

Chromalox®

Installation, Operation

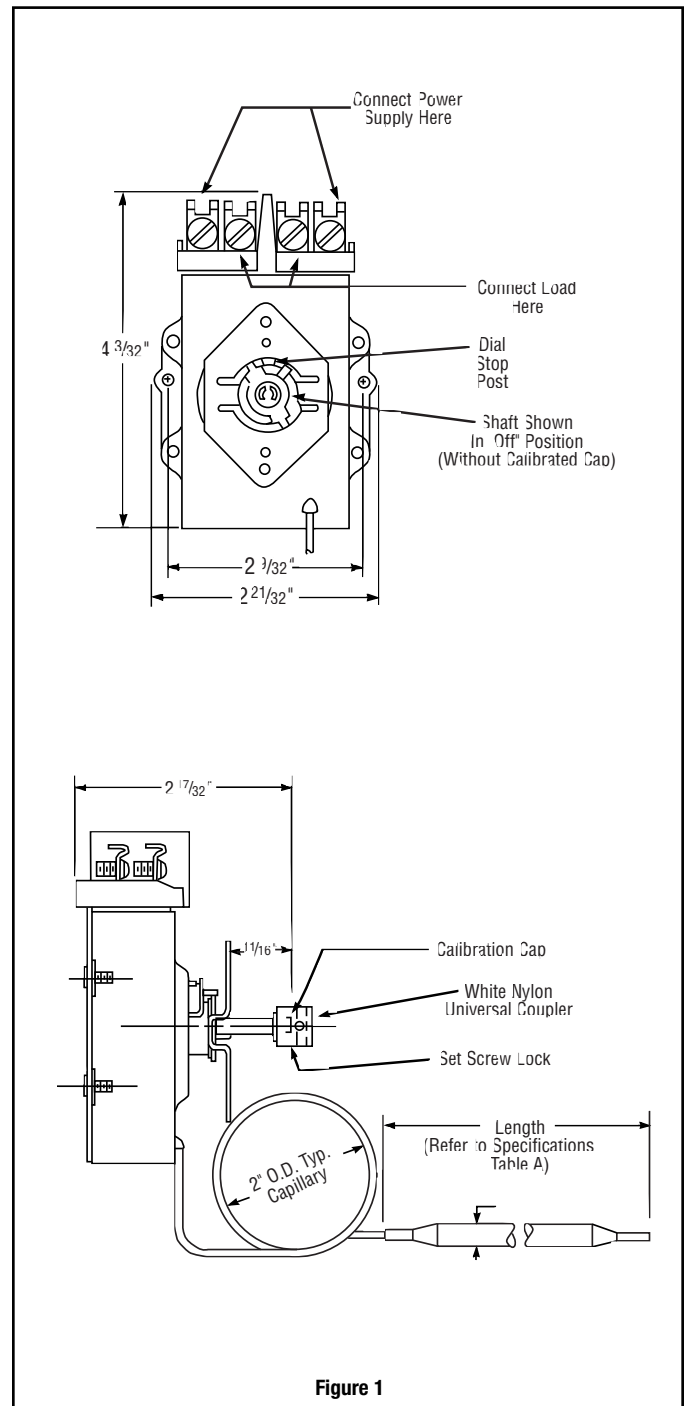
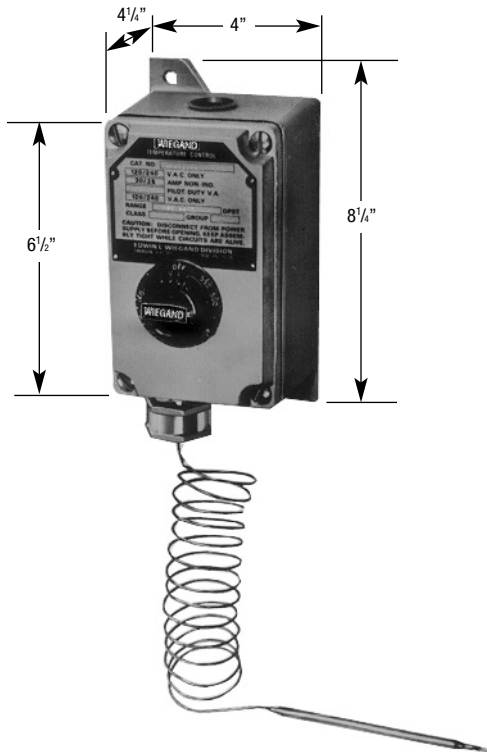
and

RENEWAL PARTS IDENTIFICATION

SERVICE REFERENCE

DIVISION 4	SECTION AR
SALES REFERENCE (Supersedes PK413-3)	PK413-4
161-562791-001	
DATE	SEPTEMBER, 1995

Type AR-EP Industrial Explosion-Resistant Thermostat



Specifications – Table A

Model	Temperature Range (°F)	Sensing Bulb			Capillary Length (Ft.)	Max. A.C. Rating (Amps)	
		Style	Dia. (In.)	Approx. Length (In.)			
AR-115EP	0 – 100	5	0.375	4 ³ / ₈	7	30 Amp 120-277 VAC	
AR-115AEP					2		
AR-115CEP					12		
AR-214EP	60 – 250	4	0.250	5 ⁵ / ₃₂	7		
AR-214DEP					15		
AR-215EP					7		
AR-215AEP					2		
AR-219EP					7		
AR219DEP					15		
AR-514EP	200 – 550	4	0.250	5 ⁵ / ₈	7		250 VA 120-277 VAC (Pilot Duty)
AR-515EP					7		
AR-515AEP					2		
AR-519EP					7		
AR-519DEP					15		
AR-715EP					300 – 700	5	
AR-715DEP	15						
AR-719EP	7						

GENERAL

NOTICE: Type AR-EP controls 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, 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-duty cast aluminum.

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 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 two $\frac{5}{16}$ " diameter mounting holes in mounting lugs 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).

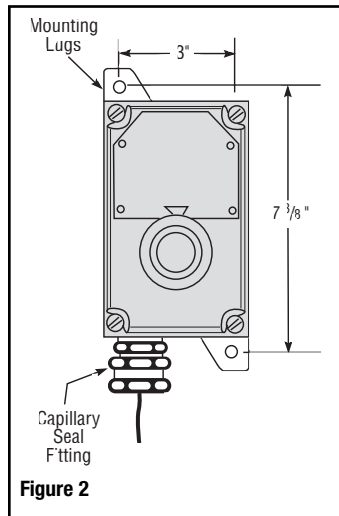


Figure 2

- 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.

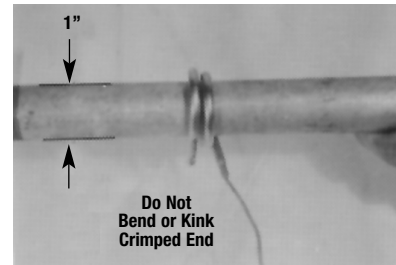


Figure 3
(Sensing Bulb)



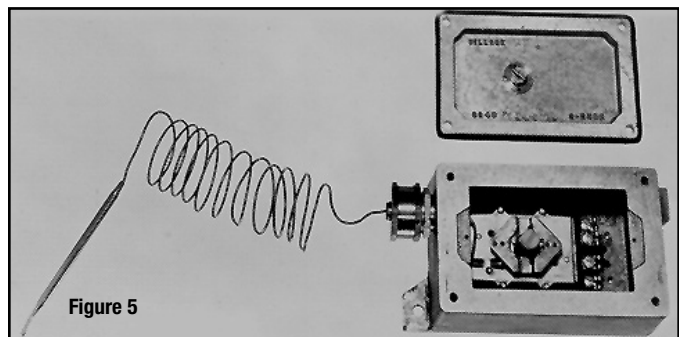
Figure 4
(Capillary Tube)

- 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: Hazard of Electric 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 National Electrical Codes and local codes. **WARNING: Use copper conductors only.**
2. Entrance for wiring is provided by one $\frac{3}{4}$ " NPT hole in the top of the housing. Wiring to control housing must be in rigid conduit also in accordance with National Electrical Codes (NEC) for hazardous locations.
3. Set thermostat knob to OFF position and remove cover plate by loosening and removing four (4) fastening screws (see Figure 5).



WIRING

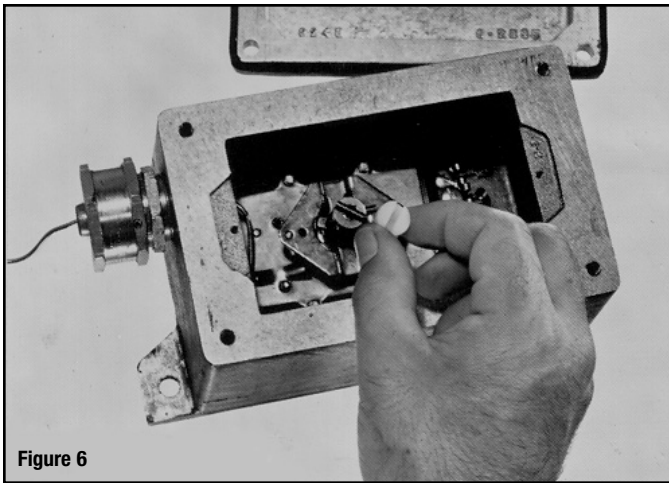


Figure 6

4. Remove white shaft coupler for safe-keeping while making wiring connections (see Figure 6).
5. Connect wires according to wiring diagrams (Figures 7 thru 11). **Note:** Electrical connections should be made with generous loops of wire — approximately 6" per lead.
6. Replace white shaft coupler.

7. **WARNING: It is possible to replace enclosure cover with adjustment knob 180 rotational degrees out of alignment resulting in large calibration errors. To avoid this, carefully follow these procedures.**
 - A. Be sure that thermostat shaft is fully counter-clockwise (see Figure 12). With thermostat knob held in the indicated OFF position, carefully replace enclosure cover while feeling for proper engagement of shaft coupling.
 - B. With cover screws replaced and moderately fastened, check for full rotation of dial knob. **Note:** Mild shaft resistance should be encountered. If satisfied, that proper engagement of shaft coupler is accomplished; finish tightening cover screws.

8. **Note:** If load amperage or voltage rating exceeds switch rating, a contactor must be used. Contactor and wiring to be supplied by customer (see

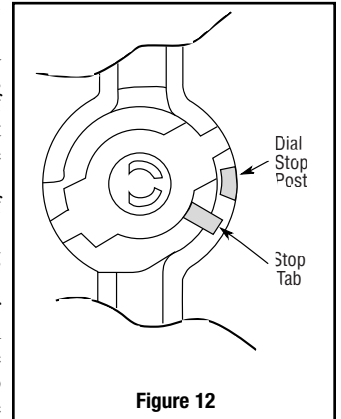


Figure 12

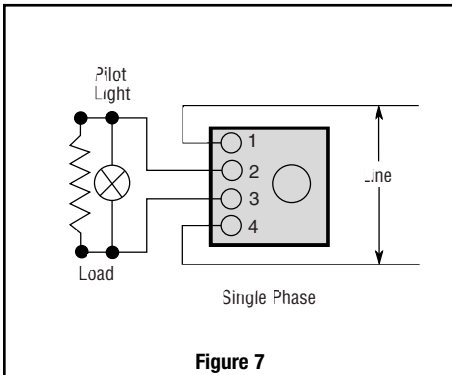


Figure 7

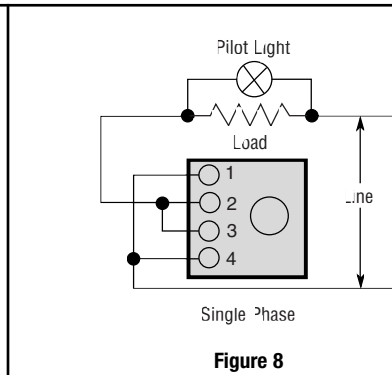


Figure 8

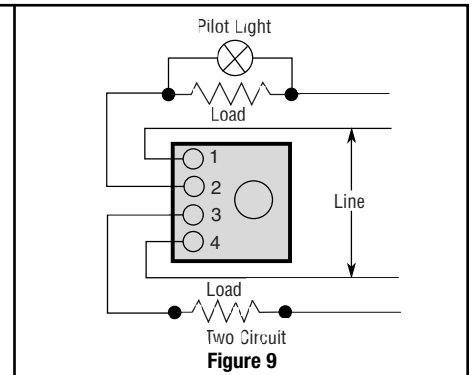


Figure 9

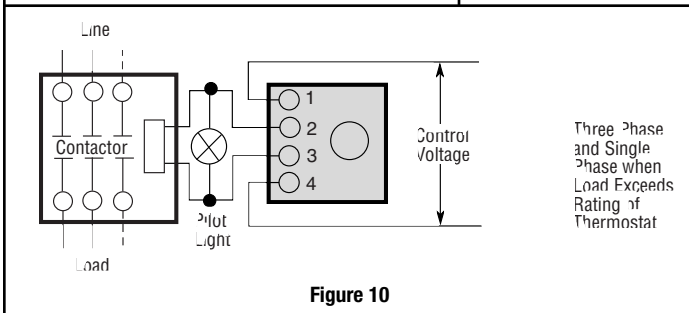


Figure 10

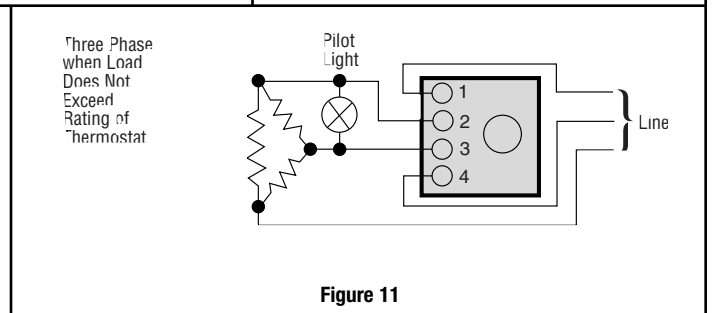


Figure 11

CALIBRATION

WARNING: Hazard of Electric Shock. Extreme care should be exercised during calibration adjustments because of shock hazard due to exposed electrical terminals. Failure to comply can result in electrical shock or electrocution.

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°). See Figure 13.
2. With the aid of an accurate thermometer or other temperature measuring device, recalibration may be performed within the process as in Figure 14.

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

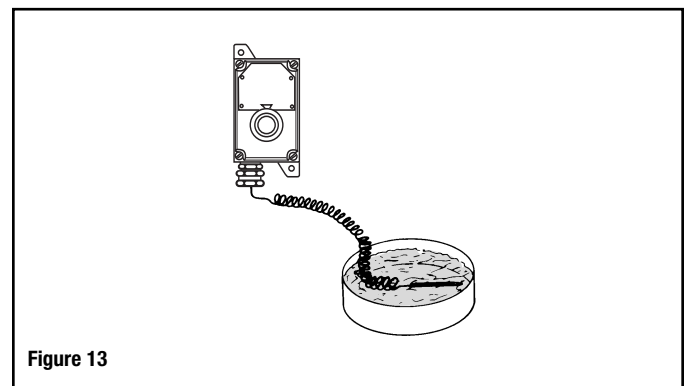


Figure 13

CALIBRATION

DANGER: Calibration will involve exposure of internal control terminals to ambient conditions during some part of the recalibration procedure. Combustible materials which cause hazardous conditions must not be present during recalibration process — otherwise explosion may result.

1. Heat water bath or the equipment in which the control is installed (tank, die, platen or machine) to the selected calibration temperature. The entire sensing bulb and at least one foot of its capillary tube are to be exposed to calibrating temperature. With thermostat energized, allow process or bath to reach setpoint. This is accomplished when thermostat begins cycling action.
2. Compare adjustment knob cut off temperature indication against actual temperature to which sensing bulb is exposed. Figure 15 shows example of a control knob showing a control indication of 250°F when true process temperature measured 230°F. In this example, the control knob must be rotated 20° counterclockwise to bring the 230°F knob marking under the index mark in order to recalibrate the control.
3. Without disturbing the shaft setting, loosen the thermostat knob set-screw and re-align dial setting accordingly. Retighten knob set-screw.
4. Recheck for thermostat operation as per steps 2 and 3 and make further calibration adjustment if indicated.
5. Recheck of thermostat operation following final adjustment completes the calibration procedure.

IMPORTANT: Under no circumstances must the temperature range, and in particular, the maximum temperature setting of control be increased above maximum temperature indicated on control nameplate. Such changes voids U.L. listing of the control.

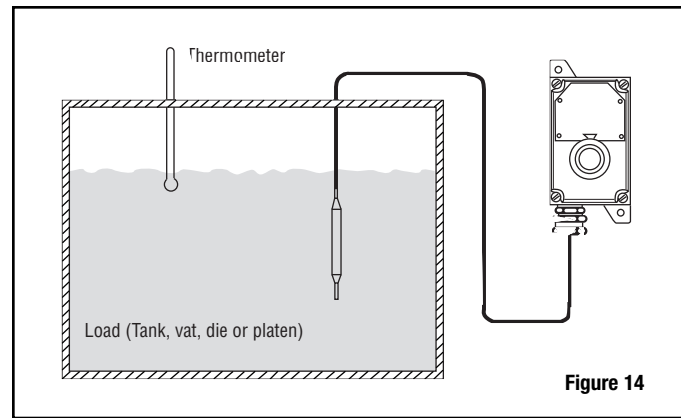


Figure 14

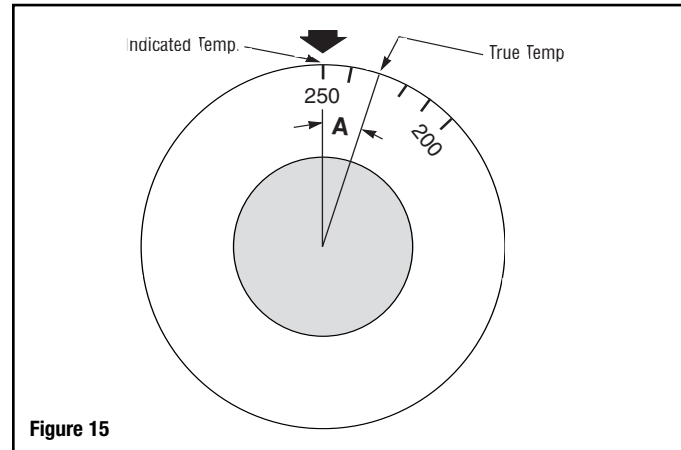


Figure 15

THERMOSTAT SUB ASSEMBLY REPLACEMENT

1. Before removing enclosure cover, turn thermostat knob to the OFF position (counterclockwise). Place a piece of masking tape over the knob to keep it in the OFF position.
2. Remove the enclosure cover by removing four fastening screws (Figure 5).
3. Remove the white shaft coupler for safe-keeping.
4. Remove the thermostat mounting screws (2).
5. Loosen the capillary-seal retaining cap set screws and then remove the retaining cap.
Note: Do not remove the entire capillary seal fitting from the enclosure.
6. Remove the capillary seals and thermostat from the enclosure.
7. Remove the calibration cap (Figure 1) and insert pin from the old thermostat. Rotate the position of the calibration cap, for use in the next step.
8. With replacement thermostat in the OFF position (shaft completely counterclockwise), install insert pin and calibration cap. Install calibration cap with same orientation as noted in step 7 above.
9. If excess capillary, on old thermostat, had been coiled in enclosure, it may be necessary to coil an equal amount on replacement thermostat per step 4D mounting instructions.
10. After proper capillary length is obtained on replacement thermostat, insert capillary in the enclosure and thru the capillary seal fitting.
11. Recheck for proper capillary length (external to enclosure) and adjust if necessary.
12. Align spacer plate and replacement thermostat to mounting holes in the bottom of enclosure using mounting screws (2 – #10-32 x 3/8 Lg.) to secure thermostat to enclosure.
13. Slide the capillary seals into the capillary fitting making sure the capillary is positioned in the center groove of the seals.
WARNING: If capillary is not located in the center groove properly, damage to the capillary will result, rendering the thermostat inoperable or unreliable.
14. Replace capillary seal retaining cap and tighten set screws to lock in position.
Note: Per the NEC, all threaded connections in a hazardous environment must be tightened sufficiently to engage five full threads.
15. Rewire replacement thermostat per appropriate wiring diagrams (Figures 7 thru 11).
16. Replace the white nylon coupling on the calibration cap and enclosure cover per step 7 of the wiring section.
17. Replacement thermostat control should be monitored to insure proper operation. If calibration is required, see the calibration section for instructions.

RENEWAL PARTS IDENTIFICATION

Model	Thermostat Sub Assembly	Control Knob
AR-115EP	300-027566-001	169-019605-002
AR-115AEP	300-027566-014	169-019605-002
AR-115CEP	300-027566-012	169-019605-002
AR-214EP	300-027566-004	169-019604-001
AR-214DEP	300-027566-015	169-019604-001
AR-215EP	300-027566-009	169-019604-001
AR-215AEP	300-027566-007	169-019604-001
AR-219EP	300-027566-002	169-019604-001
AR-219DEP	300-027566-016	169-019604-001
AR-514EP	300-027566-005	169-019604-002
AR-515EP	300-027566-008	169-019604-002
AR-515AEP	300-027566-006	169-019604-002
AR-519EP	300-027566-003	169-019604-002
AR-519DEP	300-027566-018	169-019604-002
AR-715EP	300-027566-010	169-019605-001
AR-715DEP	300-027566-011	169-019605-001
AR-719EP	300-027566-013	169-019605-001

Part	Parts Common to All	Part Number
Capillary Seal Fitting		119-053954-001
White Nylon Coupler		079-512424-001

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

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