

PROPORTION AIR

MM1/MM2 INSTALLATION & MAINTENANCE INSTRUCTIONS

DESCRIPTION / IDENTIFICATION

The MM series proportional control valves utilize Proportion-Air's unique closed loop control technology for superior control of pressurized gases and fluids.

The MM delivers pressure control which is linear and proportional to either a DC current or DC voltage command signal.

The MM is designed to have "Universal Mounting" capabilities which include DIN rail, panel mount, or manifold mounting for use on a sub-base for multiple unit applications. Sub-base configurations are available from 2-12 units (consult factory for more units). The sub-base offers a common supply and exhaust port with individually controlled outlet ports to minimize plumbing connections and maximize installation/maintenance efficiency.

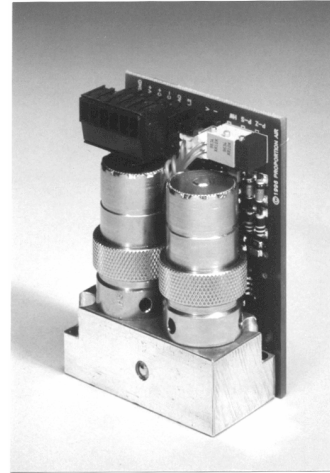
The MM1 uses two solenoid valves to control system pressure. One valve functions as an inlet control, the other as an exhaust control. A strain gauge pressure transducer measures the system pressure and provides a feedback signal to the electronic controls. This feedback signal is compared against the command signal. Any difference between the two signals causes one of the valves to open allowing pressure in or out of the system. Closed loop proportional control of pressure is maintained in this manner.

The MM2 is similar to the MM1 but uses a double loop control scheme. In addition to the internal pressure transducer, the MM2 also receives a feedback signal (0-10Vdc standard) from an external sensing device. The external signal functions as the primary feedback and is compared to the command signal. This comparison is summed with the internal pressure transducer signal. A difference between the two comparisons causes one of the two solenoid valves to open, allowing pressure in or out of the system.

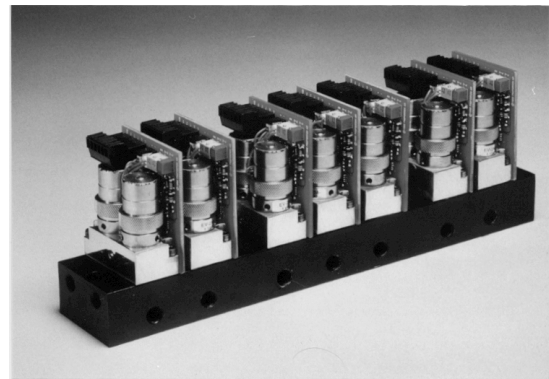
Since the secondary feedback is an electrical signal, many types of sensors may be used as feedback such as pressure, force, position, flow, etc.

A 0-10Vdc analog output is also standard on both the MM1 and MM2 and can be used for data acquisition or taken to a panel meter for display.

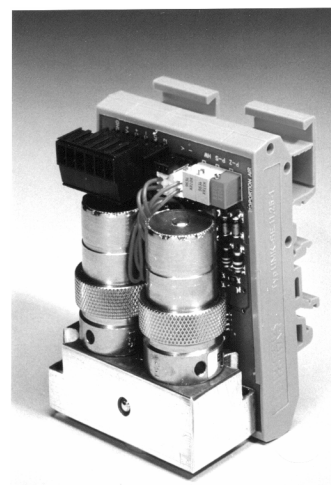
PANEL MOUNT



MANIFOLD MOUNT



DIN RAIL



<u>SPECIFICATIONS</u>	<u>MIN</u>	<u>TYP</u>	<u>MAX</u>	<u>TERM</u>
<u>ELECTRICAL</u>				
Supply Voltage	15	-	24	Vdc
Supply Current	35	-	250	mA max
Command Signal	Voltage Current	0 4	- -	Vdc mA differential
Command Signal Impedance	Voltage Current	- -	4700 100	Ohms Ohms
2nd Loop Signal Impedance		-	4700	Ohms
Monitor Signal		0	-	10 Vdc @ 10mA
<u>PHYSICAL</u>				
Operating Temperature	32 (0)	-	158 (70)	°F (°C)
Weight per unit (sub-base not included)	-	0.7 (0.3)	-	Lb (Kg)
<u>MECHANICAL</u>				
Pressure Ranges	29.9 in. Hg (vac) (3) 760 mm Hg (vac)	- -	300* (1) 20.68	Psig Bar
Cv Capacity	-	0.04	-	
Min Closed End Volume	-	1 (17)	-	in ³ (cm ³)
Filtration Recommended	40	-	-	micron
Hysteresis	0	±0.15	0.4	% F.S. (Adjustable) (2)
Repeatability	-	±0.02	-	% F.S. (2)
Accuracy / Linearity	-	±0.2	-	% F.S. (2)
Temperature Effect	-	±1	-	% F.S. (2)
Wetted Parts Elastomers.....Fluorocarbon Manifold.....Brass Valves.....Nickel plated brass P. TransducerSilicon, Aluminum, RTV (1) Pressure ranges are customer specified, others available. (2) The hysteresis of the MM series is adjustable. See step 9 of the Calibration Procedure. Adjusting the hysteresis also affects repeatability, accuracy and linearity. (3) MM units for vacuum only service are designed to provide pressure control of a vacuum level that is linearly proportional to an analog electronic command. Vacuum only service units always provide a higher level of vacuum for a higher analog command. A typical example is 4-20mA = 0-20in Hg vacuum, where 4mA gives 0in Hg and 20mA gives 20in Hg vacuum. Vacuum through positive pressure units must have positive pressure equal to or greater than vacuum level.				

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.
- ◆ You must have a good understanding of what the adjustments are on this product before using them.
- ◆ 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.

CONNECTION PROCEDURE

DIN Rail Mount

Mounting

The DIN rail MM servo valve comes assembled to a DIN rail with a universal foot to allow all modules to be snapped onto all available DIN footprints:

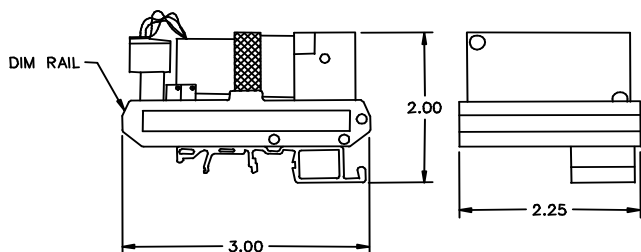


Figure 1

Panel Mount

Mounting

The panel mount MM servo valve can be assembled to a panel by inserting two 8-32 socket head cap screws into the manifold and torque each screw into the panel (figure 3).

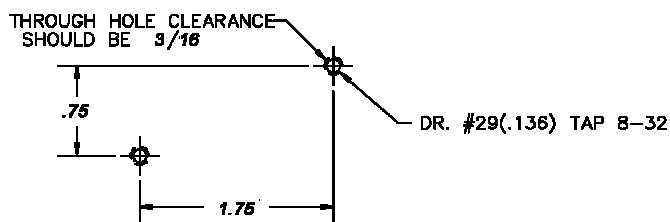


Figure 3

Pneumatic Connections

1. Apply a small amount of anaerobic sealant to the male threads of the in-line filter supplied with the MM. Units with S938 option are not shipped with in-line filter.
2. Connect supply pressure to the “I” port (figure 2) not to exceed rated supply pressure. (See table 1) **Be sure to look at the stamping because the supply “I” and the exhaust “E” ports are reversed in high pressure units.** For units with S938 option, the supply “I” and the exhaust “E” ports are reversed. The supply pressure must be connected to “E” port.
3. Connect the outlet “O” port (figure 2) to the device being controlled.
4. Proceed with electrical connection.

DIN Rail Mount

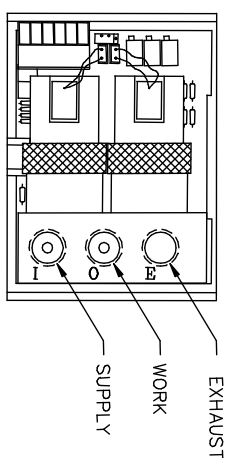


Figure 2

Pneumatic Connections

1. Apply a small amount of anaerobic sealant to the male threads of the in-line filter supplied with the MM. Units with S938 option are not shipped with in-line filter.
2. Connect supply pressure to the “I” port (figure 4) not to exceed rated supply pressure. (See table 1) **Be sure to look at the stamping because the inlet “I” and the exhaust “E” ports are reversed in high pressure units.** For units with S938 option, the supply “I” and the exhaust “E” ports are reversed.
3. Connect the outlet “O” port (figure 4) to the device being controlled.
4. Proceed with electrical connection.

Panel Mount

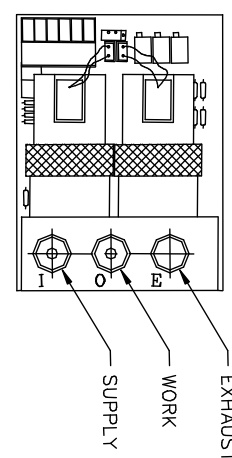


Figure 4

TABLE 1
RATED PRESSURE FOR MM VALVES

MAX calibrated pressure of:	Max inlet pressure is:
-1 up to 1 psig (-0.07 to 0.07 bar)	Consult factory
Vacuum up to 30 psig (Vacuum to 2.07 bar)	35 psig (2.41 bar)
31 up to 100 psig (2.14 to 6.89 bar)	110 psig (7.58 bar)
101 up to 175 psig (6.96 to 12.07 bar)	190 psig (13.10 bar)
176 up to 300 psig (12.13 to 20.68 bar)	330 psig (22.75 bar)

MM Manifold Mounting:

Installation:

1. Install the three O-rings in the O-ring grooves of the sub-base manifold. (figure 5, ref E)
2. Align the MM servo control valve over the three O-rings. Orientation of the MM unit should be the same for all MMs on the manifold and can be determined by the “I” and “E” marks on the MM brass manifold and the aluminum sub-base manifold (figure 5, ref item H). **Be sure to look at the stamping because the inlet “I” and the exhaust “E” ports are reversed in high pressure units.**
3. Insert the two cap screws that hold the servo valve to the sub-base manifold. Torque each screw to 8 in-lbs and then torque each cap screw to 13-15 in-lbs (figure 5, ref item D).
4. To install the sub-base manifold to a panel use 1/4-20 socket head mounting screws (figure 5, ref item A).

Removal:

1. Disconnect supply air and the electrical connector from the MM servo valve to be removed.
2. Remove the cap screws that mount the MM servo valve to the sub-base manifold (figure 5, ref item D).
3. The MM servo valve may now be lifted free of the sub-base manifold. Be careful to retain the three O-rings in their grooves on the sub-base manifold (figure 5, ref item E).

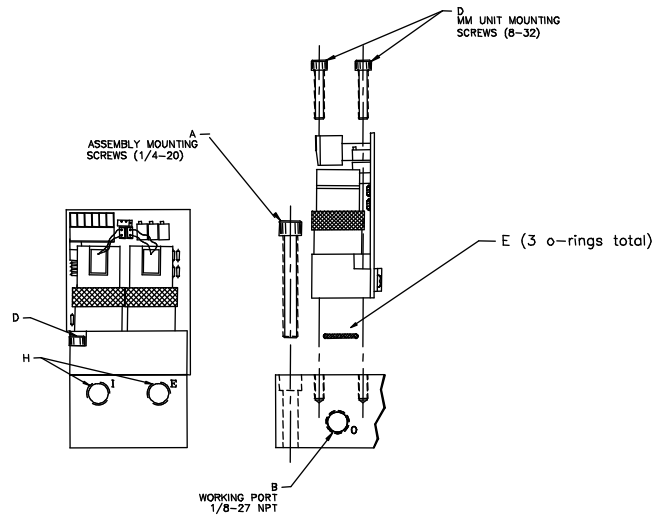


Figure 5

Pneumatic Connections

1. Connect supply pressure to the “I” port (figure 5, ref item H) not to exceed rated supply pressure. (See table 1) **Be sure to look at the stamping because the inlet “I” and the exhaust “E” ports are reversed in high pressure units.**
2. Connect the “O” port (figure 5, ref item B) to the device being controlled.
3. Proceed with electrical connection.

Vacuum Only & Vacuum Through Positive Pressure Units

Pneumatic Connections

1. Apply a small amount of anaerobic sealant to the male threads of the in-line filter supplied with the MM.
2. Connect vacuum supply to the “E” port (figure 6).
3. Connect supply pressure to the “I” port (figure 6) not to exceed rated supply pressure (See table 1). Supply pressure is necessary on vacuum to positive pressure MM units and when a MM air pilots a volume booster.
4. Connect the outlet “O” port (figure 6) to the device being controlled.
5. Proceed with electrical connection.

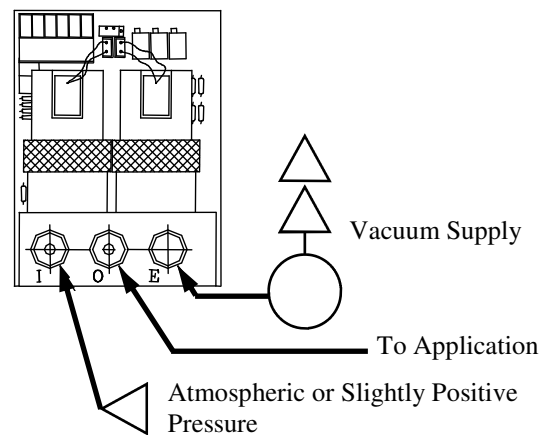


Figure 6

Electrical connections

1. Ensure all power is off before making any electrical connections.
2. Figure 7 shows the location of the MM electrical connector and Table 2 identifies each connection.
3. See figure 8 for voltage command wiring, and figure 9 for voltage monitor wiring.
4. See figure 10 for current command wiring.
5. See figure 11 for second loop connections.
6. See figure 6 for switching current command and voltage command.

Voltage command valves:

All voltage command MMs use common mode voltage, meaning the DC Common pin is the common reference for both power and command. Figure 8 shows the proper connections.

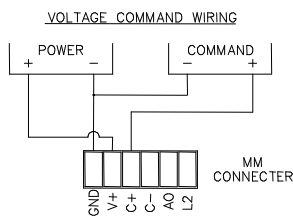


Figure 8

Voltage monitor:

See figure 9 for voltage monitor feedback signal wiring.

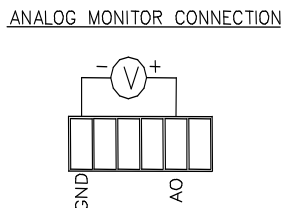


Figure 9

Current command valves:

All current command MMs use a differential current loop scheme, meaning current flow is from C+ to C- on the MM valves. Figure 10 shows the correct connection for conventional current flow.

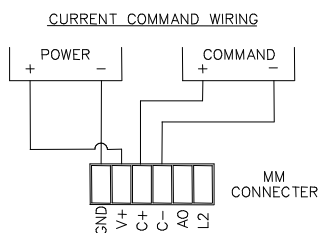


Figure 10

TABLE 2

CONNECTOR LABEL	FUNCTION
GND	DC COMMON
V+	(+) DC POWER
C+	(+) COMMAND (0-10VDC or 4-20mA)
C-	(-) COMMAND (4-20mA RETURN)
Ao	(+) ANALOG MONITOR
L2	(+) 2ND LOOP IN – MM2 ONLY

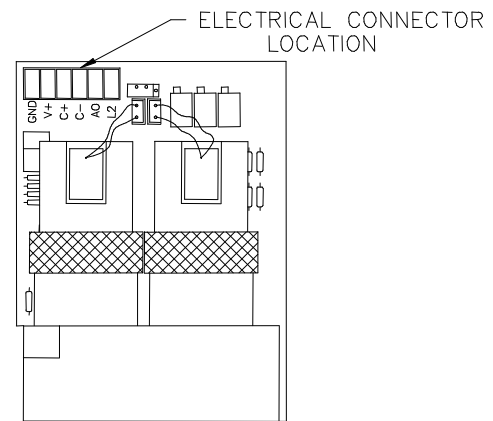


Figure 7

MM2 second loop connections:

All MM2 valves are designed to accept a 0-10Vdc second loop input signal.

1. Make electrical connections according to the section titled “Voltage command valves” for a voltage command unit or “Current command valves” for a current command unit.
2. Attach the external feedback signal to the terminal on the electrical connector which corresponds to the L2 pin on the p.c. board. (See figure 11)

2nd LOOP CONNECTION PROCEDURE ELECTRICAL

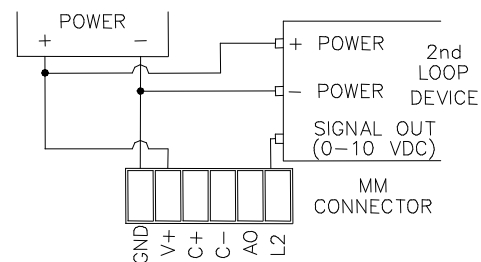


Figure 11

RE-CALIBRATION PROCEDURE :

All MM valves come pre-calibrated from the factory using precision calibration equipment. If the MM valve needs re-calibration, use the procedure described below:

MM1 VALVES:

1. Wire control valve according to the section titled "Electrical Connections."
2. Connect a precision measuring gauge or transducer to the outlet port of the MM.

NOTE: There must be a closed volume of at least 1 cu.in. (17cc) between the valve outlet and the measuring device for the valve to be stable.

3. Plumb control valve according to section titled "Pneumatic Connections". Make sure supply pressure does not exceed the rating for the valve (see table 1).
4. On the printed circuit board, locate the two adjustment potentiometers labeled "P-S" (span adjust) and "P-Z" (zero adjust). (See figure 12)
5. Set the electrical command input to MAXIMUM value.
6. Adjust the SPAN potentiometer until MAXIMUM de-

NOTE: Only use this step if your device is totally out of calibration. If it is slightly out of calibration, omit this step and move on to paragraph 5. Using a small screwdriver, turn both potentiometers 15 turns clockwise. Then turn them 7 turns counter clockwise. This will put the MM roughly at mid scale.

sired pressure or vacuum is reached (clockwise to increase pressure).

7. Set the electrical command input to 10 percent of full value (1Vdc for 0-10Vdc unit or 5.6mA for 4-20mA unit).
8. Adjust the ZERO potentiometer until 10 percent of maximum desired pressure or vacuum is reached. (clockwise increases pressure).
9. If at any time during the calibration procedure the control valve oscillates or becomes unstable for more than one second, turn the hysteresis potentiometer "HW" (see figure 12 for location) clockwise until the oscillation stops, then turn it one more complete turn (same direction).
10. The ZERO and SPAN potentiometers interact slightly. Repeat steps 5-10 until no error exists.
11. Verify unit shuts off by going to zero command. Check linearity by going to at least six setpoints throughout the full range.

MM2 VALVES:

This calibration procedure assumes there is a properly scaled and calibrated transducer for use as 2nd loop feedback signal. (The MM2 series accepts a 0-10Vdc 2nd loop signal.)

Follow, in order, steps 1-11 as noted in the section titled MM1 VALVES. Make sure the 2nd loop is connected before you start the calibration.

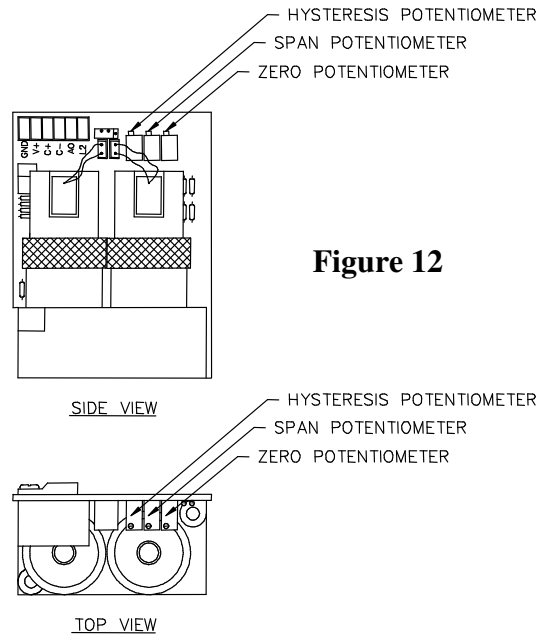


Figure 12

COMMAND SELECTION **DC VOLTAGE OR DC CURRENT**

To change the MM command from a current command to a voltage command or vice versa, remove the jumper and place it on the type of command required for your application. (See figure 13)

4-20 & 0-10VDC JUMPER

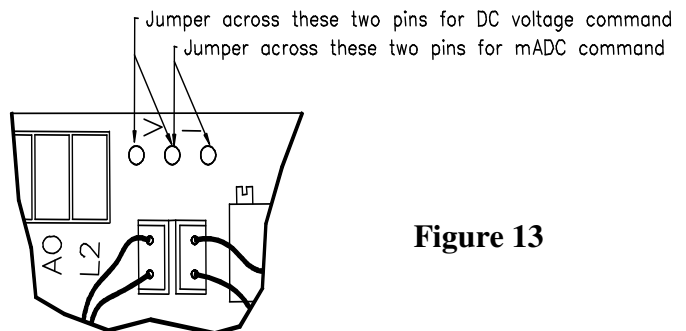
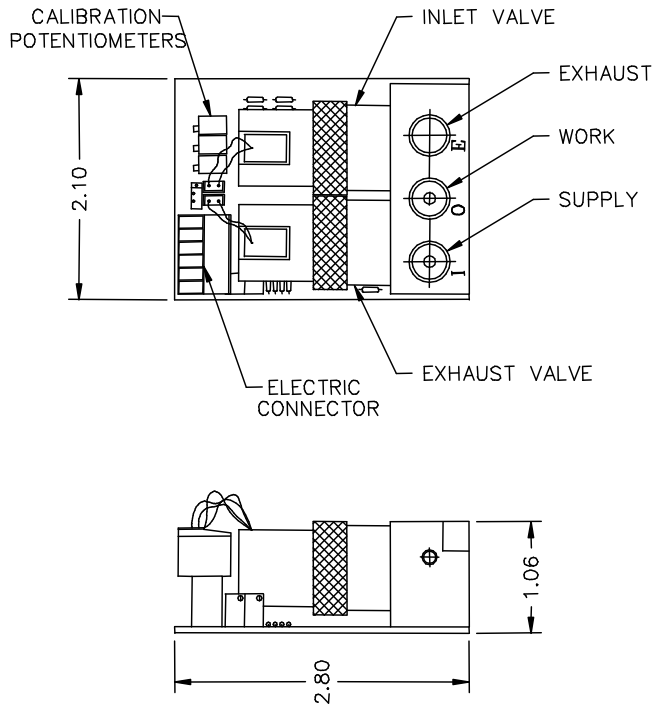


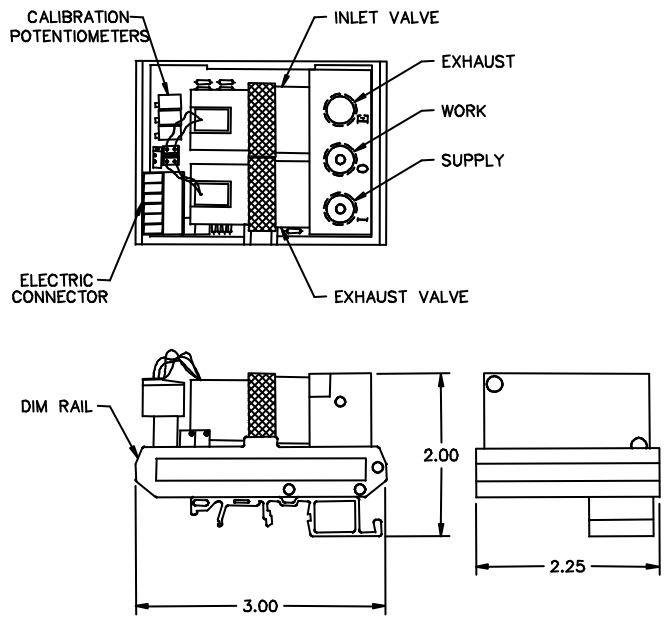
Figure 13

DIMENSIONS

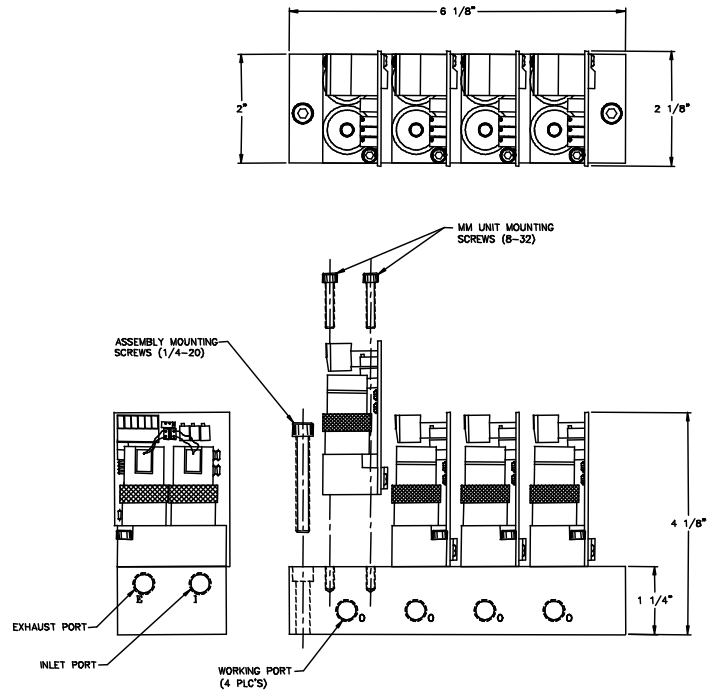
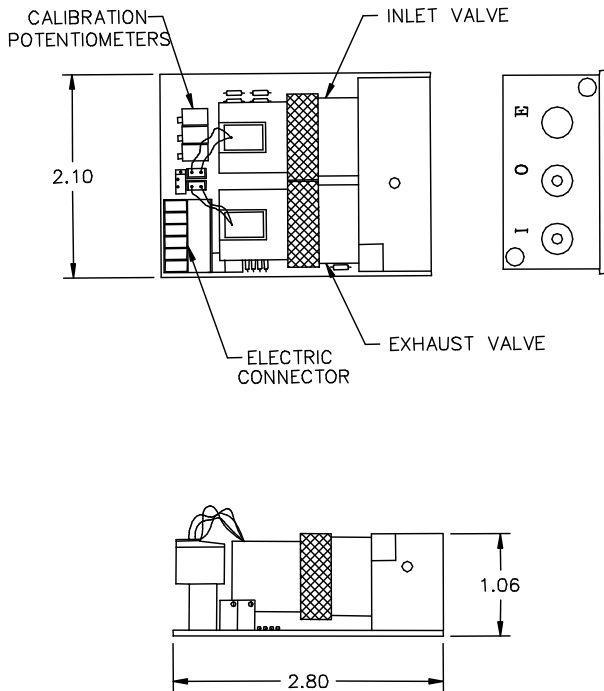
Panel Mount MM



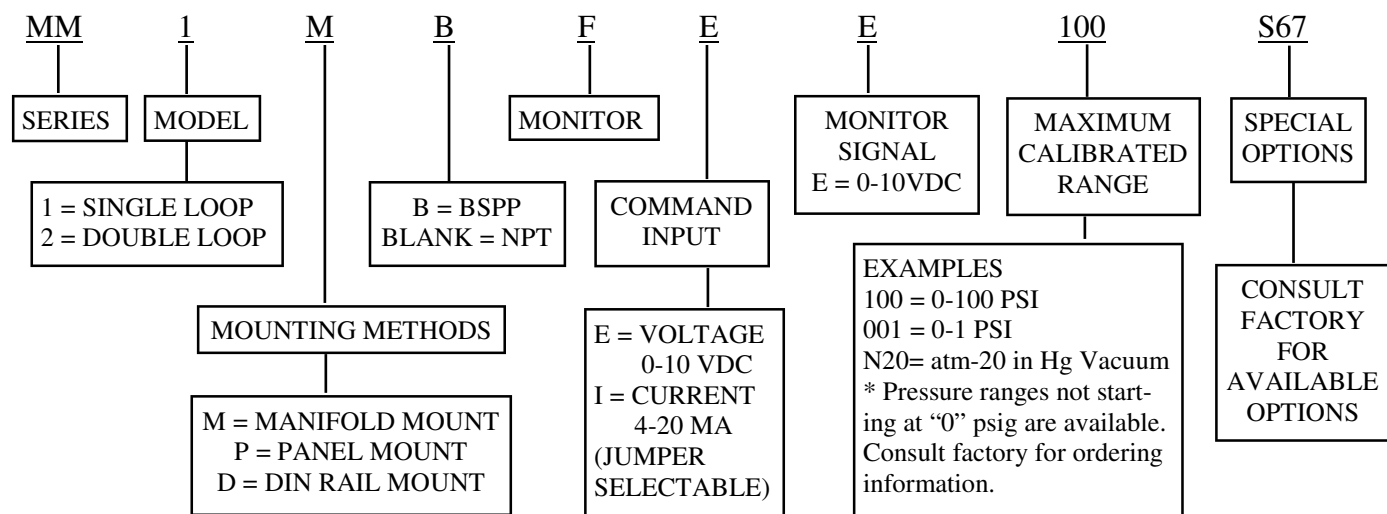
DIN Rail MM



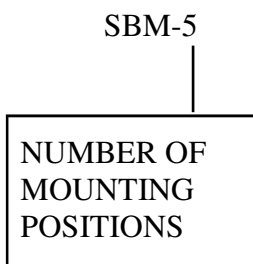
MANIFOLD MOUNT



ORDERING INFORMATION



SUB-BASE MANIFOLD*



DIN RAIL MOUNTING KIT

DRMKT-01

PANEL MOUNT KIT

PMK-MM

* For a British pipe thread sub-base add – BSPP (i.e. SBM-5-BSPP).

To order an MM assembled to the sub-base manifold, consult factory.

* for pressure ranges that exceed 175 psig, an “H” must be added to sub-base (i.e. SBM-5H).

Proportion-Air 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.

All specifications are subject to change without notice. **THIS WARRANTY IS GIVEN IN LIEU OF, AND BUYER HEREBY EXPRESSLY WAIVES, WARRANTIES OR LIABILITIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY OBLIGATION OF PROPORTION-AIR WITH REGARD TO CONSEQUENTIAL DAMAGES, WARRANTIES OF MERCHANTABILITY, DESCRIPTION, AND FITNESS FOR A PARTICULAR PURPOSE.**

WARNING: 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.

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