

A collection of components for the APR-E™ Valve, including a main valve body, a solenoid coil, a diaphragm, and a coil of tubing, all rendered in a light blue, semi-transparent style.

APR-E™ Valve

Installation & Service Manual

APR- E6
Stand Alone Controller

Please Read All Instructions Fully Before Installing

For Support Contact:

Rawal Devices, Inc.

Call: (800) 727- 6447

Email: techsupport@rawal.com



What is the APR-E?

The **APR-E™ Valve** is an *electrically driven, electronically controlled, motorized compressor unloading valve*. It is popularly used as a discharge air controller on DX systems. The APR-E will regulate the amount of refrigerant flow entering the evaporator by diverting the discharge gas into the suction line before the compressor. Thus, modulate the cooling capacity of the evaporator.

As the discharge air temperature falls below setpoint, the APR-E can be controlled to open and begin modulating. This action decreases the amount of refrigerant to the evaporator, resulting in a higher discharge air temperature off the coil.

Conversely, as the discharge air temperature rises above setpoint, the APR-E can be controlled to modulate towards the closed position. Now increasing the amount of refrigerant to the evaporator, decreasing the discharge air temperature off the coil.

We offer two control boards for all of our APR-E™ valves:

The first is the external control board. It is a small electronic circuit board drives the APR-E valves' electric motor. The external control board responds to an analog *0-10VDC* or *4-20mA* signal from a separate systems controller.

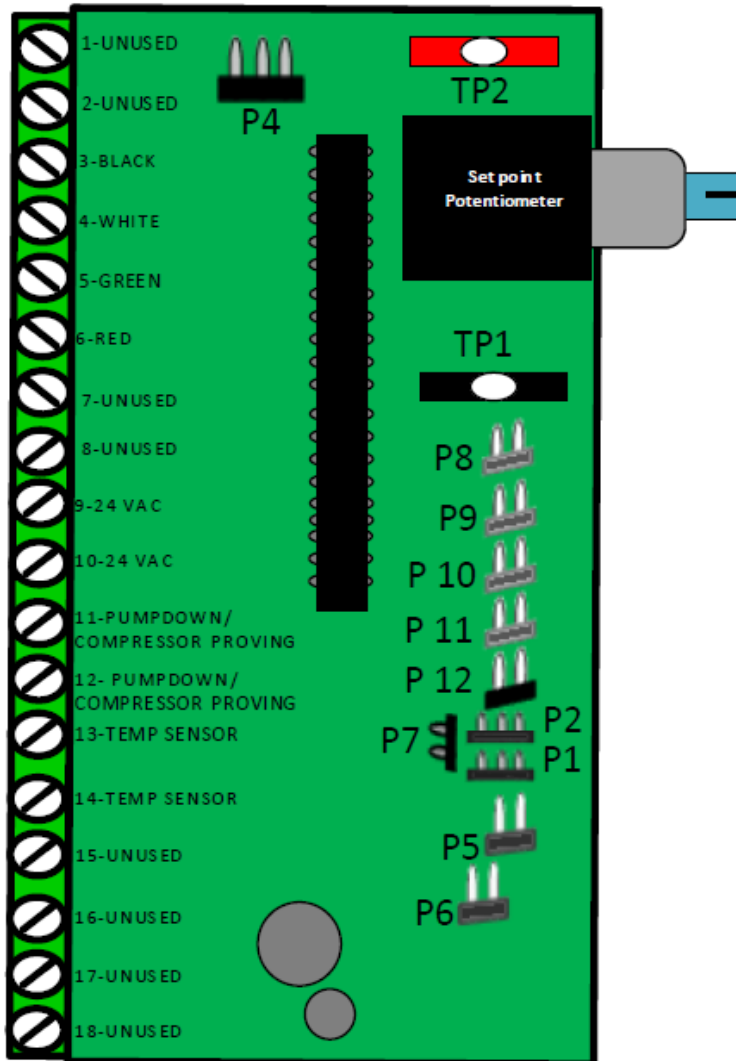
The second is a stand-alone controller that will modulate the APR-E based on discharge air temperature. Giving you the ability to *"set it and forget it."*

The APR-E is capable of maintaining a +/- 1° deviation from set-point within the modulation range.

Stand-Alone Controller Jumper Locations and Sequence of Operation

1. Upon power-up the Stand-alone controller shall enter a calibration process (about 30 seconds)
2. Once the lead compressor is proven by the lead compressor proven switch (open input on terminals 11 and 12), the Stand-Alone controller will begin to function.
3. The APR-E with the stand-alone controller shall modulate towards the open position of the step motor when the discharge air temperature is below setpoint (reducing system capacity)
4. The APR-E with the stand-alone controller shall modulate the step motor towards the closed position when the discharge air is above setpoint. (increasing system capacity)
5. The APR-E with the stand-alone controller does not interface with the systems control circuit only the compressor proven switch will enable the controller regardless of control by others.

TEST POINTS and PIN JUMPERS



TP1 Test Point 1

Positive connection point to millivolt voltmeter to read set point temperature- 32 mVdc=32°F Setpoint

TP2 Test Point 2

Negative connection point as above - 32 mVdc=32°F Setpoint

P1 Pin Jumper 1-Factory Set

P2 Pin Jumper 2-Factory Set

P4 Pin Jumper 4 -Factory Set

DO NOT CHANGE-Voids Warranty!

P5 Pin Jumper 5 -Factory Set

Force valve open switch - valve will open and will remain open as long as jumper is installed (Utilize for Testing Motor)

P6 Pin Jumper 6 -Factory Set

Force valve closes switch - valve will close and remain closed while jumper is installed (Utilize for Testing Motor)

P7 Pin Jumper 7 -Factory Set

temperature sensor enable selector

P8 Pin Jumper 8-Factory Set

“open on rise” logic selector

Jumper not installed

P9 Pin Jumper 9

“close on rise” logic selector-Factory Set

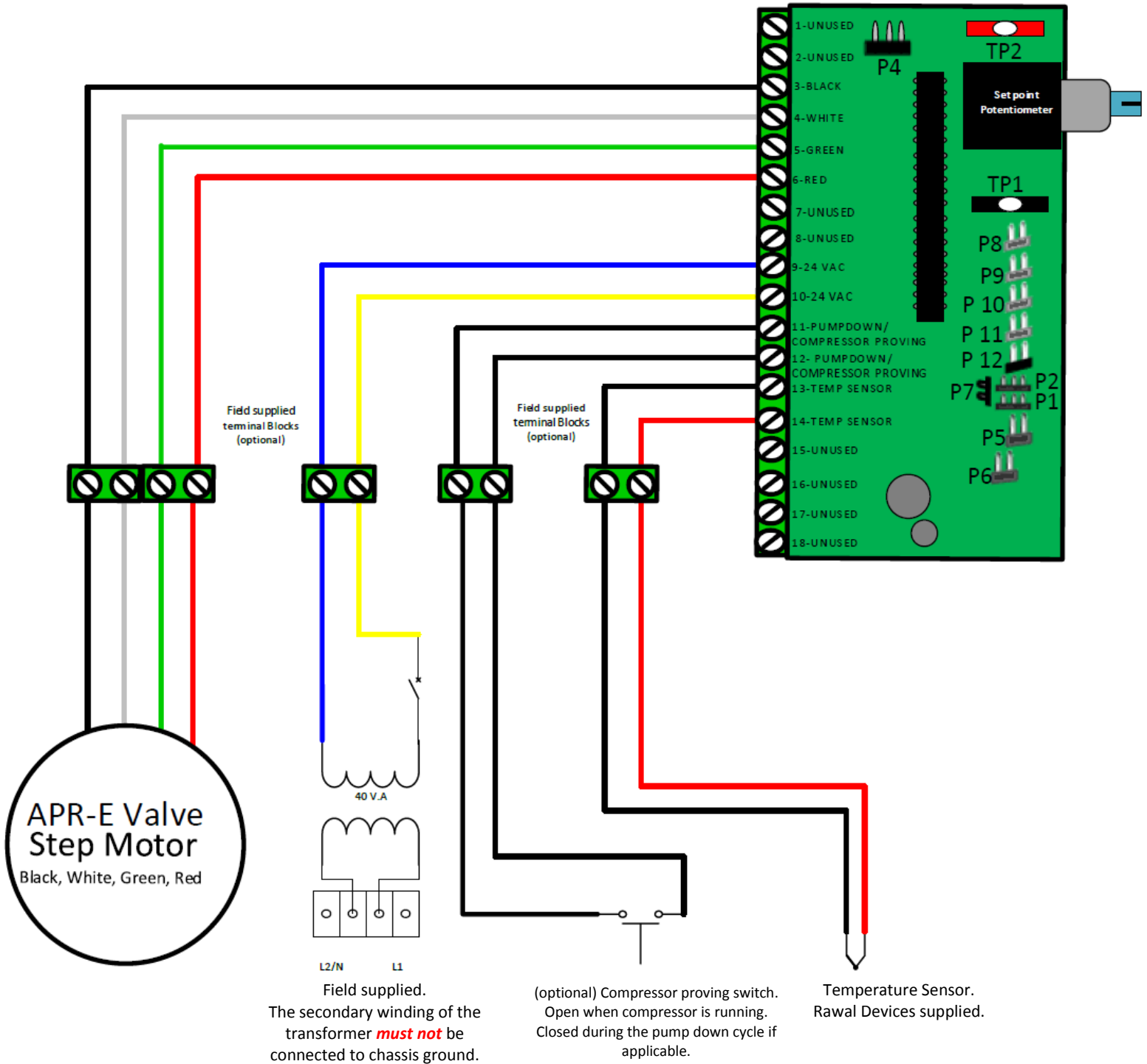
Jumper installed

P10 Pin Jumper 10 -Factory Set

P11 Pin Jumper 11 -Factory Set

P12 Pin Jumper 12 -Factory Set

APR-E w/ Stand Alone Controller Wiring Diagram



APR-E Motor & Stand-Alone Controller Testing Procedure

Test the Motor

The resistance of the motor winding may be tested without opening the system.

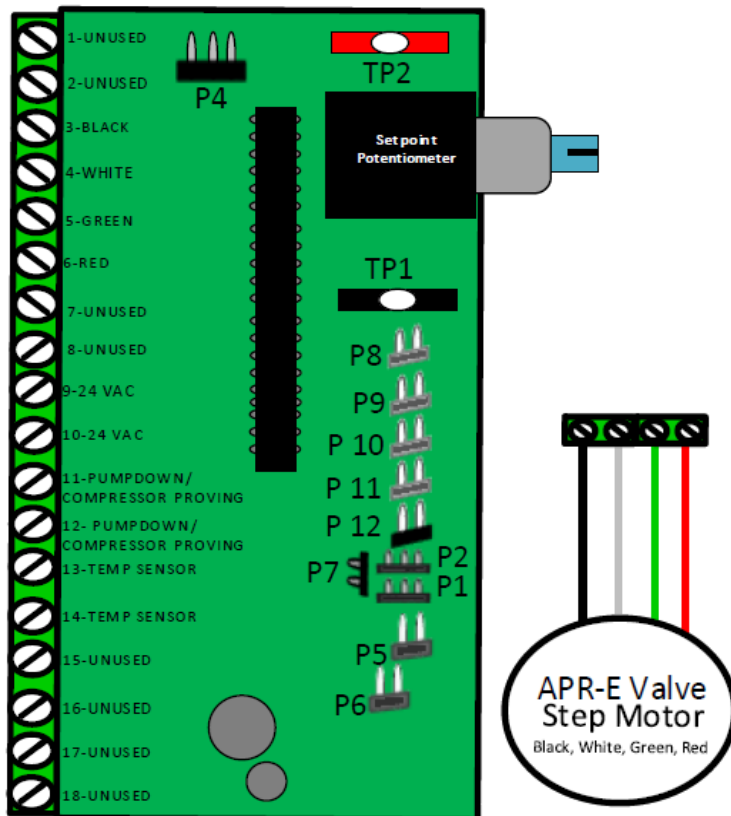
1. Remove power from the external controller and the board

2. Remove valve leads from the board

3. Measure the resistance between black and white leads of the valve. The resistance should be $75\Omega \pm 10\%$ at 71°F (For the APR -E-7, APR-E-12, and the APR-E-25, the resistance should be $100\Omega \pm 10\%$ at 71)

4. Measure the resistance between the green and red leads. This value should be within $\pm 5\%$ of the resistance between the black and white leads recorded in step 3.

5. Measure the resistance from any lead to the valve body. Resistance should be infinite (open).



Test the Controller

ALL Controller tests assumes that the valve motor is operational

1. Is there a 24V AC at terminals 9 & 10?

NO - Repair or replace power supply or power supply wiring.

2. Is the 24V AC a secondary isolation transformer?

NO - Replace the transformer with an isolated secondary type.

3. Do the wires of the valve connected to terminals 3-6 match up with the correct wire colors?

NO - Shut off power to Controller and correct wiring.

4. Connect voltmeter to the Black and White valve terminals; interrupt and restore power to the Controller -Does the meter read 12 volts AC ± 1 ?

NO - If the valve is operational, then replace the controller.

5. Repeat above test using Red and Green terminals - Does the meter read 12 volts AC ± 1 ?

NO - Replace the Controller.

6. Is pin jumper on "Temp Enable" (P7)?

NO - Correct pin jumper location.

7. Connect voltmeter to test points, does reading vary between -40 and 210 millivolts when potentiometer shaft is turned?

($32\text{ mVdc} = 32^\circ\text{F Setpoint}$)

NO - Remove potentiometer and measure resistance between the center pin and either side pin. The resistance should change as the shaft of the potentiometer is turned

8. Disconnect the temperature sensor from terminals 13 & 14 Measure the resistance through the sensor. (2K, type B, NTC thermistor)

NO - Replace the sensor.

9. Remove the wires from pump down terminals 11 & 12 and put a jumper across them. Did the valve open?

NO - Replace the Controller.

10. Remove the pin jumper from P5 and leave the pin jumper on P6. Did the valve close?

NO - Replace the controller.

11. Remove the pin jumper from P6 and put it on P5. Did the valve open?

NO - Replace the controller.

12. Remove the jumper from terminals 11 & 12 and reconnect the wires. Put the pin jumpers back in their proper location on P5 & P6.

APR-E™ VALVE - SPEC. & DIMENSION SHEET (R-410A & R-22)

Model #	Modulation Capacity (Tons)		Unit Dimensions			Connection Dimensions (OD)			Application Notes
	R-22	R-410A	X	Y	Z	L	M	G	
APR-E1	0.65 tons	1 ton	7.5"	12"	3.5"	3/8"	5/8"	3/8"	
APR-E2	1.8 tons	2.9 tons	8.5"	13"	4.5"	3/8"	5/8"	1/2"	
APR-E4	3.7 tons	5.9 tons	8.5"	13"	4.5"	3/8"	5/8"	1/2"	
APR-E5	5.1 tons	8 tons	8.5"	13"	4.5"	3/8"	5/8"	5/8"	
APR-E7	6.9 tons	11.3 tons	10"	14"	5"	3/8"	5/8"	5/8"	
APR-E12	12.5 tons	20.3 tons	10"	14"	5"	3/8"	5/8"	5/8"	

- MUST SUPPLY BALL SHUT-OFF VALVES FOR ALL CONNECTIONS
- MUST SUPPLY TEE FOR SUCTION LINE CONNECTION
- MUST SUPPLY TEE FOR HOT-GAS CONNECTION
- MUST SUPPLY TEE FOR LIQUID LINE CONNECTION

WHEN REQUIRED, MUST SUPPLY TEE FOR EE CONNECTIONS
EXTERNAL EQUILIZERS - EE - HAVE 1/4" SWEAT CONNECTION TEE
EE CONNECTIONS INTO SUCTION LINE

SENSING BULB ON LIQ INJ VALVE MUST BE ATTACHED AND INSULATED TO SUCTION
LINE BETWEEN TEE TO APR CONTROL DISCHARGE COMING FROM TOP OF THE
CHAMBER AND COMPRESSOR

APR Control Selection:

System or Stage size is reduced by the Modulation Capacity listed above

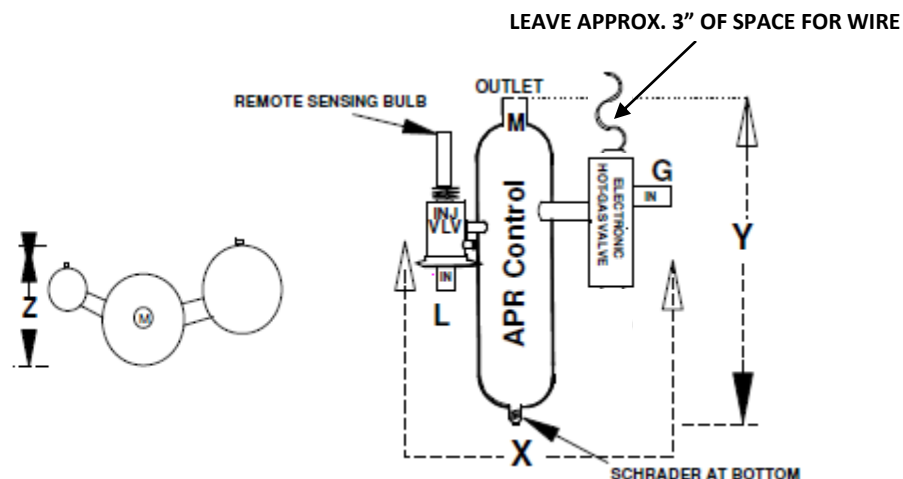
Oil entrainment in suction line must be addressed

Please refer to Rawal Devices Fast Selection Chart or Consult with Rawal
Devices Engineers

RAWAL DEVICES, INC.

Call Tech Support: (800) 727-6447

WWW.RAWAL.COM

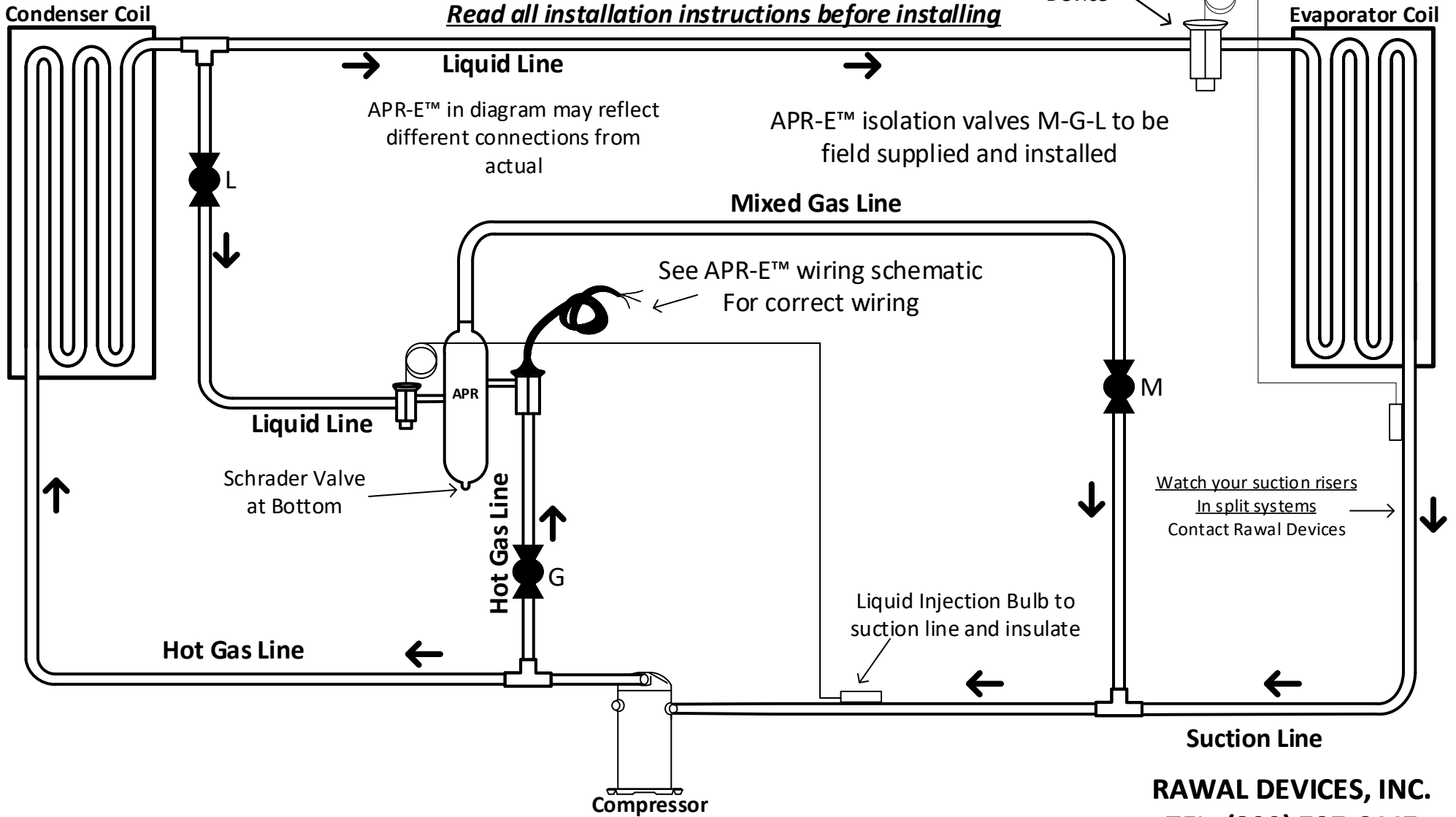


APR-E™ IN SINGLE EVAPORATOR MODE

Heat Pump(HP) Installation will be different.
See HP installation diagram

Read all installation instructions before installing

TXV or Metering Device



APR-E™ in diagram may reflect different connections from actual

APR-E™ isolation valves M-G-L to be field supplied and installed

Mixed Gas Line

See APR-E™ wiring schematic
For correct wiring

Schrader Valve at Bottom

Watch your suction risers
In split systems
Contact Rawal Devices

Liquid Injection Bulb to suction line and insulate

Suction Line

Compressor

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*Drawing for illustrative purposes only
Please call for assistance

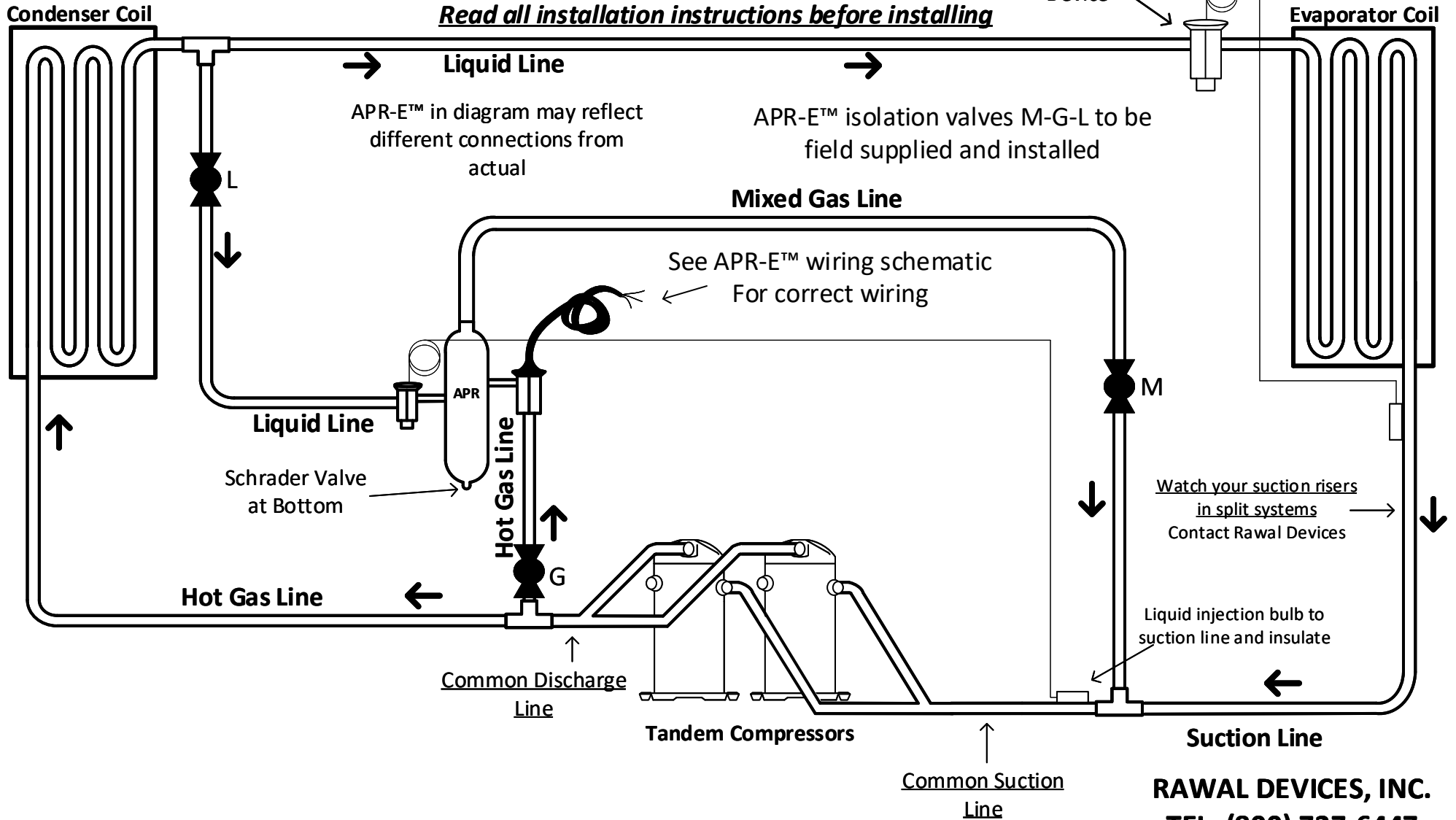


APR-E™ IN TANDEM COMPRESSOR CONFIGURATION

Heat Pump(HP) Installation will be different.
See HP installation diagram

Read all installation instructions before installing

TXV or Metering Device



APR-E™ in diagram may reflect different connections from actual

APR-E™ isolation valves M-G-L to be field supplied and installed

See APR-E™ wiring schematic For correct wiring

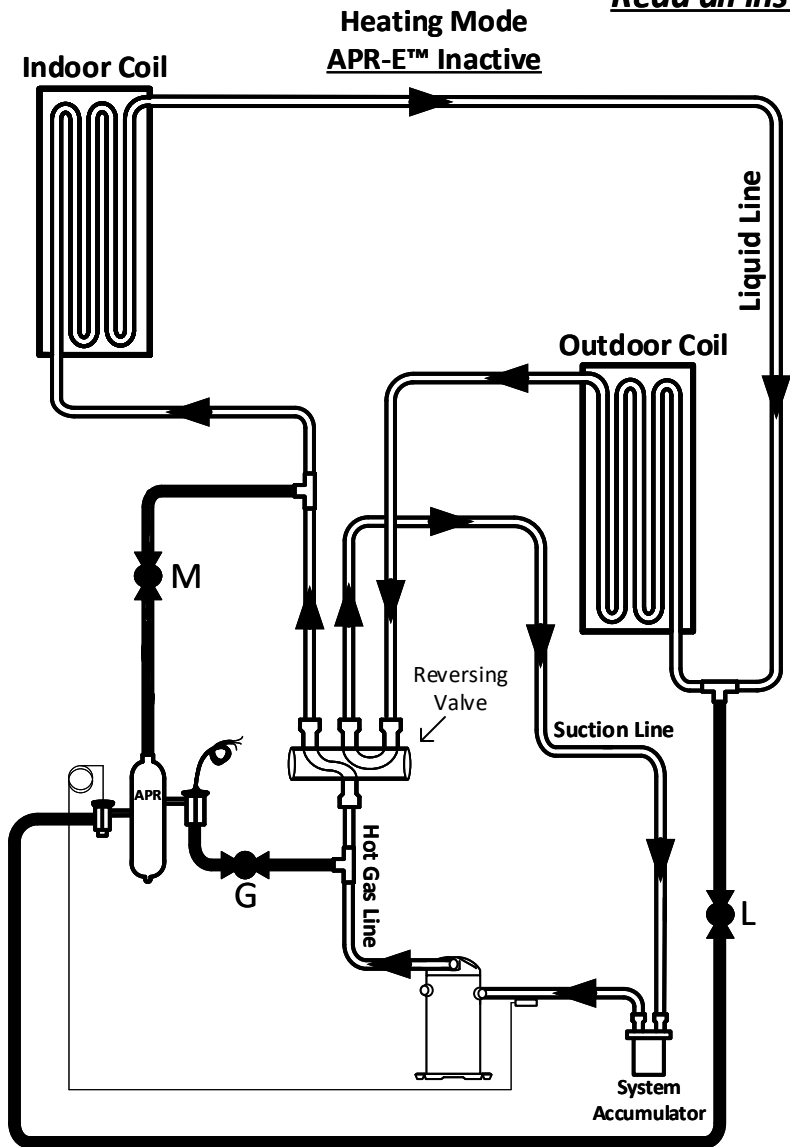
Watch your suction risers in split systems Contact Rawal Devices

Liquid injection bulb to suction line and insulate



APR-E™ IN A HEAT PUMP SYSTEM

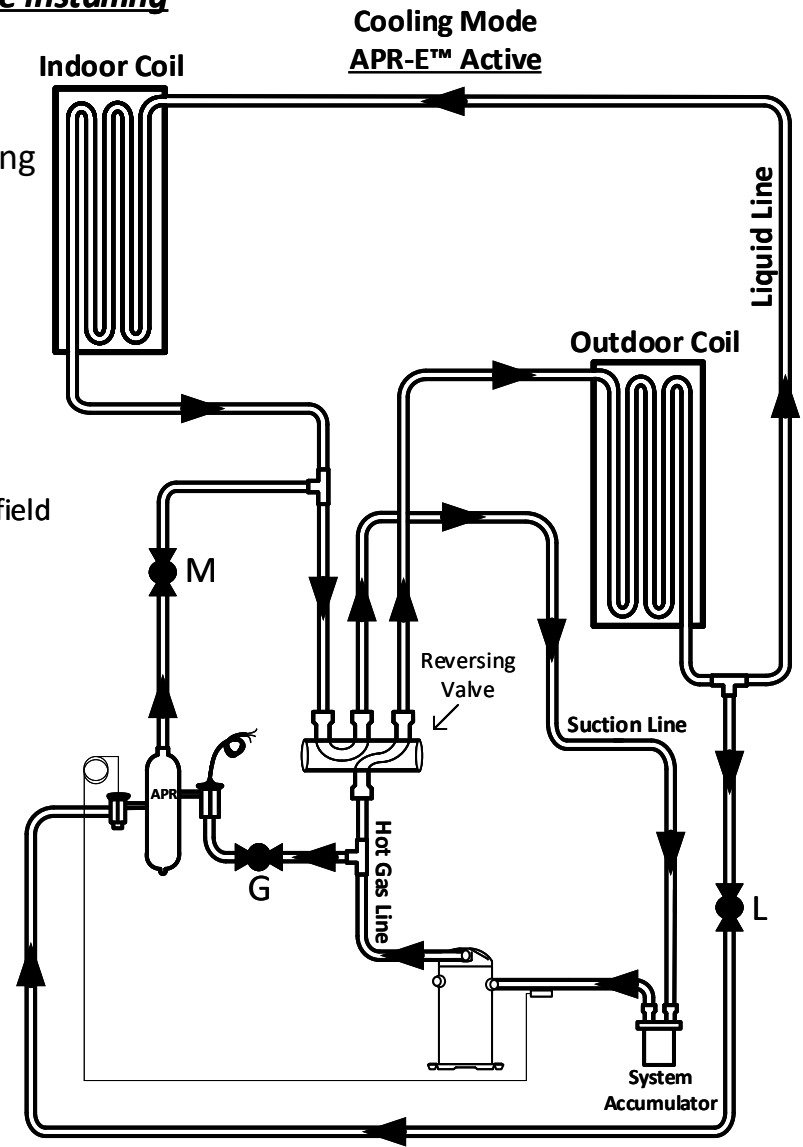
Read all installation instructions before installing



See APR-E™ wiring schematic for correct wiring

Isolation valves M-G-L to be field supplied and installed

APR-E™ active in cooling mode only



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