Hoffman|Controls

Pressure & Flow Application Notes

709 & 265 PI Interface Module Calibration & Wiring Methods

Introduction

The PI Interface will allow for two modes of fan speed control in relation to its own onboard setpoint.

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

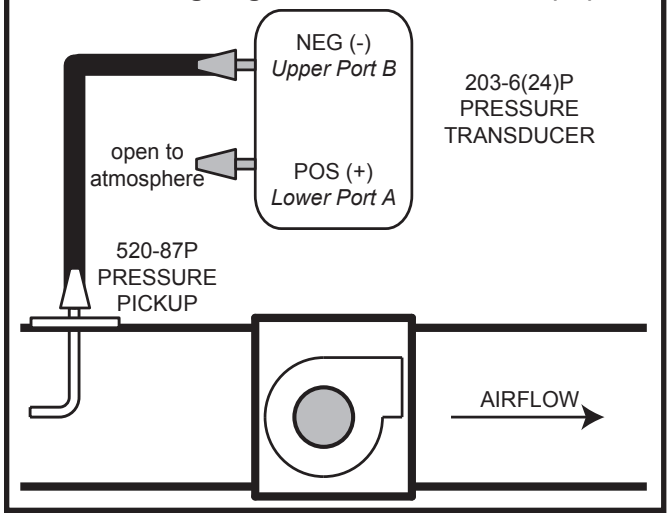
In the Reverse Acting or "RA" mode, The PI interface will continuously provide an input to the 709 series control in an attempt to maintain a control signal at the setpoint level.

The PI Interface Option can allow the 709 Series of controls to maintain a constant positive or negative pressure or a constant flow rate within an air distribution system. When combined with the Hoffman Controls 203-6 (24)P Pressure Transducer or 203-5 (24)V Flow Transducer the 265 PI Interface can maintain setpoint without signal error.

The Hoffman Controls Pressure and Flow Transducers are available in a number of pre-calibrated ranges. Choose only the model whose high range is necessary to match the maximum levels of pressure or flow in your system.

Method 1

Maintaining Negative Pressure W/203-6(24)P



• This pressure control method works from the inlet side of an exhaust fan. The PI Interface will attempt to continuously maintain a minimum negative pressure. As the negative pressure level is reduced, the PI Interface will run the fan at a higher speed in order to maintain proper negative pressure.

•This control method requires that the PI mode jumper is in the “RA” position. Use of the "RA" mode will provide continuous motor operation.

• A Hoffman Controls #520-87P Pressure Pickup should be used in conjunction with the 203-6(24)P Series transducer.

• The transducer and pickup should be as close to the point of manometer measument (inches W.G.) as possible. The DC signal lines from the transducer must be twisted pair.

• Use the (-) port of the pressure transducer to monitor the duct while connecting the (+) port of the transducer to atmosphere.

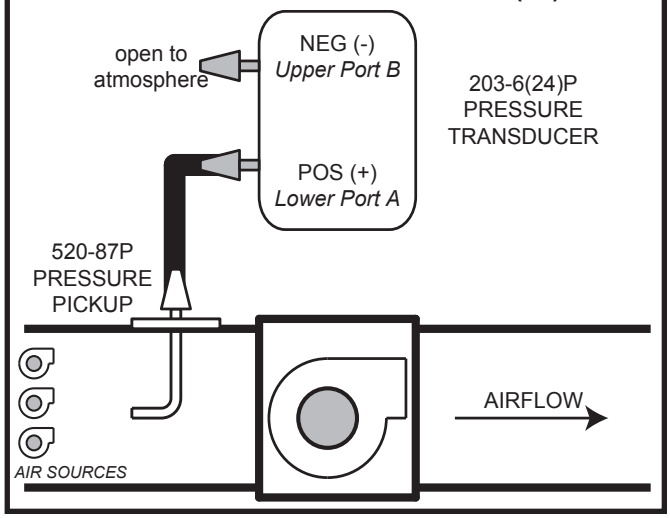
• The PI Interface will drive an increasing control signal into the 709 Series control as long as the transducer value is less than the set point value. When the transducer value exceeds the set point value the PI interface will decrease the level it is driving into the 709 Series control in order to bring the transducer value back to setpoint.

• If the transducer value remains below setpoint level the PI Interface will begin to drive the 709 control higher again in order to bring the transducer value back to setpoint.

• If an oscillation is observed during operation, it may be smoothed out by increasing the "Time Constant" pot of the PI Interface.

Method 2

Positive Pressure Switch W/203-6(24)P



• This pressure control method works from the inlet side of an exhaust fan with other exhaust fans that randomly operate on the inlet side of the primary fan. The PI Interface will switch on the primary fan when the positive pressure builds as a result of input from multiple air sources and the transducer level exceeds PI setpoint. When the fan has reduced the pressure level sensed it will be switched off.

• This control method requires that the PI mode jumper is in the “DA” position. Use of the "DA" mode will provide on / off motor operation of the primary fan.

• A Hoffman Controls #520-87P Pressure Pickup should be used in conjunction with the 203-6(24)P Series transducer.

• The transducer and pickup should be as close to the point of manometer measument (inches W.G.) as possible. The DC signal lines from the transducer must be twisted pair.

• Use the (+) port of the pressure transducer to monitor the duct, while connecting the (-) port of the transducer to atmosphere.

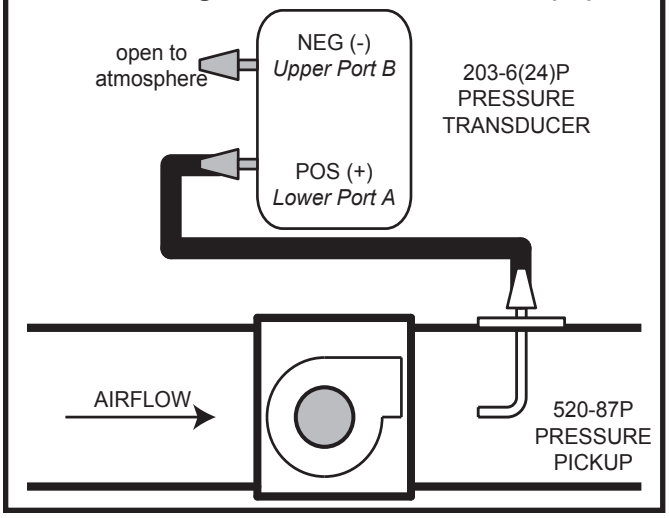
• The PI Interface will not drive a control signal into the 709 Series control as long as the transducer value is less than the set point value. When the transducer value exceeds the set point value the PI interface will begin to drive a steadily increasing input signal level into the 709 Series control.

• This steadily increasing input signal will continue up to full speed until the positive pressure available is exhausted, bringing the transducer signal below set point again.

• If an oscillation is observed during operation, it may be smoothed out by increasing the "Time Constant" pot of the PI Interface.

Method 3

Maintaining Positive Pressure W/203-6(24)P



• This pressure control method works from the discharge side of a fan. The PI Interface will attempt to continuously maintain a minimum positive pressure. As the positive pressure level is reduced, the PI Interface will run the fan at a higher speed in order to maintain proper positive pressure.

•This control method requires that the PI mode jumper is in the “RA” position. Use of the "RA" mode will provide continuous motor operation.

• A Hoffman Controls #520-87P Pressure Pickup should be used in conjunction with the 203-6(24)P Series transducer.

• The transducer and pickup should be as close to the point of manometer measument (inches W.G.) as possible. The DC signal lines from the transducer must be twisted pair.

• Use the (+) port of the pressure transducer to monitor the duct while connecting the (-) port of the transducer to atmosphere.

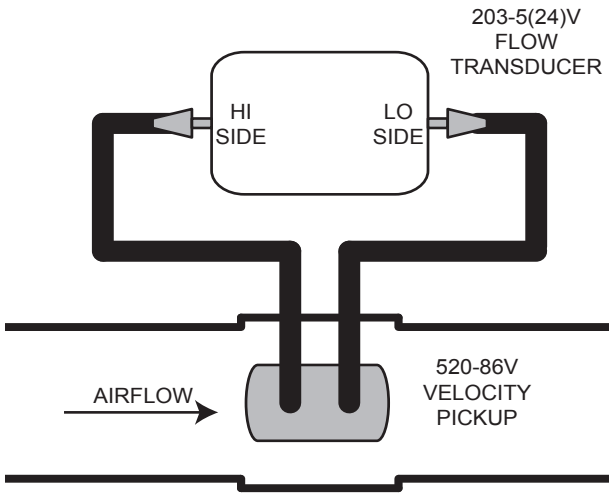
• The PI Interface will drive an increasing control signal into the 709 Series control as long as the transducer value is less than the set point value. When the transducer value exceeds the set point value the PI interface will decrease the level it is driving into the 709 Series control in order to bring the transducer value back to setpoint.

• If the transducer value remains below setpoint level the PI Interface will begin to drive the 709 control higher again in order to bring the transducer value back to setpoint.

• If an oscillation is observed during operation, it may be smoothed out by increasing the "Time Constant" pot of the PI Interface.

Method 4

Flow Control W/203-5(24)V



• This flow control method works from any location within the duct.

•This control method requires that the PI mode jumper is in the “RA” position. Use of the "RA" mode will provide continuous motor operation.

• A Hoffman Controls #520-86V Flow Pickup should be used in conjunction with the 203-5(24)V Series transducer.

• The transducer and pickup should be as close to the point of velometer measument (f.p.m.) as possible. The DC signal lines from the transducer must be twisted pair.

• Connect the upstream port of the 520-86V pickup to the "HI" side of the 203-5(24)V transducer. Connect the downstream port of the 520-86V pickup to the "LO" side of the 203-5(24)V transducer.

• The PI Interface will drive an increasing control signal into the 709 Series control as long as the transducer value is less than the set point value. When the transducer value exceeds the set point value the PI interface will decrease the level it is driving into the 709 Series control in order to reset the transducer value back to setpoint.

• If the transducer value remains below setpoint level the PI Interface will begin to drive the 709 control higher again in order to bring the transducer value back to setpoint.

• If an oscillation is observed during operation, it may be smoothed out by increasing the "Time Constant" pot of the PI Interface.

System Setup Procedures

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% at 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.

NOTE: for continuous operation applications the 709 series control will not de-energize the motor when properly configured.

• These settings should 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 recalibration procedure at the end of this document.

PI Interface Setup

Prior to configuring the PI Interface for operation, insure the system is capable of functioning in it's originally designed parameters. When the desired operating method has been determined follow the procedures below to finalize the installation of the system.

1. Disable the operation of the PI Interface by setting the mode jumper to the “DA” position and turning the “Set Point” pot to it’s fully CW position.

2. Insure all wiring to the 709 Series Control & PI Interface are correct.

3. Apply power to the system.

4. Use the “CAL” pot of the 709 Series control to simulate a signal from the transducer as an input to the PI Interface driving the 709 Series control.

5. Monitor the desired control location of the system with appropriate instrumentation for the desired control value results (flowrate in fpm or pressure in inches W.G.).

6. When the desired point of operation has been achieved make a note of the transducer output at the PI Interface input terminals. This will become the operating set point for the PI Interface.

7. You may also use response curves from your transducer data sheet to determine an approximate value for the operation setpoint.

8. IMPORTANT: Always adjust “CAL” pot of the 709 Series control back to it’s fully “CCW” position.

9. Insure the PI Interface mode ("DA" / "RA") is configured correctly for the desired control method.

10. While monitoring the PI "TP1" voltage, adjust the PI setpoint pot for a DC voltage reading equal to the transducer output or response curve datasheet (step #6 or #7 above).

11. The system setup is complete and should now be operating in the desired method. If an oscillation is observed during operation, it may be smoothed out by increasing the "Time Constant" pot of the PI Interface.

709 Calibration

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 volt input) is monitored here.

Motor Volts Measurements

It is preferable to calibrate the control while monitoring voltage present across the main motor windings.

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.

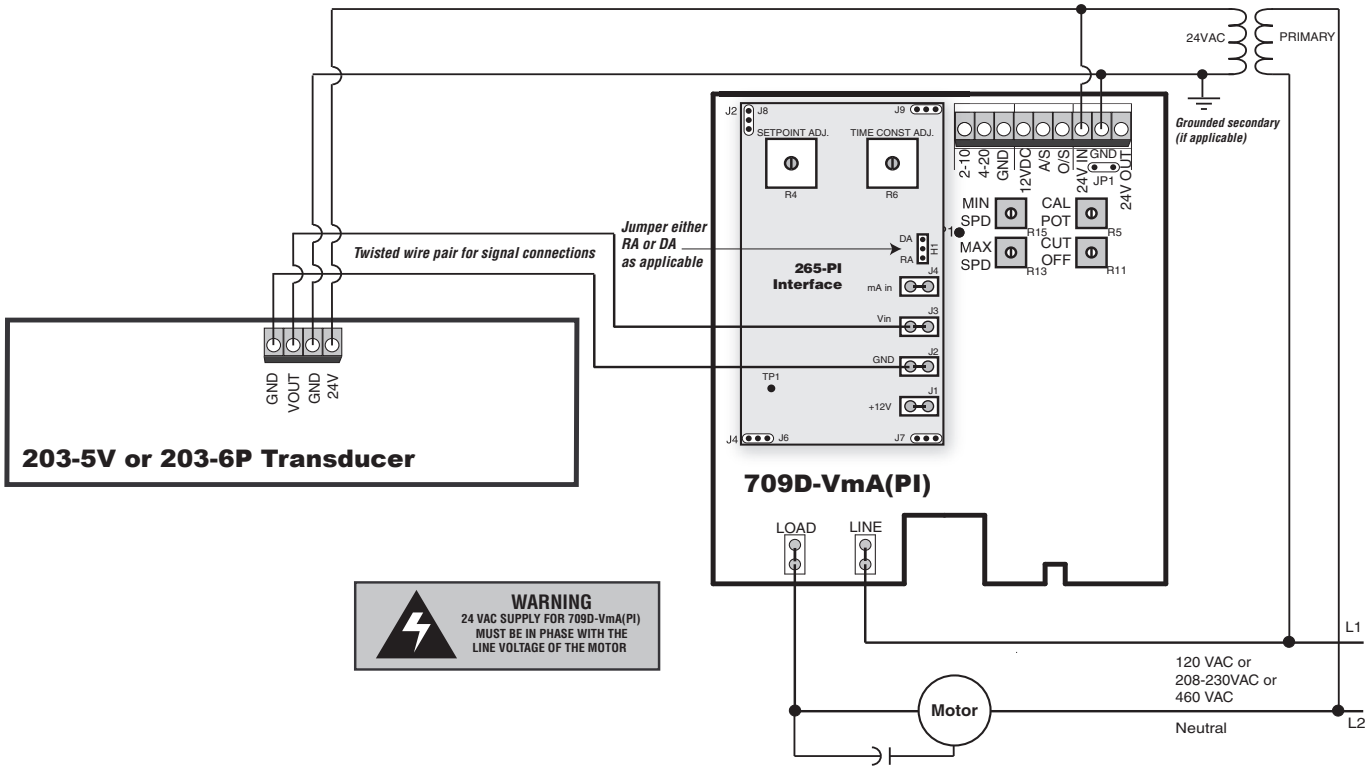
Note: If PI is installed, ensure mode select is in “DA” position with the set point pot adjusted to full CW position

CALIBRATION PROCEDURE

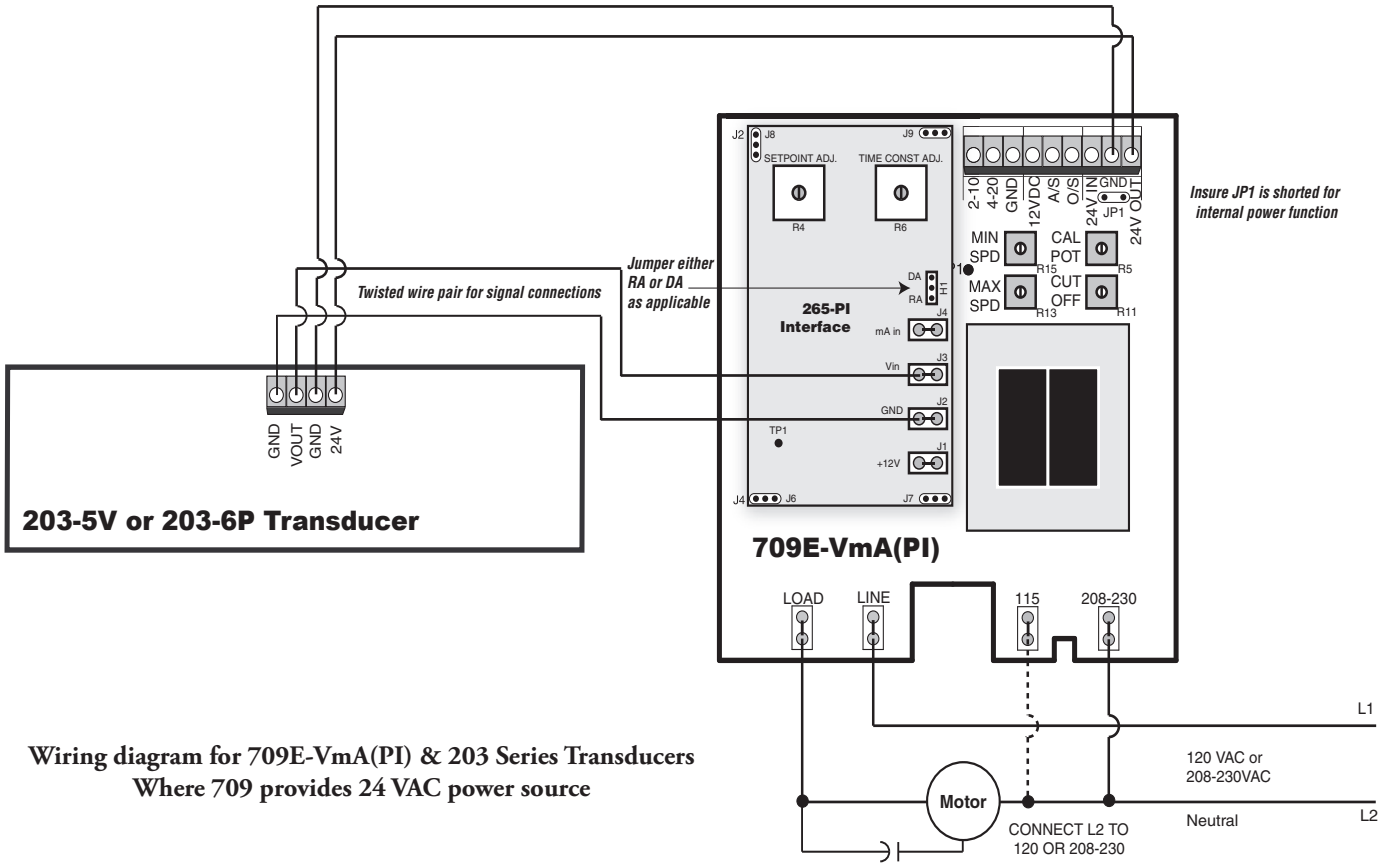
1. Disconnect 2-10 V DC or 4-20 mA input from 709 controller.
2. Power up motor & 709 controller.
3. Adjust Cal Pot R5 (cw rotation) until 10.0 V DC is read on TP1.
4. Adjust the Maximum Speed Pot R13 (cw or ccw as required) to achieve desired maximum motor voltage and RPM.
   a) HCC recommends that 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 V AC motor adjust for 108 V AC across motor.
   For a 240 V AC motor adjust for 216 V AC 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 V AC is the maximum level recommended at full speed.
5. Adjust Cal Pot R5 (ccw rotation) until 2.0 V DC 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 V DC.
   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 V DC.
   b) The minimum required cutoff input level is 2.0 V DC. The maximum available cutoff input level is 6.0 V DC.
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.

CALIBRATION COMPLETED

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



Wiring diagram for 709D-VmA(PI) & 203 Series Transducers
Where external 24 VAC power source is used



Wiring diagram for 709E-VmA(PI) & 203 Series Transducers
Where 709 provides 24 VAC power source

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