



SPM-4000 GUARDIAN INFINITY SPACE PRESSURIZATION MONITOR AND CONTROLLER

Description

The **Guardian Infinity** is a true differential space pressure measurement system engineered to combine the operability of today's microprocessor technology with state-of-the-art, industrial grade, highly accurate, ultra low range, differential pressure sensing cells. The combination of these two technologies ensures exceptional long-term stability and $\pm 0.25\%$ measurement accuracy.

The **Guardian Infinity** is a complete system package including stainless steel space and reference pressure sensors and a central signal processing module. Field configuration of engineering units, operating mode, operating range, process noise filtering, alarm set points, etc, are performed via password protected intuitive menus that are accessed through the integral six button touch pad. Device monitoring and configuration can also be performed by a building management system through either a LonWorks® or BACnet®-MS/TP Master communication network and through a local IR communication port using a laptop or handheld PDA. An additional network communication port is available for connection to Paragon Controls' **Guardian RPM**, a remote pressure monitor that can be located at a nurse's station. The front panel includes an 8 line graphic display for local indication of the space pressure and device configuration, LED indication of operational mode and status, and an audible alarm with alarm acknowledge switch.

The **Guardian Infinity** offers an optional controller that utilizes a proprietary algorithm which results in true three mode control incorporating proportional band, integral (reset) and inverse derivative (P, I, 1/D) controller functionality and tuning. The controller will provide responsive modulation of a control damper or variable speed drive guaranteeing a stable space pressure is maintained.

Features

- True differential pressure sensing assuring no sensor fouling due to airborne particulate
- Ultra low pressure measurement down to one ten-thousandth of an inch water column (0.025Pa)
- High accuracy and long-term stability
- LonWorks® and BACnet® certified by an independent testing laboratory
- Available in six full scale ranges
- Positive and negative pressure monitoring
- Eight line graphic display
- LED's to indicate normal or alarm status
- Audible local alarm and alarm acknowledge button
- Time delay to prevent nuisance alarms
- Simple field configuration and adjustment of operational mode, alarm and time delay values, and controller setpoint
- Analog output, linear to the space pressure, for remote monitoring and data logging purposes
- Form C SPDT relay for activation of a remote alarm
- Optional second space pressure monitoring and alarming
- Optional three-mode controller (P, I, 1/D) with door interlock feature programmable to either freeze controller output or bias output by a predetermined % F.S. value whenever a door into the space is opened.
- Optional monitoring and alarming of space temperature, relative humidity, and airflow/air changes per hour (ACH)
- Optional wash-down compliant to International Protection Rating Standard IP64B

SPM-4000 Technical Specifications

1. Full Scale Ranges

Bidirectional

- ±0.05 in. of water (±12.45 Pa)
- ±0.10 in. of water (±24.91 Pa)
- ±0.25 in. of water (±62.27 Pa)
- ±0.50 in. of water (±124.54 Pa)
- ±1.00 in. of water (±249.09 Pa)
- ±2.00 in. of water (498.18 Pa)

2. Accuracy

±0.25% F.S. including linearity, hysteresis, deadband and repeatability

3. Temperature Effect

Zero: ±0.03% of transducer full span per °F
Span: ±0.03% of transducer full span per °F

4. Temperature Limits

Operating: 32 to 122°F (0 to 50°C)
Storage: -20 to 158°F (-29 to 70°C)

5. Overpressure Limits

Proof Pressure: 15 psid (0.3447 bar)
Burst Pressure: 25 psid (0.689 bar)

6. Humidity Limits

0 to 95% RH, non-condensing

7. Stability

Maximum Change F.S./Yr.: ±0.5%

8. Mounting Position Effect

Below 0.5 in. of water (124.5 Pa):
≤ 0.25% full scale
Above 0.5 in. of water (124.5 Pa):
≤ 0.10% full scale

9. Span and Zero Adjustments

Performed by front panel push buttons

10. Display Low Pass Filter

Response time to reach 98% of a step change is menu adjustable by entering a value of 0 to 100 seconds

11. Output Low Pass Filter

Response time to reach 98% of a step change is menu adjustable by entering a value of 0 to 100 seconds

12. Programmable Controller Parameters

Menu selectable values for Proportional band, Integral (reset), and Inverse Derivative (P-I-¹/_D)

13. Control Accuracy

±0.5% F.S.

Indication

14. Display

A backlit, graphical LCD providing 8 lines of data display. Also used for local programming.

15. High and Low Alarm Status

Indicated by green/red LEDs, flashing text on display, and relay outputs

Inputs/Outputs

16. Analog Inputs (Field Selectable)

- a. Controller Setpoint (0-10vdc/4-20mA)
- b. Temperature (0-10vdc/4-20mA)
- c. Humidity (0-10vdc/4-20mA)
- d. Air Volume (0-10vdc/4-20mA)

17. Analog Outputs (Field Selectable)

- a. Space 1 Pressure (0-10vdc/4-20mA)
- b. Space 2 Pressure (0-10vdc/4-20mA)
- c. Controller Output (0-10vdc/4-20mA)

18. Digital Inputs

- a. Pos./Neg./Off Room Select
- b. Controller "System Start"
- c. Door Interlock

19. Relay Outputs

Remote Alarm: single (1 form C) dry contacts rated for 1 amp at 30 VDC / 3 amps at 125 VAC / 2 amps at 250 VAC resistive load

Communication

20. Network

LonWorks®
BACnet MS/TP® - Master/Slave

21. Local

IR communication via PC or PDA

Variables

22. Room Identifier

Accepts 16 alpha/numeric characters

23. Operation Mode

24. Off/Negative
Off/Positive
Positive/Off/Negative **Filters**
Output: 0 to 100 seconds
Display: 0 to 100 seconds

25. Engineering Units

Inch w.c.
Pa
KPa
mm of w.c.

26. Alarm Values

Positive High Alarm Value
Positive Low Alarm Value
Negative High Alarm Value
Negative Low Alarm Value
Alarm Delay Value

27. Audible Alarm

Selection of ON/OFF

28. Alarm Delay

Delays alarm activation after an alarm event occurs from 0 to 9999 seconds. The default is 30 seconds.

29. Field Password

Accepts up to 5 numeric characters

30. Analog Output/Space Pressure

Field selectable 4 to 20mA or 0 to 10 VDC

Power

31. Power Supply

20 to 28 VAC (50/60HZ)

32. Power Consumption

Standard Unit: 5.16 VA at 24 VAC
Full Options: 6.48 VA at 24 VAC

33. Circuit Protection

Power input is isolated and supplied with a resettable fuse

SPM-4000 Ordering Information

SPM-4

Options:

- 1 = LonWorks® Communication with BAS
- 2 = BACnet®-MS/TP Communication with BAS
- 5 = Integral Three-Mode Controller
- 6 = Space 2 Monitoring and Alarming
- 7 = Temperature Monitoring and Alarming
- 8 = Relative Humidity Monitoring and Alarming
- 9 = Airflow/Air Changes per Hour Monitoring and Alarming
- 10 = Wash-Down Compliant IP64B
- 11 = Surface Mount Electrical Box
- 12 = Palm Tangsten/E2® Programming/Monitoring Tool
- 13 = Air Tight Flush Mount Electrical Box

Note: For multiple options, separate each option code with a dash

Operating Mode:

- 1 = Off/Negative
- 2 = Off/Positive
- 3 = Positive/Off/Negative

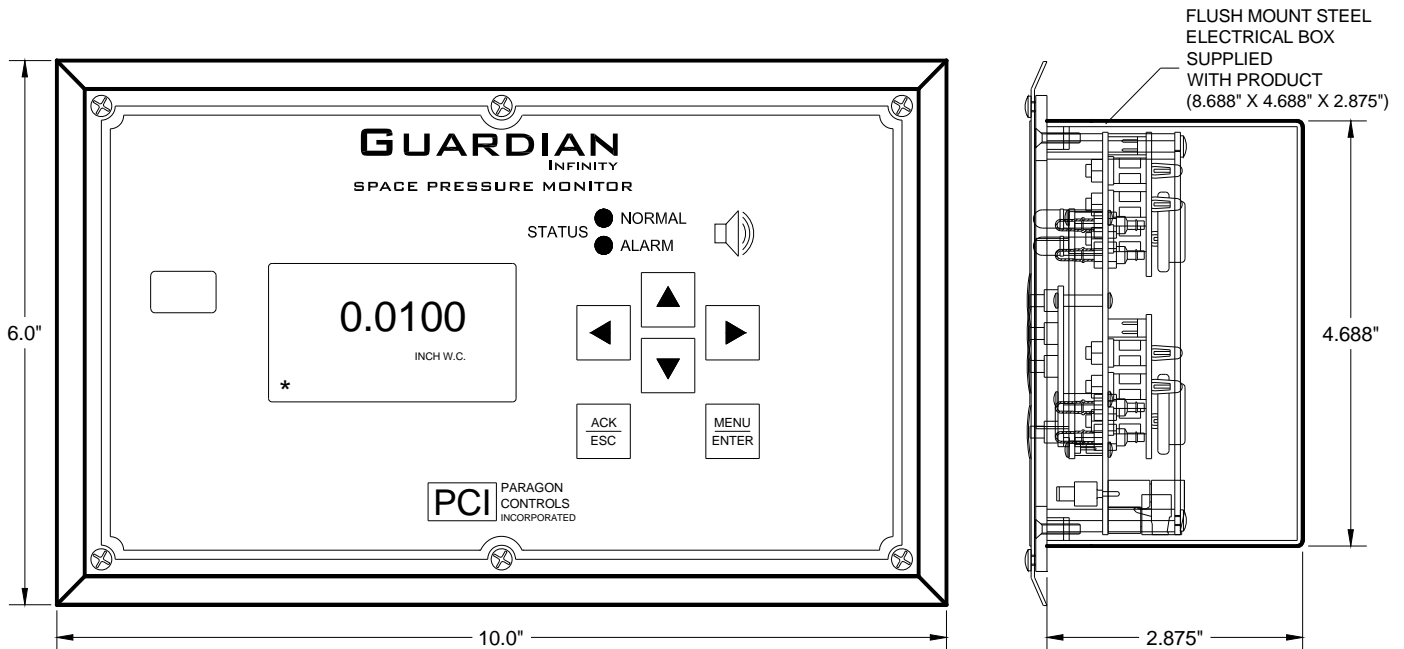
Output:

- 1 = 4-20 mA
- 2 = 0-10 VDC

Full Scale Range:

- Bidirectional
- 1 = ±0.05 in. of water (12.45 Pa)
- 2 = ±0.10 in. of water (24.91 Pa)
- 3 = ±0.25 in. of water (62.27 Pa)
- 4 = ±0.50 in. of water (124.54 Pa)
- 5 = ±1.0 in. of water (249.09 Pa)
- 6 = ±2.0 in. of water (249.09 Pa)
- 7 = Other (Specify Range)

SPM-4000 Dimensions



SPM-4000 Typical Installations

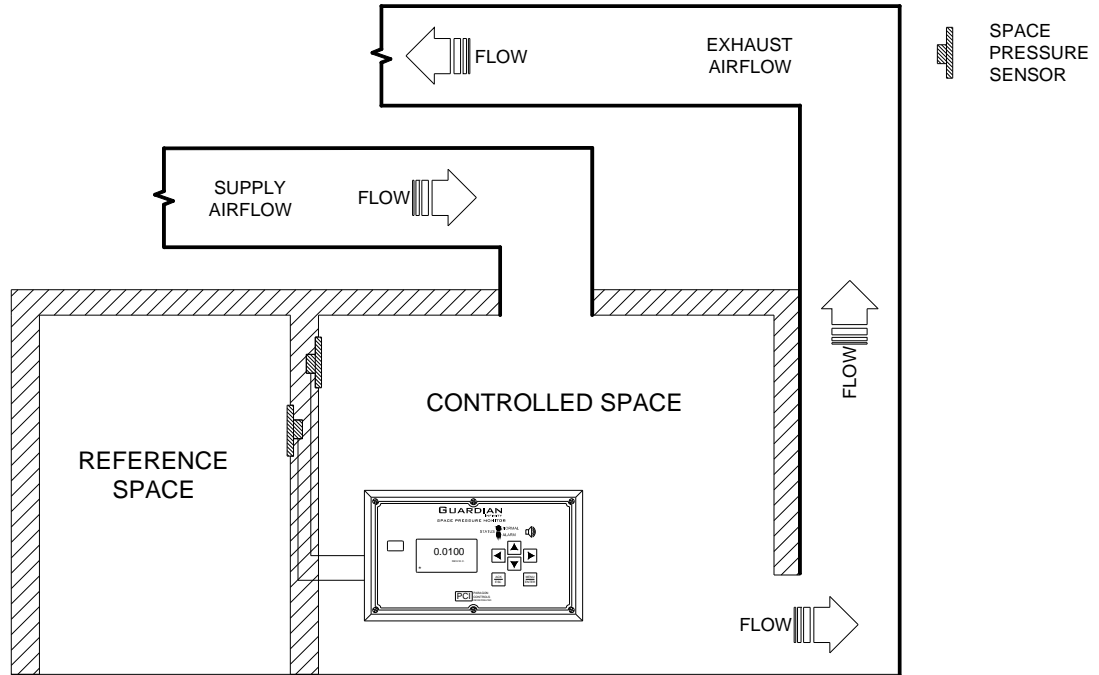


Figure 1: Pressure Monitoring Only

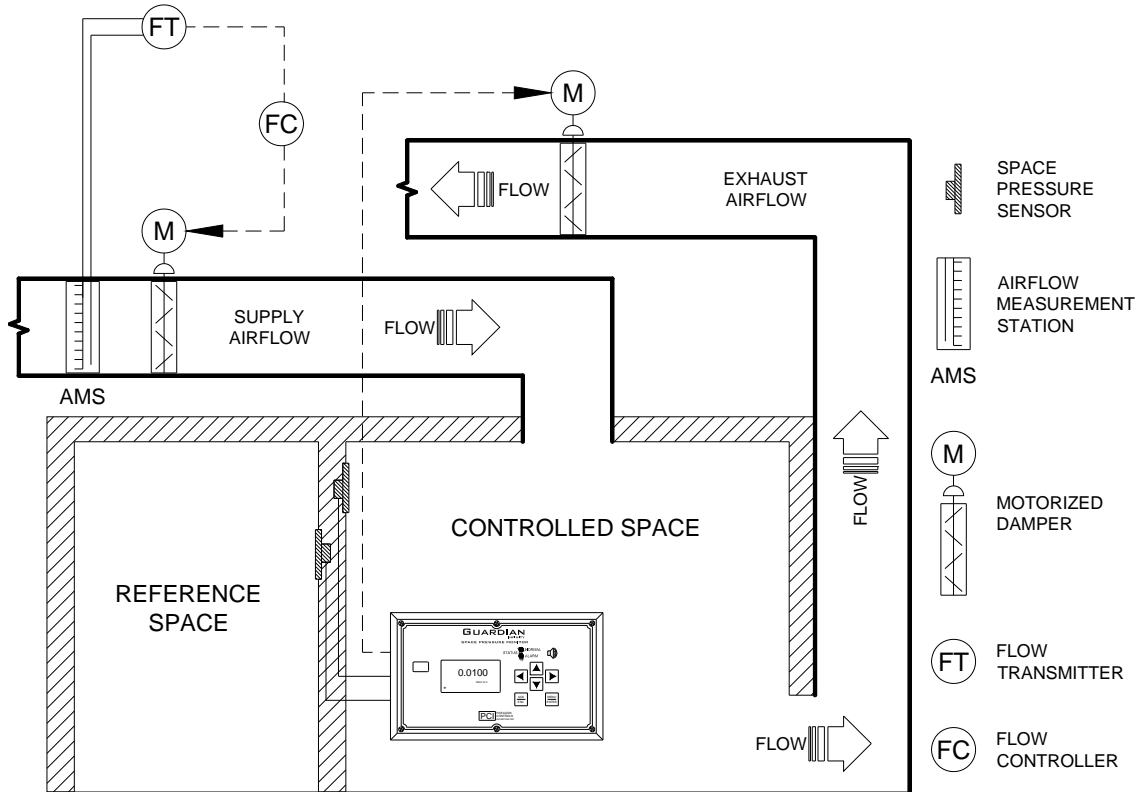


Figure 2: Constant Volume with Pressure Control

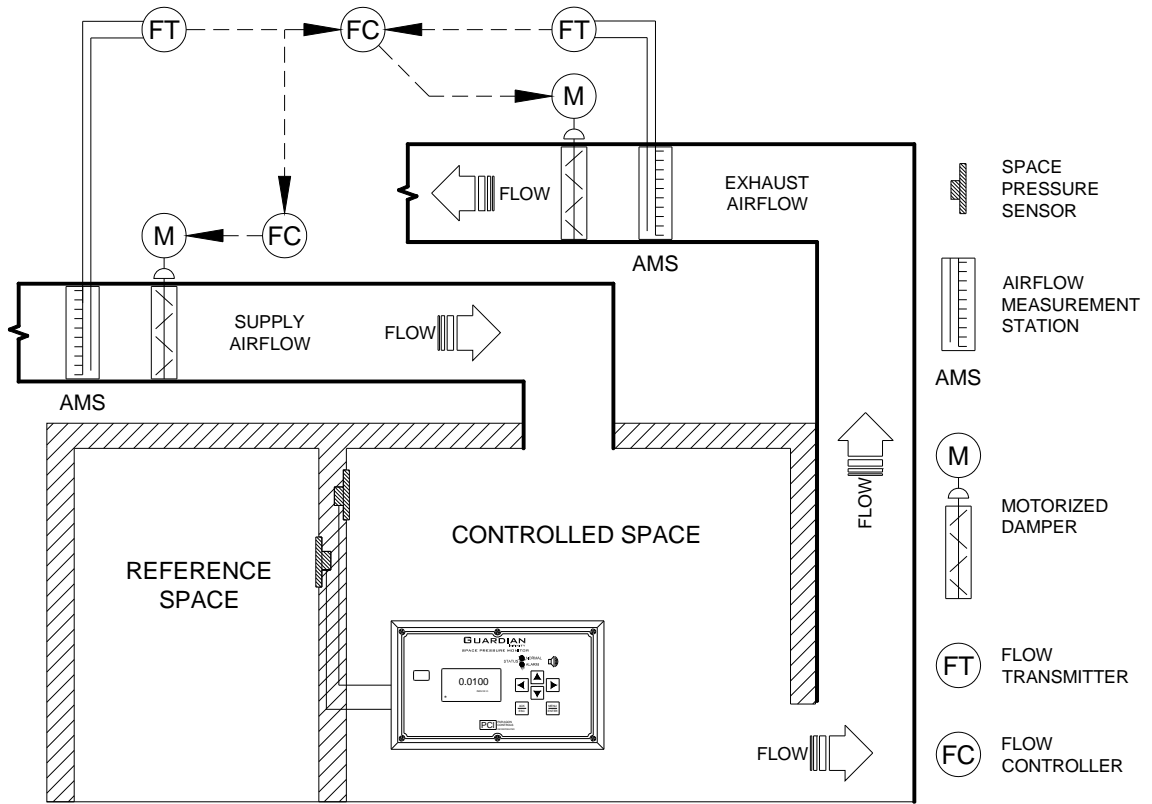


Figure 3: Volumetric Offset Control

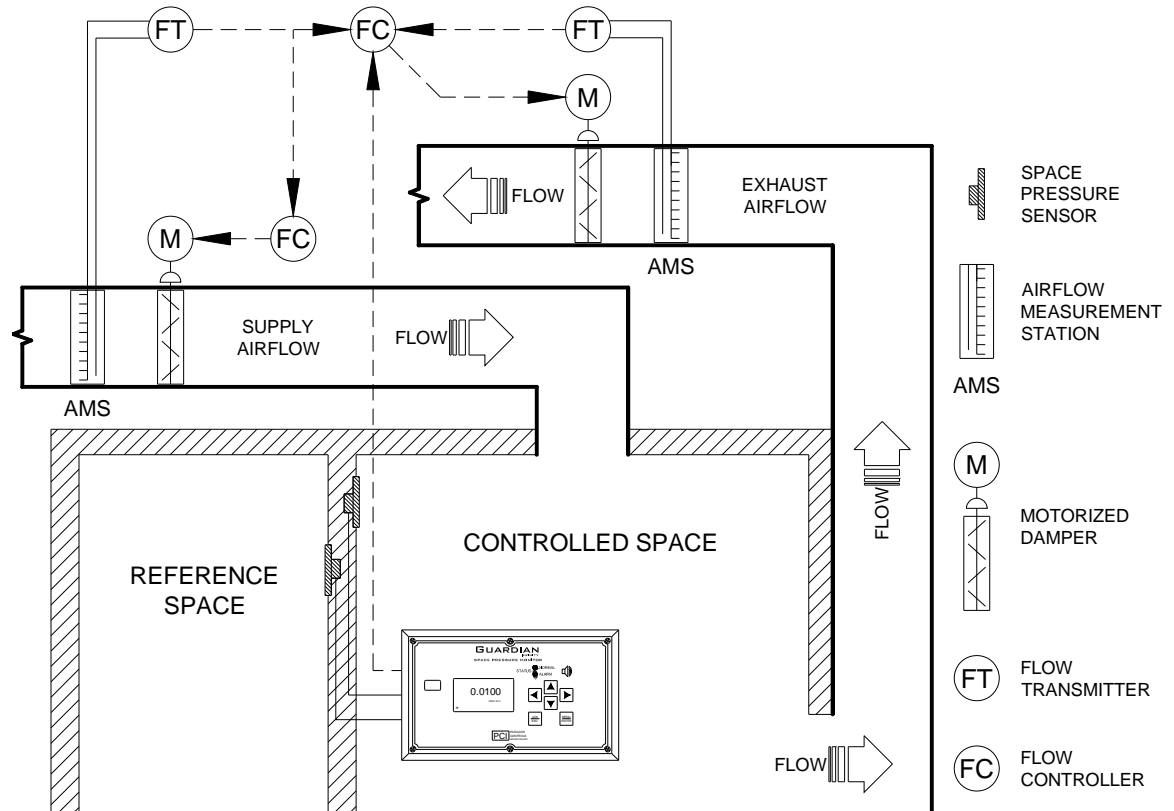
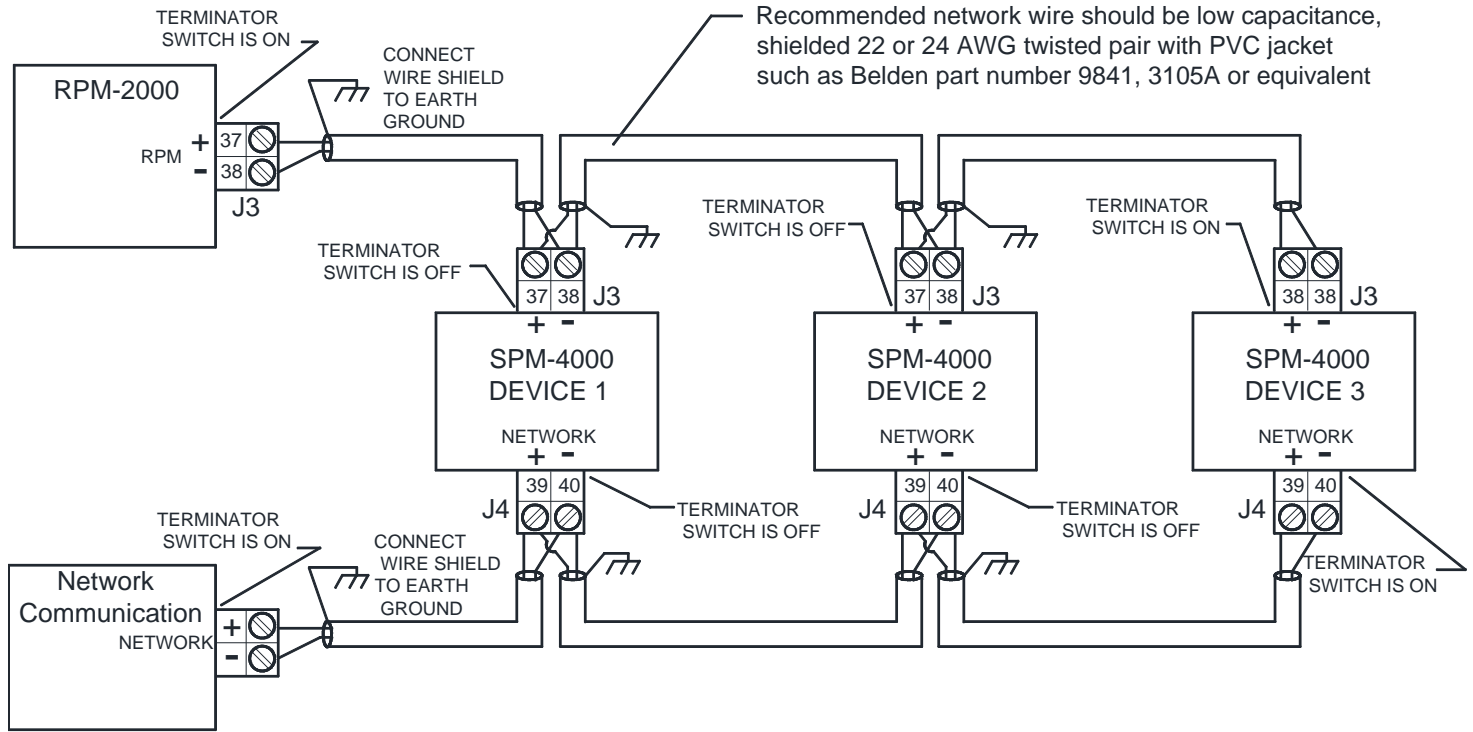


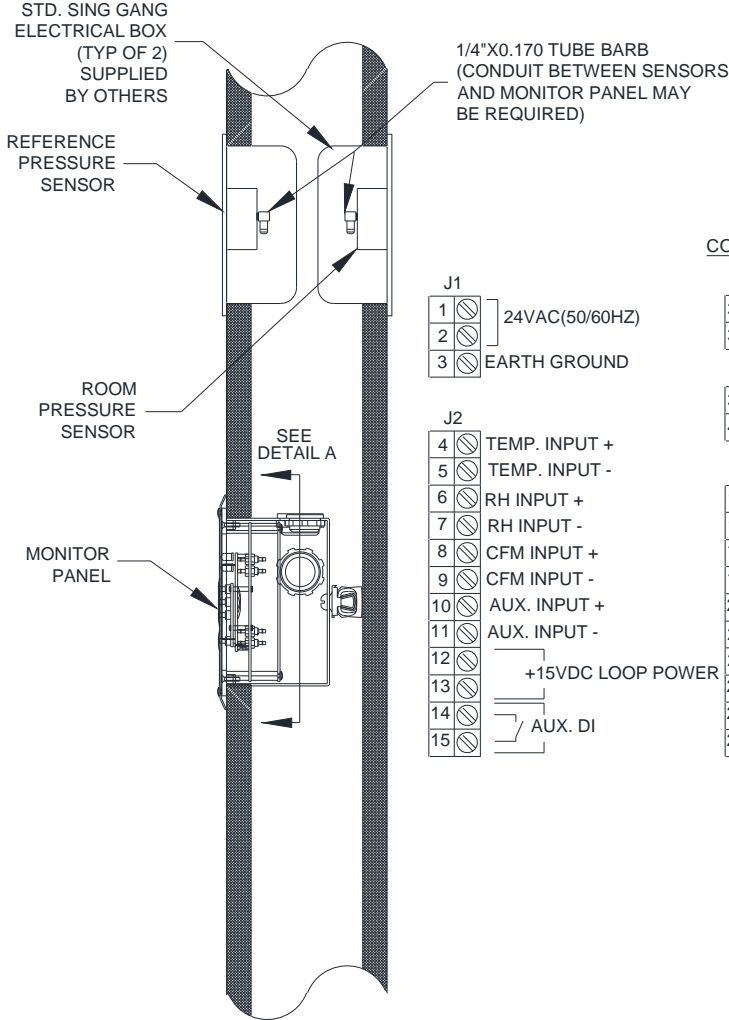
Figure 4: Cascade Pressure Control

Typical RPM-2000 & Network Communication Connection



Note: The RPM-2000 and Network Communication are independent networks. All devices must be daisy-chained as shown in the figure above.

SPM-4000 Installation and Field Connections



CONNECTION DETAILS

J1

1	24VAC(50/60HZ)
2	24VAC(50/60HZ)
3	EARTH GROUND

J2

4	TEMP. INPUT +
5	TEMP. INPUT -
6	RH INPUT +
7	RH INPUT -
8	CFM INPUT +
9	CFM INPUT -
10	AUX. INPUT +
11	AUX. INPUT -
12	+15VDC LOOP POWER
13	+15VDC LOOP POWER
14	AUX. DI
15	AUX. DI

J3

37	+	CONNECTION TO RPM
38	-	CONNECTION TO RPM

J4

39	+	NETWORK COMMUNICATION
40	-	NETWORK COMMUNICATION

J5

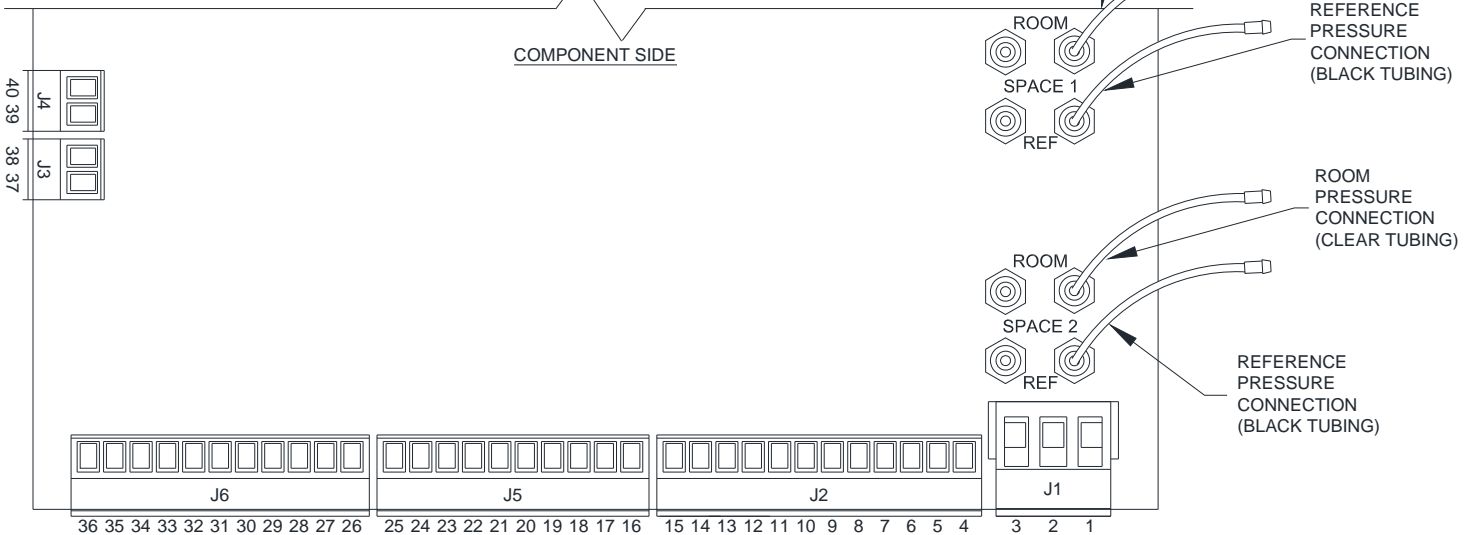
16	SPACE 1 + PROCESS OUTPUT
17	SPACE 1 - PROCESS OUTPUT(GND)
18	SPACE 2 + PROCESS OUTPUT
19	SPACE 2 - PROCESS OUTPUT(GND)
20	POSITIVE ROOM SELECT
21	NEGATIVE ROOM SELECT
22	GROUND
23	COM
24	NO SPACE PRESSURE ALARM
25	NC

J6

26	SYSTEM START
27	SYSTEM START
28	DOOR INTERLOCK
29	DOOR INTERLOCK
30	CONTROLLER SETPOINT +
31	CONTROLLER SETPOINT -
32	CONTROLLER OUTPUT +
33	CONTROLLER OUTPUT -
34	COM
35	NO AUX. RELAY
36	NC

3 POSITION POS/NEG/OFF ROOM SELECT SWITCH

DETAIL A



SPM-4000 Specification Guide

Space Pressure Monitor and Alarm Systems

1. Provide where indicated and/or scheduled a space pressure monitor and alarm system (SPM) capable of measuring the differential pressure between two spaces and alarming if any of the required control conditions are not maintained.
2. The SPM shall measure the differential pressure between two spaces using industrial grade differential pressure transducers meeting the following performance criteria. Systems using air velocity measurement between two spaces which imply a specific space pressure exists are not acceptable.
 - Accuracy: $\pm 0.25\%$ F.S. including linearity, hysteresis, deadband and repeatability
 - Temperature Effects: 0.03% F.S./deg F
 - Stability – Maximum Change F.S./Yr: $\pm 0.5\%$
 - Over-pressure: 15 psid proof/25 psid burst
3. Each SPM shall have local high intensity LED indicating lights identifying either normal or alarm status of the space being monitored, a local audible alarm, an alarm acknowledge button, and local indication of the measured space pressure down to one ten-thousandth of an inch of water (0.025 Pa)
4. Each space shall have a dedicated SPM that shall be capable of both standalone operation as well as full integration into the building management system (BMS). The SPM shall also be capable of local communication and configuration via a handheld device having an integral and compatible IR communication port or via integral pushbuttons. SPM monitoring and configuration shall be performed through [LonWorks®] [BACnet®-MS/TP communication networks] and/or through local IR communication between the SPM and compatible portable device. The operational mode (Positive/Negative/Off) shall be selectable via the use of a remote mounted key switch.
5. The SPM shall be capable of controlling either a modulating control damper or fan variable speed drive so as to maintain the required space pressure at a constant value. The SPM shall have menu selectable control mode values and be capable of "In Operation" controller tuning of proportional band, reset (integral), and inverse derivative (P,I, 1/D) to match system dynamics. The controller shall also be provided with the following:
 - Auto/Manual control output selection.
 - Local or remote adjustment of the required differential pressure setpoint value.
 - Door interlock feature programmable to either freeze controller output or bias output by a predetermined % F.S. value whenever a door into the space is opened.
 - Control accuracy of $\pm 0.5\%$ F.S.
6. The SPM shall be capable of monitoring [air changes per hour], [space temperature], and [space humidity] and issue an alarm if any of the required control conditions are not maintained.
7. The SPM shall be capable of monitoring two spaces and alarming if any of the required control conditions are not maintained.
8. The SPM shall provide a field selectable 4-20 mA or 0-10 VDC analog output signal linear to the measured space differential pressure as well as a form C SPDT binary alarm relay for remote monitoring and alarming capability.
9. Selections and adjustments that may be made at the jobsite shall include Positive and/or Negative pressurization mode selection; high and low pressure alarm activation values; alarm delay value; controller tuning; and controlled space pressure setpoint value.
10. All of the SPM system components shall meet International Protection Rating Standard IP64B for wash-down and intrusion compliance to allow for good housekeeping practices.
11. Each SPM shall include a pressure monitoring module with mounting box and two space pressure sensors. All components of the space pressure monitoring system shall be designed for both flush mounting and surface mounting, and shall be furnished to comply with the specified project requirements.

Manufacturer

1. The SPM system manufacturer shall have a minimum of ten (10) years of experience in space pressure monitoring and control, and shall be willing and able to provide a user list, with contact information, upon request.
2. The space pressure monitoring system shall be the Guardian Infinity Model SPM-4000 as manufactured by Paragon Controls Incorporated, Santa Rosa, California, telephone (707) 579-1424.
3. Alternatives requesting acceptance "as equal" less than 60 days prior to bid date or products submitted in non-conformance with the requirements of this specification will not be considered. For any product to be considered for substitution a written detailed exception/compliance document shall be submitted to the Engineer prior to any consideration for approval.