System 350™
P352 Electronic Pressure Control

The P352 Series is an on/off electronic pressure control with single-pole, double-throw relay output and LED indication. The P352 Series is designed with reverse or direct acting mode of operation, adjustable differential, and an interchangeable pressure transducer. The P352 will accept up to five S352 Stage Modules to control a total of six stages of HVAC and/or refrigeration equipment.

Like all System 350 products, the P352 is housed in a NEMA 1 high-impact plastic enclosure. The modular design provides easy, snap-together connections for quick installation and future expandability.

Figure 1: P352 Electronic Pressure Control

Features and Benefits	
❑ Modular Design	Provides the flexibility to add up to five S352 Stage Modules, a D352 Display Module and a Y350R Power Module
❑ Plug-in Connectors and 35 mm DIN-rail Mountability	Eliminates wiring between modules and reduces installation costs
❑ Adjustable Setpoint Range of 90 to 250 PSIG	Handles pressures required for most fan cycling and compressor unloading applications
❑ Differential Adjustable from 10 to 100 PSI	Enables user to match the equipment cycle rate and/or sequencing for a given application
❑ Field-Selectable Reverse or Direct Acting Mode Jumpers	Energizes relay output on either an increase or decrease in pressures
❑ Interchangeable Pressure Transducer	Increases versatility and serviceability

Part No. 24-7664-52, Rev. B
Code No. LIT-930040

Application Overview

The P352 Pressure Control can be used as a standalone device or in conjunction with System 350 plug-in accessory modules to control a variety of single- or multiple-stage HVAC and refrigeration pressure control applications. The P352 setpoint range is from 90 to 250 PSIG. Typical applications include:

- condenser fan cycling
- compressor unloading
- high pressure alarm

Typically, a System 350 pressure control scheme would include the following:

- P352 Pressure Control
- S352 Stage Modules
- D352 Digital Pressure Sensor/Setpoint Display Module
- Y350R Power Module (or 24 VAC transformer)
- P99 Series Pressure Transducer

Operation

IMPORTANT: Use the System 350 controls only as operating controls. Where failure or malfunction of the System 350 controls 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 System 350 controls.

IMPORTANT: Utiliser ce System 350 controls uniquement en tant que dispositif de contrôle de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du System 350 controls 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 System 350 controls.

The P352 Pressure Control operates on 24 VAC and supplies a SPDT relay output. A front-panel “ON” LED lights to indicate the relay is energized. Adjustable features include:

- setpoint
- differential
- reverse/direct acting mode

Setpoint Adjustment

Setpoint is defined as the pressure at which the relay will de-energize. The setpoint can be adjusted from 90 to 250 PSIG. Adjustment is made using the concealed setpoint adjustment dial located under the cover in the center of the printed circuit board (see Figure 5).

Differential Adjustment

Differential is defined as the change in transducer pressure between energization and denergization of the relay. The differential can be adjusted from 10 to 100 PSI. Adjustment is made using the potentiometer marked “DIFF ADJUST” located on the printed circuit board below and to the right of the setpoint dial (see Figure 5).

Reverse/Direct Action Mode

With the **reverse action (RA) mode** selected, the differential is below the setpoint. The relay will de-energize as the pressure rises to the setpoint. As the pressure drops to the setpoint *minus* the differential, the relay will energize and the LED will illuminate.

With the **direct action (DA) mode** selected, the differential is above the setpoint. The relay will de-energize as the pressure drops to the setpoint. As the pressure rises to the setpoint *plus* the differential, the relay will energize and the LED will illuminate.

The direct/reverse action mode is selected via jumper blocks marked “RA/DA” located on the right side of the circuit board above the relay (see Figure 5). As shipped from the factory, the RA/DA jumper blocks are installed in the horizontal (direct action) position.

Dimensions

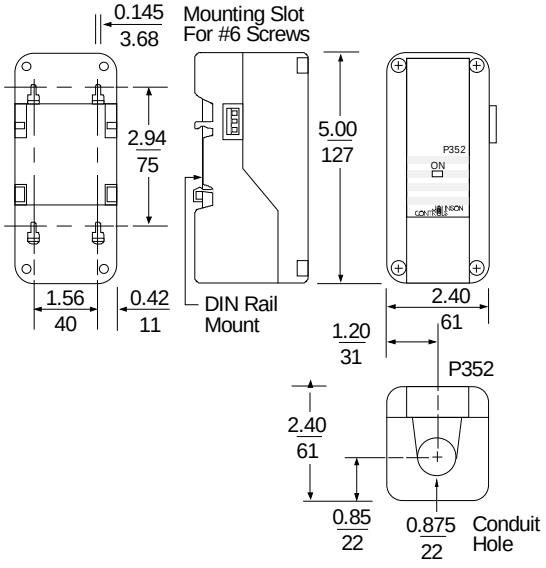

Figure 2: P352 Dimensions in./mm

Installation and Wiring

The P352 Electronic Pressure Control is housed in a compact NEMA 1 plastic enclosure designed for standard 35 mm DIN-rail mounting. Four key-slot mounting holes on the back of the control case are provided should surface mounting be required.

Note: When mounting the P352 (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 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.

- All wiring must be installed to conform to the National Electrical Code and local regulations. For maximum electrical rating of control see label inside control cover. Use copper conductors only.
- Consult the typical wiring diagrams (Figures 3 and 4) for proper wiring and terminal designations.

Transducer Wiring

The P352 Pressure Control is used with the P99 Series Active Pressure Transducer, which is powered by the 14 VDC power supply of the P352. The transducer is connected at the four-conductor screw terminal block located at the upper left of the circuit board. (See Figure 5 and Table 1.)

Shielded cable is not generally required for transducer wiring on runs of less than 50 feet. When using shielded cable, isolate and tape the shield at the transducer. Connect the shield to the COM terminal on the P352.

A maximum shielded cable length of 1000 feet is recommended using 14 to 22 AWG wire.

Table 1: Pressure Transducer Connections

P352 Terminal Designations	P99 Wire Color
COM	(A) Green
SEN	(B) White
VDC	(C) Brown

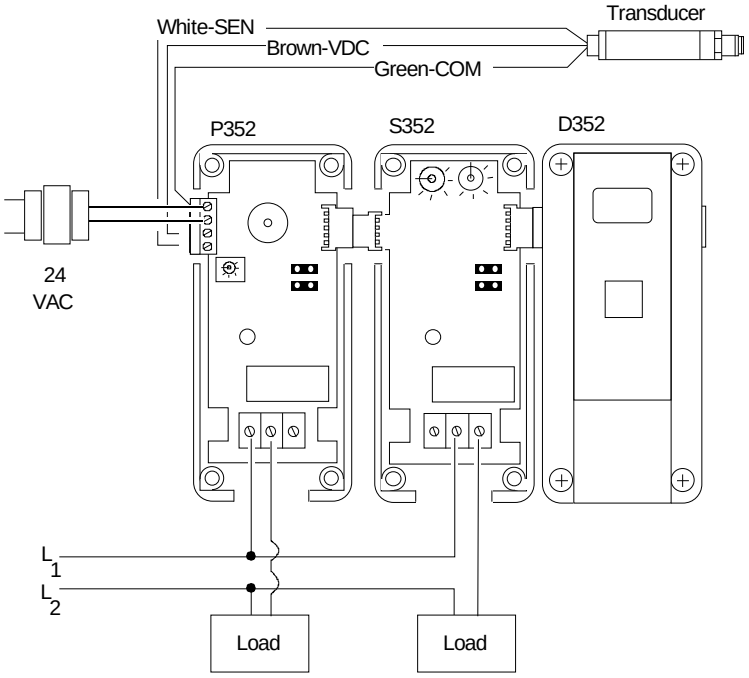

Figure 3: System 350 Powered by an External Transformer With the P99 Transmitter Located Less Than 50 Feet From the P352

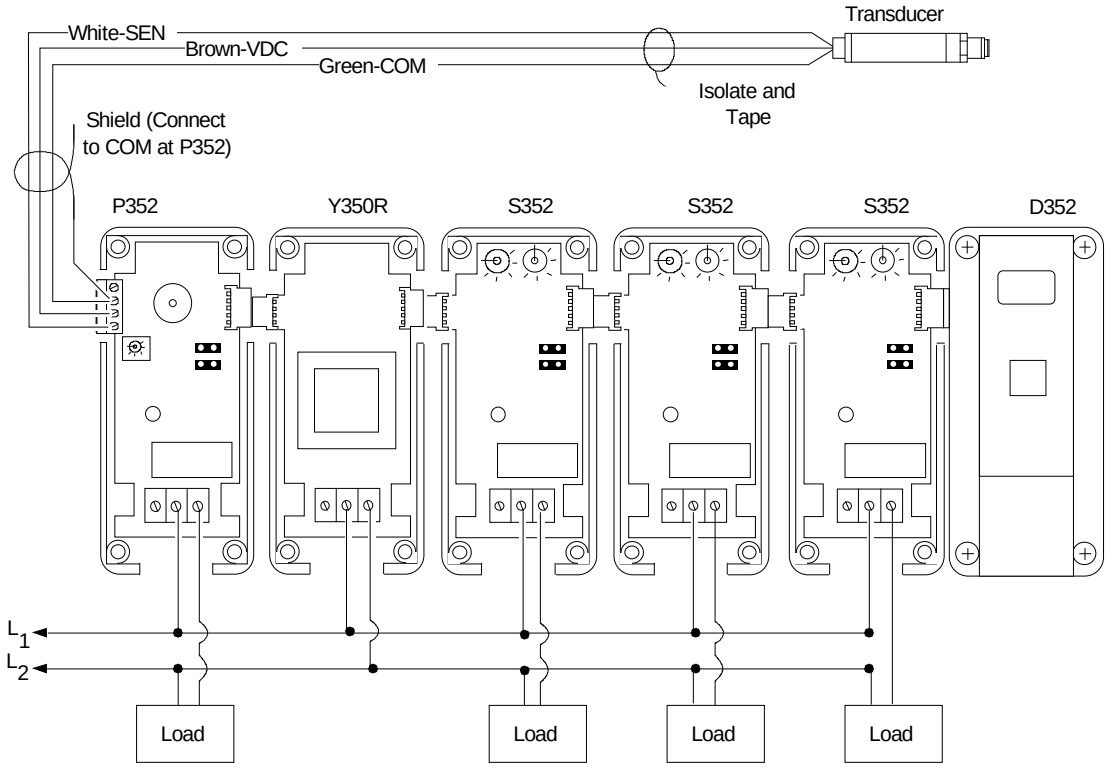

Figure 4: System 350 Powered by Y350R Power Module With P99 Transmitter Between 50 and 1000 Feet From the P352

Add-On Modules

The S352 Stage, D352 Digital Pressure Display, and Y350R Power Modules snap together and plug into the P352 Electronic Pressure Control via connectors on the both sides of each add-on module.

S352 Pressure Stage Modules

The S352 Stage Modules receive their power, setpoint, and sensor input from the P352 Control. As many as five S352 Stage Modules can plug into the P352 Control.

D352 Digital Pressure Display Module

The D352 Display Module receives its power, sensor, and setpoint information from the P352. A three-digit liquid crystal display (LCD) gives a continuous readout of the sensed pressure. When the "PRESS FOR SETPOINT" button is depressed the setpoint of the adjoining P352 is displayed.

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 Y350R supplies a rectified 24 VAC to the modules.

The Y350R can be plugged into the right side of the P352 Control or any of the add-on modules. The Y350R is capable of providing power to a P352, a D352 Display Module, and up to five S352 Stage Modules.

IMPORTANT: Verify that the jumpers are in the proper position before powering the System 350 components. If the jumpers on the System 350 components are in the wrong position, the device will activate the relay in response to the opposite signal. The relay may remain energized until the jumper position is corrected.

Adjustments

P352

1. Remove the P352 cover by loosening the four captive cover screws.
2. Set the reverse/direct action (RA/DA) jumper blocks to the desired mode of operation. Position the jumper blocks vertically for reverse action or horizontally for direct action. (See Figure 5.)
3. Adjust the differential potentiometer to the desired setting. Clockwise rotation increases the differential.
4. Turn the setpoint adjustment dial to the desired setpoint.
5. Replace the cover and tighten the captive cover screws.

Note: Use the D352 Pressure Display Module for the most accurate setpoint selection.

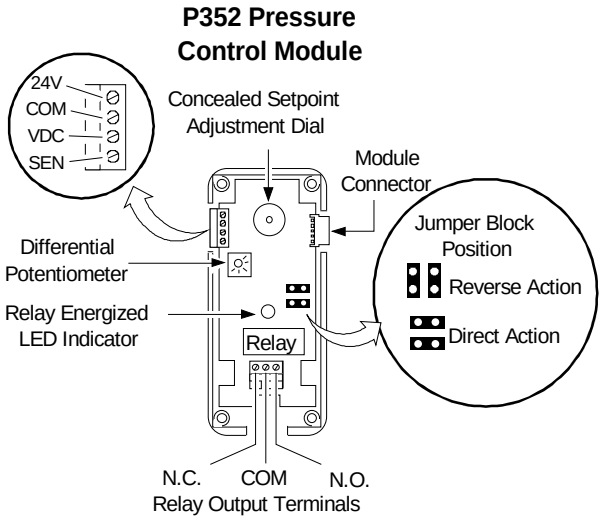

Figure 5: P352 Electronic Pressure Control Adjustment Potentiometer Locations and Board Layout

S352

1. Remove the S352 cover by loosening the four captive cover screws.
2. Set the reverse/direct action (RA/DA) jumper blocks to the desired mode of operation. (See Figure 6.)
3. Adjust the differential potentiometer to the desired setting. (Refer to the typical multistage application in Figure 7.)
4. Adjust the offset potentiometer to the desired pressure from the P352 setpoint (above setpoint with direct action mode selected or below setpoint with reverse action mode selected) at which the stage relay will de-energize.
5. Replace the cover on the S352.

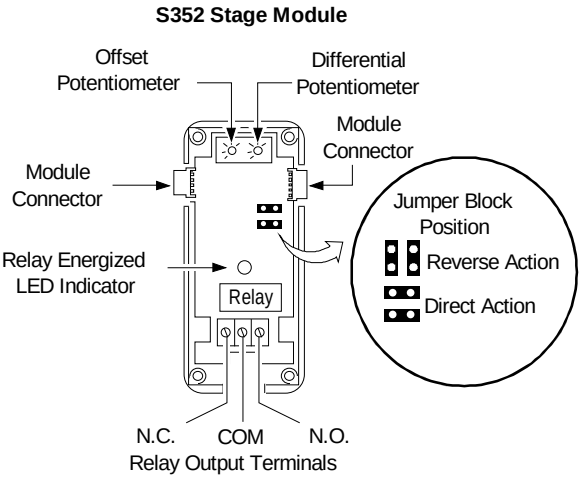

Figure 6: S352 Stage Module Adjustment Potentiometer Locations and Board Layout

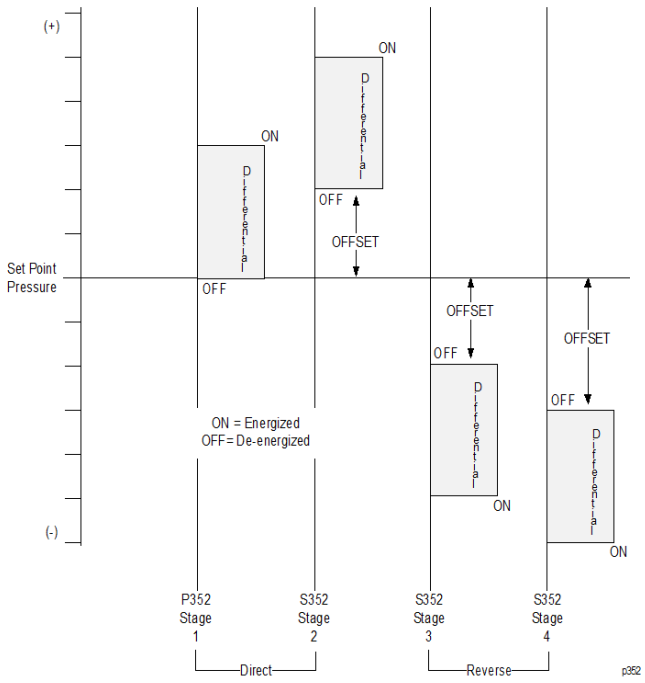

Figure 7: Typical Reverse Action/Direct Action Application Using One P352 and Three S352s

Checkout Procedure

Before applying power, make sure installation and wiring connections are according to job specifications. After necessary adjustments and electrical connections have been made, put the system in operation and observe at least three complete operating cycles before leaving the installation.

Troubleshooting

If the control system does not function properly, verify that the proper mode is selected on each module (e.g. reverse action/direct action) and then use the following procedures to determine the cause of the problem:

1. **Check for proper voltage applied to the control module.**

   a) Connect a digital voltmeter (DVM) between the “24V” (+) and “COM” (-) terminals located on the control's left-side terminal block (Figure 2).

   - ***If an external transformer is used*,** select AC volts on the DVM and verify that the voltage is between 20 and 30 VAC.
   - ***If a Y350R Power Module is used,*** select DC volts on the DVM and verify that the voltage is between 16 and 38 VDC.

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

   c) If the DVM reading is NOT within the indicated voltage range, check wiring then replace the Y350R or the external transformer.

Table 2: P352 Control Relay Troubleshooting

Action	LED	N.O. Relay Status	Setpoint Dial Setting
Reverse	ON	Closed	($PSIG_T$) + differential
Reverse	OFF	Open	($PSIG_T$)
Direct	ON	Closed	($PSIG_T$) - differential
Direct	OFF	Open	($PSIG_T$)

2. Check pressure transducer for proper output voltage.

a) Disconnect the transducer "OUT" wire from the P352 "SEN" terminal.

b) Connect a DC voltmeter between the transducer "OUT" wire and the control "COM" terminal. Measure voltage.

Note: A transducer output of 0 to 10 VDC should correspond to a pressure of 0 to 435 PSIG.

- If the voltage conversion to pressure is close to the expected PSIG at the transducer ($PSIG_T$), proceed to Step 3.
- If the voltage conversion to pressure is not what was expected, replace the transducer.

3. Check the control for proper operation.

Note: Steps 1 and 2 must be performed first.

a) Adjust the setpoint dial to at least 100 PSIG below the pressure expected at the transducer ($PSIG_T$) as determined in Step 2.

b) Increase the setpoint by slowly adjusting the dial until the control relay and LED turn ON and OFF as shown in Table 2.

c) If the relay performs as expected, continue to Step 4.

d) If the relay does NOT perform as indicated in Table 2, replace the control.

4. Check the stage modules for proper operation.

If this is a single-stage system, skip to Step 5.

Note: Steps 1, 2 and 3 must be performed first.

a) Turn the setpoint dial on the control to the 90 PSIG setting.

b) Increase the setpoint by slowly adjusting the dial until the stage relays and LEDs turn ON and OFF as shown in Table 3.

c) If the relays do NOT perform as indicated in Table 4, adjust the differential and offset potentiometers to their minimum values and try again.

d) If the relays still do NOT turn on and off, replace the defective stage module(s).

Note: There is the unlikely possibility that a defect in one stage module could cause defective symptoms in all modules. Plug each stage into the control individually and check its performance as outlined in Steps 3a and 3b.

5. Check the display module for proper operation.

If there is no display module in the system, skip this step.

Note: Steps 1 through 4 must be performed first.

a) Check pressure at the transducer ($PSIG_T$) as determined in Step 2a. The display should read the same value.

b) If the display module does NOT read the correct transmitter pressure ($PSIG_T$), replace the display module.

c) Pressing the button on the display module should cause the display to read the selected setpoint.

d) If pressing the SETPOINT button results in an out-of-range reading (greater than 435 PSIG) replace the display module.

e) If pressing the SETPOINT button results in a reading other than the expected setpoint value, check the setpoint potentiometer 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 3: S352 Stage Relay Troubleshooting

Action	LED	N.O. Relay Status	Setpoint Dial Setting
Reverse (RA)	ON	Closed	($PSIG_T$) + offset + differential
Reverse (RA)	OFF	Open	($PSIG_T$) + offset
Direct (DA)	ON	Closed	($PSIG_T$) - offset - differential
Direct (DA)	OFF	Open	($PSIG_T$) - offset

Repairs and Replacement

Field repairs or calibration must not be made. Transmitters and replacement controls are available through local Johnson Controls branch and wholesale distributors.

Ordering Information

Table 4: Ordering Information

Item	Product Code Number	Description
Electronic Pressure Control	P352AA-1C	With SPDT Relay and 90 to 250 PSIG Range
Pressure Transducer	P99V-2C	0 to 435 PSIG; 1/4 in. SAE Flare Connector
Display Module	D352AA-1C	Digital Pressure Display Module
Stage Module	S352AA-1C	Pressure Stage Module with PSIG Scale
Power Module	Y350R-1C	Rectified 24 VAC from 120/240 VAC Source
DIN Rail Sections	BKT287-1R BKT287-2R	35 x 7.5 mm, 0.305 m (12 in.) long 35 x 7.5 mm, 0.914 m (36 in.) 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)

* WHA29A-600R can also be used to daisy chain S352 Stage Modules together.

Notes

Notes

Specifications

Product	P352 Electronic Pressure Control		
Differential Range	10 to 100 PSI		
Pressure Setpoint Range	90 to 250 PSIG		
DC Power Supply	14 VDC Provided to Power the Pressure Transmitter		
Input Voltage*	24 VAC Class 2; 50/60 Hz +15%, -10%		
Relay	SPDT Enclosed Relay; Contacts Rated at 10 Amp Non-inductive, 1/2 hp 120/240 VAC		
Current Draw	1.8 VA		
Input Signal	0 to 10 VDC Corresponding to 0 to 435 PSIG		
Electrical Ratings	Full Load Amps:	9.8 (120 VAC)	4.9 (208/240 VAC)
	Locked Rotor Amps:	58.8 (120 VAC)	29.4 (208/240 VAC)
	Non-Inductive Amps:	10 at 24/240 VAC	
	Pilot Duty:	125 VA at 24/240 VAC	
Ambient Temperature	Operating : -30 to 150°F (-34 to 66°C)		
	Shipping: 40 to 185°F (-40 to 85°C)		
Ambient Humidity	0 to 95% RH Non-Condensing		
Material	Case, Cover: NEMA 1 High Impact Noryl® Plastic		
Agency Listing	UL Guide No. XAPX, File E27734		
	CSA Class No. 4813 02, File LR948		

*Only one input voltage source may be used.
Noryl is a registered trademark of the General Electric Company.

Add-on Modules:		
S352	Input Voltage:	14 VDC Reference Provided by the P352; 24 VAC Power Supply
	Relay Contacts:	SPDT, 10 amps Non-inductive, 1/2 hp 120/240 VAC
	DIFF & OFFSET:	10 to 100 PSI Differential; 10 to 60 PSIG Offset
Y350R	Input Voltage:	120/240 VAC, 50/60 Hz
	Output Power:	24 VAC Rectified, 10 VA Maximum
D350	Display Range:	90 to 250 PSIG

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

Johnson Controls

Controls Group
507 E. Michigan Street
P.O. Box 423
Milwaukee, WI 53201

FAN 930
System 350 Product Guide
Printed in U.S.A.