Hoffman|Controls

Installation & Operating Instructions

709D-VmA and 709E-VmA Series Electronic Fan Speed Controllers

Introduction

The 709 Series of Electronic Fan Speed Controllers consists of two models. These 2 models allow for the option of deriving power for the control via an external 24 VAC transformer (provided by customer), or directly from line and phase of the “onboard” PCB mounted transformer. The 709D does not include the 24 VAC transformer. The 709E includes the transformer internally connected to the line voltage.

Each of these models have the option of using a Hoffman Controls Proportional Integration (PI) Interface plug-in PCB assembly. This document contains instructions for establishing the electrical connections for each of the 709 Series controllers' four configurations.

The 709E controller has sufficient VA (power) to drive the optional Proportional Integration (PI) Interface plug in card and one of the the following signal sources; a Hoffman Controls 203-5(24)V Flow Transducer, a 203-6(24)P Pressure Transducer, or a 906VmA Thermostat. IMPORTANT: When using 709D series controllers, select a transformer to meet the requirements of all the components being used.

PI Interface Options

The 709 series of controllers have an available PI Interface option. The PI Interface will allow for two modes of fan speed control in relation to a setpoint.

In the Direct Acting or "DA" mode, the PI Interface does not provide an input to the 709 series control until a control signal has exceeded the setpoint level.

In the Reverse Acting or "RA" mode, The PI interface will continuously provide an input to the 709 series control in an attempt to maintain a control signal at the setpoint level.

Refer to the Hoffman Controls PI Interface Product Data Sheets, PI Interface Installation & Operation Instructions, or Application Notes literature for complete details on the operation of the optional PI Interface board.

Initial Controller Installation

Insure that all power sources have been disconnected.

Remove longer top cover of 709D or E (with B or C suffix) model controller by removing (4) self-tapping screws.

Secure the controller via the heat sink mounting tabs.

Connect the green wire to earth ground.

709D Wiring

Transformer Phasing
The model 709D Series Electronic Fan Speed Control requires an external 24 VAC source. ***This 24 VAC SOURCE MUST BE IN PHASE with the line voltage being supplied to the motor***. Motor line voltage and transformer primary MUST be on the same phase/lines.

Motor Line Voltage Wiring (Figures 1 & 2)
Connect one side of the motor to the "LOAD" terminal on the 709D PCB. Connect the other side of the motor to L1.

Connect L2 or Neutral to the "LINE" terminal on the 709D PCB assembly.

24 Volt Wiring (Figures 1&2)
Connect the primary side of the 24 VAC transformer to the same L1 & L2 or Neutral as the motor.

The primary of this external 24 VAC transformer MUST BE THE SAME PHASE that is supplying power to the motor.

Connect the leads of the 24 VAC transformer secondary to the "24V IN" & adjacent "GND" terminals of the 709 PCB assembly. The GND terminal allows for a grounded secondary of the 24 volt transformer if required. ***Do not share this AC GND with DC signal sources, use a separate wire connection for dc signal ground.***

Control Signals (Figure 1)
The 709D accepts industry standard 2-10 VDC or 4-20 ma input signals. Connect the 2-10 VDC or 4-20 mA control signal and it's GND reference to their respective terminal block locations.

There is a common signal GND shared by both VDC and mA.

PI Interface Option (Figure 2)
IMPORTANT: The PI Interface Option will replace the standard 2-10 VDC and 4-20 mA inputs on the 709D control. When using this option the control signals are connected to their respective terminals on the PI Interface PCB, not the 709 PCB terminals.

709E Wiring

Transformer Phasing
The model 709E Electronic Fan Speed Control contains an internal transformer to provide the required 24 VAC that is "in phase" when the speed control is required to function.

Motor Wiring (Figures 3 & 4)
Connect one side of the motor to the "LOAD" terminal on the 709E PCB. Connect the other side of the motor to L1.

Power Supply (Figures 3 & 4)
Connect L2 or Neutral to the "LINE" terminal on the 709E PCB. Connect L1 to the 120 VAC or 208-240 VAC terminal as is appropriate for the voltage required.

Control Signals (Figure 3)
The 709E accepts industry standard 2-10 VDC or 4-20 mA input signals. Connect the 2-10 VDC or 4-20 mA control signal to their respective terminal block.

There is a common signal GND shared by both VDC and mA.

PI Interface Option (Figure 4)
IMPORTANT: The PI Interface Option will replace the standard 2-10 VDC and 4-20 mA inputs on the 709E control. When using this option the control signals are connected to their respective terminals on the PI interface PCB, not the 709 PCB terminals.

Speed Controls

When shipped from the factory all 709 Series controls are configured to de-energize the motor when the dc input level falls below 2.0 VDC or 4 mA. A maximum speed setting of line voltage less 10% is also configured. Performance may be modified by calibrating the following control potentiometers.

POTENTIOMETER DEFINITIONS

Cal Pot R5
Used to simulate a 2-10 VDC input internally to the 709 Series control. (For mA calibration values, multiply VDC by 2)

Cutoff Pot R11
Used to set a given input level that causes the control to "turn off" the motor when the input signal has dropped below this level.

Maximum Speed Pot R13
Used to adjust the maximum motor speed when the full input signal (10 VDC or 20 mA) level is applied.

Minimum Speed Pot R15
Used to adjust the minimum motor speed when the input signal level of 2 VDC or 4 mA is applied.

Controller Setup

When shipped from the factory all 709 series controls have received the following standard calibration.

- The minimum motor speed setting is adjusted to approximately 400 RPM for a sleeve bearing motor.
- The maximum motor speed setting is adjusted to provide the motor with approximately line voltage minus 10% as full speed.
- The 709 Series control has a "cutoff" set to de-energize the motor when the DC input to the control drops below a 2 volt level.
- Models equipped with a PI Interface have the PI Interface configured for "DA" operation by default.

These setting may be adequate for most installations. If it is determined that a re-calibration is required due to the particulars of the installation, follow all steps of the re-calibration procedure as listed in the "Re-Calibration Procedure" section below.

Test Point (TP1) Measurements
Monitor TP1 of the 709series control with respect to circuit ground using a DVM. The Cal Pot voltage used during calibration (to simulate a 2-10 VDC input) is monitored here.

Motor Volts Measurements
It is preferable to calibrate the control while monitoring voltage present across the motor windings.

Re-Calibration Procedure

Initial Potentiometer Settings
- Cutoff Pot at full ccw (minimum) position.
- Cal Pot at full ccw (minimum) position.
- Minimum Speed Pot at approximately center position.
- Maximum Speed Pot at approximately center position.

Note: If PI is installed, ensure mode select is in “RA” position with the set point pot adjusted to full ccw position.

CALIBRATION PROCEDURE

1. Disconnect 2-10 VDC or 4-20 mA input from 709 controller.
2. Power up motor & 709 controller.
3. Adjust Cal Pot R5 (cw rotation) until 10.0 VDC is read on TP1.
4. Adjust the Maximum Speed Pot R13 (cw or ccw as required) to achieve desired maximum motor voltage and RPM.
   a) HCC recommends that a maximum motor voltage setting equal to line voltage minus 10% be used to obtain the most linear response for use of the full rpm requirement.
   For a 120 VAC motor adjust for 108 VAC across motor.
   For a 240 VAC motor adjust for 216 VAC across motor.
   b) A correctly calibrated motor will yield the most linear response curve of motor performance.
   c) A motor voltage setting equal to line voltage minus 10 VAC is the maximum level recommended at full speed.
5. Adjust Cal Pot R5 (ccw rotation) until 2.0 VDC is read on TP1. The motor *may* de-energize at this time until your minimum speed has been properly set.
6. Adjust the Minimum Speed Pot R15 (cw or ccw as required) to achieve desired minimum motor voltage and RPM.
   a) HCC recommends not less than 200 rpm for ball bearing, and 400 rpm for sleeve bearing motors.
   b) The Minimum Speed Pot and Maximum Speed Pot will interact with each other, repeat steps 3 through 6 as required.
7. For a continuous flow application, no further adjustment is required. Stop the calibration procedure at this point. Leave the Cal Pot R5 in its current position at 2.0 VDC.
   a) The motor will run at this speed until the external input signal indicates demand, forcing a change in motor speed.
   b) For a switching application that requires the control to cutoff, proceed with calibration steps 8 & 9 below.
8. Adjust cutoff pot R11 (cw rotation) slowly until motor de-energizes.
   a) This sets the point a motor will “turn off” as the input signal decreases to the set point (currently simulated by the Cal Pot setting). The motor will turn ON again at approximately this cutoff level + 0.3 VDC.
   b) The minimum required cutoff input level is 2.0 VDC.
   The maximum available cutoff input level is 6.0 VDC.
9. Adjust Cal Pot R5 back to full ccw position. This will allow the unit to run the fan in a "cutoff" mode which de-energizes the motor when the input signal indicates no demand.

RE-CALIBRATION COMPLETED

Note: Important - verify that PI mode jumper is returned to proper position for your application.

Final Controller Installation

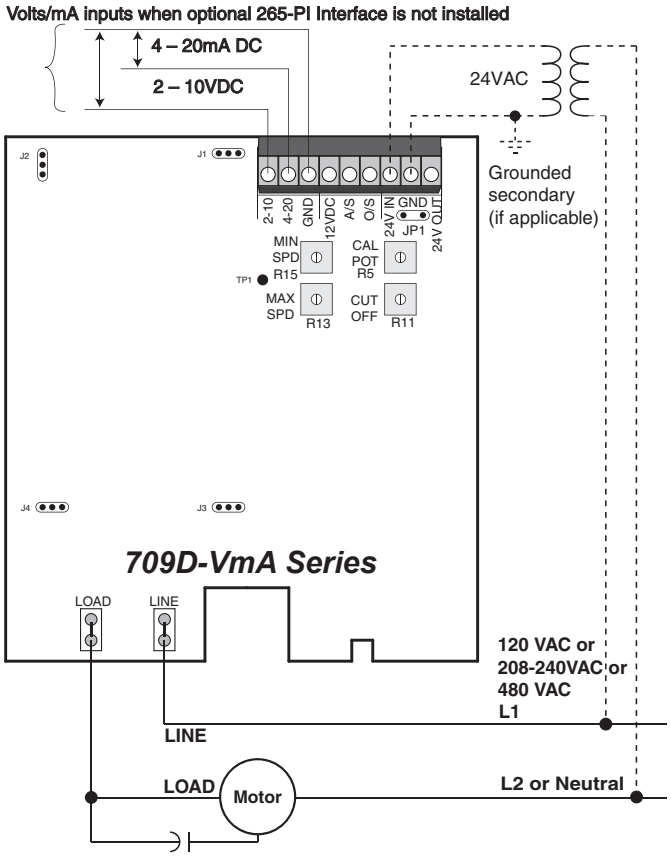
De-energize all system components.

Insure all wiring and connections are in compliance with applicable state and local codes.

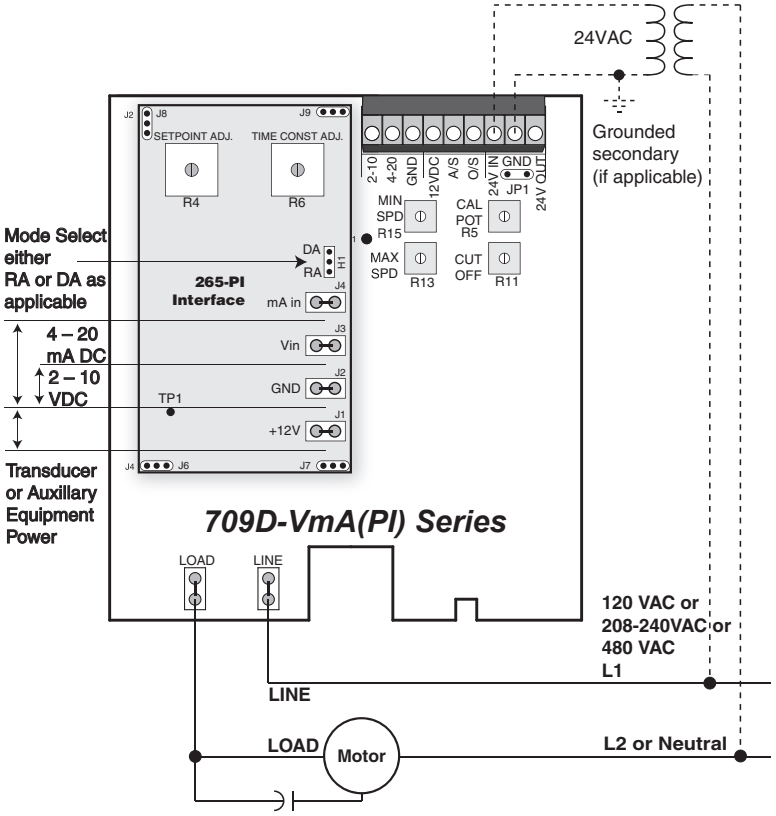
Reconnect the signal inputs to the controller, or the PI interface card, if used.

Re-install long top cover, securing it with (4) self-tapping screws.

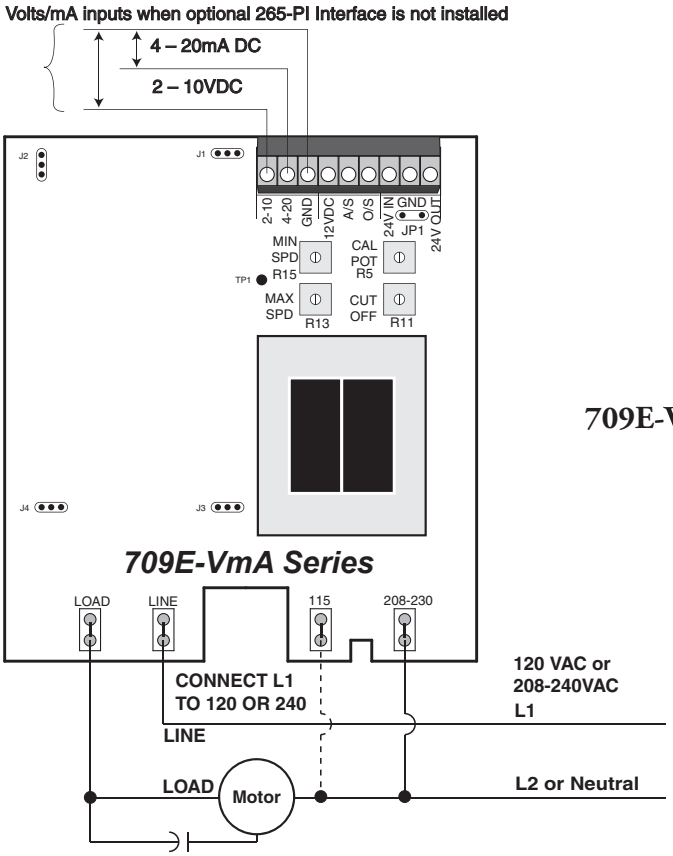
Installation Completed



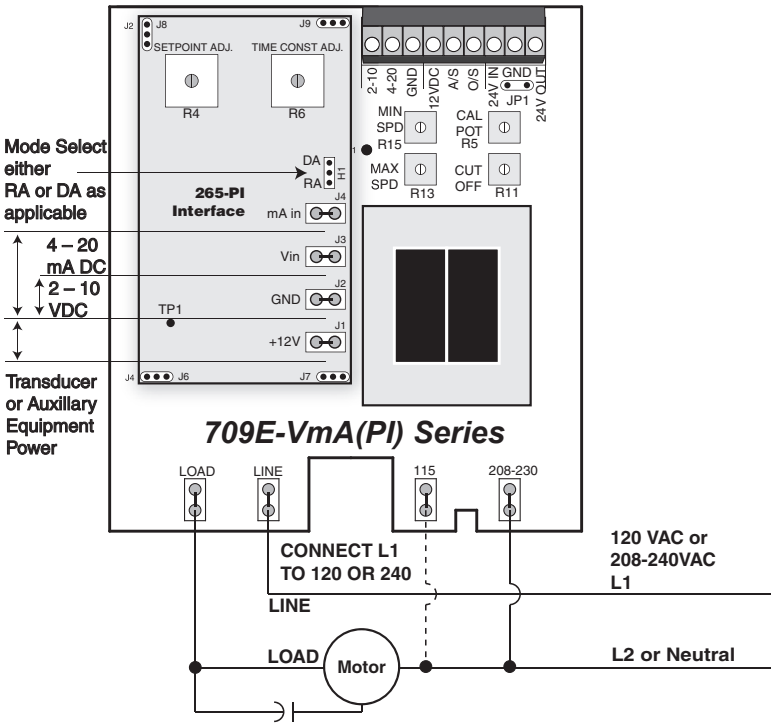
709D-VmA Wiring Diagram
Figure 1



709D-VmA(PI) Wiring Diagram
Figure 2



709E-VmA Wiring Diagram
Figure 3



709E-VmA(PI) Wiring Diagram
Figure 4