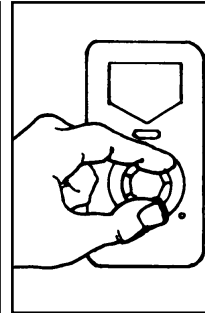


Figure 6

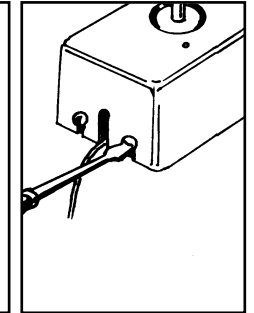


Figure 7

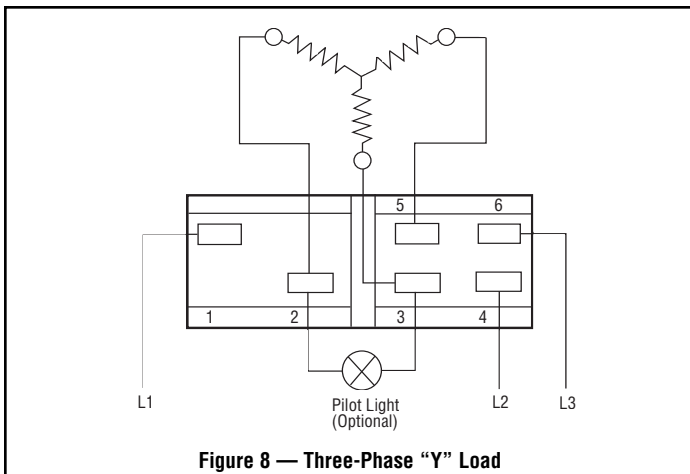


Figure 8 — Three-Phase "Y" Load

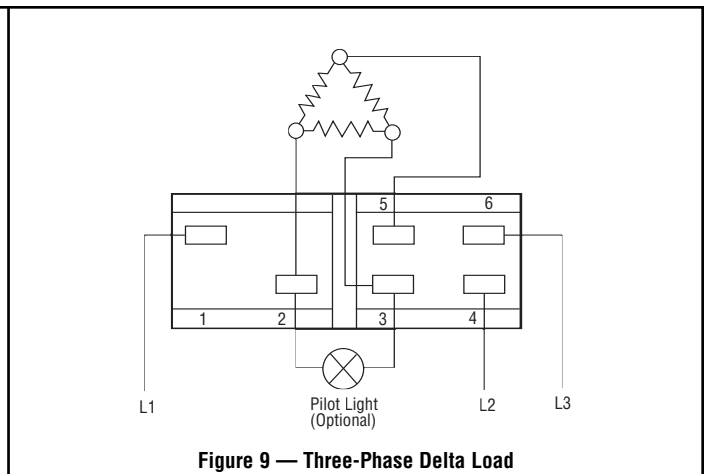


Figure 9 — Three-Phase Delta Load

Note: One line (terminals 5-6) is controlled by the dial and is on continually whenever the dial is moved from the off position. The other two lines are thermostatically controlled and cycle with the rise or fall in temperature.

CALIBRATION

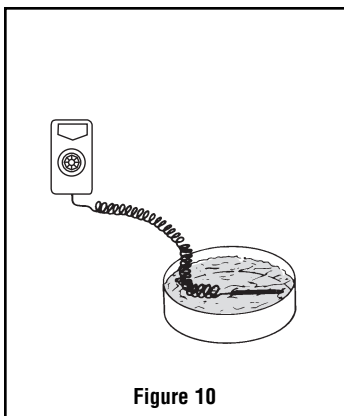


Figure 10

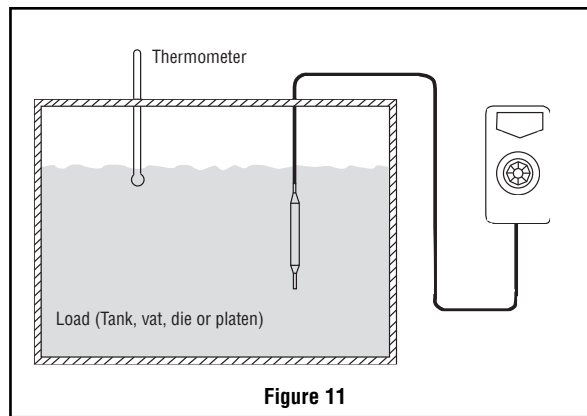


Figure 11

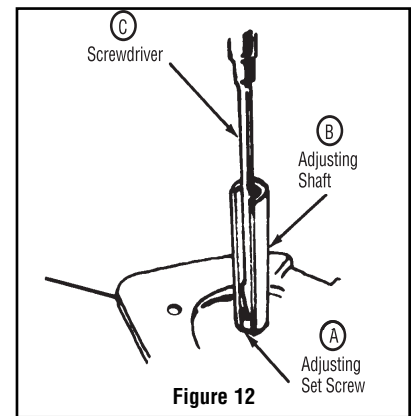


Figure 12

⚠ WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before attempting to calibrate thermostat. Failure to comply could result in personal injury.

These controls are factory calibrated to the range indicated on the control adjustment knob.

If calibration is required, either one of two methods may be followed.

1. If accurate measurement standards are not available, the thermostat can readily be adjusted to a known temperature standard such as boiling water (212°F) (see Figure 10).
2. With the aid of an accurate thermometer or other temperature measuring device, recalibration may be performed within the process as in Figure 11.

CALIBRATION (cont'd.)

For either method the following general calibration procedures should be followed.

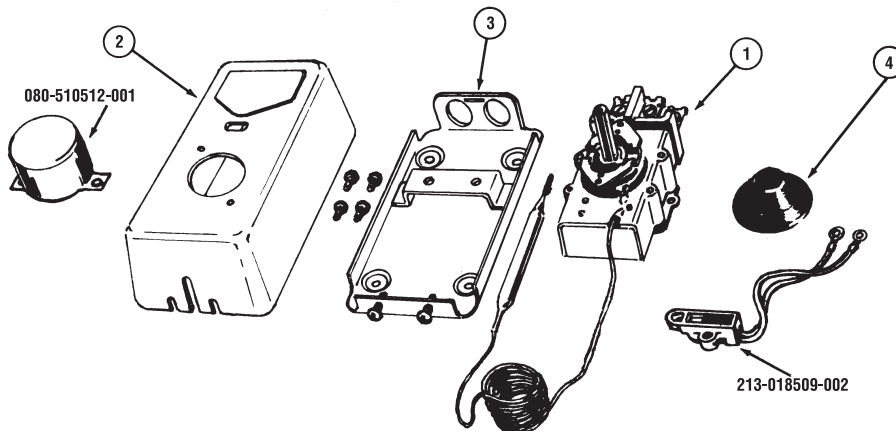
1. Remove knob cover, knob and thermostat housing as per instructions 3, 4 and 5 under WIRING.
2. Replace knob and turn to highest temperature setting.
3. Slowly turn knob and when controls click "off", compare the dial reading against the thermometer reading.
4. **If they do not agree —**
 - A. Set dial knob to thermometer temperature reading and pull off knob.

- B. While holding the adjusting shaft (B) tightly, turn small center adjusting screw (A) with small screwdriver (C) until thermostat "clicks" (see Figure 12).

Note: Always use extreme care not to damage the slot in the center adjusting screw.

- C. Each quarter turn of the screw will change the calibration approximately 30°F:
 - Clockwise to decrease temperature.
 - Counterclockwise to increase temperature.
 - D. Recheck calibration and repeat process if closer calibration is required.

RENEWAL PARTS IDENTIFICATION



Model	① Thermostat Sub-Assembly	④ Dial Knob	② Thermostat Cover	③ Base
AR-2153	300-047848-002	169-019604-001	080-024763-001	015-013819-001
AR-2153P	300-047848-002	169-019604-001	080-026032-007	015-013819-001
AR-2193	300-047848-001	169-019604-001	080-024763-001	015-013819-001
AR-2193P	300-047848-001	169-019604-001	080-026032-007	015-013819-001
AR-5153	300-047848-004	169-019604-002	080-024763-001	015-013819-001
AR-5153P	300-047848-004	169-019604-002	080-026032-007	015-013819-001
AR-5193	300-047848-003	169-019604-002	080-024763-001	015-013819-001
AR-5193P	300-047848-003	169-019604-002	080-026032-007	015-013819-001

Limited Warranty:

Please refer to the Chromalox limited warranty applicable to this product at <http://www.chromalox.com/customer-service/policies/termsforsale.aspx>.

Chromalox®
PRECISION HEAT AND CONTROL

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