METROPOLITAN NY CHAPTER

Refrigeration Service Engineers Society

Continued Education for the HVAC/R Industry

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Troubleshooting Potential Relays

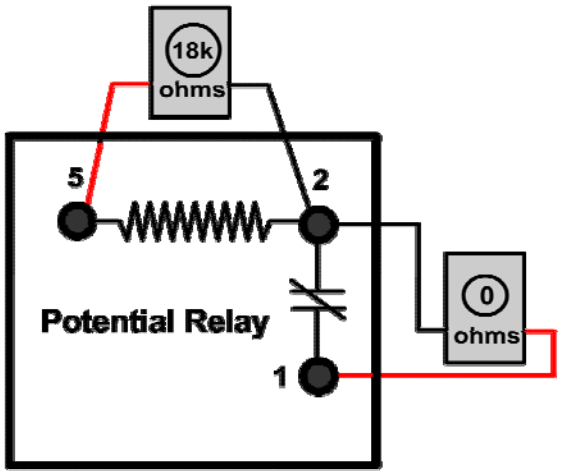
Many low and medium temperature single-phase compressors require some type of external relay to assist in the starting of its motor. The purpose of this relay is to remove the motor's start winding, start capacitor, or both, from the circuit once the motor is running.

One type of relay commonly used is a potential relay. This relay has a normally closed set of contacts which are wired in series with the motor's start winding and start capacitor, if used. The coil of this relay is wired in parallel with the motor's start winding. When the coil is energized, the normally closed set of contacts open, taking the starting winding, start capacitor, or both, out of the circuit.

Since this relay is required in the starting of the motor, one possible cause of a compressor which fails to start is a defective relay. If the relay has an open coil or its contacts welded closed, the starting components of the motors will not be removed from the circuit and the compressor will cycle off on its overload. If the contacts of the relay are stuck open, the starting components will not be in the circuit during the starting of the motor and the motor will not have sufficient torque to start, and again the compressor will cycle off on its overload.

Below is one popular method of troubleshooting this type of relay:

- Disconnect the voltage source from the circuit and remove the relay from the circuit.
- First check the relay's coil by placing the leads of an ohmmeter across the "2" and "5" terminals of the relay.
- If the ohmmeter reads a high resistance (approximately 3,000 to 18,000 ohms) the coil of the relay is electrically okay.
- If the coil reads infinite resistance, the coil is electrically open and the relay needs to be replaced.
- Next, check the contacts of the relay by placing the leads of the ohmmeter across the relay's "1" and "2" terminals.
- If the ohmmeter reads zero resistance, the contacts are closed, as they should be.
- If the ohmmeter reads a high resistance or an infinite resistance, the contacts are defective and the relay needs to be replaced.



Another way to check a potential relay is with an clamp-on analog ammeter meter. This is used to check the operation of this relay.:

- Set the ammeter to a high scale.
- Clamp the ammeter around the wire connected to the "1" terminal of the relay.
- Apply voltage to the motor's circuit.
- The needle of the meter should swing high and then drop to zero.
- If the needle does not move or moves and does not return to zero there may be a problem with the relay.
- Disconnect the voltage applied to the circuit; remove the relay from the circuit, and use an ohmmeter to check the relay's coil and contacts.

Being able to identify a defective relay as the cause of a compressor not starting is an important part of effectively troubleshooting single-phase compressors. Occasionally a good compressor is deemed defective when the true problem is only a defective starting relay. This is never good for you or your customer.

TEST YOUR KNOWLEDGE

1. Torque is:

   A. the strength that a motor produces by turning
   B. the power that a motor consumes
   C. the speed of a motor
   D. the power factor of a motor

2. Which of the following produces the best electromagnet?

   A. cobalt
   B. soft iron
   C. paper
   D. wood

3. Unlike poles of a magnet _____ each other, and like poles _____ each other.

4. What part of a motor produces an inductive magnetic field within itself to facilitate the rotation motion?

   A. the stator
   B. the end bells
   C. the capacitor
   D. the squirrel cage rotor

5. What would be the speed of a four-pole motor if there were 7200 flow reversals per minute?

   A. 900 RPM
   B. 1800 RPM
   C. 3600 RPM
   D. 7200 RPM

6. Which of the following correctly lists the motor's starting torque from lowest to highest?

   A. capacitor-start, split-phase, shaded-pole, three-phase
   B. shaded-pole, three-phase, permanent split-capacitor, capacitor-start
   C. three-phase, split-phase, shaded-pole, capacitor-start
   D. shaded-pole, split-phase, capacitor-start, three-phase

7. What determines the rotation of a shaded-pole motor?

   A. location of windings
   B. location of shaded pole
   C. location of rotor
   D. none of the above

8. What enables a split-phase motor to develop enough torque to begin rotation?

   A. the start winding being out of phase with the run winding
   B. the start winding being in phase with the run winding
   C. the start winding being out of phase with the common winding
   D. none of these

9. What removes the start winding from the electrical circuit of an open-type split-phase motor once it reaches 75% of its operating speed?

   A. disconnect switch
   B. phase-out switch
   C. centrifugal switch
   D. starting switch

10. What is the purpose of a run capacitor?

    A. increases the life of the motor
    B. increases the running efficiency
    C. increases the motor speed
    D. both a and b

11. How are a PSC motor and a capacitor-start-capacitor-run motor similar?

    A. both use a starting capacitor
    B. both use a run capacitor
    C. both use starting relays
    D. none of the above

12. Which of the following is the capacitance of two 10 µF running capacitors connected in parallel?

    A. 10 µF
    B. 20 µF
    C. 30 µF
    D. 40 µF

13. Which of the following capacitors could be used to replace a 30 µF, 370 V running capacitor?

    A. 30 µF, 330 V
    B. 35 µF, 390 V
    C. 30 µF, 440 V
    D. 40 µF, 370 V

SAFETY TIP!

Wear goggles and gloves when transferring refrigerant from a cylinder to a system or when recovering refrigerant from a system. Do not recover refrigerant into a disposable cylinder. Use only tanks or cylinders approved by the Department of Transportation (DOT).

Answer to Test Your Knowledge
1.a 2.b 3.attract, repel 4.d 5.b 6.d 7.b 8.a 9.c 10.b 11.b 12.b 13.c

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METROPOLITAN NEW YORK CHAPTER, RSES

For Information Call: Stan Hollander, CMS (718) 232-6679

We are planning to begin our 2012 school program in January. We will be offering the Technical Training Institute Program #1 and #2 again, plus we are introducing #3 for the more advanced technicians, and those who successfully completed #2 last year. Application and information is on our website, and will be in next month's Newsletter.

Wednesday October 12th, 2011 at 7:30pm

at

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21-01 24th Avenue, Astoria NY 11102

System Troubleshooting – A "Systematic" Approach

by

Rick Rasch, Tecumseh Products

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EDUCATIONAL PROGRAM
Wednesday October 12th, 2011
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The HVACR Training Authority
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