Hoffman Controls

Installation & Operating Instructions

870-10D Head Pressure Control
ECM / PSC Fan Cycle Switch

General

CAUTION

Failure to read and understand the accompanying instructions and diagrams or failure to complete the "Checkout Procedure" prior to energizing the Control may result in permanent damage to the Control.

The 870-10D Fan Cycle Switch requires an external 24V AC power source. The primary of the 24V AC transformer must be wired to the same line voltage phase as the condenser fan motor.

HCC recommends use of the **Adjustable Sensor Simulator**, Part Number 510-0027-000 for installation and troubleshooting.

Pre-Installation Information/ Instructions

1. The 870-10D Condenser Fan Cycle Switch is for use with Single Phase, direct drive, discrete speed Electrically Commutated Motors (ECM), or open frame drip proof, Permanently Split Capacitor (PSC) motors and shaded pole motors.
2. Line Voltage Range: From 115V to, 208-230 VAC.
3. Wiring must comply with Local and National Electrical Codes.
4. One 870-10D Fan Cycle Switch may operate more than one motor.
   a. Maximum running amps under all conditions for multiple motors is not to exceed 10 Amps.
   b. Locked Rotor Amps (LRA) not to exceed 30 Amps for 1 second.
5. Do not mount the Controller in an airtight cabinet/compartment or near/on a heat generating source.

WARNING

Disconnect power from the unit and electrically disable the compressor prior to installation.

Installation

- If mounted outdoors, install the controller in a weatherproof control panel or use HCC's **NEMA 3R Weatherproof Kit (Part Number 545-0202-007). Note:** Controller must be protected from moisture and condensation.

IMPORTANT

Refrigerant charge is critical. Unit must provide 4°F to 6°F liquid line subcooling when ambients are at 95°F. At 60°F ambients subcooling should be about 22°F. At 30°F ambients subcooling should be about 34°F..

- Select the appropriate line voltage wiring diagram for a discrete speed ECM type motor (Figure 2) or PSC type motor with either a single capacitor (Figure 3) or dual capacitor (Figure 4) configuration.
- Insure that all power has been removed from the compressor and the condenser fan motor.
- NOTE: The 870-10D is installed is series with the condenser fan motor.
- Secure the controller via the heat sink mounting tabs

24VAC Transformer Wiring/Phasing (See Figure 2, 3 or 4)

- Note that the 870-10D Fan Cycle Switch requires an external 24VAC power supply.
- Insure that the 24VAC power source is derived from the same phase of line voltage that is supplied to the condenser fan motor. For 24VAC transformer phasing see Figure 2, 3 or 4.
- Connect the 24 VAC transformer's secondary leads to the 870-10D Control's "24 VAC" & adjacent "COM" terminals. The "COM" terminal allows for a grounded 24 VAC, if required.

Motor Line Voltage Wiring (See Figure 2, 3 or 4)

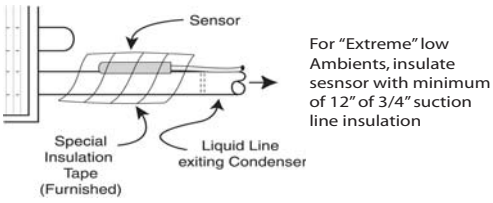
- Disconnect the condenser fan motor's common wire from the contactor's **unpowered** "T1" terminal. Remember which line terminal the common wire was connected to. It will be used below
- Connect the condenser fan motor's common wire to the 870-10D Control's "LOAD" terminal.

Installation Continued

- Connect the condenser fan motor's common wire to the 870-10D Control's "LOAD" terminal.
- Connect a new wire from the **unpowered** contactor terminal, that was previously wired to the condenser motor's common wire, to the 870-10D Control's "LINE" terminal.
- Verify the wire from the contactor's **unpowered** "T2"or Neutral terminal to the condenser motor's run wire (and run capacitor if a PSC motor is being used) is still present.

Liquid Line Sensor (See Figure 1)

- Install Sensor to the top of liquid line where the line exits the condenser coil (see Figure 1).
- Use the special tape provided to secure the sensor to the liquid line. Stretch the tape slightly, as you wrap around the sensor and liquid line. Use all the tape, lapping the sensor. Firm contact is required between the metal tab of the sensor and the liquid line.
- Insert the sensor's connectors into the 870-10D Control's "SENSOR" terminals. See Table 1 for sensor ºF vs Ohms info.
- Additional insulation of the taped sensor and adjacent refrigerant line back to condenser header may be required in extremely cold ambients (+20º F).



Sensor Diagram Figure 1

Temp °F	Sensor (Ohms)	Temp °F	Sensor (Ohms)	Temp °F	Sensor (Ohms)
40.0	26,109	64.0	13,823	88.0	7,685
42.0	24,712	66.0	13,139	90.0	7,332
44.0	23,398	68.0	12,492	92.0	6,997
46.0	22,160	70.0	11,881	94.0	6,679
48.0	20,996	72.0	11,3033	96.0	6,378
50.0	19,899	74.0	10,8509	98.0	6,092
52.0	18,872	76.0	10,2095	100.0	5,820
54.0	17,903	78.0	9,750	102.0	5,561
56.0	16,990	80.0	9,287	104.0	5,316
58.0	16,128	82.0	8,848	106.0	5,094
60.0	15,315	84.0	8,433	108.0	4,873
62.0	14,547	86.0	8,056	110.0	4,662

Temperature to Resistance Table - Key Point Values
Table 1

Checkout Procedure

Step 1

With power disconnected and the control wired:

1. Measure the resistance (ohms) across the **unpowered** contactor's "T2" terminal and the control's "LOAD" terminal using an ohm meter.
2. If you read 1 ohm or less for a 115 VAC operating voltage, or 5 ohms or less for a 208/230 VAC operating voltage, the fan cycle switch is improperly wired.

Note: Control wiring can be tested by shorting the two SENSOR terminals with a pair of needle nose pliers, When shorted the motor should run full speed and will indicate that the wiring is correct.

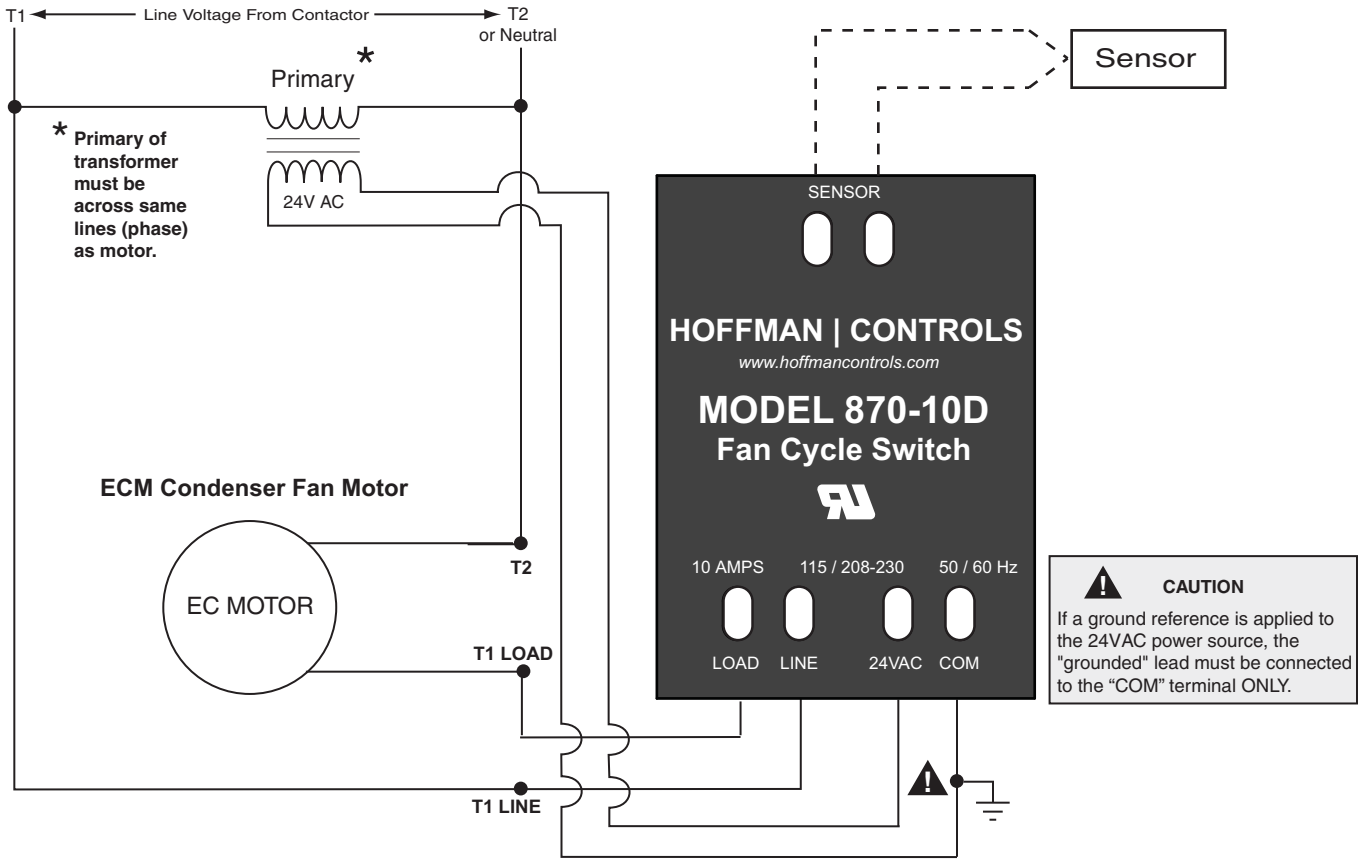
CAUTION

Correct wiring error(s). Do not apply power to the controller if incorrect ohm values were measured during checkout. The load is shorted, applying power will distroy the controller.

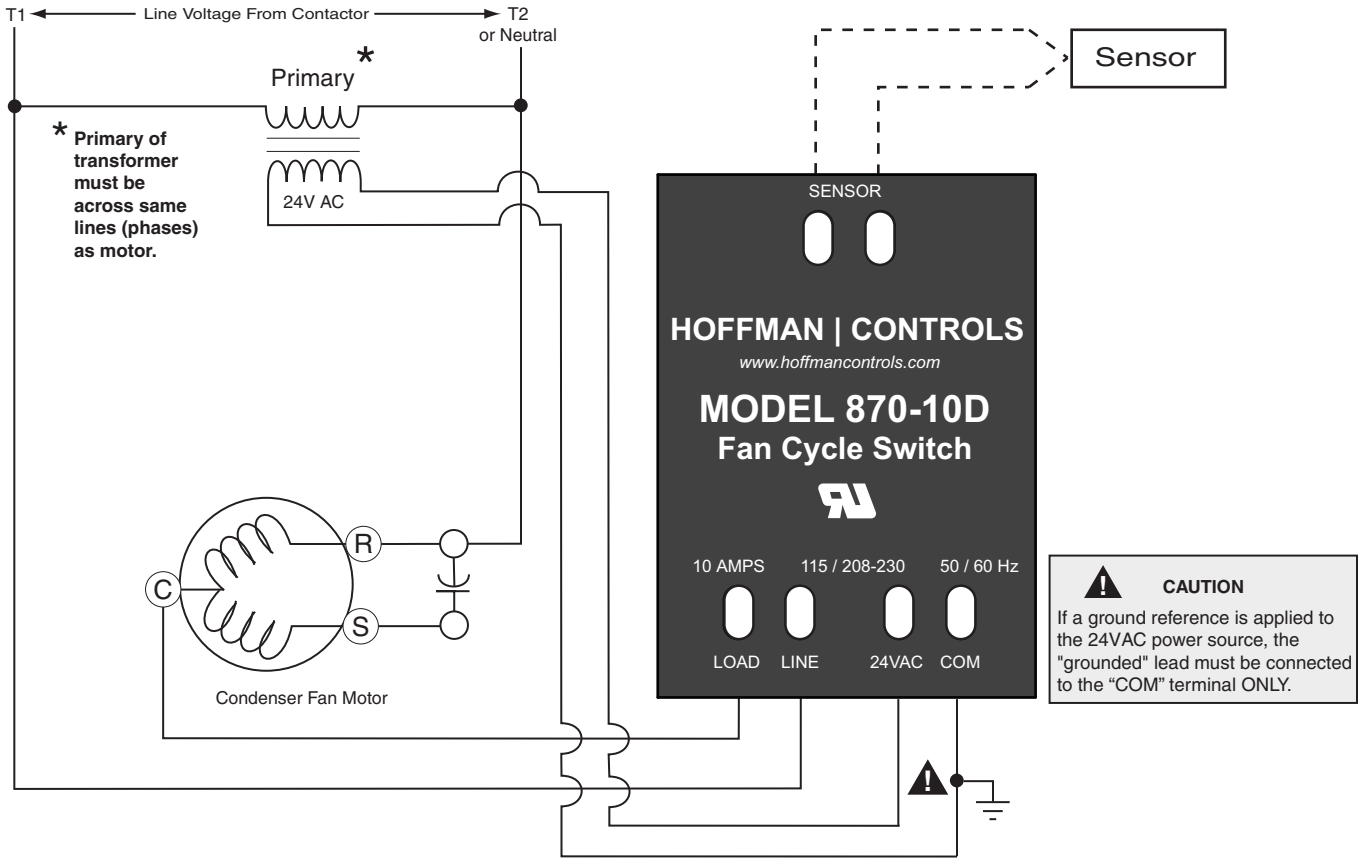
Step 2

Turn the compressor and condenser fan power back on. Set the system for cooling demand. Condenser fan will start if the liquid line is above 78 value required to start

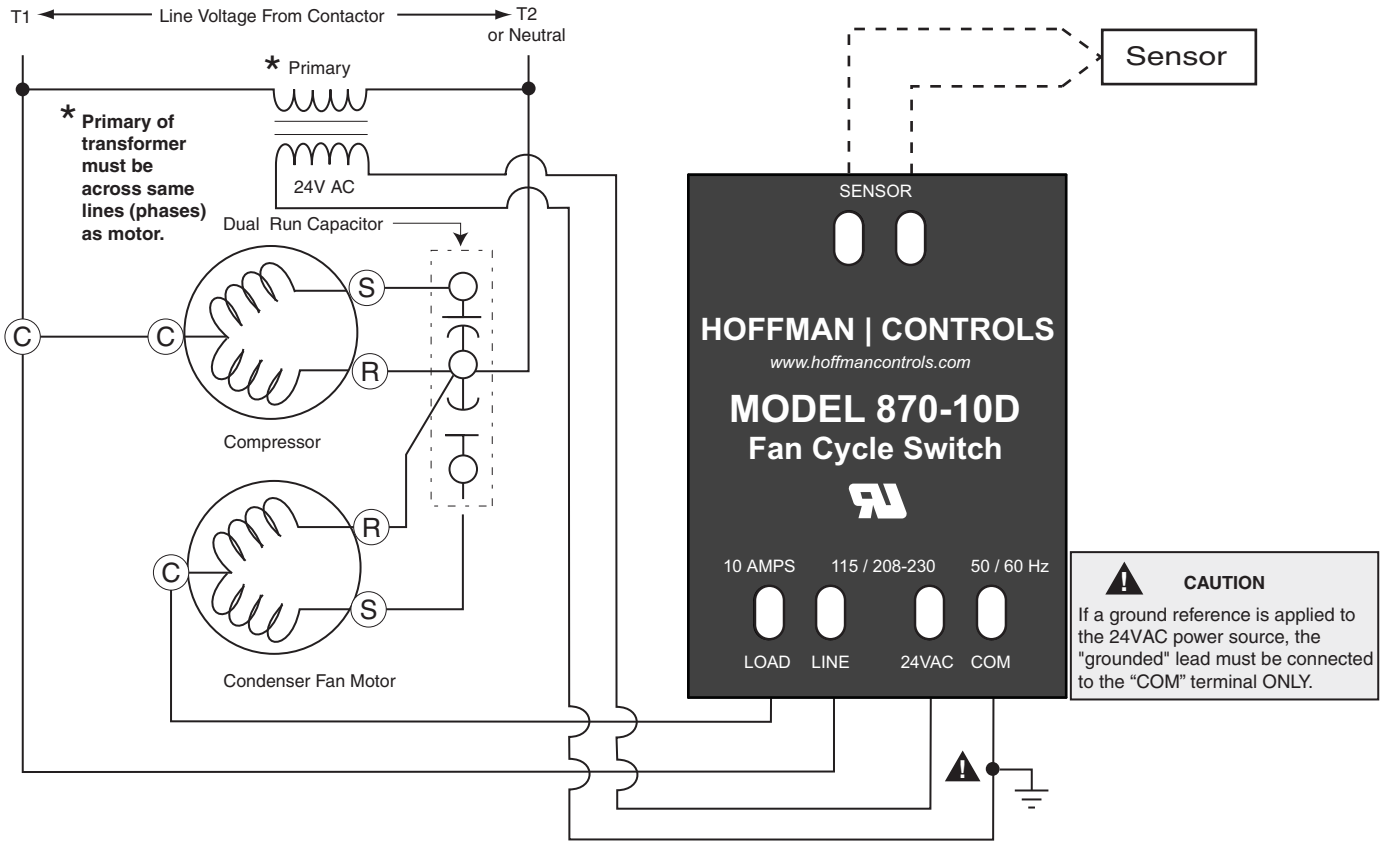
1. Monitor the liquid line's temperature along with the condensor motor's voltage and current.
2. Verify that the condenser motor is operating properly as the liquid line temperature changes.
   a. Below 60 the motor will be off.
   b. Above 78 the motor will run at full speed.
   c. Between 60 and 78 the motor:
      - The motor will be off when the liquid line temperature is rising from 60 to 78 .
      - The motor will be running at full speed when the liquid line is falling from 78 to 60 .



Wiring Diagram for the 870-10D with ECM Fan Motor
Figure 2



Wiring Diagram for the 870-10D with PSC Fan Motor
Figure 3



Wiring Diagram for the 870-10D with Dual Run Capacitor
Figure 4

Troubleshooting Guide

Condition	Cause	Solution
Motor Will Not Run	**1.** Improper installation, Motor not wired correctly. **2.** 24 Vac not in phase with motor line. **3.** Input signal below 60 **4.** Motor “OFF” on internal overload. **5.** Sensor not connected to control.	**1.** Check wiring, review instructions. **2.** Verify 24 VAC phasing is same as motor phase **3.** Normal operation. **4.** Motor protected. **5.** Install/repair input signal wire.
Motor Runs at Full Speed Only	**1.** Motor not wired correctly. **2.** Motor not wired correctly. Control damaged. **3.** sensor temperature at or above 78	**1.** Check wiring, review instructions. **2.** Check wiring. Replace control. **3.** Normal operation.
Motor Overheats	**1.** Motor design not applicable for continuous variable speed regulation. Motor is Totally Enclosed Design.	**1.** Replace motor.
Motor Current not correct	**1.** Fan blade does not load motor at full RPM (speed).	**1.** Compare FLA rating to measured FLA.