P470 Electronic Pressure Control with Display

Product/Technical Bulletin

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The P470 Electronic Pressure Control with Display is a single-stage, On/Off, electronic pressure control with a Single-Pole, Double-Throw (SPDT) output relay. The control may be field set to operate in one of three pressure ranges (0 to 100 psi, 0 to 500 psi, or 50 to 750 psi), as either an open-high or open-low control.

The P470 control features a large LCD that displays the sensed pressure and other system-status indicators, as well as the adjustable setpoints in the programming mode. The P470 control has a lockable, three-button touchpad for adjusting setpoints, and a front-panel LED that indicates the output relay status.

The P470 control uses a P499 Electronic Pressure Transducer in conjunction with a WHA-PDK3 Wiring Harness to sense system pressure. This arrangement virtually eliminates the chance of a refrigerant leak because there are no capillaries or bellows to break or fail.

Figure 1: P470 Pressure Control with Transducer and Wiring Harness (Control, transducer, and harness must be purchased separately.)

Table 1: Features and Benefits

Features	Benefits
Easy to Read Liquid Crystal Display (LCD)	Clearly displays the sensed pressure (and other control information), and in many situations pressure may be monitored without applying gauges to the controlled equipment
Three Field-Selectable Pressure Ranges between 0–750 psi	Provides the flexibility to cover most HVACR pressure applications with three field-selectable pressure ranges; 0–100 psi with 5 psi minimum differential, and 0–500 psi or 50–750 psi with 20 psi minimum differential
24 VAC, and 120 or 208/240 VAC Models	Increases application options, with two controls that cover most common voltages
Lockable, 3-Button, Front-Panel Touchpad	Deters tampering and over adjustment of control settings by unauthorized personnel
Built-in, Adjustable, Anti-Short Cycle Time-Delay	Reduces compressor short cycling and nuisance lockouts, which can extend compressor life
Uses an Economical and Versatile Transducer and Wiring Harness	Eliminates many of the constraints of capillary control applications and allows up to a 100 ft (30.5 m) cable between control and transducer

Application

IMPORTANT: Use this P470 Electronic Pressure Control only as an operating control. Where failure or malfunction of the P470 control could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the P470 control.

IMPORTANT : Utiliser ce P470 Electronic Pressure Control uniquement en tant que dispositif de contrôle de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du P470 control risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du P470 control.

Application Options

The P470 Electronic Pressure Control with Display is designed for On/Off control (direct or pilot duty) of refrigeration and HVAC loads based on system pressure.

The P470 control's overall setpoint range is 0 to 750 psi. The available operating ranges are: 0 to 100 psi, 0 to 500 psi, and 50 to 750 psi, depending on which P499 transducer is wired to the control. See Table 2 for more information.

Note: Each of the P470 control's three field-selectable, operating pressure ranges require a specific P499 transducer to operate properly. See Table 2 for more information.

The P499 transducer may be used with any fluid or vapor that is compatible with 17-4PH stainless steel. This includes all non-corrosive refrigerants and ammonia.

The P470 control may replace a variety of electromechanical pressure controls, and provides a clear LCD display of the controlled equipment pressure. The transducer may be mounted up to 100 ft (30.5 m) away from the control using three-wire shielded cable, providing greater installation versatility, and eliminating many of the constraints of capillary tubes found on electro-mechanical pressure controls.

You may use a maximum of four P470 controls wired to a single P499 transducer. For example, high-pressure control and condenser fan cycling can use a common transducer in conjunction with two P470 Controls to control high-side pressure. The P470 Controls may be connected to a single transducer on the suction manifold to stage four compressors on a refrigeration rack. See Figure 7.

Operation Overview

The P470 control uses a P499 Electronic Pressure Transducer to sense pressure. The control's operating pressure range depends on the transducer model selected and the position of the pressure range jumpers. See *Positioning the Jumpers* and Table 2.

The P499 transducer is mounted to a pressure tap point on the refrigerant system. The transducer generates a 0.5 to 4.5 VDC ratiometric signal that the P470 pressure control converts to a psi value. Refer to the *P499 Electronic Pressure Transducer Product/ Technical Bulletin (LIT-12011190)*.

The sensed psi value is refreshed every two seconds and displayed on the Liquid Crystal Display (LCD), along with other control status information, during normal operation. See Figure 3.

When the pressure at the transducer reaches the cut-in setpoint, the output relay is energized, the front-panel LED lights, the Normally Open (N.O.) contacts close, and the Normally Closed (N.C.) contacts open. When the cutout setpoint is reached, the output relay is de-energized, the LED goes off, and the contacts return to their normal positions.

Dimensions

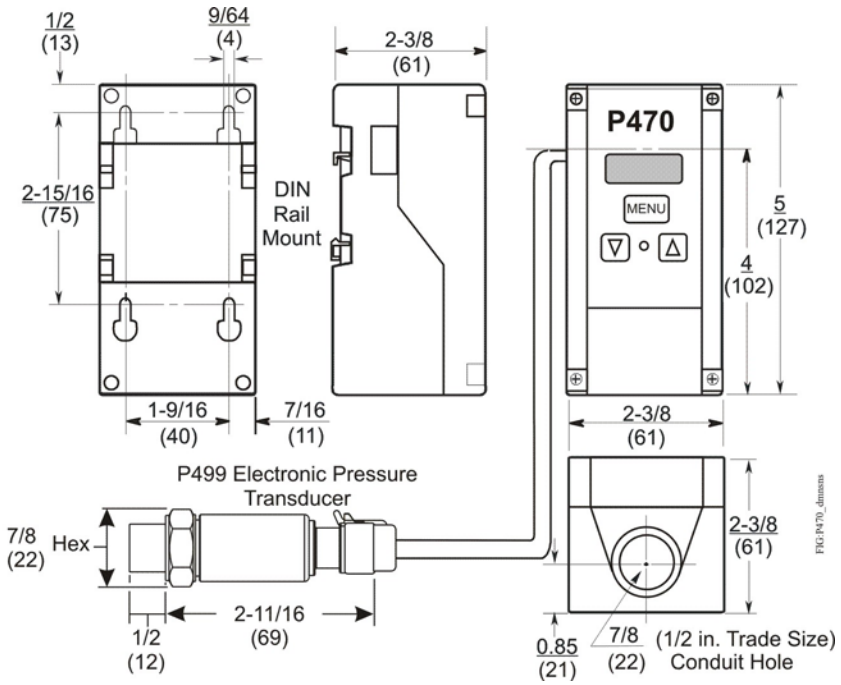

Figure 2: P470 Electronic Pressure Control Dimensions, inches (mm)

Liquid Crystal Display

The P470 control has an LCD that displays the sensed pressure during normal operation. See Figure 3.

The LCD also displays whether the control is operating with the primary or secondary setpoints (**S1** or **S2** is displayed in upper right corner), and indicates if the control is operating as an Open-high (⍋) or Open-low (⍒) control. (See Figure 3.) The LCD also indicates if the control is in Anti-Short Cycle Delay. See *Anti-Short Cycle Delay*.

When adjusting the control, the LCD displays the adjustable setpoints and their values. See Table 3 and the *Adjustments* section for information on display codes and changing the settings. After 30 seconds of inactivity at the touchpad, the control and display return to normal operation. See Figure 3.

P470 Pressure Control Settings

The P470 control allows the user to establish a variety of control settings by positioning jumpers inside the control and using the three-button touchpad to change setpoint values. For specific instructions, see the *Positioning the Jumpers* and *Changing Setpoint Values and Anti-short Cycle Delay Time-Interval* sections.

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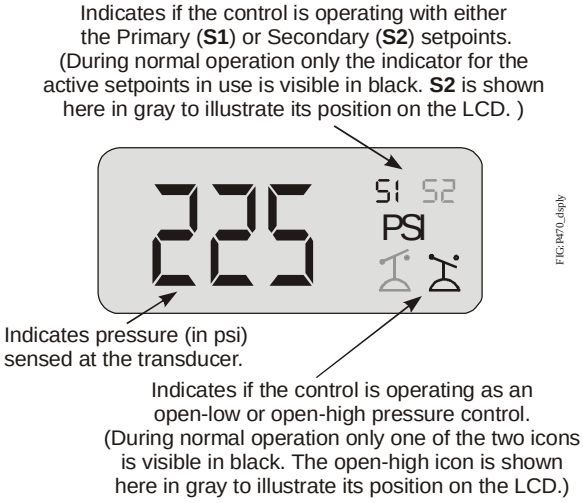

Figure 3: P470 Control Operating Display

Touchpad Adjustable Setpoints

Cut-In

Cut-In establishes the pressure value (in psi) at which the output relay is energized, which closes the N.O. contacts, opens the N.C. contacts, and the LED is on.

Cutout

Cutout establishes the pressure value (in psi) at which the output relay is de-energized, returning the contacts to their normal positions, and the LED is off.

When the cut-in and cutout values are established, the P470 control automatically determines the control operation and displays either an Open-high (⍓) or Open-low (⍔) icon in the lower right of the LCD during normal operation. See Figure 3.

The cut-in (ci1) and cutout (co1) values establish the primary setpoints (**S1**). A secondary set (**S2**) of cut-in (ci2) and cutout (co2) values may be also be set. The **S2** setpoints are enabled by a user-supplied Single-Pole, Single-Throw (SPST) switching device such as a control-clock or temperature control. See *Secondary Cut-in and Cutout Setpoints* for instructions.

Anti-Short Cycle Delay

Anti-Short Cycle Delay establishes the minimum time that the controlled equipment remains off before starting again. The anti-short cycle delay activates when the output relay de-energizes. The delay does not allow the output relay to re-energize until the user-set delay time has elapsed. When the delay is activated, the LCD flashes (alternately) the sensed pressure value and A x, where **x** is the number of minutes of remaining delay time. The anti-short cycle delay may be programmed for 0 to 9 minutes in 1-minute increments.

Note: A 0 indicates that the control is in the final minute of the delay sequence.

Note: Any power interruption to the control also activates the anti-short cycle delay.

Secondary Cut-in and Cutout Setpoints

Secondary Cut-in and Cutout Setpoints establish a second set of cut-in and cutout values, which are enabled when a circuit is closed between the binary input terminals (**SP2** and **COM**) on the upper terminal block (**TB3**). When the secondary setpoints are enabled, **S2** is displayed instead of **S1** in the upper right corner of the LCD. See Figure 3.

Settings Established by Jumper Position

Two of the P470 control settings are established by positioning jumpers inside the control. These parameters are explained in the following section. For instructions on how to position the jumpers, see *Positioning the Jumpers* in the *Adjustments* section.

Pressure Range Jumper

Pressure Range Jumper positions establish the operational pressure range of the P470 control. Each of the three pressure ranges requires a specific P499 transducer with a matching range. See Table 2 for transducer model and pressure range information.

The pressure range jumpers may be positioned to operate the control in a 0–100, 0–500, or 50–750 psi range. See *Positioning the Jumpers* and Table 2.

Touchpad Lock Jumper

Touchpad Lock Jumper position establishes if the front panel may be used to adjust the control or not. Locking out the touchpad helps deter tampering or accidental changes to the established setpoints.

Note: The P470 control settings are non-volatile and remain in the control's memory during power interruptions.

Mounting

Note: When mounting the P470 control to rigid conduit, attach the hub to the conduit before securing the hub to the control enclosure.

The P470 control has a NEMA 1 plastic enclosure with four key-slot mounting holes on the back for surface mounting. The mounting hole pattern on the P470 control is identical to the System 450 modules and many other Johnson Control/PENN controls. The P470 control may also be mounted on 35 mm DIN rail. See the *Dimensions* section. The P470 control is not position sensitive but should be mounted for convenient wiring, setup, and adjustment.

Wiring

WARNING: Risk of Electric Shock.
Disconnect the power supply before making electrical connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

AVERTISSEMENT : Risque de décharge électrique.
Débrancher l'alimentation avant de réaliser tout branchement électrique. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

Observe the following guidelines and refer to the wiring diagrams when wiring the control. See Figure 4, Figure 5, Figure 6, and Figure 7.

- All wiring must conform to the National Electric Code and local regulations.
- Use copper conductors only.
- Input power and output relay terminal blocks (**TB1** and **TB2**) accept a 12 AWG (or smaller) wire. The sensor terminal block (**TB3**) accepts a 16 AWG (or smaller) wire.
- Minimum required wire insulation rating is 90°C.
- Recommended maximum wire length between the control and controlled equipment is 50 ft (15.2 m).
- Recommended maximum cable length between the control and the transducer is 100 ft (30.5 m).

The P470 control uses a P499 transducer to generate the 0.5–4.5 VDC input signal. The transducer is wired to the control at the terminal block (**TB3**) on the upper-left of the circuit board. See Figure 4, Figure 5, Figure 6, and Figure 7 when wiring the transducer to the control. Connect the cable shield to **COM** on the **TB3** terminal block. Do not connect the other end of the cable shield to anything.

Use 22 AWG, three-wire, shielded cable to extend the wiring harness. The recommended maximum length of shielded cable is 100 ft (30.5 m) between the transducer and the control. Refer to the P*499 Electronic Pressure Transducer Product/ Technical Bulletin (LIT-12011190)* for more information about the installing and wiring the pressure transducer.

IMPORTANT: No more than four P470 controls should be wired to a single P499 transducer. Use a three-wire cable that is 15 ft (4.5 m) or less to connect the controls. See Figure 7.

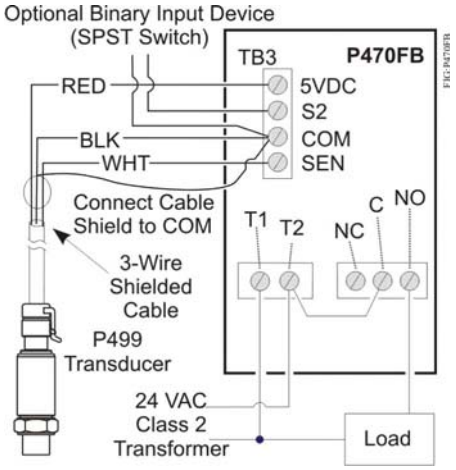

Figure 4: Typical Wiring for 24 VAC Applications of the P470FB-1 Pressure Control

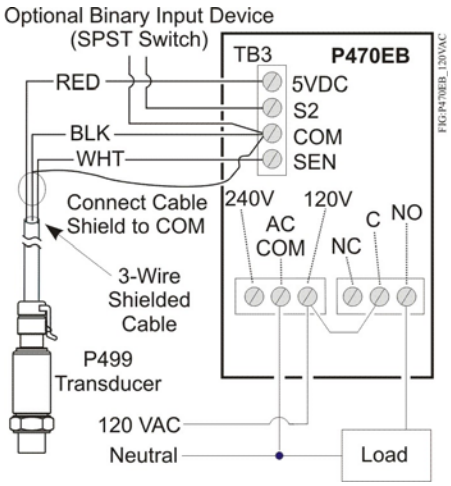

Figure 5: Typical Wiring for 120 VAC Applications of the P470EB-1 Pressure Control

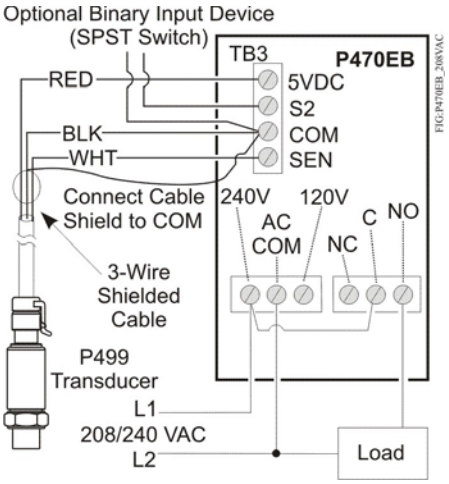

Figure 6: Typical Wiring for 208/240VAC Applications of the P470EB-1 Pressure Control

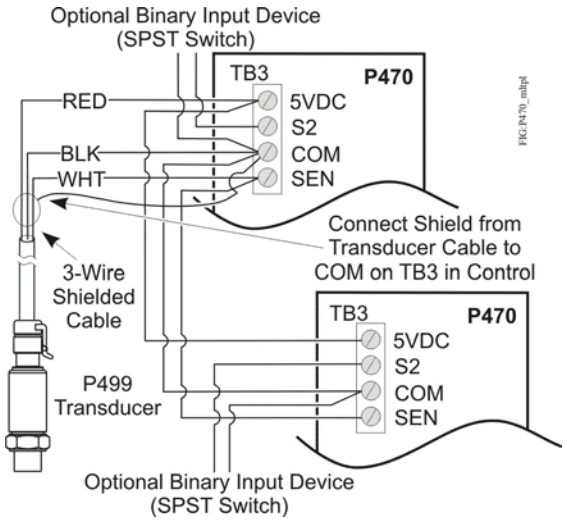

Figure 7: Wire Multiple P470 Controls in Parallel with a Single Transducer

Adjustments

This section provides instructions for setting up and adjusting the P470 control using the internal jumpers and front panel touchpad.

Positioning the Jumpers

The **P5** jumper-pin terminal has a single pair of jumper pins and is used to lock or unlock the touchpad. The **P6** jumper-pin terminal has two pairs of jumper pins and is used to establish the control's operating pressure range.

To position a jumper in the Installed position, place the jumper on both pins. To position a jumper in the Removed position, place the jumper on only one pin. (Save the jumper in case it is required in the future.) See Figure 8.

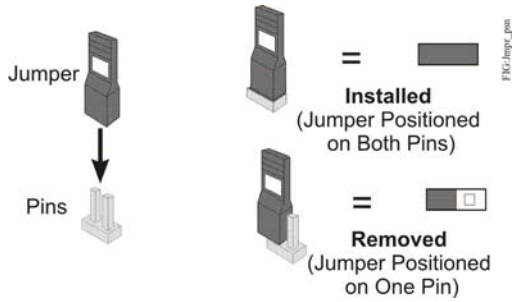

Figure 8: Positioning the Jumpers

Set the jumpers as follows, using Figure 8 and Figure 9 as guides.

1. Disconnect all power sources to the P470 control.
2. Remove the control's cover by loosening the four captive cover screws.
3. Position the jumpers to set the desired operating pressure range and lock or unlock the touchpad.
4. Replace the cover, and restore power to the control.

IMPORTANT: The P470 control's three field-selectable operating pressure ranges require specific P499 transducer models for the control to operate properly. **Do not use a transducer model that is not specified for the P470 control's field-selected operating pressure range.** See Table 2.

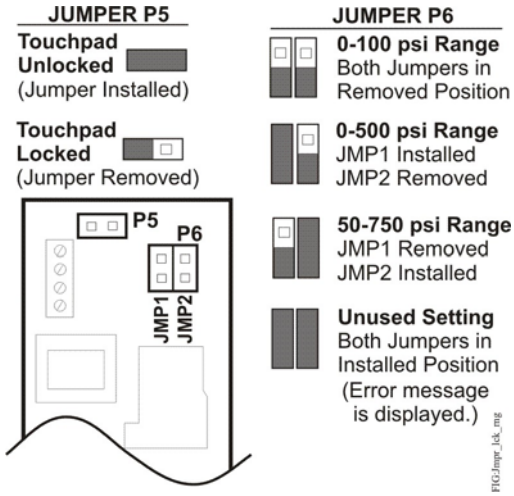

Figure 9: Jumper Positions for Locking Touchpad and Establishing the P470 Control's Operating Pressure Range

Table 2: Specified Transducer Models, Required Jumper Positions with the Resulting Operating Pressure Ranges, and Factory Settings at Startup

Transducer Model Number[1]	Pressure Connection Fitting	Required P6 Jumper Positions	Control's Operating Pressure Range	Factory Set Cut-in[2] (in psi)	Factory Set Cutout[2] (in psi)	Minimum Setpoint Differential	Factory Set Setpoint Differential
P499RAP-101C **P499RAP-101K**	1/8 in. NPT Male	JMP1 Removed JMP2 Removed	0–100 psi	**S1-**40 **S2-**45	**S1-**20 **S2-**25	5 psi	20 psi
P499RCP-101C **P499RCP-101K**	1/4 in. SAE Female (Schrader® Fitting)						
P499RAP-105C **P499RAP-105K**	1/8 in. NPT Male	JMP1 Installed JMP2 Removed	0–500 psi	**S1-**250 **S2-**220	**S1-**190 **S2-**160	20 psi	60 psi
P499RCP-105C **P499RCP-105K**	1/4 in. SAE Female (Schrader Fitting)						
P499RAP-107C **P499RAP-107K**	1/8 in. NPT Male	JMP1 Removed JMP2 Installed	50–750 psi	**S1-**250 **S2-**220	**S1-**190 **S2-**160	20 psi	60 psi
P499RCP-107C **P499RCP-107K**	1/4 in. SAE Female (Schrader Fitting)						

1. C suffix is transducer (only). K suffix is transducer with 2 meter long wiring harness.
2. S1 = Primary Setpoint Value and S2 = Secondary Setpoint Value.

Changing Setpoint Values and Anti-short Cycle Delay Time-Interval

Follow these steps to change the P470 control setpoint values and anti-short cycle delay time-interval:

1. Press the Menu button once and the display changes to a flashing **ci1** (Cut-in Setpoint 1).
   - If you want to change Cut-in Setpoint 1, proceed to Step 3.
   - If you want to change another setpoint value or the anti-short cycle delay time-interval, proceed to Step 2.

   Note: After 30 seconds of inactivity, the control reverts to the operating pressure display.
2. Press the Up button once to go to Cutout Setpoint 1 (**co1**). Press the Up button again to go to Cut-in Setpoint 2 (**ci2**), and again to go to Cutout Setpoint 2 (**co2**), and once more to go to anti-short cycle delay (**ASd**).
   - You may press the Up button again to go back to Cut-in Setpoint 1, or press the Down button (repeatedly) to scroll through the parameters in reverse order.
3. Once the parameter you want to change is flashing on the display, press the Menu button once. The current pressure setpoint value (or delay time-interval) is displayed.
4. Press the Up or Down button to change the setpoint value (or time-interval).
5. Press the Menu button to save the new value. The display then returns to the operating pressure display.

   Note: If the Menu button is not pressed within 30 seconds after changing a setpoint or time-interval value, the control reverts to the previously programmed setpoint or time interval value.

Scrolling through the Adjustable Setpoints

Figure 10 illustrates the order of the adjustable setpoints displayed when scrolling through them using the Up or Down buttons. Press the Up button to scroll through and display the adjustable setpoints in a clockwise direction. Press the Down button to scroll through and display the adjustable setpoints in a counterclockwise direction.

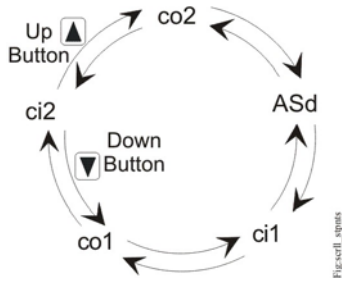

Figure 10: Order of the Adjustable Setpoints and Time Delay Interval

IMPORTANT: Before applying power to the control and controlled equipment, make sure installation, wiring, and control settings are according to the application requirements. Then power the equipment and observe the controlled equipment for at least three complete operating cycles before leaving the installation.

Troubleshooting

WARNING: Risk of Electric Shock.
Do not touch any exposed metal parts with anything other than properly insulated tools or insulated probes of the digital voltage meter. Failure to use properly insulated tools and probes may result in severe personal injury or death.

AVERTISSEMENT : Risque de décharge électrique.
Ne jamais toucher une partie métallique exposée avec tout élément autre que des outils correctement isolés ou les sondes isolées du voltmètre numérique. L'utilisation d'outils et de sondes incorrectement isolés risque de provoquer des blessures graves, voire mortelles.

IMPORTANT: The P470 pressure control and P499 transducer are not field repairable. Perform the following procedures, in the order they are presented, to determine the problem. If the problem is with the control or transducer, contact a Johnson Controls/PENN sales representative for a replacement.

Determine what the proper supply voltage is for the control you are troubleshooting. See Figure 4, Figure 5, and Figure 6 for the wiring diagram and terminal designations for the control.

See Figure 3 and Table 3 for more information about displayed codes (error codes) that appear on the LCD.

On dual control applications, disconnect one control and check each control as a single control application using the following procedures. See Figure 7.

Equipment Needed

- An accurate and reliable pressure gauge connected near the transducer.
- A reliable and accurate Digital Voltmeter (DVM) capable of measuring AC voltage and DC voltages down to ± 0.1 VDC in the 0–10 VDC range.

IMPORTANT: The control and the controlled equipment must be powered and operating at a stable pressure to perform many of the following procedures.

1. Check for proper supply voltage to the control.
   a. Before powering control and equipment, check that all of the wiring is correct and all of the connections are tight.
   b. Apply power to the control.
   c. With the DVM, check the voltage between the control's supply power terminals: **T1** and **T2** for the low-voltage model, and **AC COM** and **120V** or **240V** for the line voltage model.
      - For low-voltage controls powered by a 24 VAC Class 2 transformer, select AC volts on the DVM. The supply voltage must be between 20–30 VAC.
      - For line-voltage controls, select AC volts on the DVM. The supply voltage must be between 102–132 VAC for controls powered at the **120V** and **COM** terminals, and between 177–264 VAC for controls powered at the **240V** and **COM** terminals.
   d. If the voltage reading is within the specified voltage range, proceed to Step 2.
   e. If the DVM reading is **not** within the indicated voltage ranges, replace the 24 VAC Class 2 transformer or check the line voltage power source and provide for proper power to the control.
   f. Recheck for proper supply voltage.
2. Check for proper supply voltage to the pressure transducer.
   a. Select DC volts on the DVM and measure the voltage (**VDC_S**) between **5VDC** and the **COM** terminals on the terminal block on the upper left side of the control.
   b. The voltage must be 5.0 VDC (± 0.2 VDC). If the voltage is in this range, proceed to Step 3.
      - If the voltage is out of this range, power down the controlled equipment and disconnect it from the control. Disconnect the transducer from the control. With the control powered, measure the voltage (**VDC_S**) between the **5VDC** and **COM** terminals on the terminal block on the upper left side of the control.
      - The voltage must be 5.0 VDC (± 0.2 VDC). If the voltage is in this range, replace the transducer. If the voltage is out of range, replace the P470 control.
3. Check pressure transducer for proper output signal voltage.
   a. Measure and record the voltage (**V_O**) between the **SEN** and the **COM** terminals on the control terminal block.
   b. At the same time, observe and record the pressure reading (**psi_T**) on the gauge.

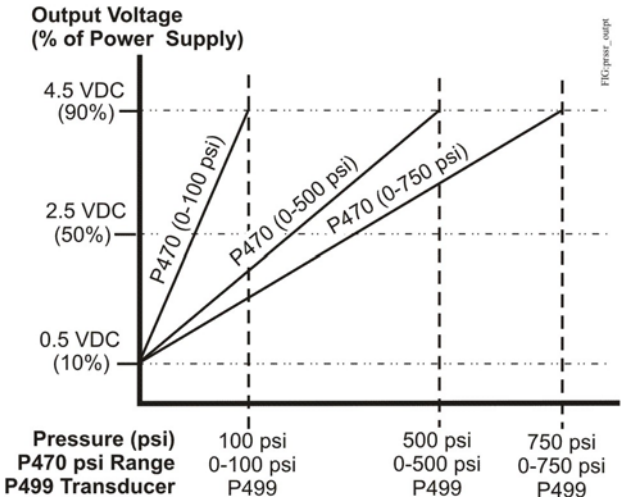

Figure 11: Pressure vs. Output Voltage

   c. The transducer output signal voltage (**V_O**) increases proportionally with an increase in the pressure at the transducer (**psi_T**). Use the graph in Figure 11 to compare the measured signal voltage to the measured pressure or use the formula below to compare the voltage and pressure values.

$$psi_T = \left(V_o - \frac{VDC_S}{10}\right) \times \frac{1.25 \times P_{max}}{VDC_S}$$

Figure 12: Output Signal Voltage

psi_T = Pressure measured at transducer

V_O = Transducer output signal voltage (VDC)

VDC_S = Supply voltage to the transducer (measured in Step 2a).

P_{max} = Transducer pressure range maximum

Example:

The measured pressure at the gauge is approximately 245 psi (psi_T), the measured transducer output voltage is 2.5 VDC (V_O), the measured supply voltage to the transducer is 5.03 VDC (VDC_S), and the transducer's rated range is 0 to 500 psi (P_{max}). Use the formula above to calculate the pressure you would expect from the measured voltage.

$$\left(2.5 - \frac{5.03}{10}\right) \times \frac{1.25 \times 500}{5.03} = 248.1 \text{ psi}$$

Figure 13: Output Signal Voltage Example

Since the measured pressure, psi_T (245 psi), is close to the pressure (248.1 psi) calculated from the measured voltage, the transducer output voltage is considered acceptable.

Note: Depending on the accuracy of the instrumentation used to measure the actual pressure at the transducer (psi_T) and the transducer output voltage (V_O), the actual and calculated pressure may not exactly agree.

4. Check the control for proper operation.

   Perform Steps 1-3 first.

   Note: The pressure range jumpers must be positioned to operate the control in a pressure range that is compatible with the transducer used. See Table 2.

Note: When the LED is lit, the output relay should be energized and the N.O. contacts should be closed.

Note: Use the minimum differential value for the selected operating pressure range. See Table 2.

Note: The following procedures change the cut-in and cutout setpoints and shift the setpoint differential so the displayed pressure is not within the Setpoint Differential range. See Figure 14 and Figure 15.

a. Set the P470 control's anti-short cycle delay to 0 (zero), and make sure that the control is operating on the primary setpoints (**S1**).

b. Disconnect power to the controlled equipment and allow the pressure in the unpowered equipment to stabilize at a pressure of 30 psi or more above the minimum pressure for the selected operating pressure range.

c. Disconnect the wires from the P470 control's output relay, and make sure the control is powered.

d. The pressure displayed on the control should equal the pressure measured at the transducer with a pressure gauge. If the two pressure value differ greatly, check the gauge for accuracy. If the gauge checks out, replace the control and recheck display and measured pressure.

e. (See Figure 14.) **If the control is operating as an open-high control and:**

- **The LED is Off.** Increase cutout setpoint above the displayed pressure by the minimum differential pressure (for the selected operating pressure range) plus 10 psi. Then increase the cut-in setpoint above the displayed pressure by 5 psi. The LED should go On (and the N.O. contacts close).

- **The LED is On.** Decrease cut-in setpoint below the displayed pressure by the minimum differential pressure plus (for the selected operating pressure range) 10 psi. Then decrease the cutout setpoint below displayed pressure by 5 psi. The LED should go Off (and the N.O. contacts open).

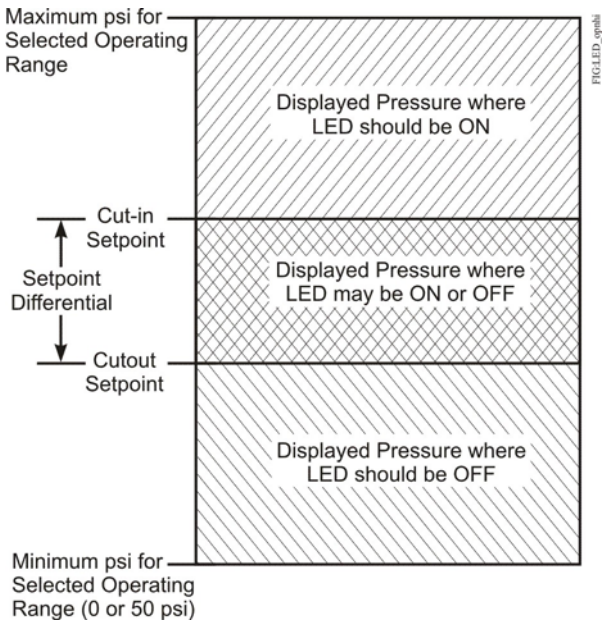

Figure 14: LED Status for Open-High Controls

f. For example, if the control and transducer are setup for a 0–100 psi pressure range with a 40 psi cut-in setpoint and a 50 psi cutout, and the displayed pressure is 47 psi, the LED may be On or Off. Adjust the cutout up to 62 psi (or higher) and the cut-in up to 52 psi (or higher). The LED should be On. Then adjust the cut-in down to 32 psi (or lower) and the cutout down to 42 psi (or lower). The LED should go Off.

g. This procedure, in effect, moves the crosshatched areas shown on the graphs in Figure 14 and Figure 15 above or below the displayed pressure, and forces the LED to go On or Off (and output relay to close or open) and verifies the control is functioning properly. (See Figure 15.) **If the control is operating as an open-low control and:**

- **The LED is Off.** Decrease cutout setpoint below the displayed pressure by the minimum differential pressure (for the selected operating pressure range) plus 10 psi. Then decrease the cut-in setpoint below the displayed pressure by 5 psi. The LED should go On (and the N.O. contacts close).
- **The LED is On.** Increase cut-in setpoint above the displayed pressure by the minimum differential pressure (for the selected operating pressure range) plus 10 psi. Then increase the cutout setpoint above displayed pressure by 5 psi. The LED should go Off (and the N.O. contacts open).

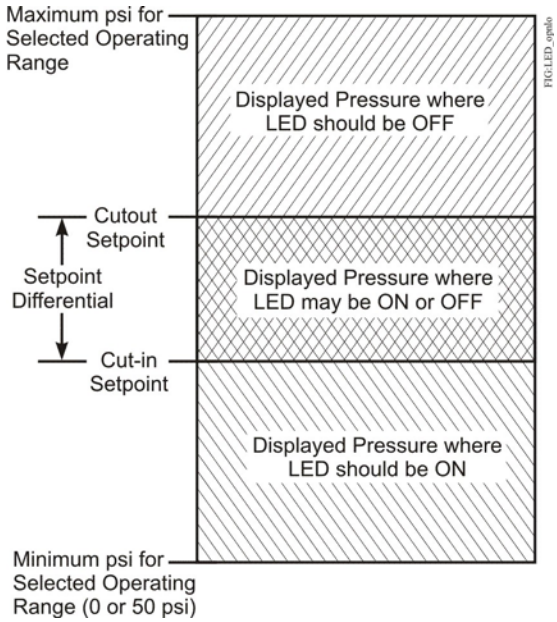

Figure 15: LED Status for Open-low Controls

If the LED does not respond as indicated above, replace the control.

IMPORTANT: The P470 control is not repairable. Do not attempt to repair the control if it is defective or functioning improperly. Contact a Johnson Controls/PENN sales representative to order a new control. See *Ordering Information*.

Table 3: Display Codes and How to Respond to Them

Flashing Display Code	What the Display Codes Indicates, and How to Respond to Them
EE	Indicates the control's operating pressure range has been changed, both P6 jumpers are in the Installed position, or a program failure has occurred. Ensure that the P6 jumpers are positioned for the correct pressure range. (See Table 2.) Press the Menu button twice to reset the control for a new operating pressure range. If **EE** is still displayed, a program failure has occurred and the control must be replaced.
A x	A flashing **A x** alternating with a flashing **XXX *psi*** indicates the control is in an Anti-Short Cycle delay sequence. The **x** in **A x** indicates the minutes of remaining Anti-Short Cycle delay. 0 minutes indicates the control is in the final minute of the delay. **XXX *psi*** indicates the sensed pressure value in this display.
ci1	Indicates that the primary cut-in setpoint may be changed by pressing the Menu button once to display the current **ci1** value (**XXX *psi***). Then press the Up or Down buttons to change the current **ci1** value.
co1	Indicates that the primary cutout setpoint may be changed by pressing the Menu button once to display the current **co1** value **XXX *psi***). Then press the Up or Down buttons to change the current **co1** value.
ci2	Indicates that the secondary cut-in setpoint may be changed by pressing the Menu button once to display the current **ci2** value (**XXX *psi***). Then press the Up or Down buttons to change the current **ci2** value.
co2	Indicates that the secondary cutout setpoint may be changed by pressing the Menu button once to display the current **co2** value (**XXX *psi***). Then press the Up or Down buttons to change the current **co2** value.
ASd	Indicates that the Anti-short Cycle delay may be changed by pressing the Menu button once to display the current Anti-short Cycle delay time in minutes. Then press the Up or Down buttons to change the current Anti-short Cycle delay to any whole-minute value between 0 and 9 minutes.
XXXpsi	Indicates the current pressure setpoint value (in psi) for either **ci1**, **co1**, **ci2**, or **co2**, depending on the previously displayed Display Code. Press the Up or Down buttons to change the setpoint value.
[1]Err	Indicates that an invalid pressure setpoint has been entered, and the resulting setpoint differential is less than the required minimum setpoint differential. Press the Up or Down buttons to create a setpoint differential that is greater than or equal to the required minimum differential for the selected operating pressure range.

1. The *Err* display code does not flash.

Ordering Information

Table 4: Ordering Table for P470 Controls, Transducers and Wiring Harnesses

Item	Product Code	Description
P470 (Low-Voltage) Electronic Pressure Control with Display	P470FB-1C	Low Voltage (<30 VAC) Electronic Pressure Control with Display Supply Voltage: 24 VAC Class 2 Transformer (See *Technical Specifications* for complete Relay Electrical Ratings.)
P470 (Line-Voltage) Electronic Pressure Control with Display	P470EB-1C	Line Voltage Electronic Pressure Control with Display Supply Voltage: 120 or 208/240 VAC (See *Technical Specifications* for complete Relay Electrical Ratings.)
P499 Electronic Pressure Transducers[1]	P499RAP-101C P499RAP-101K	0 to 100 psi Pressure Transducer with 1/8 in. NPT Male Fitting
	P499RCP-101C P499RCP-101K	0 to 100 psi Pressure Transducer with 1/4 in. SAE (Schrader) Female Fitting with integral valve depressor
	P499RAP-105C P499RAP-105K	0 to 500 psi Pressure Transducer with 1/8 in. NPT Male Fitting
	P499RCP-105C P499RCP-105K	0 to 500 psi Pressure Transducer with 1/4 in. SAE (Schrader) Female Fitting with integral valve depressor
	P499RAP-107C P499RAP-107K	0 to 750 psi Pressure Transducer with 1/8 in. NPT Male Fitting
	P499RCP-107C P499RCP-107K	0 to 750 psi Pressure Transducer with 1/4 in. SAE (Schrader) Female Fitting with integral valve depressor
Wiring Harnesses for P499 Transducers	WHA-PKD3-200C	6 ft 6-1/2 in. (2 m) 3-Wire Cable with Plug-in Connector for P499 Transducer
	WHA-PKD3-400C	13 ft 3 in. (4 m) 3-Wire Cable with Plug-in Connector for P499 Transducer
	WHA-PKD3-600C	19 ft 8 in. (6 m) 3-Wire Cable with Plug-in Connector for P499 Transducer

1. **C** suffix is transducer (only). **K** suffix is transducer with 2 meter long wiring harness.

Note: P470 controls do not include a transducer or wiring harness. P499 Transducer and wiring harness must be purchased separately. Transducer must be matched to the selected pressure range. See Table 2.

Repair Information

The P470 pressure control and P499 transducer are not field repairable. Perform the following procedures, in the order they are presented, to determine the problem. If the problem is with the control or transducer, contact a Johnson Controls/PENN sales representative for a replacement.

Technical Specifications

Table 5: Output Relay Contacts Electrical Ratings

	P470EB-1			P470 FB-1
	120 VAC	**208 VAC**	**240 VAC**	**24 VAC**
Horsepower N.O. (N.C.)	1 (1/4)	1 (1/3)	1 (1/2)	100 VA, 30 VAC maximum, Class 2
Full Load Ampere N.O. (N.C.)	16 (5.8)	9.2 (4.0)	8.0 (4.9)	
Locked Rotor Ampere N.O. (N.C.)	96 (34.8)	55.2 (24)	498 (29.4)	
Non-Inductive Ampere N.O. (N.C.)	15 (10)	10 (10)	10 (10)	
Pilot Duty	125 VA (N.O.) at 24–240 VAC 125 VA (N.C.) at 120–240 VAC 50 VA (N.C.) at 24 VAC			

P470 Electronic Pressure Control with Display

Operating Pressure Ranges	0–100 psi	0–500 psi	50–750 psi
Minimum Differential Pressure	5 psi	20 psi	20 psi
Displayed Resolution	1 psi	3 psi	5 psi
Control Accuracy	± 1.5% of selected Operating Pressure Range plus transducer accuracy		
Supply Voltage	**P470FB-1:**24 VAC, 50/60 Hz, Class 2 **P470EB-1:**120 or 208/240 VAC, 50/60 Hz		
Power Consumption	1.8 VA Maximum		
Transducer Type	P499 Electronic Pressure Transducer		
Ambient Temperature at Control	Operating:-30–140°F (-34–60°C) Shipping:-40–185°F (-40–85°C)		
Ambient Humidity at Operating Control	0 to 95% RH noncondensing; Maximum Dew Point: 85°F (29°C)		
Enclosure	Case and Cover: NEMA 1 High-impact Thermoplastic		
Agency Information	UL: File SA516; CCN SDFY Canadian UL: File SA516; CCN SDFY7 FCC/DOC Part 15, Class A		

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, contact Refrigeration Application Engineering at (800) 275-5676. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

United States Emissions Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

Canadian Emissions Compliance

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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