

# Chromalox®

## Installation Instructions and RENEWAL PARTS IDENTIFICATION

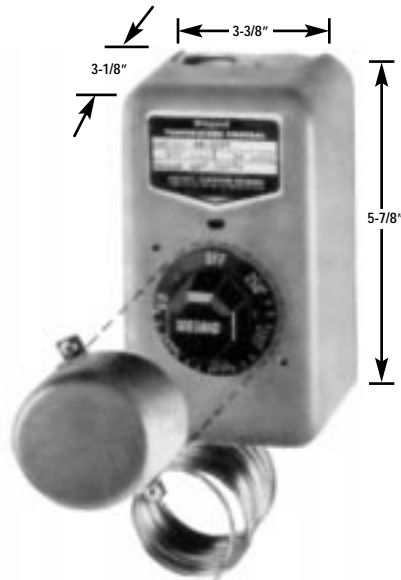
### SERVICE REFERENCE

DIVISION 4	SECTION AR
SALES REFERENCE (Supersedes PK405-16)	PK405-17
161-049287-001	
DATE	DECEMBER, 1998

## AR (Single Phase) Industrial Thermostat

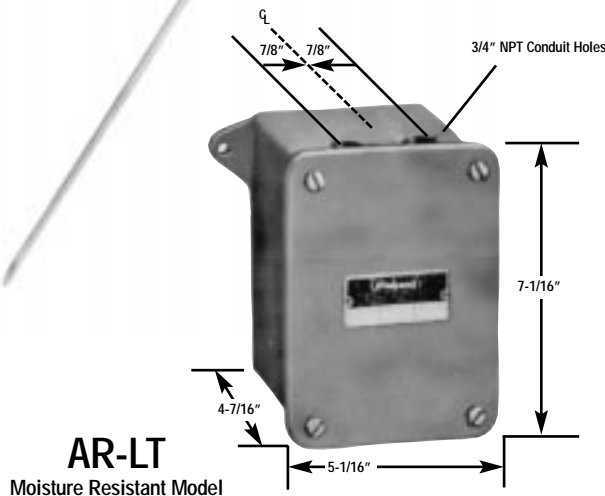
Table A - Specifications

NEMA I Model*	Temperature Range (°F)	Sensing Bulb			Capillary Length (Ft.)	Maximum A.C. Rating (Amps.)		
		Style	Dia. (In.)	Approx. Length (In.)				
AR-115	0-100°F	5	0.375	4-3/8	7	10 Amp. 480 Vac  30 Amp. 120-277 Vac  250VA 120-277 Vac (Pilot Duty)		
AR-115A					2			
AR-115C					12			
AR-214	60-250°F	4	0.250	5-5/32	7			
AR-214D					15			
AR-215		5	0.375	4	7			
AR-215A					2			
AR-219					9	0.188	10-3/4	7
AR-219D								15
AR-514	200-550°F	4	0.250	7-5/16	7			
AR-515					7			
AR-515A		5	0.375	3-5/8	2			
AR-519					7			
AR-519D					15			
AR-715	300-700°F	5	0.375	3-11/16	7			
AR-715D					15			
AR-719					9	0.188	12	7



NEMA-I Model

\*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.  
Models installed in a moisture resistant enclosure are designated by the suffix "LT" on the Model Number.  
Pilot Light nor Knob Cover available on LT models.



AR-LT  
Moisture Resistant Model

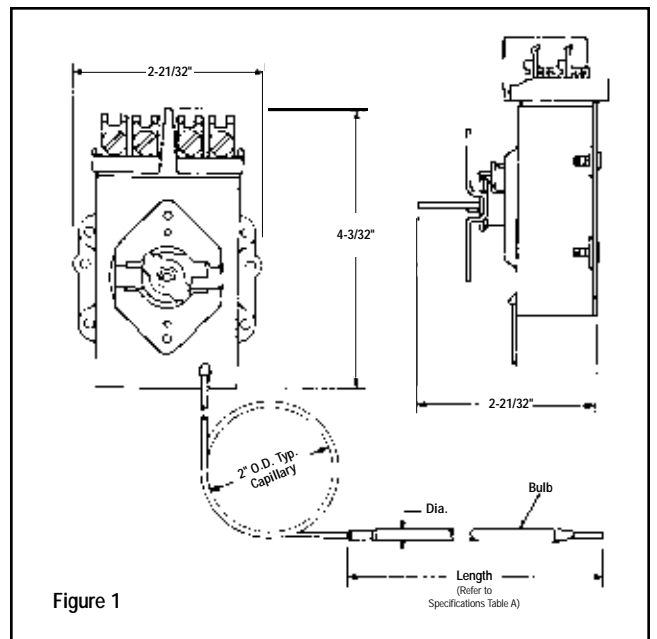


Figure 1

## 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:** Users should install adequate back-up controls and safety devices with their electric heating equipment. Where the consequences of failure may be severe, back-up controls are essential. Although the safety of the installation is the responsibility of the user, Wiegand will be glad to make equipment recommendations.

**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 on NEMA-I models.

Moisture resistant (LT) models have housing and cover assembly made of heavy gauge cast aluminum.

**Power Supply** – **WARNING:** Use on AC only. Thermostat is not DC rated.

**Control Range** – The following temperature ranges are available:

Fahrenheit	
0° to 100°	200° to 550°
60° to 250°	300° to 700°

**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.

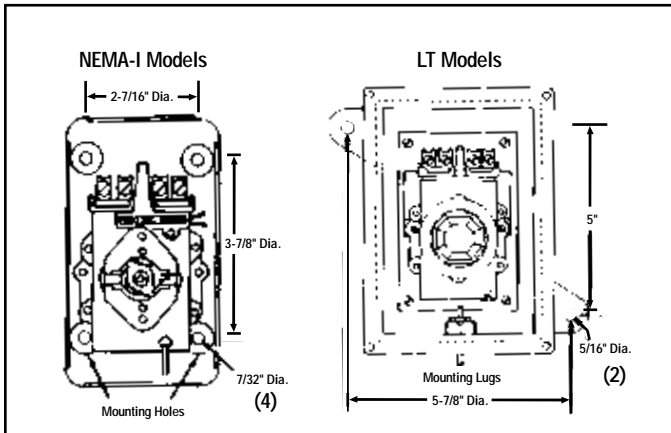
**Packing Glands** – If a sealed or leak-proof connection is required at the point where the capillary enters the oven, tank, pipe or similar equipment, an appropriate packing gland is available as an optional part. (Model Numbers CCF-25A, CCF-25D or CCF-25E).

**WARNING:** Not for use in hazardous environments as described in National Electrical Code. Failure to comply can result in Explosion or Fire.

## MOUNTING

**Note:** Do not mount control 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 control 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 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.

**Note:** If material in contact with bulb or capillary is corrosive, a protective well should be used. Protective wells are available as an optional part. Check factory.

### 4. CAUTION –

- 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).
- 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 1/2" I.D. (see Figure 4).

Figure 3  
(Sensing Bulb)

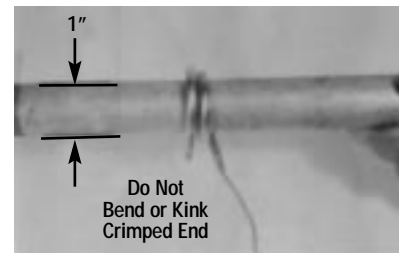


Figure 4  
(Capillary Tube)



- C. Any deformations of bulb or capillary that result in leakage of fluid from control renders control inoperative.
- 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

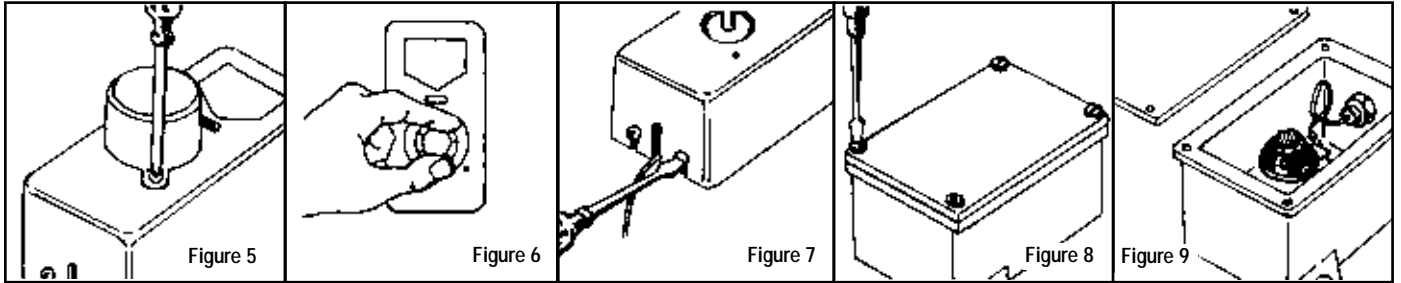
**WARNING:** Hazard of Electrical Shock. Disconnect all power before wiring or servicing this control. Failure to comply can result in Electrical Shock or Electrocution.

1. Electrical wiring must be installed in accordance with National Electrical Codes or local codes. **WARNING:** Use copper conductors only.

### NEMA-I Models –

- A. Entrance for wiring is provided by two 1/2" conduit holes in end of base plate.
- B. If control is a “-KC” model (knob cover), remove knob cover as in Figure 5.
- C. Set thermostat knob to OFF position and then remove knob by lifting knob from shaft (see Figure 6).
- D. Loosen two screws from end of base plate and remove thermostat cover (see Figure 7).

## WIRING



### LT Models –

- A. Entrance for wiring is provided by two 3/4" NPT conduit holes in end of housing. Wiring to control housing should be in moisture-resistant conduit.
  - B. Remove cover by removing four hexhead screwbolts (see Figures 8 and 9).
2. Connect wires according to wiring diagrams (Figure 11 thru

15). **Note:** Electrical connections should be made with generous loops of wire – approximately 6" per lead.

3. Replace cover and tighten screws.
4. Replace dial knob and dial knob cover. (NEMA-I models only).
5. **Note:** If load amperage or voltage rating exceeds switch rating, a contactor must be used (see Figure 14). Contactors are available as an optional part.

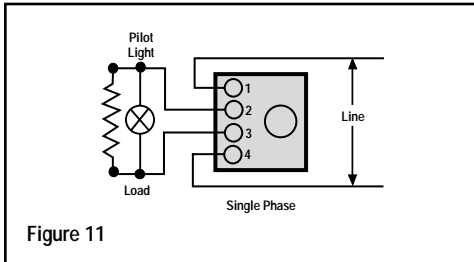


Figure 11

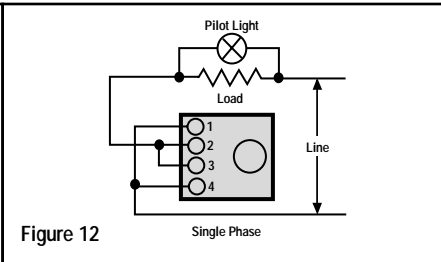


Figure 12

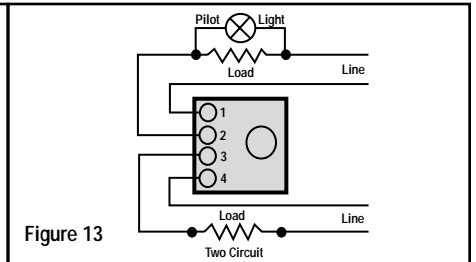


Figure 13

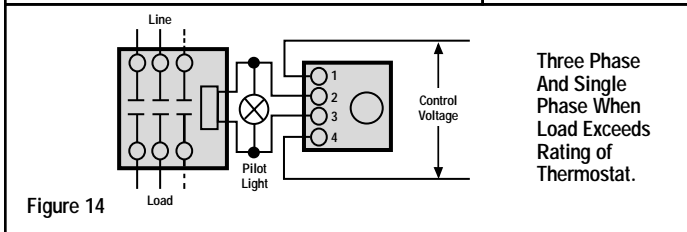
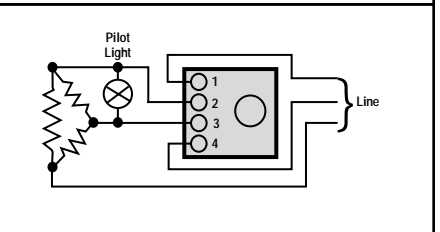


Figure 14

Three Phase  
And Single  
Phase When  
Load Exceeds  
Rating of  
Thermostat.

Three Phase  
When Load  
Does Not  
Exceed  
Rating of  
Thermostat.

Figure 15



## WIRING

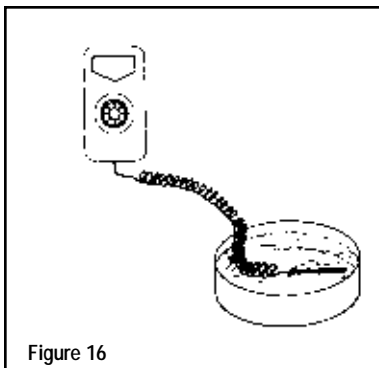


Figure 16

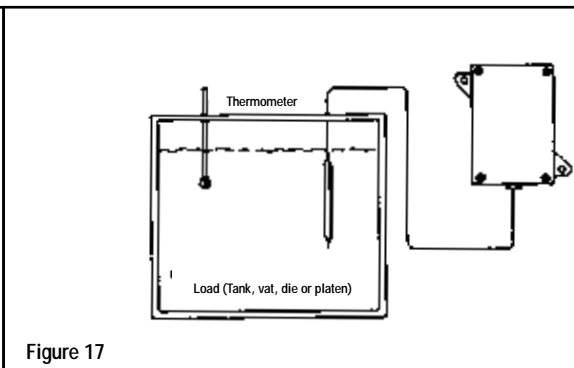


Figure 17

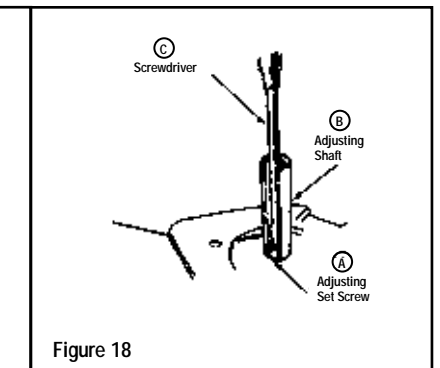


Figure 18

**Warning: Hazard of Electrical Shock. Disconnect all power before attempting to calibrate thermostat.**

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:

- A. If accurate measurement standards are not available, the thermostat can be readily adjusted to a known temperature standard such as boiling water (212°F) (see Figure 16).
- B. With the aid of an accurate thermometer or other temperature measuring device, recalibration may be performed within the process as in Figure 17.

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.

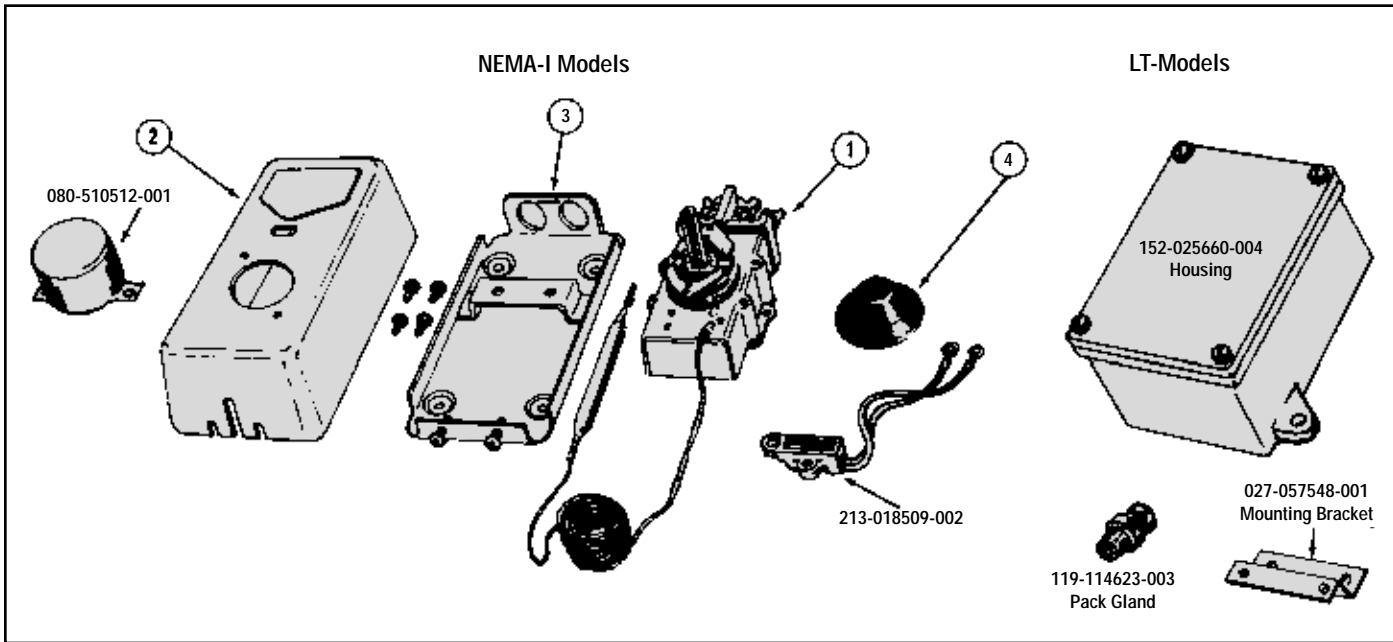
### 4. If they do not agree –

- 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 "off" (see Figure 18).

**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	② Thermostat Cover	③ Thermostat Base	④ Knob
AR-115	300-048518-005	080-024763-001	015-013819-001	169-019605-002
AR-115A	300-048518-012	080-024763-001	015-013819-001	169-019605-002
AR-115C	300-048518-019	080-024763-001	015-013819-001	169-019605-002
AR-214	300-048518-001	080-024763-001	015-013819-001	169-019604-001
AR-214D	300-048518-026	080-024763-001	015-013819-001	169-019604-001
AR-215	300-048518-010	080-024763-001	015-013819-001	169-019604-001
AR-215A	300-048518-013	080-024763-001	015-013819-001	169-019604-001
AR-219	300-048518-002	080-024763-001	015-013819-001	169-019604-001
AR-219D	300-048518-022	080-024763-001	015-013819-001	169-019604-001
AR-514	300-048518-003	080-024763-001	015-013819-001	169-019604-002
AR-515	300-048518-011	080-024763-001	015-013819-001	169-019604-002
AR-515A	300-048518-014	080-024763-001	015-013819-001	169-019604-002
AR-519	300-048518-004	080-024763-001	015-013819-001	169-019604-002
AR-519D	300-048518-027	080-024763-001	015-013819-001	169-019604-002
AR-715	300-048518-006	080-024763-001	015-013819-001	169-019605-001
AR-715D	300-048518-029	080-024763-001	015-013819-001	169-019605-001
AR-719	300-048518-007	080-024763-001	015-013819-001	169-019605-001

## WARRANTY AND LIMITATION OF REMEDY AND LIABILITY

Chromalox warrants only that the Products and parts manufactured by Chromalox, when shipped, and the work performed by Chromalox when performed, will meet all applicable specification and other specific product and work requirements (including those of performance), if any, and will be free from defects in material and workmanship under normal conditions of use. All claims for defective or nonconforming (both hereinafter called defective) Products, parts or work under this warranty must be made in writing immediately upon discovery, and in any event, within one (1) year from delivery, provided, however all claims for defective Products and parts must be made in writing no later than eighteen (18) months after shipment by Chromalox. Defective and nonconforming items must be held for Chromalox's inspections and returned to the original f.o.b. point upon request. THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Notwithstanding the provisions of this WARRANTY AND LIMITATION Clause, it is specifically understood that Products and parts not manufactured and work not performed by Chromalox are warranted only to the extent and in the manner that the same are warranted to Chromalox by Chromalox's vendors, and then only to the extent that Chromalox is reasonably able to enforce such warranty, it being understood Chromalox shall have no obligation to initiate litigation unless Buyer undertakes to pay all cost and expenses therefor, including but not limited to attorney's fees, and

indemnifies Chromalox against any liability to Chromalox's vendors arising out of such litigation. Upon Buyer's submission of a claim as provided above and its substantiation, Chromalox shall at its option either (i) repair or replace its Products, parts or work at the original f.o.b. point of delivery or (ii) refund an equitable portion of the purchase price.

THE FOREGOING IS CHROMALOX'S ONLY OBLIGATION AND BUYER'S EXCLUSIVE REMEDY FOR BREACH OF WARRANTY, AND IS BUYER'S EXCLUSIVE REMEDY AGAINST CHROMALOX FOR ALL CLAIMS ARISING HEREUNDER OR RELATING HERETO WHETHER SUCH CLAIMS ARE BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES, BUYER'S FAILURE TO SUBMIT A CLAIM AS PROVIDED ABOVE SHALL SPECIFICALLY WAIVE ALL CLAIMS FOR DAMAGES OR OTHER RELIEF, INCLUDING BUT NOT LIMITED TO CLAIMS BASED ON LATENT DEFECTS. IN NO EVENT SHALL BUYER BE ENTITLED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES AND BUYER SHALL HOLD CHROMALOX HARMLESS THEREFROM. ANY ACTION BY BUYER ARISING HEREUNDER OR RELATING HERETO, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES, MUST BE COMMENCED WITHIN ONE (1) YEAR AFTER THE DATE OF SHIPMENT OR IT SHALL BE BARRED.

W2008M

**Chromalox**<sup>®</sup>  
**PRODUCT SERVICE**  
 1382 HEIL QUAKER BLVD., LAVERGNE, TN 37086  
 Phone: (615) 793-3900 Fax: (615) 793-3563

WIEGAND INDUSTRIAL DIVISION  
 EMERSON ELECTRIC CO.



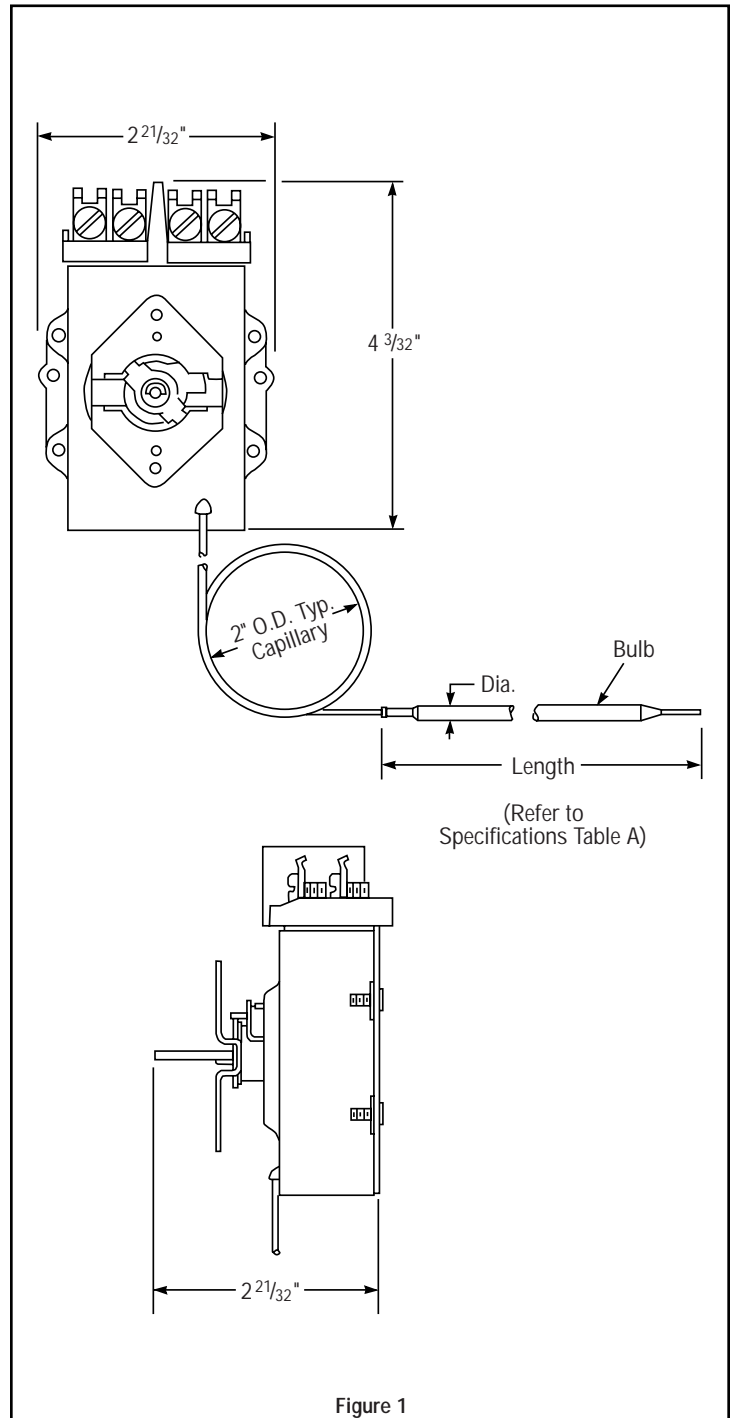
# Chromalox®

## Installation, Operation and RENEWAL PARTS IDENTIFICATION

### SERVICE REFERENCE

DIVISION 4	SECTION AR
SALES REFERENCE (Supersedes PK407-2)	PK407-3
161-562793-001	
DATE	SEPTEMBER, 1987

## 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	$\frac{3}{8}$	$4\frac{1}{4}$	30 Amps @ 277 Volts
AR-2193	60-250	9	$\frac{3}{16}$	$10\frac{3}{4}$	
AR-5153	200-550	5	$\frac{3}{8}$	$3\frac{1}{4}$	
AR-5193	200-550	9	$\frac{3}{16}$	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.

## GENERAL

**CAUTION:** Not for use in hazardous environments as described in National Electrical Code. Failure to comply can result in explosion or fire.

**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.

**CAUTION:** Users should install adequate back-up controls and safety devices with their electric heating equipment. Where the consequences of failure may be severe, back-up controls are essential. Although the safety of the installation is the responsibility of the user, Chromalox will be glad to make equipment recommendations.

**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-gage electrical grade plastic.

**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)

## 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).

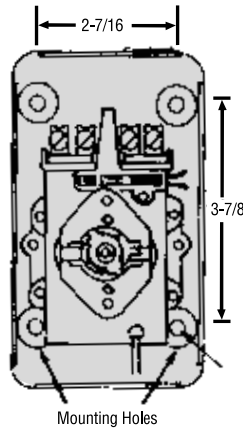


Figure 2

- 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.

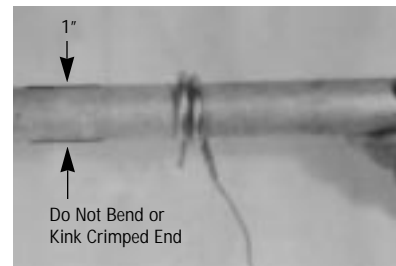


Figure 3  
(Sensing Bulb)



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

**CAUTION:** Hazard of Electrical Shock. Disconnect all power before wiring or servicing this control. Failure to comply can result in electrical shock or electrocution.

1. Electric wiring to heater must be installed in accordance with local and National Electrical Codes. **WARNING:** Use copper conductors only.
2. Entrance for wiring is provided by two  $\frac{1}{2}$ " 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)

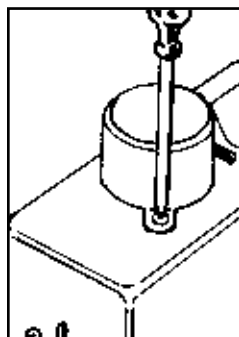


Figure 5

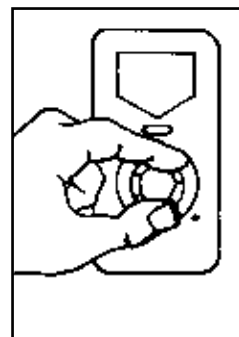


Figure 6

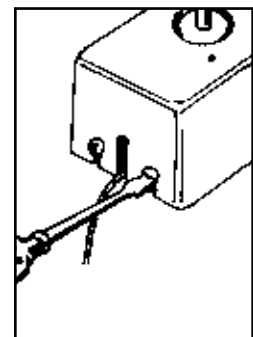


Figure 7

## WIRING

5. Loosen two screws from end of base plate and remove thermostat cover (see Figure 7).
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.

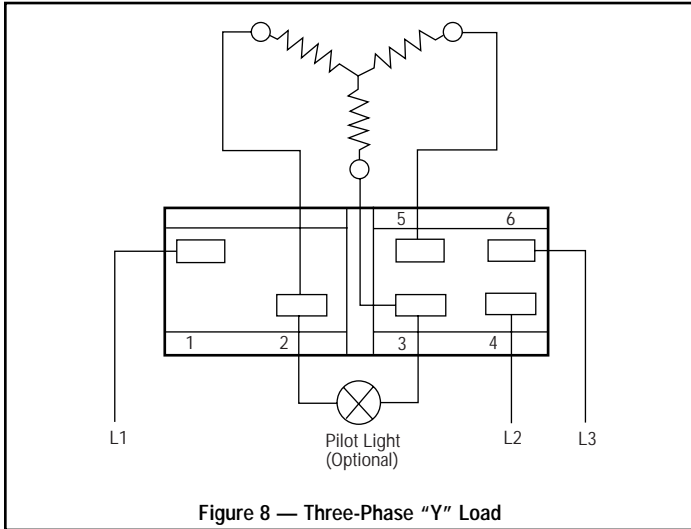


Figure 8 — Three-Phase "Y" Load

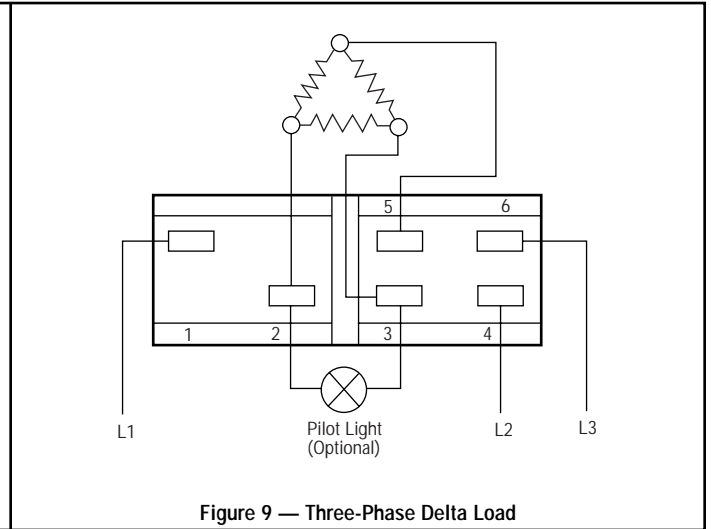


Figure 9 — Three-Phase Delta Load

**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

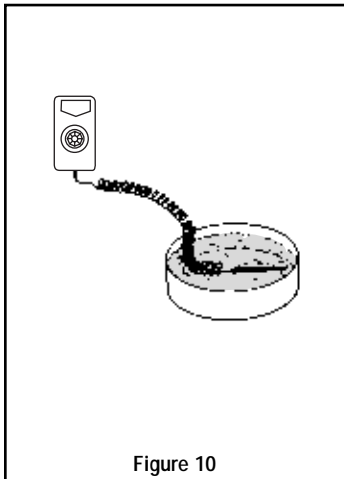


Figure 10

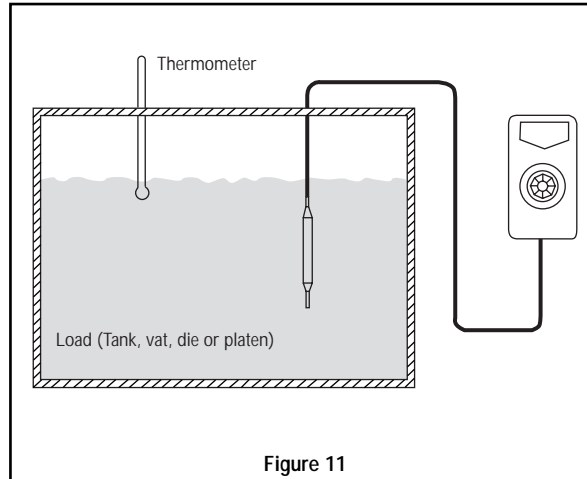


Figure 11

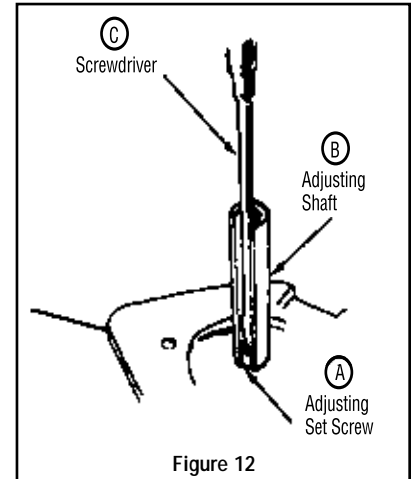


Figure 12

**CAUTION: Hazard of Electric Shock. Extreme care should be exercised during calibration adjustments because of shock hazard due to exposed electrical terminals.**

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.

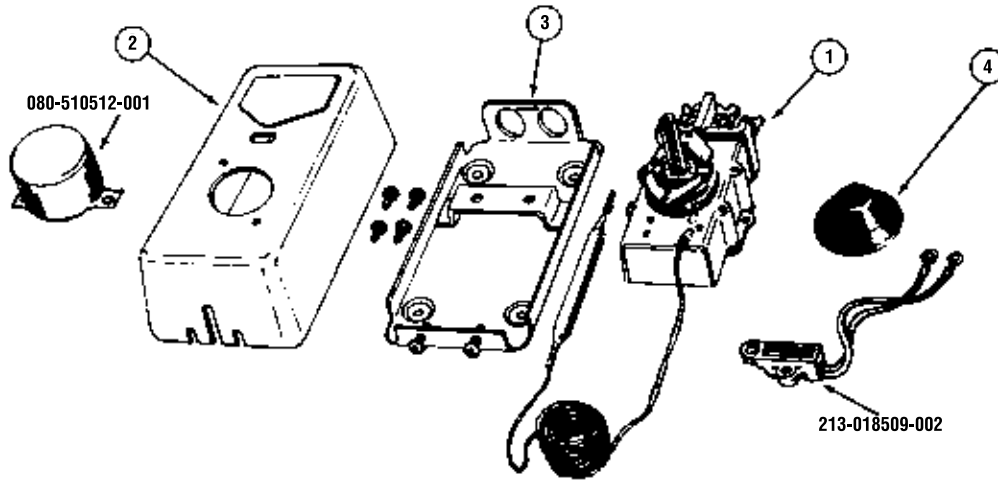
1. If accurate measurement standards are not available, the thermostat can readily be adjusted to a known temperature standard such as boiling water (212°F) (see Figure 10).
2. With the aid of an accurate thermometer or other temperature measuring device, recalibration may be performed within the process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

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

## WARRANTY AND LIMITATION OF REMEDY AND LIABILITY

Chromalox warrants only that the Products and parts manufactured by Chromalox, when shipped, and the work performed by Chromalox when performed, will meet all applicable specification and other specific product and work requirements (including those of performance), if any, and will be free from defects in material and workmanship under normal conditions of use. All claims for defective or nonconforming (both hereinafter called defective) Products, parts or work under this warranty must be made in writing immediately upon discovery, and in any event, within one (1) year from delivery, provided, however all claims for defective Products and parts must be made in writing no later than eighteen (18) months after shipment by Chromalox. Defective and nonconforming items must be held for Chromalox's inspections and returned to the original f.o.b. point upon request. THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Notwithstanding the provisions of this WARRANTY AND LIMITATION Clause, it is specifically understood that Products and parts not manufactured and work not performed by Chromalox are warranted only to the extent and in the manner that the same are warranted to Chromalox by Chromalox's vendors, and then only to the extent that Chromalox is reasonably able to enforce such warranty, it being understood Chromalox shall have no obligation to initiate litigation unless Buyer undertakes to pay all cost and expenses therefor, including but not limited to attorney's fees, and indemnifies Chromalox against any liability to Chromalox's

vendors arising out of such litigation.

Upon Buyer's submission of a claim as provided above and its substantiation, Chromalox shall at its option either (i) repair or replace its Products, parts or work at the original f.o.b. point of delivery or (ii) refund an equitable portion of the purchase price.

THE FOREGOING IS CHROMALOX'S ONLY OBLIGATION AND BUYER'S EXCLUSIVE REMEDY FOR BREACH OF WARRANTY, AND IS BUYER'S EXCLUSIVE REMEDY AGAINST CHROMALOX FOR ALL CLAIMS ARISING HEREUNDER OR RELATING HERETO WHETHER SUCH CLAIMS ARE BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES, BUYER'S FAILURE TO SUBMIT A CLAIM AS PROVIDED ABOVE SHALL SPECIFICALLY WAIVE ALL CLAIMS FOR DAMAGES OR OTHER RELIEF, INCLUDING BUT NOT LIMITED TO CLAIMS BASED ON LATENT DEFECTS. IN NO EVENT SHALL BUYER BE ENTITLED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES AND BUYER SHALL HOLD CHROMALOX HARMLESS THEREFROM. ANY ACTION BY BUYER ARISING HEREUNDER OR RELATING HERETO, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES, MUST BE COMMENCED WITHIN ONE (1) YEAR AFTER THE DATE OF SHIPMENT OR IT SHALL BE BARRED.

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