JOHNSON CONTROLS

System 350TM P352PN Electronic Proportional Plus Integral Pressure Controls for PSI Applications

The P352PN Series controls are electronic proportional plus integral or proportional-only pressure controls that generate a 0 to 10 VDC and a 0 to 20 mA analog output signal based on sensed pressure. Three models are available with setpoint ranges of 0-100 psi, 90-250 psi, and 240-600 psi.

The P352PN Series controls have a wide adjustable throttling range (proportional band), as well as three selectable integration constants.

The P352PN Series controls are housed in a NEMA 1 high-impact thermoplastic enclosure. The modular design provides easy, plug-together connections for quick installation and integration with specified power, stage, and display modules.

Figure 1: P352PN Electronic Proportional Plus Integral Pressure Control for PSI Applications

Features and Benefits

❑ **Modular Design**	Provides the flexibility to add a D352 Pressure Display Module, S352 Stage Modules, and a Y350R Power Module
❑ **Plug-together Connectors and 35 mm DIN Rail Mounting**	Eliminates wiring between modules and reduces installation costs
❑ **Three Models Cover Wide Setpoint Ranges: 0-100 psi, 90-250 psi, and 240-600 psi**	Reduces inventory while providing control for most positive-pressure refrigeration and HVAC applications, in three overlapping pressure ranges
❑ **Adjustable Minimum Signal Output**	Allows the user to adjust the minimum output between 0 and 60% of the output signal range
❑ **Wide Adjustable Throttling Ranges: 5 to 50 psi and 10 to 100 psi**	Enables user to match the range of pressure control to specific application requirements
❑ **Reverse or Direct Acting Modes**	Works in a variety of pressure applications
❑ **Three Selectable Integration Constants**	Allows the user to adjust system recovery rate to setpoint pressure at slow, medium, or fast to meet application requirements

Part No. 24-7664-1911, Rev. —
Code No. LIT-930044

Application

A P352PN Series pressure control may be set as a proportional-only control or as a proportional plus integral control, to generate two standard analog output signals (0 to 10 VDC and 4 to 20 mA).

The P352PN controls can be used as stand-alone devices or in conjunction with plug-together power, stage, and display modules.

A typical System 350™ pressure control application includes the following:

- P352PN Pressure Control
- Y350R Power Module (or 24 VAC transformer)
- S352AA-2 Stage Module
- D352AA-2 Digital Pressure Display Module
- P399 Pressure Transducer

Typical P352PN pressure control applications include:

- Condenser fan speed control
- Damper positioning
- Flow valve positioning

Operation Overview

IMPORTANT:	The P352PN controls are intended to control equipment under normal operating conditions. Where failure or malfunction of the P352PN control could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory systems) intended to warn of, or protect against, failure or malfunction of the P352PN control must be incorporated into and maintained as part of the control system.

The P352PN control operates on 24 VAC and provides two analog output signals: 0 to 10 VDC and 0 to 20 mA. A 10-segment front panel LED bar graph indicates percentage of output. Adjustable features include:

- Setpoint
- Minimum output
- Throttling range (proportional band)
- Integration constant
- Reverse acting or direct acting mode of operation

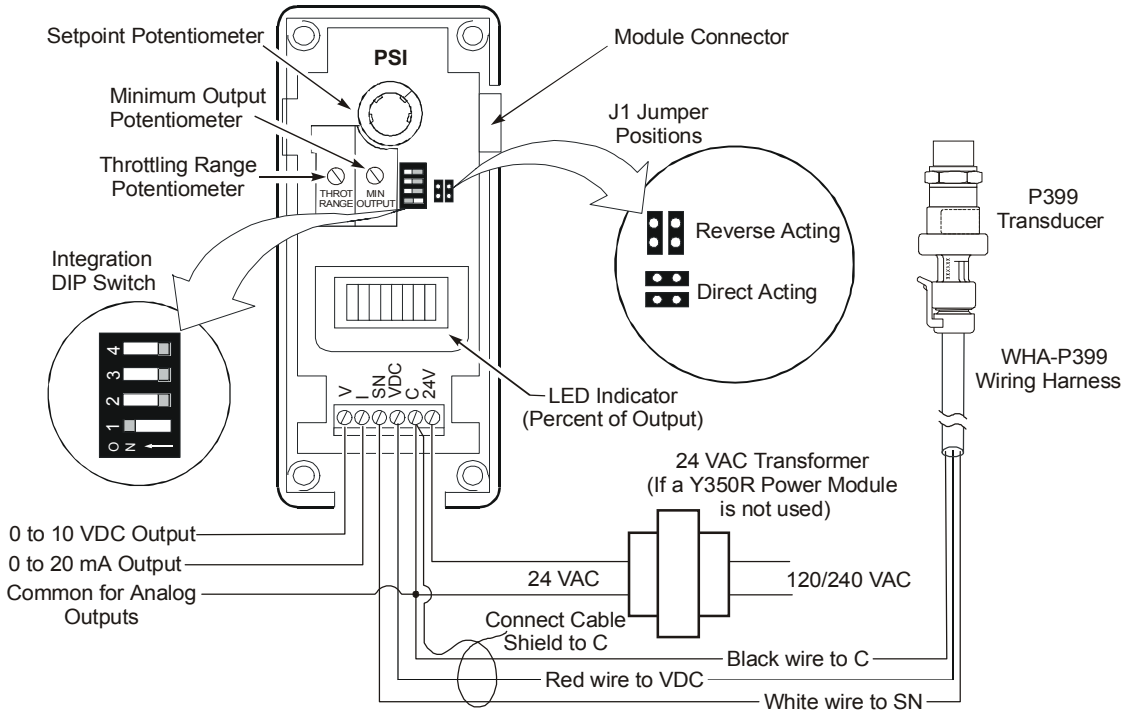

Figure 2: Interior View and Typical Wiring of P352PN Control

Proportional-Only Controls

Proportional-only controls work by continuously adjusting the magnitude of the control's output signal in proportion to the difference (input-error) between the control's setpoint value and the actual value sensed in the controlled system. As load on a system increases, the input-error to the control increases. The control reacts by increasing the magnitude of the output signal, driving the controlled device to respond to the increased load. (See Figure 3.)

The advantages of proportional-only controls are that they are easy to set up and adjust, and they provide good stability and rapid response to changing load conditions.

A disadvantage of proportional-only controls is they can not maintain a system process at the exact control setpoint. A proportional offset (or droop) is always present when there is a steady load on the controlled system. (See Figure 3.)

The result is that a proportional-only control maintains a system process at a control-point instead of the desired setpoint. Control-point is setpoint plus the proportional offset. The greater the load on the system, the greater the proportional offset and the further the control-point is from the system setpoint. A proportional-only control can not adjust the output signal to drive a system process from the control-point to the desired setpoint. (See Figure 3.)

Systems with proportional-only controls and large loads or highly variable load conditions may operate at control-points that vary significantly from the desired setpoint.

Proportional Plus Integral Controls

The P352PN proportional plus integral (PI) pressure control incorporates integral (or reset) control action along with proportional-only control action. The advantage to this is that the PI design effectively eliminates proportional offset, and the PI control can adjust the output signal to not only match a steady load on the system, but also drive the system process towards setpoint. On a properly sized system with steady load conditions, a PI control can maintain the system process very close to the system setpoint. (See Figure 3.)

The speed at which the PI control drives the system process to setpoint (recovery rate) is determined by the system's capacity, the size of the load, and the integration constant set on the PI control.

The integration constant establishes the rate at which the control re-adjusts to the load as it drives the process towards setpoint. The faster the integration constant, the faster the control re-adjusts the magnitude of the output signal, and the faster the recovery rate of a properly sized and setup system.

On traditional PI controls, the rate of re-adjustment can become too large if the process load exceeds the capacity of the equipment. When the controlled equipment is at full capacity and the setpoint still cannot be reached, traditional PI controls continue to readjust the magnitude of the output signal. The result is called *integral windup*.

The P352PN Series proportional plus integral controls avoid *integral windup* with a patented circuit that puts a dynamic ceiling on the integrator, which allows the process to recover from an out-of-range condition without experiencing a long period of overshoot.

It should be noted that PI controls might not be suitable for all applications. Improperly applied PI controls may be unstable and overshoot setpoint.

Also, PI controls require two separate adjustments that are dependent on each other. The system must be properly sized to handle the maximum process load, and close observation is necessary when the PI controls are initially set up and checked out. But on the proper applications PI controls provide superior accuracy and continuous setpoint control.

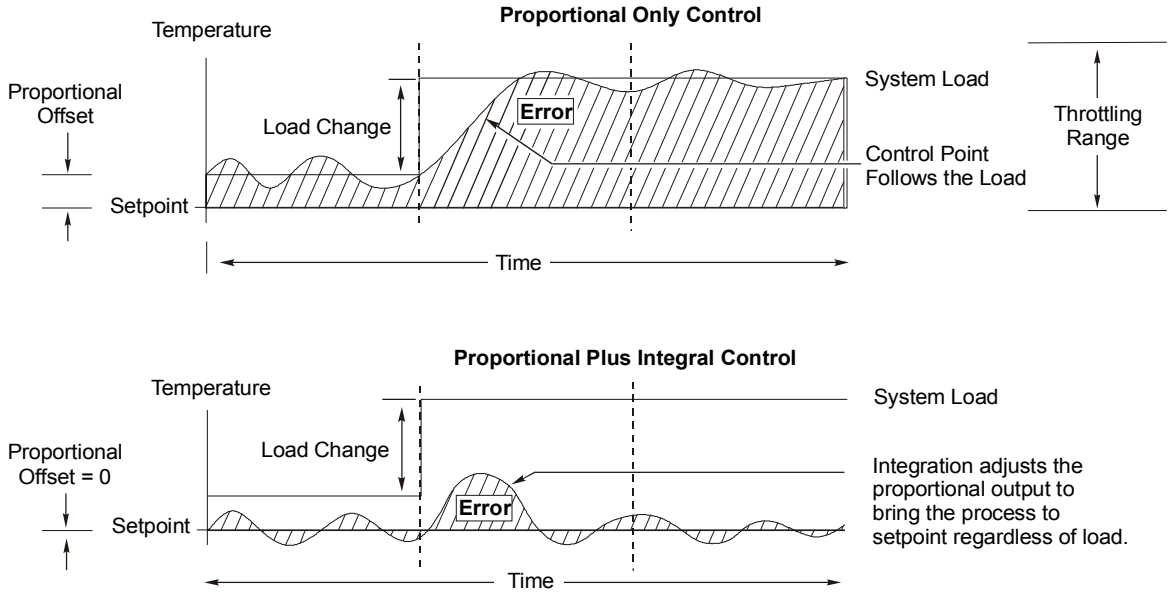

Figure 3: Operation of Proportional Only vs. Proportional Plus Integral Control

Minimum Output Adjustment and LED Bar Graph Output Indicator

The minimum output adjustment sets the minimum signal output (in VDC or mA) that the P352PN control provides to the controlled device. The minimum output can be set between 0 and 60% of the output range (up to 6 VDC or 12 mA).

Example: For a controlled device that responds to a 4 to 20 mA output signal, the minimum output must be 4 mA or 20% of the 0 to 20 mA range. (See Figure 4.)

Adjust the MIN OUTPUT potentiometer located in the center of the circuit board. The LED bar graph will advance one LED segment for each 10% increase in output range. The first segment lights at 10%, the second segment at 20% and so on, until the tenth segment lights at 100%.

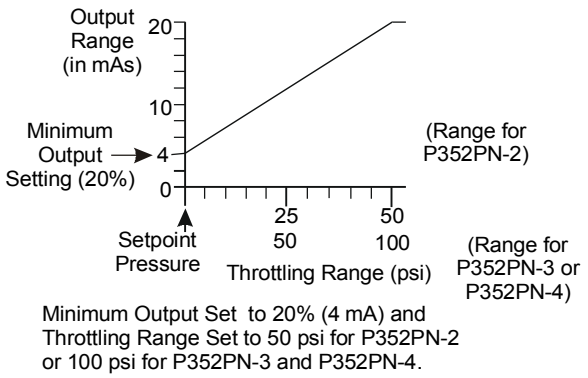

Figure 4: Minimum Output and Throttling Ranges for the P352PN Controls

Throttling Range (Proportional Band)

On controls set for proportional only, the throttling range or proportional band setting establishes how far the system pressure must deviate from the P352PN control setpoint to generate a 100% output signal from the control.

Thus, on a proportional only control with a throttling range setting of 25 psi, the output signal (VDC or mA) is 0% when the system pressure equals the setpoint pressure. The output signal increases to 100% (10 VDC or 20 mA) when the system pressure rises 25 psi above the setpoint in DA mode, or drops 25 psi below the setpoint in RA mode.

When setting up controls for proportional plus integral operation, start with the integration constant OFF (in the proportional only mode), and set the throttling range (or proportional band) to a wide setting (60% or more of the total range) to assure a stable control loop. Then set the integration constant as slow as possible. (Refer to *Integration Constant DIP Switch Settings.*)

Adjust the throttling range by turning the THROT RANGE potentiometer located under the control cover on the center of the circuit board.

The throttling range can be adjusted from 5-50 psi on the P352PN-2 model and 10-100 psi on the P352PN-3 and P352PN-4 models. (See Figures 4 and 5.)

Integration Constant DIP Switch Settings

Depending on the application, the P352PN control can be set to operate as a proportional-only control or as a proportional plus integral control. Refer to sections *Proportional-Only Controls* and *Proportional Plus Integral Controls*.

The control has three different integration constants to choose from, which allow you to setup the control for the optimum recovery rate for your application. Use the Integration DIP switch shown in Figures 2 and 5, and the guidelines below to set the control for proportional-only or set to the integration constant rate for proportional plus integral control.

- **OFF: Switch 1 On and all others Off** provide proportional only operation. In open-loop applications, (without feedback) select proportional-only operation. (See Figure 5.)
- **Slow: Switch 2 On and all others Off** is the slowest integration constant and is suitable for most proportional plus integral applications. **Slow** is the recommended initial setting.
- **Medium: Switch 3 On and all others Off** provides a faster integration constant. If the rate of system recovery to setpoint is sluggish when the control is set to Slow, and the system has enough capacity to drive the process to setpoint at a faster rate, the Medium setting may be used.
- **Fast: Switch 4 On and all others Off** is the fastest integration constant. This should be used only in instances where the rate of change at the transducer is extremely rapid and system capacity is sufficient to compensate for rapid load changes.

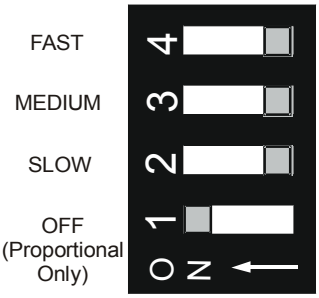

Figure 5: DIP Switch for Setting Integration Constant or Proportional Only Control (Switch shown is set for Proportional Only Control)

Direct Acting or Reverse Acting Mode

In Direct Acting (DA) mode, the analog output signal magnitude increases as the pressure rises. In Reverse Acting (RA) mode, the analog output signal magnitude increases as the pressure drops. (See Figure 5.)

Select the desired mode of operation by positioning the two jumpers on the **J1** jumper block. Position the jumpers vertically for Reverse Acting, or horizontally for Direct Acting. (See Figure 2.)

The Reverse Acting/Direct Acting jumpers are installed in the Reverse Acting position at the factory.

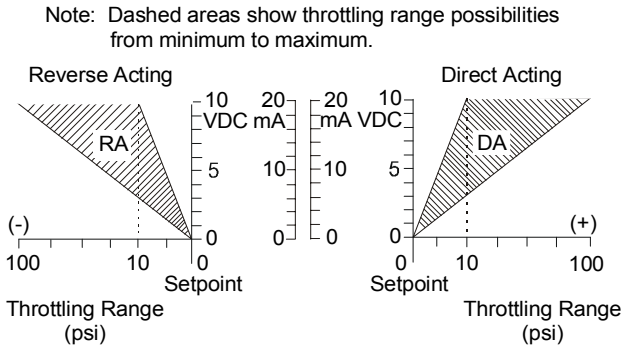

Figure 6: Reverse and Direct Acting Throttling Ranges (Proportional Bands) Shown in Proportional Only Mode (Model Depicted has 10-100 psi Throttling Range)

Dimensions

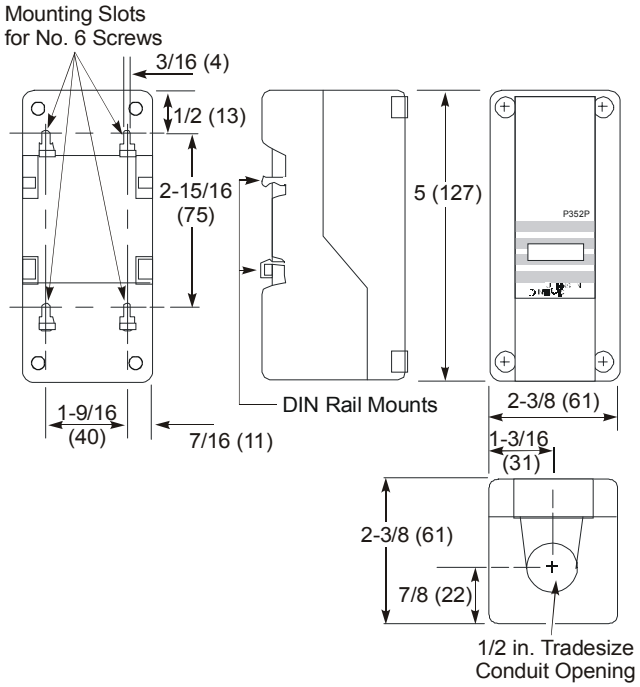

Figure 7: P352PN Control Dimensions, in. (mm)

Installation and Wiring

The P352PN control is housed in a compact NEMA 1 plastic enclosure designed for standard 35 mm DIN rail mounting. The control is not position sensitive but should be mounted for convenient wiring and adjustment. Four key-slot mounting holes on the back of the control case are provided should surface mounting be required.

Note: When mounting the P352PN control (or any System 350 Module) to rigid conduit, attach the hub to the conduit before securing the hub to the control enclosure.

WARNING: **Risk of Electrical Shock.** This control, and any modules connected to it, may have more than one power supply. Disconnect all power supplies before making electrical connections to avoid possible electrical shock or equipment damage.

- All wiring must be installed to conform to the National Electrical Code and local regulations. For maximum electrical rating of control, see label inside the control cover. Use copper conductors only.
- The P352PN control can output a variable signal from 0 to10 VDC or 0 to 20 mA. Connections are made to the terminal block located in the wiring compartment at the bottom of the case.
- Both the voltage and milliampere outputs can be used at the same time, allowing the P352PN control to drive two independent devices simultaneously (off the same RA or DA ramp). This feature may be used to drive different types of motor actuators or variable speed drives.

Table 1: P352PN Control Wiring Terminal Designations

Terminal Designation	Terminal Description
V	0 to 10 VDC output signal
I	0 to 20 mA output signal
SN	0.5 to 4.5 VDC input signal from the pressure transducer
VDC	5 VDC power supply to the pressure transducer
C	Common for the pressure transducer and output signals
24V	24 volts AC

Wiring the Transducer

The P352PN controls use a P399 Pressure Transducer to generate the 0.5 to 4.5 VDC input signal. The transducer is wired to the control at the terminal block at the bottom of the circuit board. Refer to Table 2 and Figure 2 for proper wiring configuration. Connect the cable shield to C on the terminal block.

The maximum recommended length of 22 AWG shielded transducer cable is 250 ft (76 m). Refer to the *P399 Electronic Pressure Transducer Product/Technical Bulletin (LIT-125515)* for more information about the pressure transducer.

Table 2: P399 Transducer Connections

Terminal and Wire Designations	
P352PN Control Terminals	**Transducer Cable**
SN	White
VDC	Red
C	Black

Add-on System 350 Modules

The D352 Digital Pressure Display Module, S352AA-2 Stage Module, and Y350R Power Module are designed to connect together and plug into the P352PN control. The power module connects to the control via a connector on the control's right side. The display module and stage module connects to the right side of the power module.

D352 Pressure Display Module

The D352 display module receives its power, pressure, and setpoint information from the P352PN control. A 3-digit Liquid Crystal Display (LCD) gives continuous read-out of the sensed pressure. Pushing the PRESS FOR SETPOINT button on the display module displays the P352PN control setpoint. Refer to *System 350 D350 Display Modules Product/Technical Bulletin, LIT-930070* for more information.

Y350R Power Module

The Y350R power module provides a convenient method of powering System 350 Modules from a 120 or 240 VAC power source. The power module supplies power to all of the modules. Refer to *System 350 Y350R Power Module Product/Technical Bulletin, LIT-930090*, for more information.

S352AA-2 ON/OFF Stage Module

The S352AA-2 stage module provides ON/OFF pressure control based on the P5352PN control setpoint and the stage module offset. Refer to *System 350 S350A Temperature, S351A Humidity, and S352A Pressure Stage Modules Product/Technical Bulletin, LIT-930080*, for more information.

Adjustments

Use the following procedure to set up and adjust the P352PN pressure control.

1. Remove its cover by loosening the four captive cover screws.
2. Set the RA/DA jumper blocks to the desired mode. Position the jumper blocks vertically for RA or horizontally for DA mode. See *Reverse or Direct Acting Mode* section and Figure 2.
3. Adjust the throttling range potentiometer to desired setting. Rotate clockwise to increase the throttling range. Refer to *Throttling Range (Proportional Band)* section and Figure 2.

   Note: If the P352PN control is to be used in proportional plus integral mode, the initial throttling range adjustment should not be set below 30 psi for the P352PN-2 model or 60 psi for the P352PN-3 and P352PN-4 models. A narrow proportional band used in conjunction with the integration may result in unstable control.
4. If minimum output is required, set the minimum output potentiometer to the desired position. The 10-segment LED bar graph or a voltmeter can be used to read the minimum output. See *Minimum Output Adjustment* section and Figure 2.

   Note: Before setting the minimum output, verify that the minimum output potentiometer is set to zero (turned fully counterclockwise), and that no LEDs are lit on the LED bar graph.

   For each 10% increase in output, the LED bar graph will advance one LED segment (only one bar is lit at anytime). In a milliampere application, each bar equals 2 mA. In a voltage application, each bar equals 1 VDC.

   Example: To set the control for a minimum output of 4 mA, slowly turn the minimum output potentiometer clockwise until the second LED segment just lights.
5. Adjust the P352PN control to the desired setpoint, replace cover, and place the system in operation.

   Table 3 gives the tolerances for setpoint readings at mid scale and scale-end.

   Note: The D352 Display Module is unaffected by these tolerance shifts. Use the display module to achieve the most accurate setpoint selection.

Table 3: Setpoint Mid-scale and Scale-end Tolerance Values

Control Model	Mid-scale Tolerance	Scale-end Tolerance
P352PN-2	±1.5 psi	±2.5 psi
P352PN-3	±1.5 psi	±3.5 psi
P352PN-4	±3.5 psi	±8 psi

6. Make sure the operating system is stable before setting the integration constant (if necessary). Refer to the *Checkout Procedure* section and *Integration Constant DIP Switch Settings* when setting the integration constant.

Checkout Procedure

Proportional-only and proportional plus integral controls should be carefully set up and then check out during system operation. Use the following guidelines to check out the P352PN controls:

1. Before applying power, make sure installation and wiring connections are according to job specifications.
2. After all electrical connections have been checked, and any necessary adjustments have been made, put the system in operation and observe at least three complete operating cycles to determine that the system is stable.
3. If integration is required, select slow, medium, or fast. The slow integration constant is the recommended initial setting. (Refer to the *Integration Constant DIP Switch Settings* section.)
4. Put the system back into operation. Observe system operation and make any additional adjustments necessary to obtain stable process control.

Troubleshooting

If the System 350 control modules do not appear to function properly, verify that the proper mode (RA or DA) has been selected on each control module. Then perform the following procedures (in the listed order) to determine the problem.

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

WARNING: **Risk of Electrical Shock.** To perform many of the following procedures it is necessary to power the control and the controlled equipment while the control cover is removed. Do not touch any exposed metal control components with anything other than properly insulated tools or insulated probes of the digital voltage meter. Failure to use properly insulated tools and probes can result in severe electrical shock.

Equipment Needed:

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

1. Check for proper supply voltage to the P352 Control.

a. Before powering control and equipment, check to assure that all of the wiring is correct and all of the connections are tight.

b. With the DVM, check the voltage between the **24V** and the **COM** terminals on the terminal block on the upper left side of the control.
If an external 24 VAC transformer powers the P352 control, select AC volts on the DVM. The voltage should be between 20 and 30 VAC.
If a Y350R Power Module powers the P352 control, select DC volts on the DVM. The voltage should be between 16 and 38 VDC.

c. If the DVM reading is within the indicated voltage range, proceed to Step 2.

d. If the DVM reading is **not** within the indicated voltage ranges, replace the external transformer or the Y350R Power Module, and recheck for proper supply voltage.

2. Check the for proper supply voltage to the pressure transducer.

a. Select DC volts on the DVM and measure the voltage between **VDC** and the **COM** terminals on the terminal block on the upper left side of the control.
The voltage should be 5.0 VDC (+ or – 0.1 VDC). If the voltage is in this range proceed to Step 3.

b. 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 between **VDC** and the **COM** terminals on the terminal block on the upper left side of the control.
The voltage should be 5.0 VDC (+ or – 0.1 VDC). If the voltage is in this range, replace the transducer.

c. If the voltage is out of range, replace the control.

3. **Check pressure transducer for proper output signal voltage.**
   a. Measure and record the voltage between the **SEN** and the **COM** terminals on the control terminal block. V_O = _____
   b. At the same time observe and record the pressure reading. psi_T = _____
   c. The transducer output signal voltage (V_O) increases proportionally to an increase in the pressure at the transducer (psi_T). Use the graph in Figure 8 to compare the measured signal voltage to the measured pressure. Or use the formula below to compare the voltage and pressure values.

$$psi_T \approx (V_o - 0.5V) \times \frac{P_{max}}{4V}$$

psi_T = Pressure measured at transducer
V_O = Transducer output signal voltage (VDC)
P_{max} = Transducer pressure range maximum

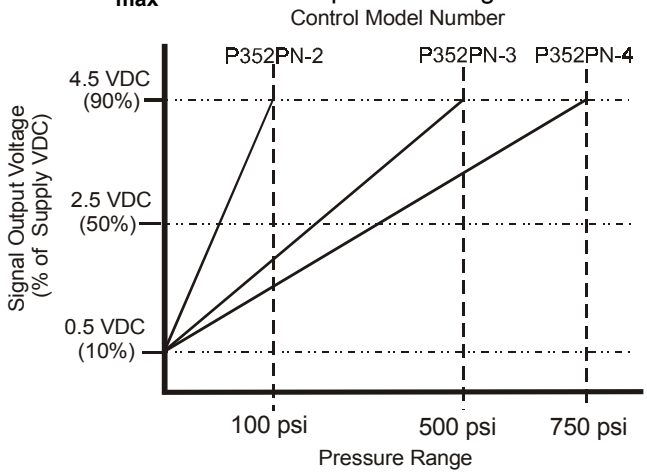

Figure 8: Transducer Pressure vs. Output Signal Voltage

Example:

The measured pressure at the gauge is approximately 245 psi, the measured voltage is 2.5 VDC (V_O), 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.

$$(2.5V - 0.5V) \times \frac{500psi}{4V} = 250psi$$

Since the measured pressure of 245 psi is close to the pressure calculated from the measured voltage (250 psi), the transducer output voltage should be considered within the desired range.

4. **Check the P352PN control for proper operation.** Perform Steps 1-3 first.
   a. Record the current setpoint, integration constant, and throttling range in Table 4 below.

Table 4: Record of Current Settings

Current P352PN Control Settings	
Setpoint	
Integration Constant	
Throttling Range	

   b. Set integration constant to OFF (proportional only). See *Integration Constant* section.
   c. Disconnect all power to the system and control.
   d. Disconnect the equipment from the control.
   e. Reconnect power to the control.
   f. Verify that the power supply and transducer are connected properly.
   g. Use an accurate gauge to take an independent pressure reading at the transducer. (This procedure requires a minimum of 30 psi static pressure at the transducer.)
   h. Set the P352PN control to Direct Acting mode. Refer to Figure 2.
   i. Adjust the throttling range potentiometer to approximately 25 psi.
   j. Observe the LED display while adjusting the setpoint for each of the settings listed in Table 5. If the display varies substantially from these values, replace the control.

Table 5: Output at Select Setpoint Settings

Setpoint Setting	Approximate Output Expected
At or Above Transducer Reading	No LED bars lit
12 to 13 psi Below Transducer Reading	4 or 5 LED bars lit
25 psi Below Transducer Reading	All LED bars lit

   k. Reconnect the equipment to the control. Reset the control to the original settings (Table 4), and reconnect power to the system.
   l. Observe the system for a minimum of three operating cycles. If the system still does not perform properly, check application settings, and replace the control if it does not operate as expected for those settings.

5. Check the stage modules for proper operation.

If stage modules are not used, skip this step.

Perform Steps 1-4 first.

a. Determine and record if the control is in the DA or RA mode of operation. _____

b. Determine the differential setting. _____

c. Observe and record the offset setting._____

d. Observe and record the system pressure at the gauge. _____

e. **If the stage module is in the DA mode**, adjust the setpoint setting to a value lower than the observed gauge pressure. If the stage module LED is not lit, turn the control setpoint adjustment knob counterclockwise until the LED lights.

f. With the stage module LED lit, slowly turn the control setpoint adjustment knob clockwise (to increase the setpoint setting) until the LED goes off. Observe the control setpoint, which should be the same as the gauge pressure minus the offset setting when the stage module LED goes off.

g. Next turn the setpoint adjustment slowly counterclockwise until the stage module LED lights again. Observe the control setpoint, which should be equal to the gauge pressure minus the differential setting and offset setting when the LED is lit.

h. **If the control is in the RA mode**, adjust the setpoint setting to a value higher than the observed gauge pressure. If the stage module LED is not lit, turn the setpoint adjustment knob clockwise until the LED lights.

i. With the stage module LED lit, slowly turn the setpoint adjustment knob counterclockwise (to decrease the setpoint setting) until the LED goes off. Observe the control setpoint, which should be equal to the gauge pressure plus the offset setting when the LED went off.

j. Next turn the setpoint adjustment slowly clockwise until the stage module LED lights again. Observe the control setpoint, which should be equal to the gauge pressure plus the offset and differential settings.

6. Check the display module for proper operation.

If a display module is not used, skip this step.

Perform Steps 1-5 first.

a. Check the gauge pressure at the transducer (psi).

b. If the display module does **not** display the (approximate) pressure measured at the gauge, replace the display module.

c. Pressing the button on the display module should display the current setpoint setting.

d. If the displayed setpoint is out of the control's setpoint pressure range (check scale-plate at the setpoint knob for control's pressure range) replace the control.

e. If pressing the SETPOINT button results in a reading other than the expected setpoint value, check the setpoint setting and correct if necessary. If the display continues to read an incorrect value, replace the display module.

Note: If the control and add-on modules all appear to be operating properly, but the field device still does not turn on and off as expected, check the wiring from the control or stage module to the field device.

Table 6: S352AA-2 Stage Module Output Relay Troubleshooting

Operating Mode	LED	N.O. Contact Position	Setpoint Setting equals approximately…
Reverse Acting (RA)	ON	Closed	(gauge pressure) **+** offset **+** differential
Reverse Acting (RA)	OFF	Open	(gauge pressure) **+** offset
Direct Acting (DA)	ON	Closed	(gauge pressure) **-** offset **-** differential
Direct Acting (DA)	OFF	Open	(gauge pressure) **-** offset

*R*epairs and Replacement

Do not make field repairs or perform calibration. The P352PN Pressure Controls and the P399 Transducer are available through local Johnson Controls representatives.

Table 7: Ordering Information

Item	Product Code Number	Description
Electronic Proportional Plus Integral Pressure Controls for PSI Applications	P352PN-2C P352PN-3C P352PN-4C	Setpoint Range: 0-100 psi Throttling Range: 5-50 psi Setpoint Range: 90-250 psi Throttling Range: 10-100 psi Setpoint Range: 240-600 psi Throttling Range: 10 to 100 psi Note: Controls do not include pressure transducer or wiring harness.
Display Module	D352AA-2C	Digital Pressure Display Module with 0-750 psi Scale
Power Module	Y350R-1C	120/240 VAC, 50/60 Hz input
Stage Module	S352AA-2C	ON/OFF Pressure Controlled Stage module with SPDT Output Relay
Pressure Transducers	P399AAA-1C P399AAC-1C P399BAA-1C P399BAC-1C P399CAA-1C P399CAC-1C	Used with P352PN-2 control. Fitting: 1/8 in. NPT Used with P352PN-2 control. Fitting: 1/4 in. SAE Female with valve depressor Used with P352PN-3 control. Fitting: 1/8 in. NPT Used with P352PN-3 control. Fitting: 1/4 in. SAE Female with valve depressor Used with P352PN-4 control. Fitting: 1/8 in. NPT Used with P352PN-4 control. Fitting: 1/4 in. SAE Female with valve depressor Note: Wiring harness must be purchased separately.
Wiring Harnesses	WHA-P399-200C WHA-P399-400C	6 ft 6-1/2 in. (2 m) 13 ft 3 in. (4 m)
Conduit Adapter	ADP11A-600R	1/2 in. Snap-fit EMT Conduit Adapter (box of 10)
DIN Rail Section	BKT287-1R BKT287-2R	35 x 7.5 mm standard DIN rail, 12 in. (0.305 m) long 35 x 7.5 mm standard DIN rail, 36 in. (0.914 m) long
DIN Rail End Clamps	PLT344-1R	Consists of Two End Clamps
Cable for Remote Mounting of D352 Display Module	WHA29A-600R WHA29A-603R WHA29A-604R	3 ft (0.9 m) 25 ft (7.6 m) 50 ft (15.2 m)

Specifications

Product	P352PN Electronic, Proportional Plus Integral Pressure Controls for PSI Applications
Setpoint and Throttling Ranges	P352PN-2: Setpoint Range 0-100 psi; Throttling Range 5-50 psi P352PN-3: Setpoint Range 90-250 psi; Throttling Range 10 to 100 psi P352PN-4: Setpoint Range 240-600 psi; Throttling Range 10 to 100 psi
Supply Power Requirements	AC Supply: 24 VAC Class 2, 50/60 Hz, (20 to 30 VAC) 5 VA (for P352PN control only) Y350R Power Module: See *Add-on Modules* below.
Add-on Modules:	
Y350R Power Module	Input Voltage: 120/240 VAC, 50/60 Hz
D352 Display Module	Display Range of 0 to 750 psi
S352AA-2 Stage Module	SPDT Enclosed Output Relay rated for 10 A Non-inductive, 125 VA Pilot Duty-24/240 VAC, 1/2hp 120/240 VAC
Analog Output	0 to 10 VDC (550 ohm Load Minimum) and 0 to 20 mA (600 ohm Load Maximum)
Minimum Output Signal Magnitude	Adjustable from 0 to 60% of Full Output Signal Range
Output Indication	A 10-segment LED bar graph indicates percentage of output.
Control Action	Direct or reverse action is jumper selectable.
Integration Constant	Three Selectable Integration Constants: Slow, Medium, Fast, and an OFF (or Proportional Only Control) Position
Ambient Temperature	Operating: -30 to 150°F (-34 to 66°C) Shipping: -40 to 185°F (-40 to 85°C)
Ambient Humidity (all modules)	0 to 95% RH Non-condensing; Maximum Dew Point: 85°F (29°C)
Material	Case, Cover: NEMA 1 High-impact Thermoplastic
Agency Listings	UL Listed, CCN XAPX, File E27734 UL Listed for Canada, CCN XAPX7, File E27734

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult Johnson Controls/PENN Application Engineering at (414) 274-5535. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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