Hoffman|Controls

Installation & Operating Instructions

816-10DH Microprocessor Based Electronic Head Pressure Control

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 816-10DH Controller requires an external 24V AC power source. The primary of the 24V AC transformer must be powered by the same phases that supply the motor.

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

Pre-Installation Information/ Instruction

1. For use with Single Phase, direct drive, open frame permanent split capacitor, or shaded pole motors. Motors are to be selected or designed for variable speed drive applications.
2. Line Voltage Range: Available from 115V AC, 208-230V AC, 460V AC, or 600VAC.
3. Wiring must comply with Local and National Electrical Codes.
4. One Controller may control more than one motor.
   a. Max. running amps under all conditions 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 or compartment.
6. ***Application Limitation:*** Speed regulation and performance characteristics will vary with motor design and motor ventilating capability. Motors used should be designed for Phase Proportioning and should be evaluated for suitability and acceptability. TEC (totally enclosed types) are not recommended or not generally suitable.

Installation

- Select the appropriate line voltage wiring diagram for either a single capacitor (figure 3) or dual capacitor (figure 4) configuration.
- Disconnect all factory wiring connecting the motor to the line.
- 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.

WARNING

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

- Setting Minimum Speed Adjust: An adjustment is provided to accommodate the slowest allowable speed for ball bearing or sleeve bearing type motors.

Recommended Minimum Speed

Ball Bearing Motors	200 RPM	9–7 o'clock
Sleeve Bearing Motors	400 RPM	9–11 o'clock

IMPORTANT

- **Do not install the Controller in an airtight compartment, or near heat generating sources.**
- **Do not attempt to set Minimum Speed Adjust to obtain a desired head pressure. This adjustment is only provided to compensate for fan bearing type and must not be used otherwise. Improper operation will result.**
- **Single sensor application must use "S1" & "COM". (Motor will run at full speed if sensor is not connected to "S1" & "COM").**

Heat Pump Mode Jumper

NON-Heat Pump Application

For **NON**-Heat Pump System applications, the jumper tab should be in the **"DA"** position as shown in Figure 1 for proper operation.

NOTE: If the jumper tab is in the "RA" position for NON-Heat Pump applications, the condenser fan motor will operate at full speed and will not modulate.

Heat Pump Application

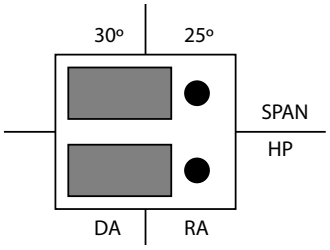
For Heat Pump System applications, the jumper tab location is as follows:

Jumper position "RA" is used when the Heat Pump reversing

(changeover) valve is activated (Heat Mode) by the **absence of 24Vac** at the Heat Pump input terminals of the Control.

Jumper position "DA" is used when the Heat Pump reversing (changeover) valve is activated (Heat Mode) by the **presence of 24Vac** at the Heat Pump input terminals of the Control.

Note: *The Condenser Fan Motor should run at full speed when in the heating mode. The applicable RA or DA method of operation varies by manufacturer and must be verified by the Installer/Service Technician.*



Mode Jumper Diagram Figure 1

816-10DH Span

A selectable span of 25ºF or 30ºF is available. The 25ºF span is recommended for high efficiency units where the 30ºF span is recommended for typical low efficiency units.

Range Adjust Pot

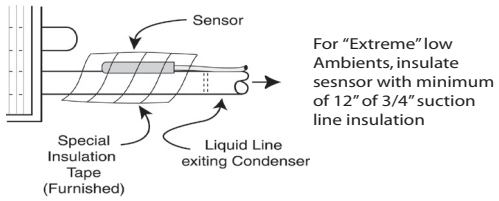
The Range Adjust potentiometer, once selected, provides 50ºF-80ºF up to 70ºF-100ºF for the 30ºF span. The 25ºF span provides for adjustments from 55ºF-80ºF up to 75ºF-100ºF. Markings are in 5ºF increments. Typically TXV devices should be set at full CCW or at the second mark. Orifice or Cap Tube devices should be set at the 4th or full CW markings. These positions should provide adequate control of head pressure for the specific device being used. The lower range adjust positions will allow control to a lower ambient. Conversely, the higher range adjust positions will provide control only to a higher ambient. Factory Range Adjustment is set at 50ºF-80ºF.

CAUTION: It is not recommended that the range adjust be set to satisfy a selected head pressure. These various range adjustments are provided to ensure proper ambient control when the system is properly charged (no vapor in the sight glass), filters and coils are clean, and the air flow of 400 cfm/ton is available for delivery in the HVAC system. In refrigeration application, consult factory or see Engineering Bulletin for "Low Ambient Refrigeration Applications."

Sensor Installation

Liquid Line Sensor

- Install Sensor(s) to the top of liquid line where the line exits the condenser coil (refer to Figure 2). If two compressors (circuits) are used, a second Sensor is required for the second refrigerant circuit. (Part Number 100-0017-001.)
- Use the special tape provided to secure the Sensor to the liquid line. Stretch the tape slightly, as you wrap Sensor around the liquid line. Use all the tape, lapping the Sensor. Firm contact is required between the metal tab of the Sensor and the liquid line. When using one sensor, always use the S1 terminal.
- Connect the Sensor(s) to the Sensor input terminals.
- 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 2

Checkout Procedure

Step 1

With power disconnected and the Controller wired:

1. Measure the ohms across the MOTOR terminals "#1" and "#2" using an ohm meter.
2. If you read 1 ohm or less (115V AC operating voltage), or 5 ohms or less (208V AC or greater operating voltage), the Controller is improperly wired.

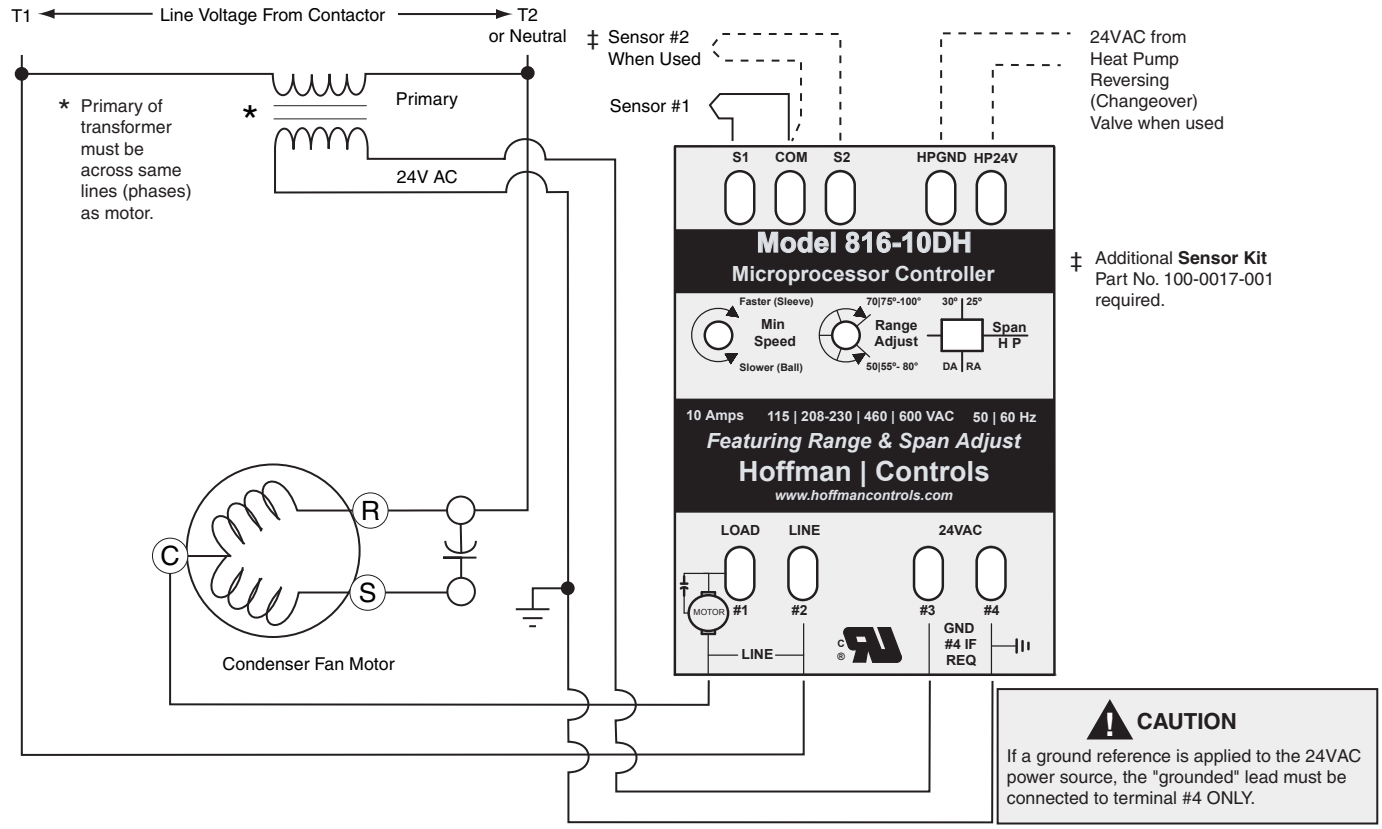
CAUTION

Correct wiring error(s). Do not apply power if incorrect values were measured during checkout. (The load is shorted; applying power will destroy the Controller.)

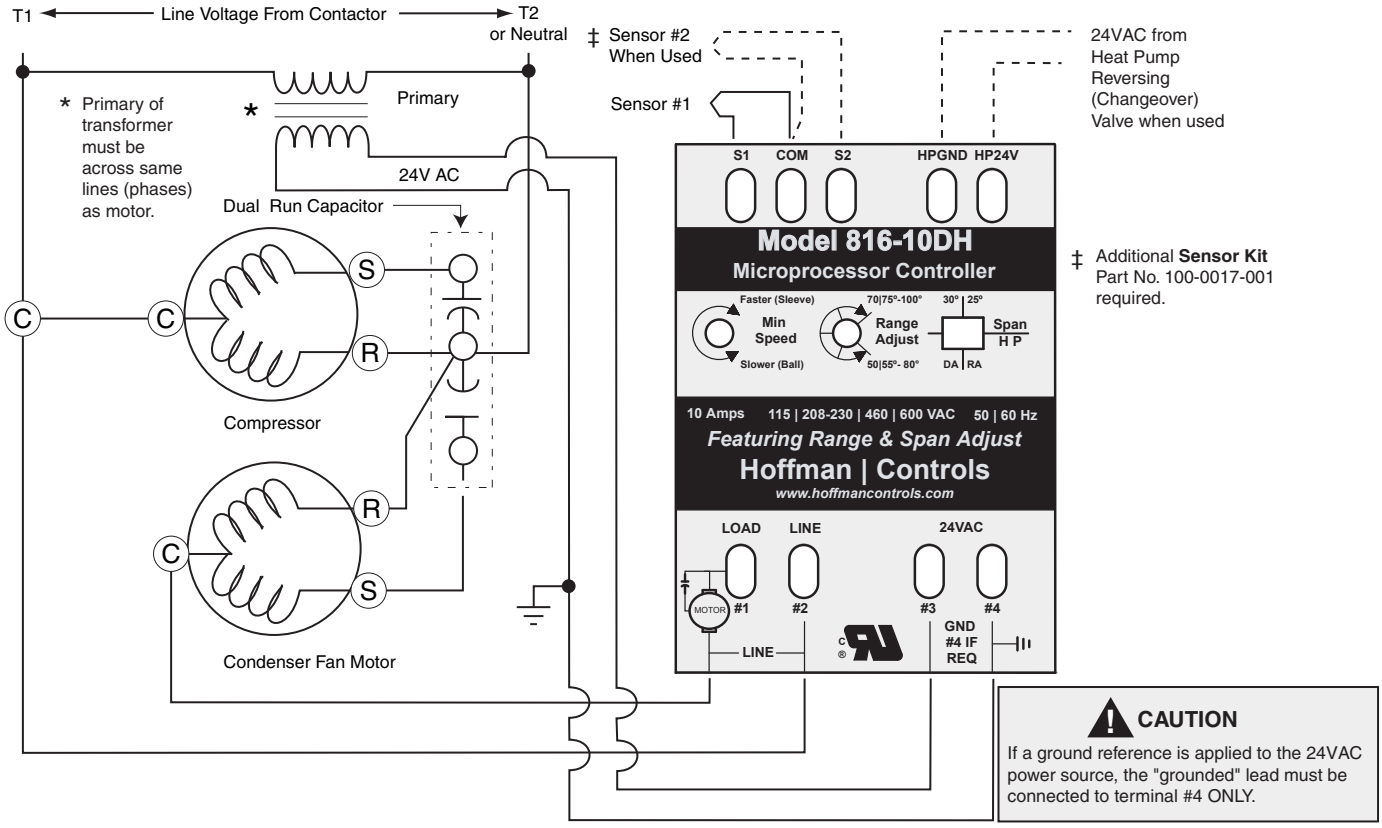
Step 2

With the compressor disabled, set thermostat for cooling demand and apply voltage to the unit. Condenser fan will start if ambient/liquid line is 3º above the lowºF value for the span and range selected.

1. Monitor liquid line temperature (°F) and condenser motor voltage and current.
2. Verify that the motor is operating properly for temperature sensed. Depending on the Range Adjust position, when the sensor temperature at "start up" is:
   a. **Below Selective Span and Range Minimum,** depending on where the range adjust is set, the motor(s) will not start.
   b. **Within Selective Span and Range,** the motor(s) will start at full speed for a few seconds and immediately modulate to a reduced speed proportional to the temperature sensed when the temperature is 3ºF above the low end of the range adjust.
   c. **Above Selective Span and Range,** The motor(s) will start and remain at full speed when temperatures are above the high end of the range adjust.



Wiring Diagram for the 816-10DH
Figure 3



Wiring Diagram for the 816-10DH
Figure 4

d. Simple Tests:

1. If Sensor 1 is not connected, motor runs at full speed.

2. With Sensor 1 connected, force motor to minimum speed by shorting "S1" to "HP GND" for 6 seconds and then removing the short.

3. To return motor to full speed mode again, short "S1" to "HP GND" for 6 seconds and remove the short.

Important: Always use Sensor 1 input.

Step 3

Making unit ready for normal operation.

1. Disconnect power to the unit & reconnect the disabled compressor.
2. Reconnect power to the unit & observe operation.
3. Verify operation as described above by monitoring liquid line temperature and observing motor speed.

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

Troubleshooting Guide

Condition	Cause	Solution
Motor Will Not Run	**1.** Improper installation, Motor not wired correctly.	**1.** Check wiring, review instructions.
	2. 24 VAC not in phase with motor line.	**2.** Verify 24 VAC supply phasing..
	3. Sensor below 50°F up to 70°F.	**3.** Normal operation.
	4. Motor "OFF" on internal overload.	**4.** Motor protected.
	5. Heat Pump applications; control not providing full speed during defrost cycle.	**5.** Check Heat Pump Mode Jumpers "DA" and "RA".
Motor Runs at Full Speed Only	**1.** Motor not wired correctly.	**1.** Check wiring, review instructions.
	2. Motor not wired correctly. Control damaged.	**2.** Replace control.
	3. Low refrigerant. (Hot gas in liquid line.)	**3.** Charge system.
	4. Sensor opened. (Verify Ohms vs. Temp.)	**4.** Replace Sensor.
	5. Sensor above 80°F up to 100°F.	**5.** Normal operation.
	6. Heat Pump Mode improperly programmed.	**6.** Switch jumper.
Motor Overheats	**1.** Minimum speed set too low.	**1.** Raise Min. RPM speed.
	2. Motor design not applicable for phase proportioning speed regulation.	**2.** Replace motor.
Motor Will Not Modulate Properly	**1.** Sensor not properly located or attached to liquid line.	**1.** Relocate per instructions.
	2. Fan blade does not load motor at full RPM (speed).	**2.** Compare FLA rating to measured FLA.
	3. Sensor Ohms vs. Temperature measured not in compliance with values in Table 1.	**3.** Replace Sensor.
	4. Motor design not applicable for proper phase proportioning speed regulation.	**4.** Replace Motor.
	5. System not properly charged.	**5.** Recharge system. Add or remove refrigerant. (Liquid line must not indicate vapor/gas.)
	6. Expansion valve is not properly metering refrigerant; cap tube or orifice not properly sized for low ambient operation.	**6.** Adjust or replace expansion valve, cap tube or orifice to provide proper control of lowside.
	7. Low evaporation and head pressure.	**7.** Reset Range Adjust up (CW) to provide evaporator temperature above 32°F.