

INSTALLATION & MAINTENANCE INSTRUCTIONS

High Resolution Electro-Pneumatic Pressure Regulator

DESCRIPTION / IDENTIFICATION

The SPV1 is an electronically controlled closed loop pressure regulator. The device converts a 0-10 VDC command signal to a customer specified pressure range. The SPV1 consists of a control circuit board, a variable orifice two-way normally closed solenoid valve, an integral electronic pressure sensor, and a manifold. The control board compares the command signal to the integral pressure sensor, then drives the variable orifice solenoid valve so that desired pressure is maintained even if the required flow rate varies. No exhaust function is included. Exhaust must be through the consumption of the output media. The signal from the on board electronic pressure sensor is available as a 0-10 VDC monitor signal.



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SPECIFICATIONS

ELECTRICAL

POWER REQUIREMENT	15-24 VDC
COMMAND SIGNAL	0-10 VDC
MONITOR SIGNAL	0-10 VDC
CURRENT DRAW	140 mA Max

MECHANICAL

MAXIMUM INLET PRESSURE	165 PSIG (11.3 BAR)
OUTPUT PRESSURE†	0-100% of range (0-150 PSIG)
FLOW RATE	Based on inlet valve orifice size
Min CLOSED END VOLUME	1 in ³
THREAD TYPE	10-32 UNF or M5
MOUNTING TYPE	Din Rail or Manifold Mount
ACCURACY	<±0.25% F.S.
REPEATABILITY	<±0.02% F.S.
RESOLUTION	Up to ±0.015% F.S.

WETTED PARTS ‡

ELASTOMERS	Viton
BASE MANIFOLD	304 Stainless Steel
IND MANIFOLD	Clear coat Anodized Aluminum
PRESSURE TRANSDUCER	Silicon, Aluminum
SOLENOID VALVES	Nickel Plated Brass

PHYSICAL

AMBIENT TEMPERATURE	-4 to 158°F (-20 to 70°C)
MEDIA WORKING TEMPERATURE	-4 to 131°F (-20 to 55°C)
WEIGHT	1 lbs. (0.45 kg)

† Pressure ranges are customer specified. Output pressures other than 100% are available.

Before you get started, please read these warnings:

- ◆ Examine the product. Ensure that you received what you ordered.
- ◆ Read this guide first before you start and save it for later use.
- ◆ All compressed air and power should be shut off before installing, removing or performing maintenance on this product.
- ◆ Installation and use of this product should be under the supervision and control of properly qualified personnel in order to avoid the risk of injury or death.

TUNING PROCEDURE - *Prior to Re-calibration Only*

1. Preset the tuning potentiometers on the SPV1 to the following settings: PROP = full CCW, BIAS = 2500 Ω , and INT = full CCW.
2. Set the command voltage to 1 VDC. Adjust the PROP as high as it can go without visible oscillation on the oscilloscope. Check this setting and back down if necessary the PROP at command voltages of 1, 2, 3, 4,...10V so that the PROP is as high it can be without oscillation at any of the voltages.
3. Set the command voltage to 10 VDC. Adjust the INT so that the external feedback voltage matches the command voltage. There may be a slight voltage offset between the command voltage, but this will be consistent through all command voltages. Adjust the INT very slightly CW (1/20th turn) of the necessary position to achieve this command voltage.
4. Record the actual final values for PROP, BIAS and INT along with the serial number and the test date & time.

OUTPUT PRESSURE CALIBRATION

The following test equipment is required to properly calibrate the unit.

Command signal source (0 – 10 VDC).

Volt meter(s)

Precision pressure gauge.

Needle valve. (only if integral bleed orifice is not installed on the unit).

15 - 24 VDC power supply.

1. Connect the pressure gauge and needle valve to the work port of the unit. Barely crack open the needle valve (if used) to create a small leak.
2. Connect supply power, command signal with a volt meter, and a volt meter on the analog monitor signal.
3. Connect supply pressure to the inlet port on the unit.
4. With zero command and zero output pressure adjust the Pressure Zero potentiometer until the volt meter on the Analog Monitor reads 0.00 VDC. An alternative way to set the Zero potentiometer is to give the unit a 0.5 VDC command signal and adjust the Zero potentiometer for an output pressure of 10% of desired full scale.
5. Give the unit a 10 VDC command signal. Adjust the Pressure Span potentiometer for an output pressure of 100% of the desired full scale. If the unit is unable to achieve the desired pressure and the Analog Monitor signal is significantly lower than the command signal, the leak rate is too high, close down on the needle valve.

Repeat steps 4 and 5 until further adjustments are not required.

DETERMINING CURRENT POTENTIOMETER SETTINGS

The control potentiometers are labeled on the outer edge of the PCB next to their actual location. On the back of the PCB there is a row of three pads approximately a tenth of an inch square. Each pad corresponds to its associated potentiometer. To determine the setting of any of the potentiometers, measure the resistance between the desired pad and common. The power to the unit must be shut off to do this.

BEFORE ADJUSTING POTENTIOMETERS PLEASE RECORD THE CURRENT SETTINGS USING THE PROCESS ABOVE

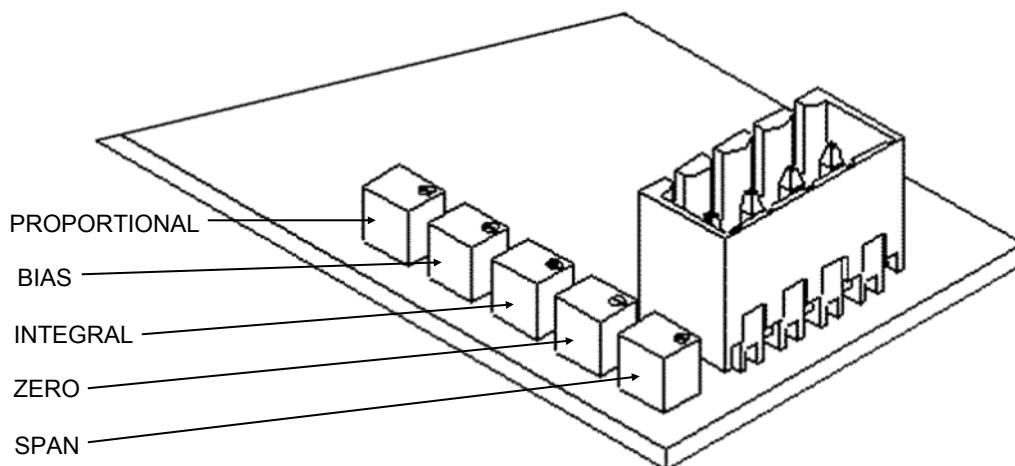
There are two calibration adjustments for the on board pressure transducer, zero and span. They are used to set the pressure range of the unit.

There are three control circuit adjustments to set the behavior of the control circuitry to accommodate different downstream pneumatic systems. The setting of each of the potentiometers can be determined by measuring the resistance between the corresponding a pad on the back of the board to power supply common, (unit de-energized).

Bias: This adjustment adds a bias to the control signal to the valve. The purpose is to pre-stage the valve close to the point where it begins to open. The actual Bias set point is influenced by the supply pressure and calibrated range of the unit. A typical range of this adjustment is about 1000 ohms to 2500 ohms.

Proportional: This is the same as a proportional adjustment in a traditional PID control system. The Proportional adjustment sets the magnitude of the error signal for a given difference between the command and feedback. Excess Proportional Gain can cause the unit to oscillate.

Integral: This is similar to the Integral adjustment in a traditional PID control system, typically it works to eliminate any difference between the command and feedback over a period of time. On the SPV this adjustment has similar function but also helps control the drive signal to the valve in order to maintain pressure while the unit is under flow. Insufficient Integral will result in insufficient valve drive to maintain pressure at high flow rates. Excess Integral will result in low frequency ringing in the output pressure after a step change in the command signal.



DIMENSIONS

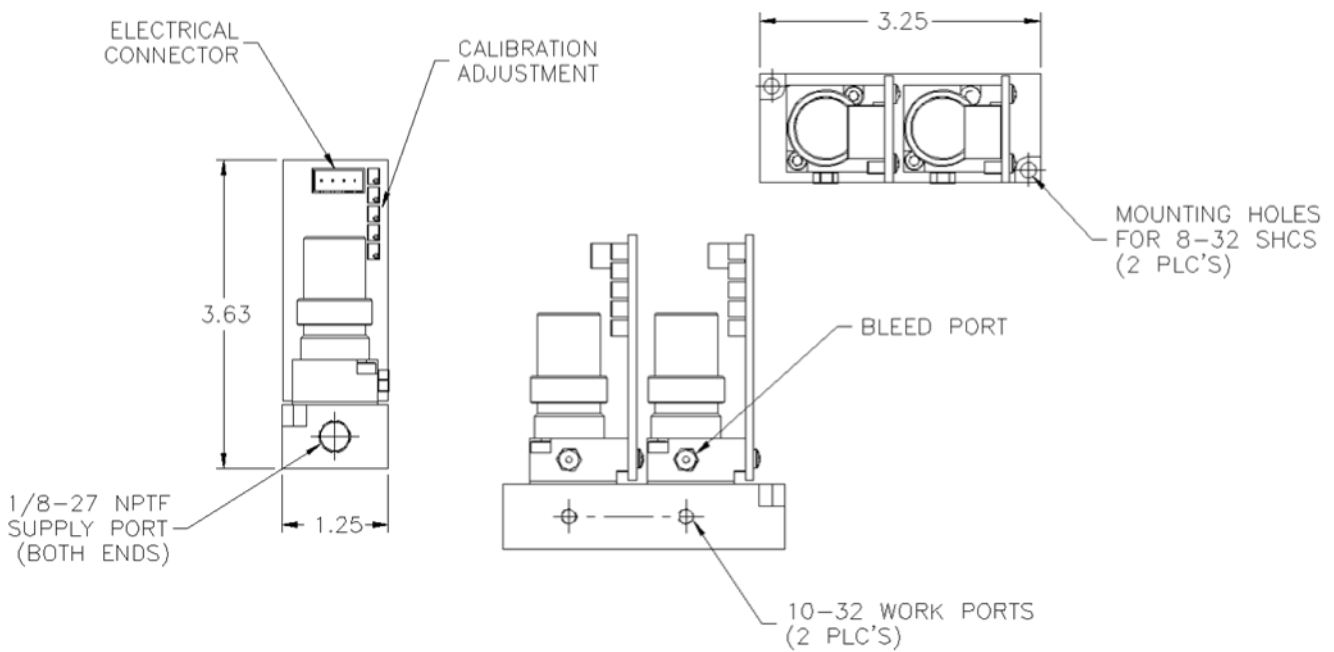
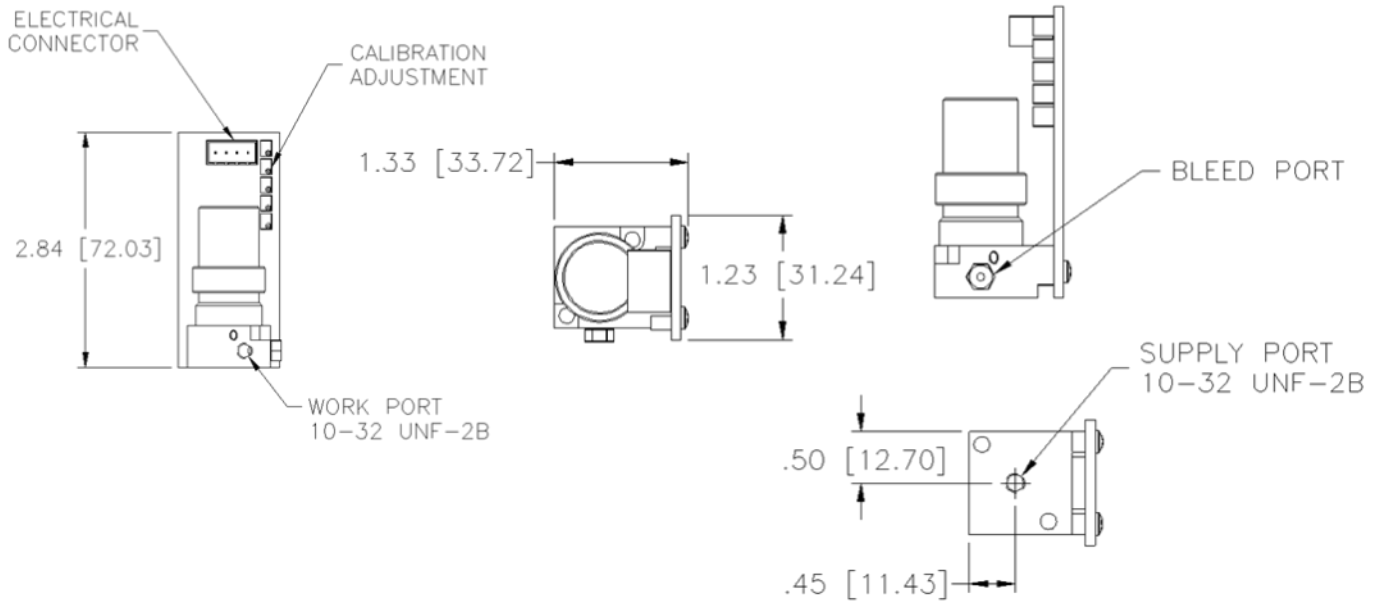


TABLE 1

RATED INLET PRESSURE FOR STANDARD SPV VALVES

For valves ordered with MAX. calibrated pressure of:	Max. inlet pressure is:
Vacuum up to 10 psig (0.69 bar)	Consult factory
10.1 up to 30 psig (0.70 up to 2 bar)	35 psig (2.4 bar)
31 up to 100 psig (2.1 up to 7 bar)	110 psig (7.6 bar)
101 up to 150 psig (6.96 up to 10.3 bar)	165 psig (11.3 bar)

SPV

ACCURACY	±0.2% F.S.	PRESSURE	Full Vac to 150 PSIG (10 Bar)											
PORT SIZE	10-32 UNF	MAX FLOW	1 SCFM (28 SLPM)											
Example Part Number SPV 1 D A U E E Z P 9 BR G A L OPTIONS														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	OPTIONS

The SPV employs a single proportional valve designed for compact under flow applications

Section Reference

1 Type
1 Single Loop
2 Dual Loop

2 Mounting Type
D DIN Rail (Threaded Face)
M Manifold (Ports on Bottom)

3 Manifold Material
A Clear Anodized Aluminum

4 Thread Type
U 10-32 UNF
M M5

5 Input Signal Range	
E 0 to 10 VDC	
K 0 to 5 VDC	
V 1 to 5 VDC*	
*Requires V for Monitor Signal (#6)	

6 Output Signal Range	
X No Monitor	
E 0 to 10 VDC	
K 0 to 5 VDC*	
V 1 to 5 VDC* ¹	
*Requires E, I or K for Input Signal Range (#5)	
* ¹ Requires V for Input Signal Range (#5)	

7 Zero Offset
N 0% Pressure is Below Zero
P 0% Pressure is Above Zero
Z 0% Pressure is Zero (Typical)

8 Zero Offset Pressure	
Typical is 0* - If greater than 30% of full scale pressure (#10 below), please consult factory.	
*If Z for Zero Offset, Please Leave this Section (#8) Blank	

9 Full Scale Pressure Type
N 100% Pressure is Below Zero
P 100% Pressure is Above Zero
Z 100% Pressure is Zero

11 Pressure Unit (no additional fee - all)		
PS PSI	Inches Hg	IH
MB Millibars	Inches H ₂ O	IW
BR Bar	Millimeters H ₂ O	MW
KP Kilo-pascal	Kilograms/cm ²	KG
MP Mega-pascal	Centimeters H ₂ O	CW
MH Millimeters Hg	Pascal	PA

10 Full Scale Pressure
Must be less than or equal to 150 psig

12 Pressure Unit of Measure
G Gauge Pressure

PLEASE CONTACT FACTORY FOR VALVE & ORIFICE SELECTION

13 Inlet Valve	
A 0.013"	
B 0.025"	
C 0.040"	
D 0.060"	
E 0.089"	
N No Inlet Valve*	
X 0.040**	
*Vacuum Pressure Units Only	

14 Bleed Orifice
N No Bleed Orifice
L Factory Standard Bleed Orifice (0.004")
2 Non-Standard Bleed Orifice (0.002")

Recommended Accessories
H161569 Power Connector (Included with SPV)
DRMKT-SPV DIN Rail Mounting Kit (Use option DR to add to part number)



Please read all of the following Safety Precautions before installing or operating any Proportion-Air, Inc. equipment or accessories. To confirm safety, be sure to observe 'ISO 4414: Pneumatic Fluid Power - General rules relating to systems' and other safety practices.



Warning

Improper operation could result in serious injury to persons or loss of life!

1. PRODUCT COMPATIBILITY

Proportion-Air, Inc. products and accessories are for use in industrial pneumatic applications with compressed air media. The compatibility of the equipment is the responsibility of the end user. Product performance and safety are the responsibility of the person who determined the compatibility of the system. Also, this person is responsible for continuously reviewing the suitability of the products specified for the system, referencing the latest catalog, installation manual, Safety Precautions and all materials related to the product.

2. EMERGENCY SHUTOFF

Proportion-Air, Inc. products cannot be used as an emergency shutoff. A redundant safety system should be installed in the system to prevent serious injury or loss of life.

3. EXPLOSIVE ATMOSPHERES

Products and equipment should not be used where harmful, corrosive or explosive materials or gases are present. Unless certified, Proportion-Air, Inc. products cannot be used with flammable gases or in hazardous environments.

4. AIR QUALITY

Clean, dry air is not required for Proportion-Air, Inc. products. However, a 40 micron particulate filter is recommended to prevent solid contamination from entering the product.

5. TEMPERATURE

Products should be used with a media and ambient environment inside of the specified temperature range of 32°F to 158°F. Consult factory for expanded temperature ranges.

6. OPERATION

Only trained and certified personnel should operate electronic and pneumatic machinery and equipment. Electronics and pneumatics are very dangerous when handled incorrectly. All industry standard safety guidelines should be observed.

7. SERVICE AND MAINTENANCE

Service and maintenance of machinery and equipment should only be handled by trained and experienced operators. Inspection should only be performed after safety has been confirmed. Ensure all supply pressure has been exhausted and residual energy (compressed gas, springs, gravity, etc.) has been released in the entire system prior to removing equipment for service or maintenance.



Caution

Improper operation could result in serious injury to persons or damages to equipment!

1. PNEUMATIC CONNECTION

All pipes, pneumatic hose and tubing should be free of all contamination, debris and chips prior to installation. Flush pipes with compressed air to remove any loose particles.

2. THREAD SEALANT

To prevent product contamination, thread tape is not recommended. Instead, a non-migrating thread sealant is recommended for installation. Apply sealant a couple threads from the end of the pipe thread to prevent contamination.

3. ELECTRICAL CONNECTION

To prevent electronic damage, all electrical specifications should be reviewed and all electrical connections should be verified prior to operation.

Exemption from Liability

- Proportion-Air, Inc.** is exempted from any damages resulting from any operations not contained within the catalogs and/or instruction manuals and operations outside the range of its product specifications.
- Proportion-Air, Inc.** is exempted from any damage or loss whatsoever caused by malfunctions of its products when combined with other devices or software.
- Proportion-Air, Inc.** and its employees shall be exempted from any damage or loss resulting from earthquakes, fire, third person actions, accidents, intentional or unintentional operator error, product misapplication or irregular operating conditions.
- Proportion-Air, Inc.** and its employees shall be exempted from any damage or loss, either direct or indirect, including consequential damage or loss, claims, proceedings, demands, costs, expenses, judgments, awards, loss of profits or loss of chance and any other liability whatsoever including legal expenses and costs, which may be suffered or incurred, whether in tort (including negligence), contract, breach of statutory duty, equity or otherwise.

Warranty

Proportion-Air, Inc. products are warranted to the original purchaser only against defects in material or workmanship for one (1) year from the date of manufacture. The extent of Proportion-Air's liability under this warranty is limited to repair or replacement of the defective unit at Proportion-Air's option. Proportion-Air shall have no liability under this warranty where improper installation or filtration occurred.

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