WESTLOCK
CONTROLS CORPORATION

# P2
# OPERATING MANUAL (2)

| | | | |
|---|---|---|---|
| **IOM:** Tech-453 | | **Revision:** | |
| **Prepared By:** Mario Twardowski | **Date:** 11/2/11 | **Drafting Work Order:** 19763 | **ECN:** 11957 |
| **Reviewed By:** A.Viciconte | **Date:** 4/18/12 | **Approved By:** Rhonda Frey | **Date:** 4/18/12 |

This IOM contains confidential information and is issued in confidence on the condition that it be returned on demand and not be copied, reproduced, disclosed to others or used in manufacture of the subject matter thereof without the written consent of Westlock Controls

**WESTLOCK CONTROLS CORPORATION**
280 MIDLAND AVENUE, SADDLE BROOK, NJ 07663 TEL: 201-794-7650 FAX: 201-794-0913
www.westlockcontrols.com

**Revision History**

**Revision**
October 31, 2011
Initial release

**Westlock Controls Offices**

**USA**
**Westlock Controls Corp.**
280 North Midland Ave. Saddle Brook, NJ 07663
Phone: (201) 794-7650 •Fax: (201) 794-0913
Email: westlockinfo@westlockcontrols.com
Internet http://www.westlockcontrols.com

**Europe**
**Westlock Controls UK**
Chapman Way, Tunbridge Wells
Kent, England TN23EF
Phone: 011-44-189-251-9046 •Fax: 011-441-892-516279
Email: sales@westlockuk.com
Internet: http://www.westlockuk.com

**South America**
**Westlock Equipmentos De Controles Ltda.**
Rua, Sao Paulo 291
Alphaville, Barueri
Sao Paulo, CEP 06465-130
Phone: 011-55-11-7291-0930 •Fax: 011-55-11-7291-0931
Email: comercial@westlock.com.br
Internet: http://www.westlock.com.br/

## TABLE OF CONTENTS


**1.** Scope of Manual…… 4
**2.** Product Certification…… 4
**3.** Warning…… 4
**4** Description…… 4
**5**. Order Guide…… 5
**6.** Symbols used in Document…… 6
**7.** Mounting the P2…… 6
**8.** Pneumatic Assembly of the P2…… 10
**9.** Wiring the P2…… 12
**10.** Setting the P2 Switches…… 12
**11.** Accutrak Conventional Module…… 13
**12.** DeviceNet Module…… 14
**13.** ASi Module…… 17
**14.** Maintenance and Repair…… 19
**Appendix A** Dimension Sheet P2 with Solenoid Valve…… 20
**Appendix B** Dimension Sheet P2 without Solenoid Valve…… 21
**Appendix C** Conventional Wiring diagram…… 22
**Appendix D** DeviceNet Wiring Diagram…… 23
**Appendix E** ASi Wiring Diagram…… 24
**Appendix F** FM approval Certificate…… 25
**Appendix G** FMC Approval Certificate…… 27
**Appendix H** ODVA Conformance certificates…… 29
**Appendix I** DeviceNet Object for setting Mac-ID and Baud rate Via Explicit Messaging. …… 30

## *1. Scope of Manual*

This manual contains installation, configuration and specification for the P2 family of valve controllers. The product family consists of Conventional, DeviceNet and ASi electronics modules.

This manual assumes that user has a basic familiarity and competence with controls, valves and actuators. Only qualified personnel should install, operate and maintain this equipment.

## 2. *Product Certification*

FM
NI/I, II, III/ABCDFG/ T4; -10° C ≤ Ta ≤+60° C
IP55
Suitable for Class I, II, and III, Division 2, Groups A,B,C,D,F and G with an ambient of; -10° C ≤ Ta ≤+60° C with and IP55 enclosure.

FMC
NI/1/2/ABCD/T4; -10° C ≤ Ta ≤+60° C
DIP/II/2/FG/T4; -10° C ≤ Ta ≤+60° C
IP55

Suitable for Class I, II, and III, Division 2, Groups A,B,C,D, Class II,III, Division 2, Groups F, and G with an ambient of; -10° C ≤ Ta ≤+60° C with and IP55 enclosure.

## *3. Warning*

If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection provided by the equipment is not compromised.

**Aggressive substances**: e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials.

**Suitable precautions**: e.g. regular checks as part of routine inspections or establishing from the materials data sheets that it is resistant to specific chemicals.

## 4. *Product Description*

# The P2 Control Monitor

The P2 Control Monitor incorporates design features addressing the challenges common to pharmaceutical and biotech facility applications. Its low profile and tool free access, via a screw-on cover, makes it ideal for short bend radius installations per the "2D Rule". The P2 utilizes a patent pending self setting limit switch assembly engineered to reduce control room nuisance alarms and false trips created by varying hysteresis due to CIP/process events causing changes in seat durometer. The patent pending self-setting High Definition Visual Indicator Beacon position indicator provides a 360º view up to a distance of 100'. The modular design of the P2 CCoM allows the easy addition of our puck style base mounted solenoid with a rubber seal spool design for proven reliability; rated for 30,000,000 cycles.

## 5. *Ordering Guide*

### *Accutrak*

**Base Model**
99P2

**Conduit**

| | |
|---|---|
| 1A | One ½"NPT(F) with Gland fitting |
| 1C | One M20 with Gland fitting |

**Solenoid Coil Voltage**

| | |
|---|---|
| 0 | None |
| D | 24 VDC |
| A | 120 VAC |

**Spool Valve**

| | |
|---|---|
| 000 | None |
| 100 | 0.1Cv, Stainless steel/Delrin |
| 550 | 0.5Cv, Delrin (24VDC solenoid option only) |

**Override Option**

| | |
|---|---|
| 0 | None |
| L | Locking |

### *Intellis*

**Protocol**

| | |
|---|---|
| 76P2 | DeviceNet |
| 77P2 | AS-interface -Version 2.1 (For version 2.0 contact factory) |

**Conduit**

| | |
|---|---|
| 1A | One ½"NPT(F) fitted with Gland fitting |
| 1M | One ½"NPT(F) fitted with Mini-connector |
| 1U | One ½"NPT(F) fitted with Micro-(Euro) connector |
| 1C | One M20 with Gland fitting |

**Solenoid Coil Voltage**

| | |
|---|---|
| 0 | None |
| D | 24 VDC |

**Spool Valve**

| | |
|---|---|
| 000 | None |
| 100 | 0.1Cv, Stainless steel/Delrin |
| 550 | 0.5Cv, Delrin |

**Override Option**

| | |
|---|---|
| 0 | None |
| L | Locking |

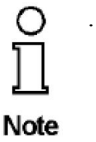
Note

**Mounting kits sold separate, consult factory for prices and part numbers for mounting kits.**

## 6. *Symbols Used in this Document*

This symbol warns the user of possible danger. Failure to heed this warning may lead to personal injury or death and/or severe damage to equipment.

This symbol identifies information about operating the equipment in a particular manner that may damage it or result in a system failure. Failure to heed this warning can lead to total failure of the equipment or any other connected equipment.




This symbol draws attention to information that is essential for understanding the operation and/or features of the equipment

## 7. *Mounting the P2 to the Actuator*

Determine the type of actuator the P2 will be mounted on.
• For Direct Mount type actuators, proceed to the Section **Direct Mount Actuators with and without solenoid**, i.e. ITT Advantage, Saunders EC.

• For Bushing Mount type actuators, proceed to the Section **Bushing Mount Actuators with and without solenoid,** i.e. Gemu, Top Line.

For strokes less than .20" it may be necessary to use the extended trigger cap SW-10601 (marked 0.50) to insure full travel of the beacon indicator.

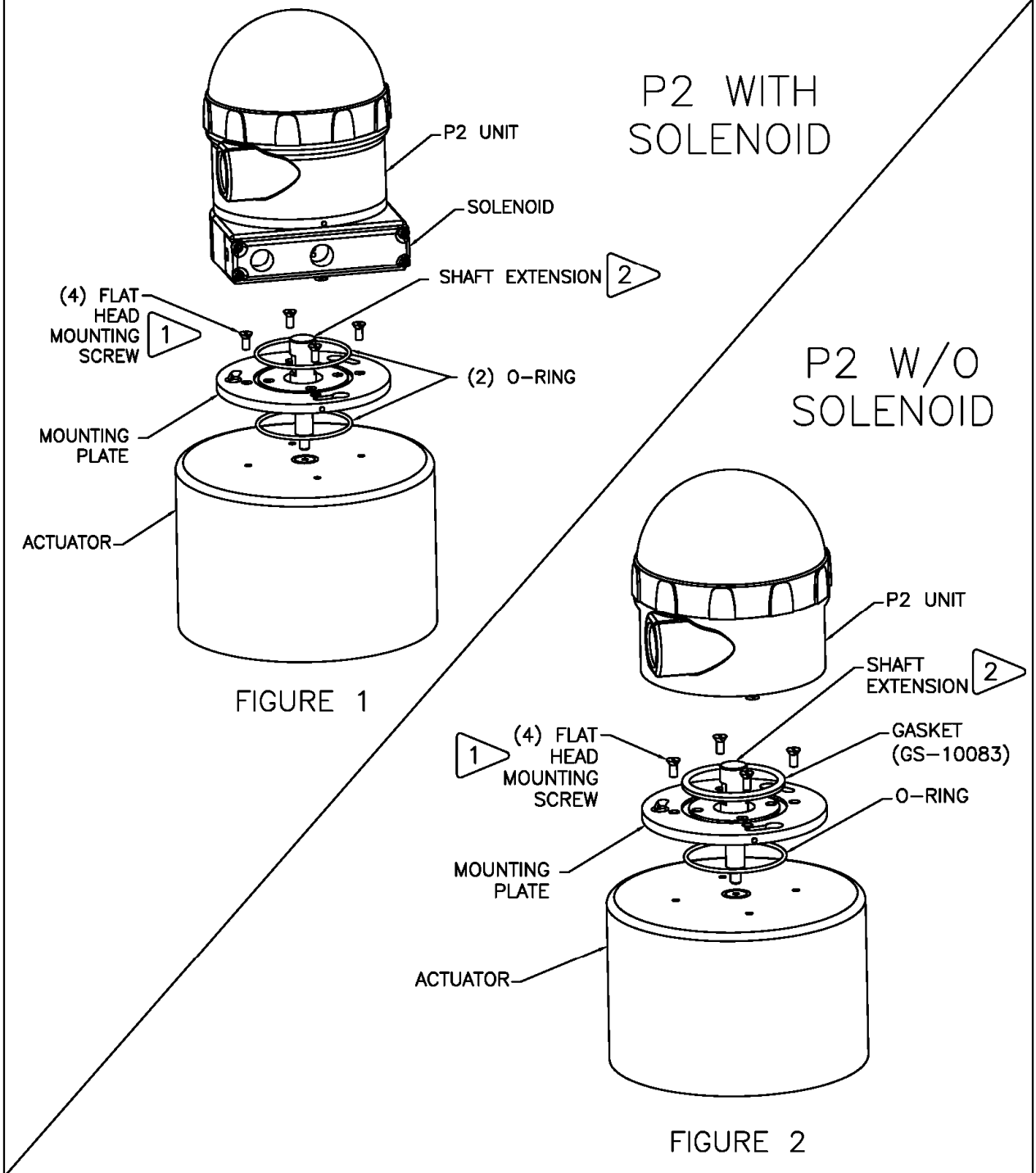
***Direct Mount Actuators with and without solenoid***
***For assistance with the following directions refer to Figure 1 or Figure 2.***

1. Thread the shaft extension onto the actuator's shaft. Tighten it firmly with a wrench.
2. **A. For units with solenoid:** Install o-ring to the top and bottom of P2 mounting plate.
   **B. For units without solenoid:** Install gasket (GS-10083) to the top and o-ring to the bottom of P2 mounting plate. Gasket (GS-10083) is adhesive backed on one side. Peel off paper and with adhesive facing down, place gasket in the gasket groove of mounting plate.
3. Thread the (3) locking set screws flush to the side walls of the mounting plate using 1/16 hex key.
4. Fasten the P2 mounting plate to the actuator using flat head mounting screws.
5. Engage the (3) flat head screws of the housing into the keyhole slots of the mounting plate.
6. Turn the housing clockwise until the housing and the mounting plate are aligned.
7. To lock in place, tighten the (3) locking set screws on the side walls of mounting plate using 1/16 hex key.

***Bushing Mount Actuators with and without solenoid***
***For assistance with the following directions refer to Figure 3 or Figure 4.***

1. Thread the shaft extension onto the actuator's shaft. Tighten it firmly.
2. Install proper o-rings to the bushing, slide it over the shaft extension and fasten the bushing into the actuator.
3. Thread the (3) locking set screws into the side walls of the mounting plate adapter approximately 1/8" away from the wall using 3/32 hex key.
4. With (4) threaded holes facing up slide the mounting plate adapter over the bushing. To lock in place, tighten the (3) locking set screws on the side walls of mounting plate adapter using 3/32 hex key.
5. **A. For units with solenoid:** Install o-ring to the top and bottom of P2 mounting plate.
   **B. For units without solenoid:** Install gasket (GS-10083) to the top and o-ring to the bottom of P2 mounting plate. Gasket (GS-10083) is adhesive backed on one side. Peel off paper and with adhesive facing down, place gasket in the gasket groove of mounting plate.
6. Thread the (3) locking set screws flush to the side walls of the mounting plate using 1/16 hex key.
7. Fasten the P2 mounting plate to the mounting plate adapter using flat head mounting screws.
8. Engage the (3) flat head screws of the housing into the keyhole slots of the mounting plate.
9. Turn the housing clockwise until the housing and the mounting plate are aligned.
10. To lock in place, tighten the (3) locking set screws on the side walls of mounting plate using 1/16 hex key.

# P2 TYPICAL DIRECT MOUNT TO ACTUATOR




1 THE NUMBER OF MOUNTING SCREWS MAY VARY. CHECK BRACKET KIT.

2 IF SHAFT REQUIRED, CHECK BRACKET KIT FOR DETAILS.

# P2 TYPICAL BUSHING MOUNT TO ACTUATOR

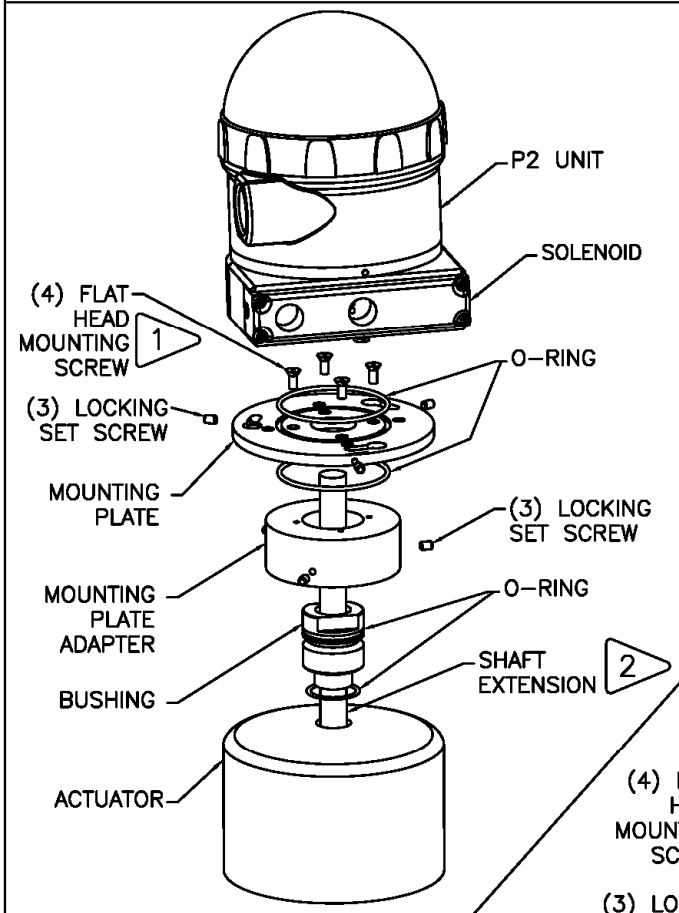



FIGURE 3

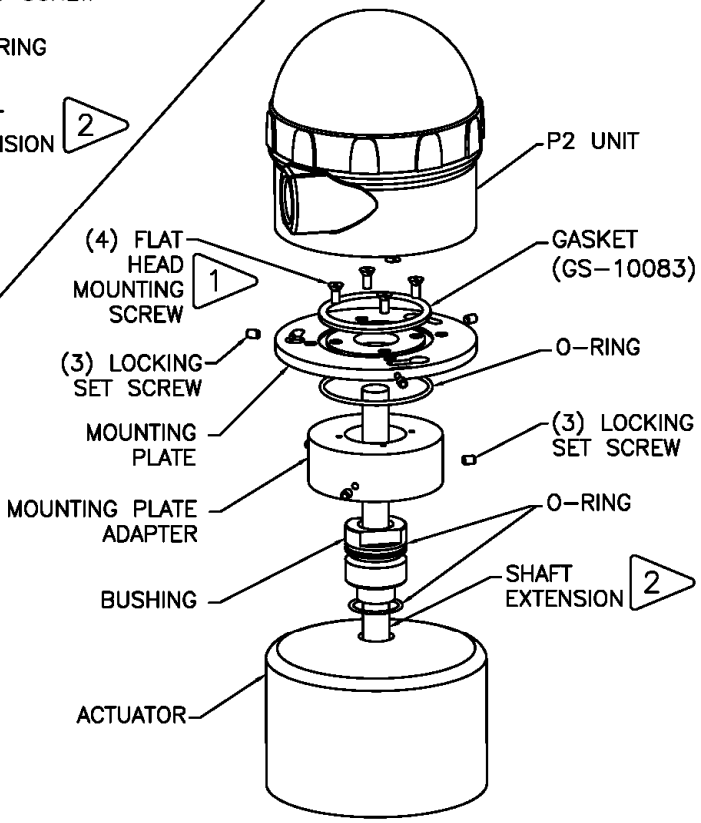



FIGURE 4

P2 WITH SOLENOID

P2 W/O SOLENOID

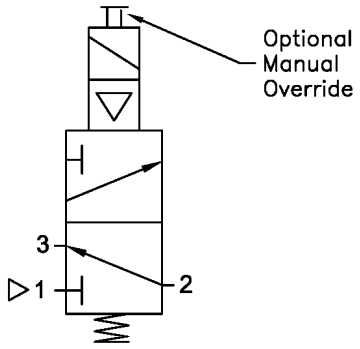
1 THE NUMBER OF MOUNTING SCREWS MAY VARY. CHECK BRACKET KIT.

2 IF SHAFT REQUIRED, CHECK BRACKET KIT FOR DETAILS.

## 8. *Pneumatic Connections*

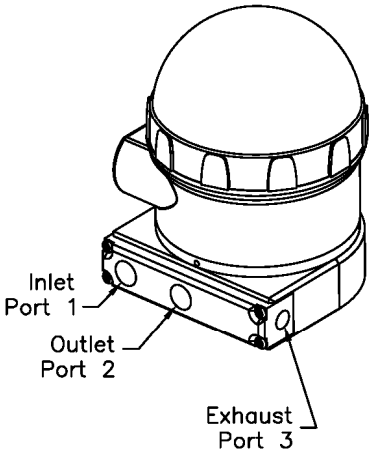
**Personal injury and/or property damage may occur from loss of process control if the supply medium is not clean, dry oil-free air or non-corrosive gas. Instrument quality air that meets the requirements of ISA Standard S7.3-1975 is recommended for use with pneumatic equipment in process control environments. Westlock Controls recommends the use of a 20 micron inlet filter with all 99P2 solenoids. It is also recommended to use a breather vent for 1/8"NPT exhaust port to keep the pneumatic system free from foreign contaminates.**

### Description of Operation

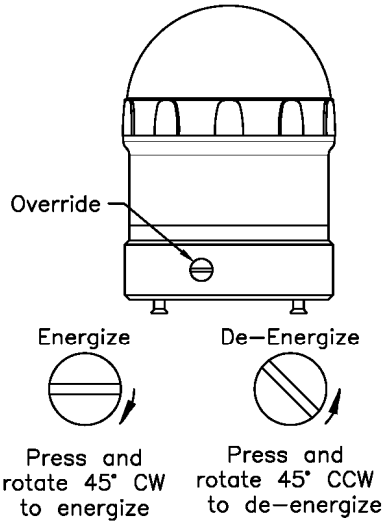



**3 Way spring return valve**
Solenoid De-energized - air flows from Outlet Port 2 to Exhaust Port 3.
Solenoid Energized - air flows from Inlet Port 1 to Outlet Port 2.

### Air Ports




### Optional Manual Override




| Solenoid Specifications | |
|---|---|
| Operating pressure | 25-100Psig |
| Operating Temperature | 14 °F to +122°F (-10°C to +50°C) |
| Operating Media | Operating Media: Non Lubricated Filtered Air to 20 Microns |
| Porting | 1/4" NPT inlet and outlet, 1/8" NPT exhaust |

**(Air Line) Installation Considerations**

Air mains and lines should be large enough to avoid excessive pressure loss under conditions of maximum flow. Air lines should be installed with as few restrictions as possible if the cost of compressed air is to be kept to a minimum. Sharp turns in piping should be avoided for more efficient air flow and economical air power. It is advisable to pitch the mains in the direction of air flow so that both gravity and air flow will carry the water to traps or water legs located at frequent intervals.

To help in preventing condensed moisture from reaching the point of usage, down pipes should never be taken directly from the bottom of air pipes or mains. Connection should be made at the top of the main and a long radius return bend used.

**Air Flow**

Pipe sizes are normally determined on semi empirical lines, basis for selection being an acceptable pressure drop e.g. not more than 10% of the applied pressure. In sizing pipes, consideration should be given to likely future demands, as a system will be inefficient if the demand outgrows the supply. It is always better to over-size mains as this will reduce air velocity and make water separation more effective.

**Air Service Equipment**

The importance of proper filtration (20 Micron) and lubrication of the air supply to pneumatic equipment can never be over-emphasized as a means of decreasing friction and preventing corrosion and wear due to moisture and abrasive solids being present in the air supply. At pressures higher than recommended, pneumatic equipment can wear excessively with no significant increase in output and compressed air is consequently wasted.

There is much to be gained, therefore, from providing pneumatic equipment with serviced air by including suitable air line filters, pressure regulators and lubricants in the installation.

**Tubes and Fittings**

The use of copper, stainless steel, nylon or polyethylene tube is recommended for piping up air circuits and equipment. As a general rule, pipe threaded fittings should not be assembled to a specific torque because the torque required for a reliable joint varies with thread quality, port and fitting materials, sealant used, and other factors. The suggested method of assembling pipe threaded connections is to assemble them finger tight and then wrench tighten further to a specified number of turns from finger tight. The assembly procedure given below is for reference only, the fitting should not be over tightened for this will lead to distortion and most likely, complete valve failure.

**Pneumatic Piping Instructions**

1. Inspect port and connectors to ensure that the threads on both are free of dirt, burrs and excessive nicks.

2. Apply sealant/lubricant or Teflon tape to the male pipe threads. With any sealant tape, the first one or two threads should be left uncovered to avoid system contamination.

3. Screw the connector into the port to the finger tight position.

4. Wrench tighten the connector approximately 1 - 2 turns (to seal) from finger tight. Again this is only reference - the fitting should **NOT** be over tightened.
5. It is recommended to use a breather vent for 1/8”NPT exhaust port to keep the pneumatic system free from foreign contaminates.

## 9. *Wiring Instructions P2*

**All wiring must be in accordance with site and local codes and the National Electrical Code (ANSI-NFPA-70) for the appropriate area classifications. Confirm devices Agency Approvals are appropriate for the area of use. This certification applies to equipment for use with Cable Glands. When mounting the enclosure in hazardous areas, only suitability certified cable glands and blanking plugs must be used to maintain the ingress protection of IP55. All unused cable entries must be plugged with certified blanking plugs that meet the rating of this device. For ambient temperatures below -10°C and above +60°C, use field wiring suitable for both minimum and maximum ambient temperatures.**

Remove the cover to access the terminal block on the electronics PCB.

1. Wire the P2 by referring to the supplied wiring diagram.
2. All unused cable entries must be plugged with suitably certified plugs that can maintain an ingress protection level of IP55.
3. When mounting the enclosure in the hazardous area, only suitably certified cable glands and blanking elements must be used to maintain ingress protection of IP55.
4. For ambient temperatures below -10°C (14°F) and above +60°C (140°F), use field wiring suitable for both minimum and maximum ambient temperatures.
5. After wires have been connected to P2 terminal block, insert terminal block PCB into the designated area inside the housing. Make sure there are no wires blocking the connection between terminal block PCB and base PCB. Terminal block PCB must be fully engaged into base PCB before fastening the P2 cover.

## 10. *Position Limit Switch Adjustment*

**Limit switches come from the factory preset, therefore adjustment of the trigger assembly should not be necessary. If the limit switches triggers do require adjustment perform the procedure listed in the Manual Adjustment Procedure**

The P2 utilizes a patent pending self setting limit switch assembly engineered to reduce control room nuisance alarms and false trips created by varying hysteresis due to CIP/process events causing changes in seat durometer. There are two means of adjustment, one utilizes the self setting mechanism and the other requires manually adjusting the target within the self setting mechanism.

***Self Setting Procedure***

1. Remove the cover from the P2.
2. Stroke the actuator to the closed position. Set the trigger housing plunger by pushing it down using a specified tool (A pen or pencil is acceptable-.30" diameter, do not use the tip) as shown in Figure 5.
3. Operate actuator from one extreme to the other several times to check switch operation.
4. Once the limit switches are operating properly, fasten the cover to the 99P2 housing.

***Manual Adjustment Procedure***

1. Remove the cover from the P2.
2. Stroke the actuator to the closed position. (If applicable) Set the close switch by turning black knob clockwise until the trigger reaches the top of the carrier then turn it counter-clockwise until the close switch makes. *Once Switch is closed, turn adjustment knob two more full turn counter-clockwise.*
3. Stroke the actuator to the open position. (If applicable) Set the open switch by turning red knob counter-clockwise until the trigger reaches the bottom of the carrier then turn it clockwise until the open switch makes. *Once the switch is closed, turn adjustment knob two more full turn clockwise.*

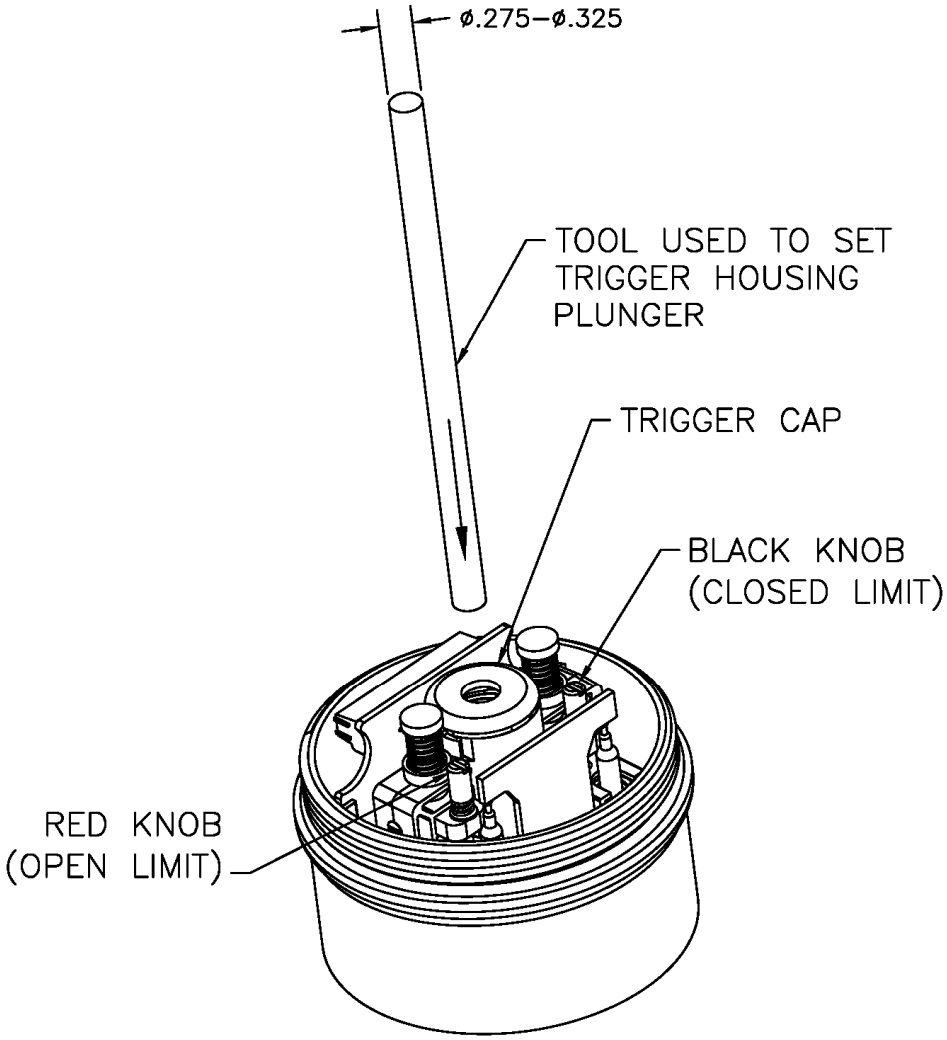
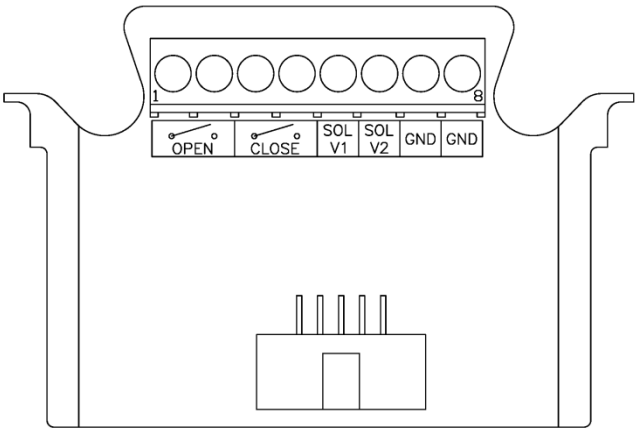



**Figure 5**

## 11. *Accutrak Conventional*

The Conventional P2 assembly employs hermetically sealed bifurcated switches. The integral snap-action and self-cleaning functionality of these switches makes them ideal for use with high and low current switching of both resistive and non-resistive loads. Zero leakage current provides excellent performance in low current applications typical of modern discrete I/O cards.

**Conventional Specification**




| Position Feedback Limit Switches | |
|---|---|
| **Contact Type** | Hermetically Sealed, Dry Contact, Polarity Insensitive |
| **Contact Arrangement** | (2) SPST, Form A (Normally Open) |
| **Voltage Capacity** | 12 - 120 VDC/VAC |
| **Current Capacity** | 1 mA - 2A VDC Max |
| **DI_0** | Valve Closed |
| **DI_1** | Valve Open |
| **Solenoid** | |
| **Operating Voltage**<br>**Power Consumption** | 24 VDC +/- 10%<br>0.35W |
| **Operating Voltage**<br>**Apparent Power** | 110 VAC +/- 10%<br>1.6 VA |
| **Operating Temperature** | 14 °F to 122°F (-10°C to +50°C) |

## 12. *DeviceNet Module*

The 76P2 is a two input, one output network monitor. The unit is designed for the use with diaphragm linear valves in a clean, (Pharmaceutical) environment. The two limit switch inputs are high repeatability hall effect sensors. The output is an open drain active low FET, fused (solid state resettable) at 0.2A with diode protection to 24Vdc. The output is connected to a .35W 24VDC poppet solenoid coil.

Connection to the network is via DeviceNet specific cable. For data exchange to occur, each network monitor connected to the DeviceNet network must be programmed with a unique address, numbered between 0 and 63 and all nodes must be set to the same baud rate as the scanner. This may be accomplished via setting the DIP switch, S1, on the electronics module. The address and baud rate may also be set via Explicit Messaging if positions 7 and 8 S1 are set to the "On" position. It is possible to exchange or add slaves during normal operation without interfering with communications to other nodes.

### DeviceNet Features

| Feature | |
|---|---|
| Device Type | Generic |
| Explicit Peer to Peer Messaging | No |
| I/O Peer to Peer Messaging | No |
| Configuration Consistency Value | No |
| Faulted Node Recovery | No |
| Baud Rates | 125K, 250K, 500K |
| Master/Scanner | No |
| I/O Slave Messaging<br>▪ Bit Strobe<br>▪ Polling<br>▪ Cyclic<br>▪ Change of State (COS) | <br>No<br>Yes<br>No<br>No |

### Current Consumption

| 24VDC .35W Solenoid | | |
|---|---|---|
| **Input Active** | **Output Active** | **Current** |
| 1 | 0 | 38mA |
| 1 | 1 | 63mA |

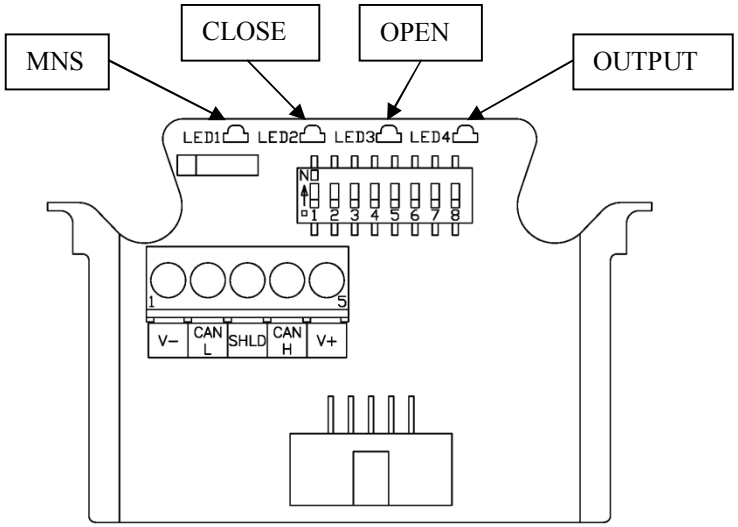
**Module Bitmap**

The module use produces 1 byte of input data and produces 1byte of output data. The defined data is outlined below.

| | | | |
|---|---|---|---|
| **I/O** | **TYPE** | **MODULE REFERENCE** | **BITMAP OF DATA** |
| Input 0 | Hall Effect Sensor | Closed Limit Switch | Byte 0, Bit 0 |
| Input 1 | Hall Effect Sensor | Open Limit Switch | Byte 0, Bit 1 |
| Output 0 | 24VDC | Solenoid | Byte 0, Bit 0 |

**LED Status Indicators**

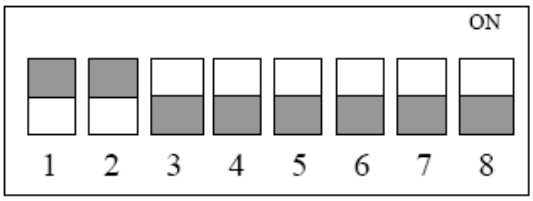
The LEDs provide information concerning the status of inputs, outputs, the module and/ or the network. The LEDs provide visual indication whether any inputs or outputs are active and whether the module or network is in a fault condition. The I/O Status LEDs are intended to indicate the state of the inputs and outputs.



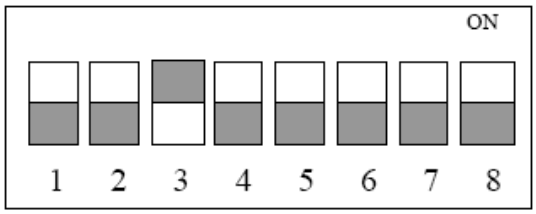

| LED Status Indicators | | | |
|---|---|---|---|
| **Module p/n** | **LED** | **State** | **Indicates** |
| EL30479 | Module/ Network Status LED MNS | Off | There is no power applied to the device. |
| | | Flashing Green | Online, not connected. For a Group 2 Only device: Device is not allocated to a Master The device Needs commissioning due to configuration missing, incomplete or incorrect. |
| | | Red | ▪ Failed communication device. The device has detected an error that has rendered it incapable of communication on the network (Duplicate MAC ID or Bus-off)<br>▪ Unrecoverable fault, device may need replacing. |
| | | Flashing Red | Recoverable fault. One or more I/O connections are in the Time-out state. |
| | | Green | For a Group 2 Only device: Device is allocated to |
| | | | Master |
| | Open LS LED I/O 2 | Yellow | **Input 1, Top L.S. OPEN**. Valve is in the open position as determined by the travel of the valve stem, Adjustment of the trigger mechanism. |
| | Closed LS LED I/O 1 | Yellow | **Input 0, Bottom L.S. Closed**. Valve is in the Closed position as determined by the travel of the valve stem, adjustment of the trigger mechanism. |
| | Output LED I/O 4 | Yellow | **Output 0**. Solenoid is energized. |

**Setting the DeviceNet Slave Address**

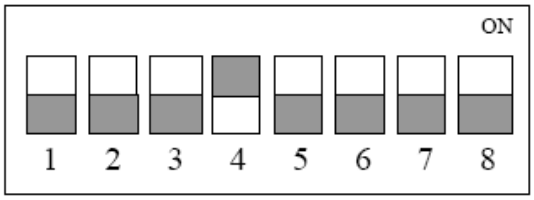
The DeviceNet slave address is configured by setting the binary address on selector switch S1. Examples are shown in figures below. See tables below for a listing of switch positions by decimal address. Alternately with switches 7 and 8 in the on position the node address can be set through the network via Explicit Messaging. Refer to Appendix I for Class Instance and Attribute.



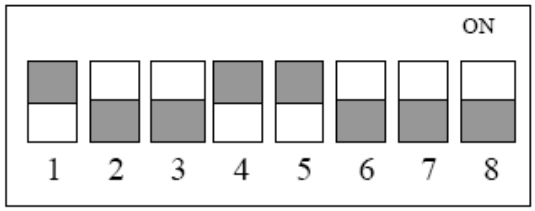

Slave Address 3




Slave Address 4




Slave Address 8




Slave Address 25

| LSB Switch S1 MSB | | | | | | | |
|---|---|---|---|---|---|---|---|
| SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | MacID | RETURNED VALUE |
| OFF | OFF | OFF | OFF | OFF | OFF | 0 | 0x00 |
| **ON** | OFF | OFF | OFF | OFF | OFF | 1 | 0x01 |
| OFF | **ON** | OFF | OFF | OFF | OFF | 2 | 0x02 |
| **ON** | **ON** | OFF | OFF | OFF | OFF | 3 | 0x03 |
| OFF | OFF | **ON** | OFF | OFF | OFF | 4 | 0x04 |
| **ON** | OFF | **ON** | OFF | OFF | OFF | 5 | 0x05 |
| OFF | **ON** | **ON** | OFF | OFF | OFF | 6 | 0x06 |
| **ON** | **ON** | **ON** | OFF | OFF | OFF | 7 | 0x07 |
| OFF | OFF | OFF | **ON** | OFF | OFF | 8 | 0x08 |
| **ON** | OFF | OFF | **ON** | OFF | OFF | 9 | 0x09 |
| OFF | **ON** | OFF | **ON** | OFF | OFF | 10 | 0x0A |
| **ON** | **ON** | OFF | **ON** | OFF | OFF | 11 | 0x0B |
| OFF | OFF | **ON** | **ON** | OFF | OFF | 12 | 0x0C |
| **ON** | OFF | **ON** | **ON** | OFF | OFF | 13 | 0x0D |
| OFF | **ON** | **ON** | **ON** | OFF | OFF | 14 | 0x0E |
| **ON** | **ON** | **ON** | **ON** | OFF | OFF | 15 | 0x0F |
| OFF | OFF | OFF | OFF | **ON** | OFF | 16 | 0x10 |
| **ON** | OFF | OFF | OFF | **ON** | OFF | 17 | 0x11 |
| OFF | **ON** | OFF | OFF | **ON** | OFF | 18 | 0x12 |
| **ON** | **ON** | OFF | OFF | **ON** | OFF | 19 | 0x13 |
| OFF | OFF | **ON** | OFF | **ON** | OFF | 20 | 0x14 |
| **ON** | OFF | **ON** | OFF | **ON** | OFF | 21 | 0x15 |
| OFF | **ON** | **ON** | OFF | **ON** | OFF | 22 | 0x16 |
| **ON** | **ON** | **ON** | OFF | **ON** | OFF | 23 | 0x17 |
| OFF | OFF | OFF | **ON** | **ON** | OFF | 24 | 0x18 |
| **ON** | OFF | OFF | **ON** | **ON** | OFF | 25 | 0x19 |
| OFF | **ON** | OFF | **ON** | **ON** | OFF | 26 | 0x1A |
| **ON** | **ON** | OFF | **ON** | **ON** | OFF | 27 | 0x1B |
| OFF | OFF | **ON** | **ON** | **ON** | OFF | 28 | 0x1C |
| **ON** | OFF | **ON** | **ON** | **ON** | OFF | 29 | 0x1D |
| OFF | **ON** | **ON** | **ON** | **ON** | OFF | 30 | 0x1E |
| **ON** | **ON** | **ON** | **ON** | **ON** | OFF | 31 | 0x1F |

| LSB Switch S1 MSB | | | | | | | |
|---|---|---|---|---|---|---|---|
| SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | MacID | RETURNED VALUE |
| OFF | OFF | OFF | OFF | OFF | **ON** | 32 | 0x20 |
| **ON** | OFF | OFF | OFF | OFF | **ON** | 33 | 0x21 |
| OFF | **ON** | OFF | OFF | OFF | **ON** | 34 | 0x22 |
| **ON** | **ON** | OFF | OFF | OFF | **ON** | 35 | 0x23 |
| OFF | OFF | **ON** | OFF | OFF | **ON** | 36 | 0x24 |
| **ON** | OFF | **ON** | OFF | OFF | **ON** | 37 | 0x25 |
| OFF | **ON** | **ON** | OFF | OFF | **ON** | 38 | 0x26 |
| **ON** | **ON** | **ON** | OFF | OFF | **ON** | 39 | 0x27 |
| OFF | OFF | OFF | **ON** | OFF | **ON** | 40 | 0x28 |
| **ON** | OFF | OFF | **ON** | OFF | **ON** | 41 | 0x29 |
| OFF | **ON** | OFF | **ON** | OFF | **ON** | 42 | 0x2A |
| **ON** | **ON** | OFF | **ON** | OFF | **ON** | 43 | 0x2B |
| OFF | OFF | **ON** | **ON** | OFF | **ON** | 44 | 0x2C |
| **ON** | OFF | **ON** | **ON** | OFF | **ON** | 45 | 0x2D |
| OFF | **ON** | **ON** | **ON** | OFF | **ON** | 46 | 0x2E |
| **ON** | **ON** | **ON** | **ON** | OFF | **ON** | 47 | 0x2F |
| OFF | OFF | OFF | OFF | **ON** | **ON** | 48 | 0x30 |
| **ON** | OFF | OFF | OFF | **ON** | **ON** | 49 | 0x31 |
| OFF | **ON** | OFF | OFF | **ON** | **ON** | 50 | 0x32 |
| **ON** | **ON** | OFF | OFF | **ON** | **ON** | 51 | 0x33 |
| OFF | OFF | **ON** | OFF | **ON** | **ON** | 52 | 0x34 |
| **ON** | OFF | **ON** | OFF | **ON** | **ON** | 53 | 0x35 |
| OFF | **ON** | **ON** | OFF | **ON** | **ON** | 54 | 0x36 |
| **ON** | **ON** | **ON** | OFF | **ON** | **ON** | 55 | 0x37 |
| OFF | OFF | OFF | **ON** | **ON** | **ON** | 56 | 0x38 |
| **ON** | OFF | OFF | **ON** | **ON** | **ON** | 57 | 0x39 |
| OFF | **ON** | OFF | **ON** | **ON** | **ON** | 58 | 0x3A |
| **ON** | **ON** | OFF | **ON** | **ON** | **ON** | 59 | 0x3B |
| OFF | OFF | **ON** | **ON** | **ON** | **ON** | 60 | 0x3C |
| **ON** | OFF | **ON** | **ON** | **ON** | **ON** | 61 | 0x3D |
| OFF | **ON** | **ON** | **ON** | **ON** | **ON** | 62 | 0x3E |
| **ON** | **ON** | **ON** | **ON** | **ON** | **ON** | 63 | 0x3F |

**Setting the DeviceNet Slave Baud Rate**

The DeviceNet slave baud rate is configured by setting the DIP switch S1 positions 7 and 8 to the appropriate setting as listed in the table below. Alternately with switches 7 and 8 in the on position the node Baud Rate can be set through the network via Explicit Messaging. Refer to Appendix I for Class Instance and Attribute.

| Switch S1 | | BAUD RATE | RETURNED VALUE |
|---|---|---|---|
| SW7 | SW8 | | |
| OFF | OFF | 125 K BITS PER SECOND | 0x00 |
| **ON** | OFF | 250 K BITS PER SECOND | 0x01 |
| OFF | **ON** | 500 K BITS PER SECOND | 0x02 |
| **ON** | **ON** | Default 125 K BITS PER SECOND OR LAST VALUE SET VIA SET_ATTRIBUTE_SINGLE | 0x00 (default) or 0x01 to 0x02 if set |

## 13. *ASI Module*

The 77P2 is a two input, one output network monitor with slave profile S-7/A, (S-I/O code/ ID code). Inputs are hall effect sensors (activated by a magnetic trigger assembly). The output is an active low current limited NPN open collector with diode protection to 30Vdc. The output is connected to a .35W 24VDC poppet solenoid coil. Minimum power supply input voltage is 22Vdc to assure proper communications.

Connection to the network is via the single unshielded two-wire cable that supplies both power, nominal 30 Vdc and signal. The sensors and actuator are connected to the AS-i cable via the AS-i slave chip. In the Extended Address Mode 62 slaves can be used on one network. The address range is still 1-31 but each slave is assigned as an "A" slave or a "B" slave. The fourth output data bit of the slave is used to identify whether a slave is an "A" slave or a "B" slave.
In each scan cycle, 3 output data bits plus one address selector bit ("A" slave or "B" slave) are transferred serially to each slave from the master and 4 input data bits are returned to master by each slave. In a full configuration with 62 slaves the scan cycle time is 10 ms. For a network with 31 slaves the scan cycle time is 5 ms. Scanning is deterministic.

For data exchange to occur, each network monitor connected to the AS-i network must be programmed with an address, numbered between 1-31 "A" and 1-31 "B" for Extended Address Mode. This may be accomplished via a handheld programmer or directly through the master. The address, which can be changed at any time, is stored internally in an EEPROM.

Insure that no two slaves on the network are at the same address, adding one module at a time to a network then checking ASI communication is the safest way. Change only the address, never change the ID codes. The use of programming equipment that can change internal EEPROM data other than the address field can render the ASI Module inoperable.

To utilize the extended addressing mode AS-i Specification rev.2.1 master must be used.

**Current Consumption at 30VDC**

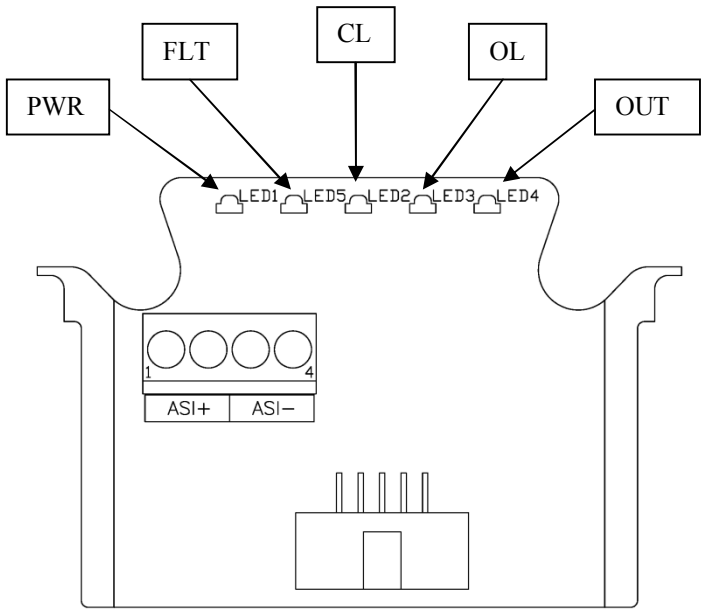
| 24VDC .35W Solenoid | | |
|---|---|---|
| **Input Active** | **Output Active** | **Current** |
| 1 | 0 | 18mA |
| 1 | 1 | 52mA |

**Module Bitmap**

| I/O | TYPE | MODULE REFERENCE | BITMAP OF DATA |
|---|---|---|---|
| Input 0 | Hall Effect | Closed Limit Switch | Byte 0, Bit 0 |
| Input 1 | Hall Effect | Open Limit Switch | Byte 0, Bit 1 |
| Output 0 | 24Vdc | 24Vdc to Solenoid | Byte 0, Bit 0 |

**LED Status Indicators**

The LED's provide information concerning the status of inputs, outputs, the module and/or the network. The LED's provide visual indication whether any inputs or outputs are active and whether the module or network is in a fault condition. The I/O Status LED's are intended to indicate the state of the inputs and outputs of the module, not necessarily the on/off condition of the I/O points themselves.



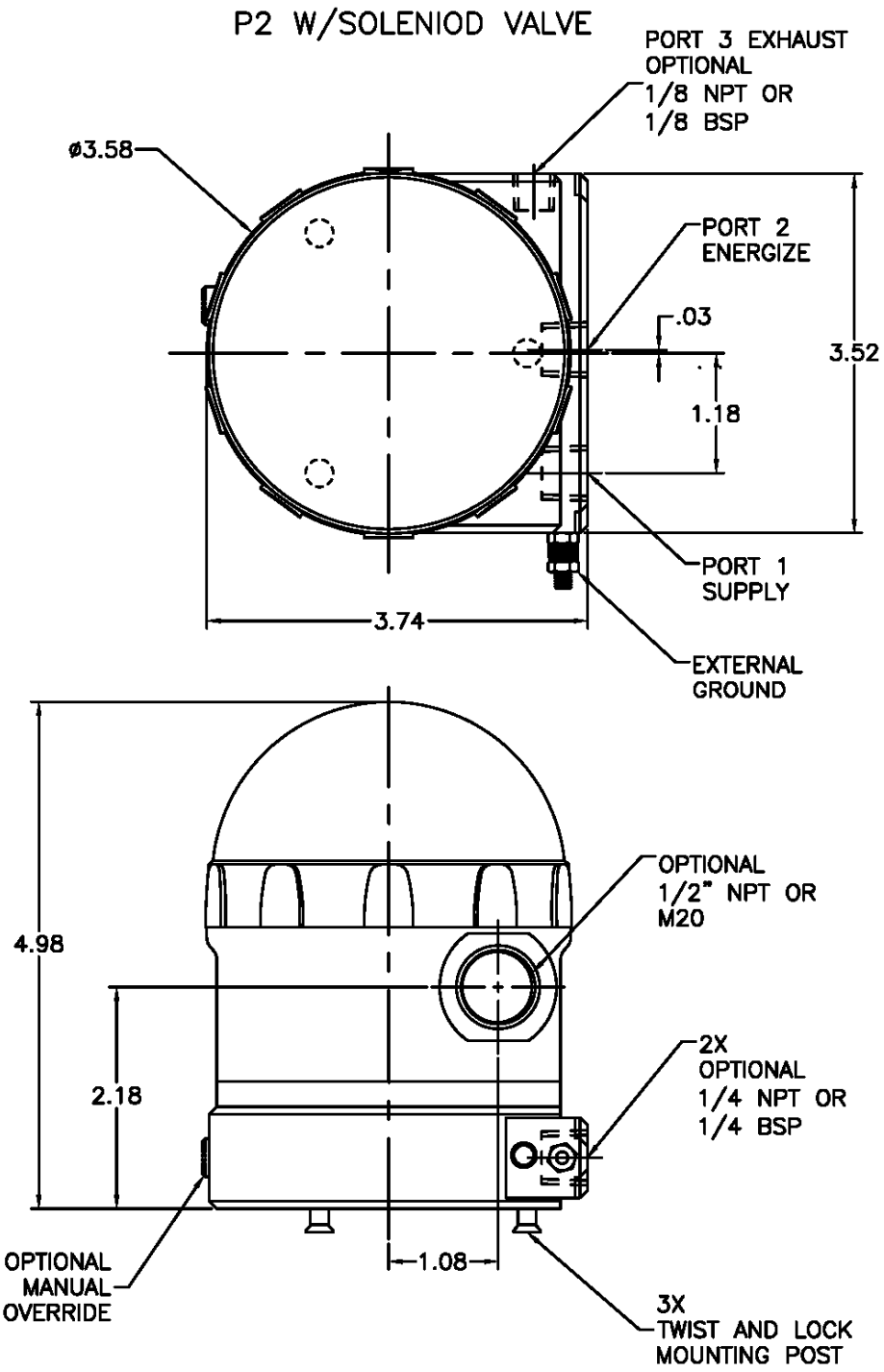

| Module P/N | LED | Condition | Indicates |
|---|---|---|---|
| EL30510 | PWR | Green | Network power available to Module/Module Energized |
| | FLT | RED | Fault condition<br>▪ "No data exchange fault" condition may result if the master is in STOP mode,<br>▪ Slave has zero address.<br>▪ Slave has an address which is not in the LPS.<br>▪ Slave has a wrong IO/ID-configuration. |
| | CL | Yellow | Input 0, Bottom L.S. Closed, Valve Closed |
| | OL | Yellow | Input 1, Top L.S. Closed, Valve Open |
| | OUT | Yellow | Output 0 Solenoid Energized |

## 14. *Maintenance and Repair*

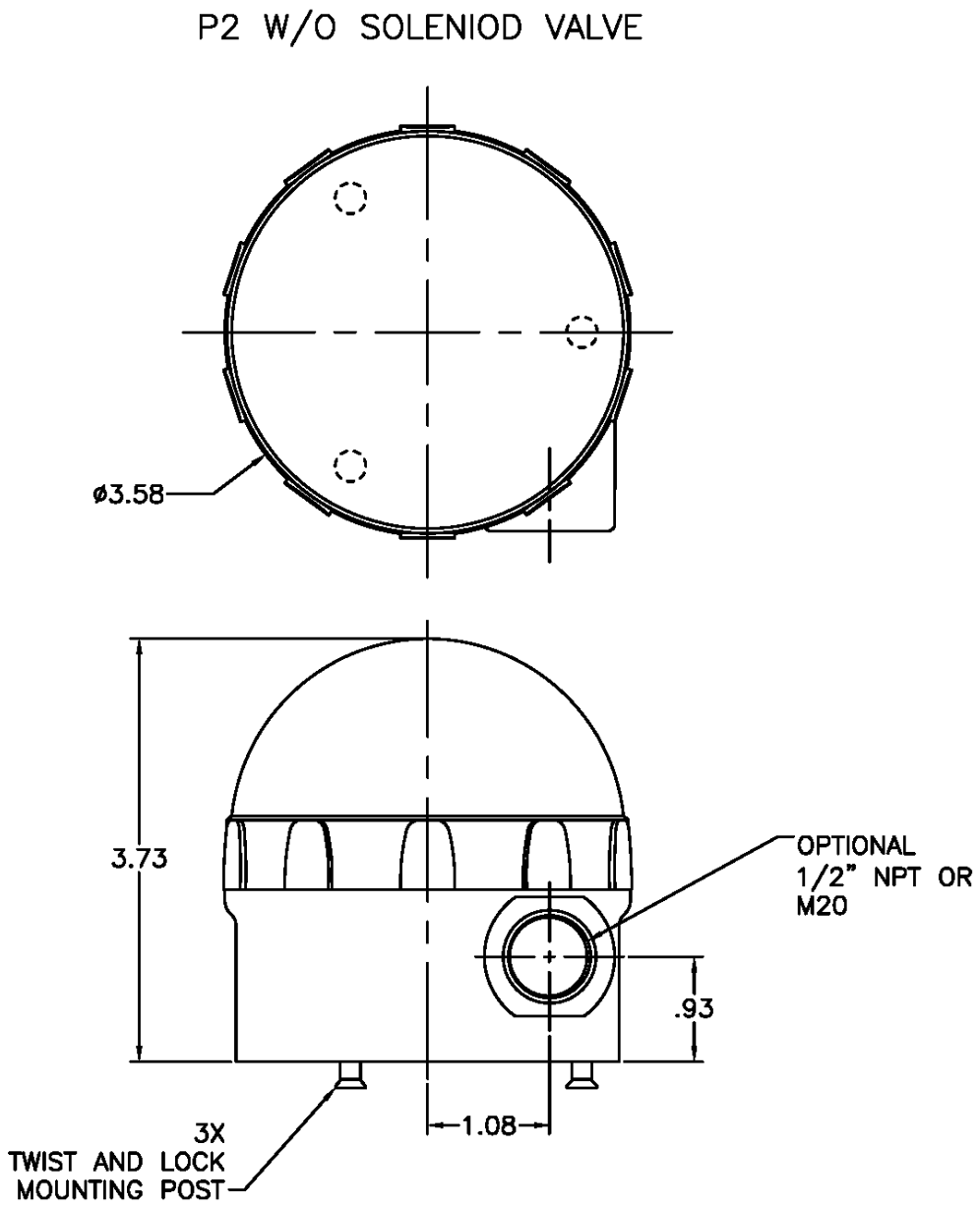
Consult factory. No user serviceable parts.

**Appendix A**

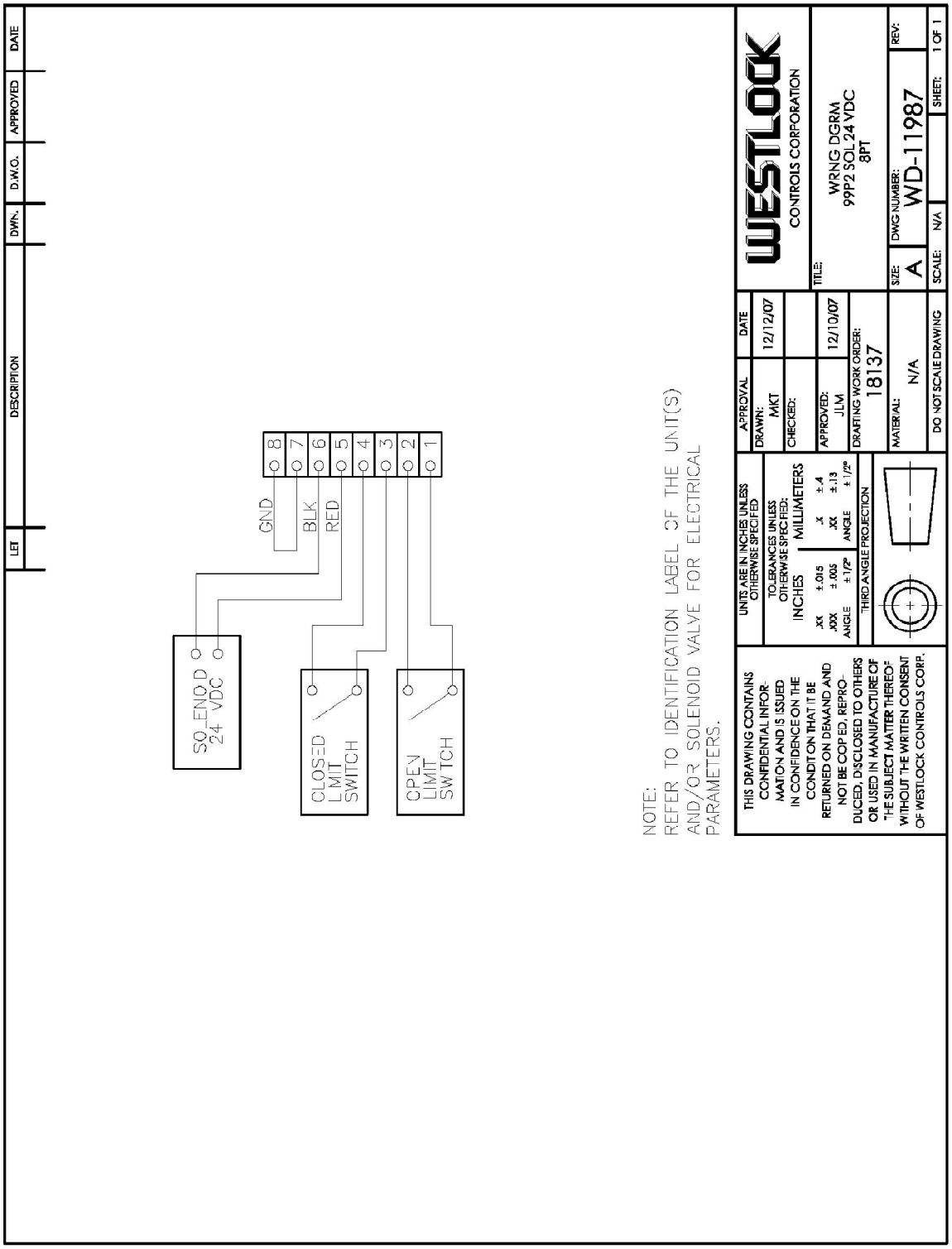
Dimension Sheet P2 with Solenoid Valve



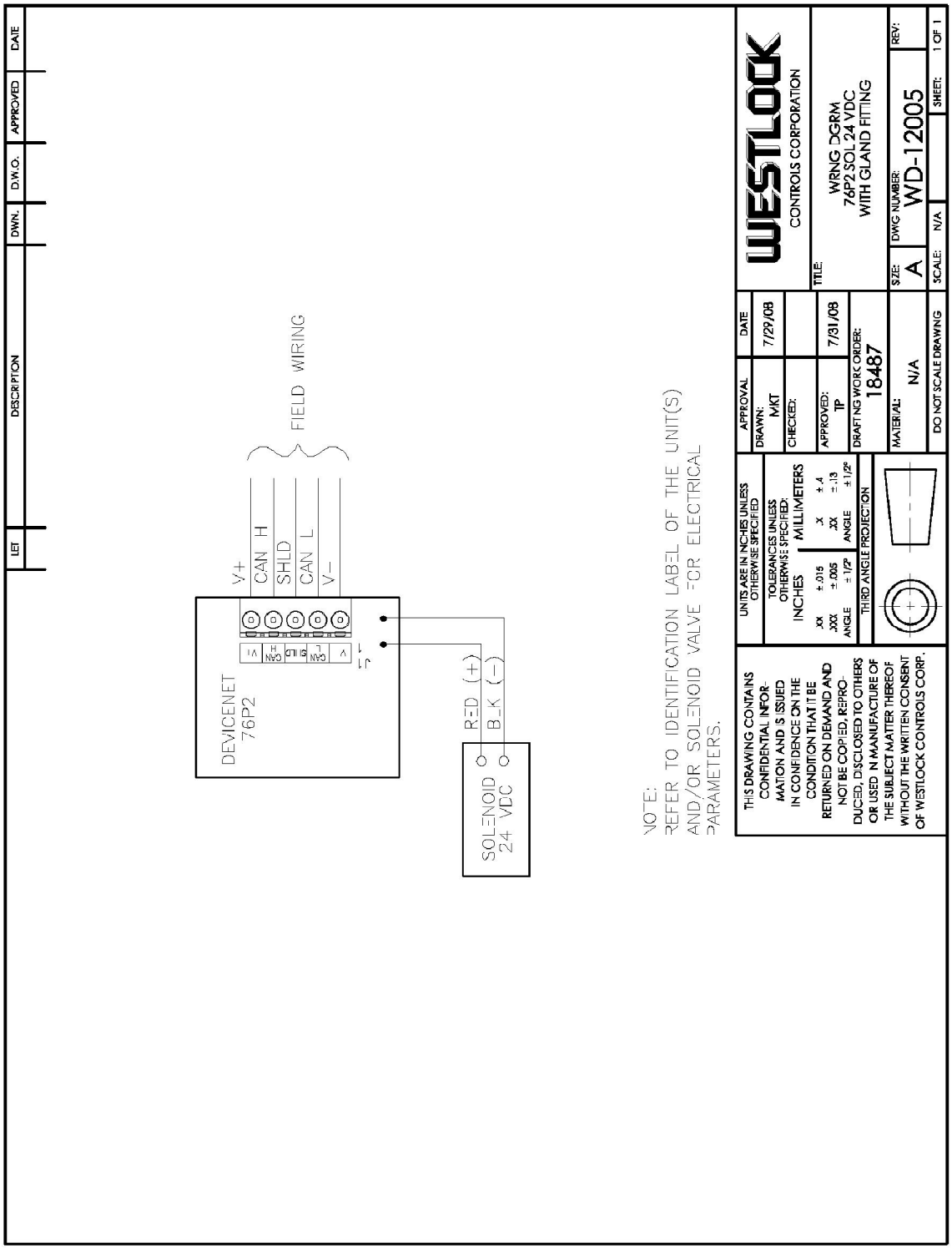
**Appendix B**
Dimension Sheet P2 without Solenoid Valve



**Appendix C**
Conventional Wiring diagram

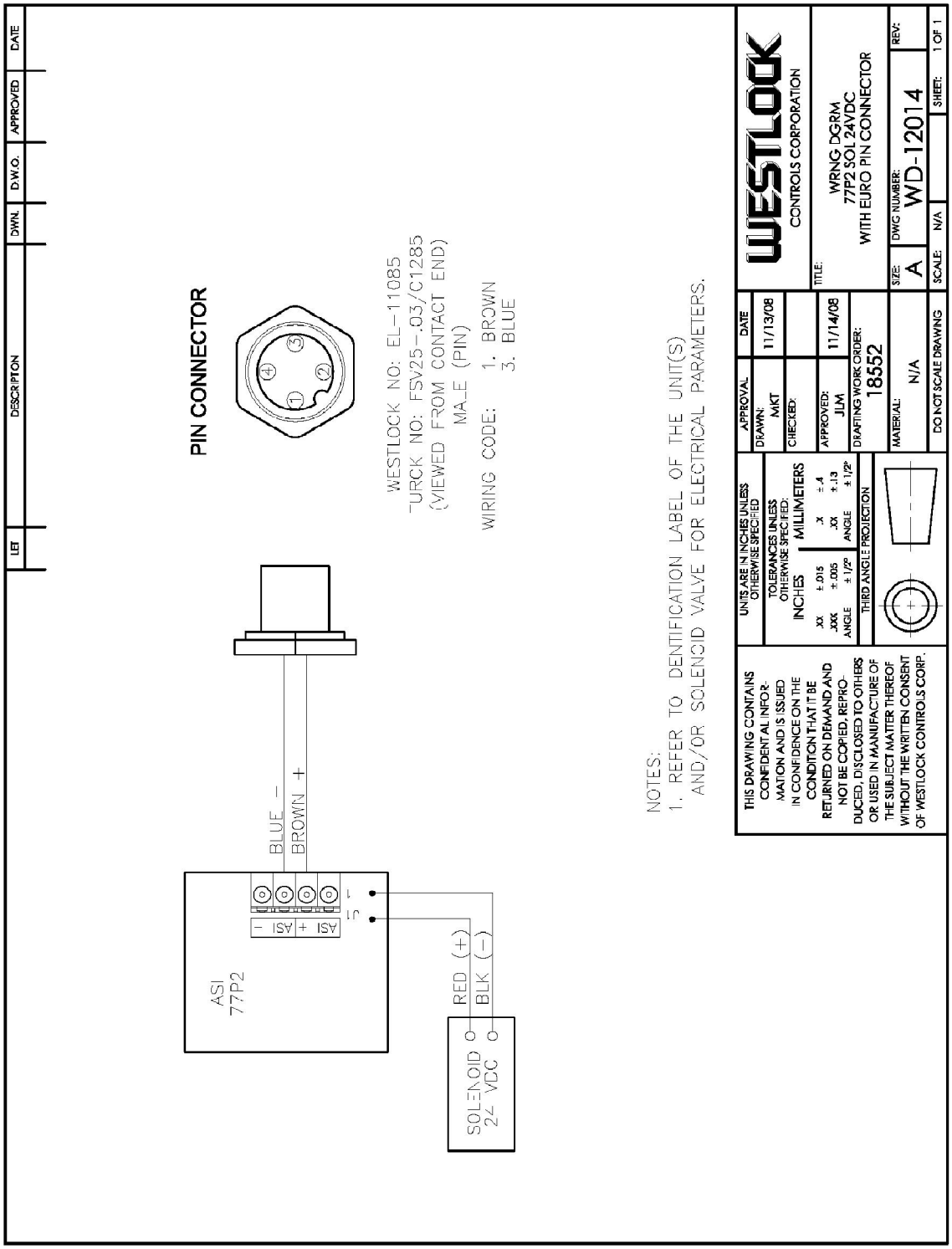


**Appendix D**
DeviceNet Wiring Diagram




Standard DeviceNet Wiring Colors: red=V+, white=CAN H, bare=SHLD, blue=CAN L, black=V-

**Appendix E**
ASi Wiring Diagram



**Appendix F**
FM approval Certificate

FM Approvals
Member of the FM Global Group

FM Approvals
1151 Boston-Providence Turnpike
P.O. Box 9102 Norwood, MA 02062 USA
T: 781 762 4300 F: 781 762 9375 www.fmapprovals.com

# CERTIFICATE OF COMPLIANCE

## HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

***PHARMA 2 Models 99P2, 76P2 & 77P2.***
NI/I,II,III/2/ABCDFG/ T4; -10 ºC ≤ Ta ≤ +60ºC;
IP55

*Special Conditions of Use:*
1. *Shall be installed in compliance with the enclosure, mounting, spacing and segregation requirements of the ultimate application, including a tool removable cover.*

Equipment Ratings:

Valve Monitor Pharma 2 Models 99P2, 76P2 and 77P2 is suitable for Class I, II, and III, Division 2, Groups A, B, C, D, F, and G with an ambient of ; -10 ºC ≤ Ta ≤ +60ºC and with an IP55 enclosure

FM Approved for:

Tyco
280 Midland Avenue, Saddle Brook NJ

FM Approvals HLC 1/06

3033224
Page 1 of 2

FM Approvals

Member of the FM Global Group

This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

| | |
|---|---|
| FM 3600 | 1998 |
| FM 3611 | 2004 |
| FM 3810 | 2005 |
| ANSI/ISA 12.00.01 | 1999 |
| ANSI/ISA 12.12.02 | 2003 |
| ANSI/ISA 82.02.01 | 2004 |
| IEC 60529 | 1989 |

Original Project ID: 3033224 Approval Granted: February 19, 2009

Subsequent Revision Reports / Date Approval Amended

| Report Number | Date | Report Number | Date |
|---|---|---|---|

FM Approvals LLC

J. E. Marquedant
Group Manager, Electrical

19 February 2009
Date

FM Approvals HLC 1/06

3033224
Page 2 of 2

**Appendix G**
FMC Approval Certificate

**Appendix H**
ODVA Conformance certificates

**Appendix I**
DeviceNet Object for setting Mac-ID and Baud rate Via Explicit Messaging

## *DeviceNet Object* *Class Code: 03(0x03)*

Class=3, Instance=0, Attribute=1

DeviceNet Object **Class** Attributes

| Attribute ID | Access Rule | Name | Data Type | Value |
|---|---|---|---|---|
| 1 | Get | Revision | UINT | 0x0002 |

Common Services - (**Class**)

| Service Code | Service Name | Description of service |
|---|---|---|
| 0x0E | Get_Attribute_Single | Returns the contents of the specified attribute |

Class=3, Instance=1, Attribute=1,2,3,4,5,6,7,8,9

DeviceNet Object **Instance** Attributes

| Attribute ID | Access Rule | Name | | Data Type | Value |
|---|---|---|---|---|---|
| 1 | Get/Set | MACID (Node Address) | | USINT | 0x00 to 0x3F (2) |
| 2 | Get/Set | Baud Rate | | USINT | 0x00 to 0x02 (3) |
| 3 | Get/Set | BOI (Bus-Off Interrupt) | | BOOL | 0x00 or 0x01 |
| 4 | Get/Set | Bus-Off Counter | | USINT | 0x00 |
| 5 | Get | Allocation Information | Choice Byte<br>Master MacID | STRUCT<br>BYTE<br>USINT | 0xXX,0xXX<br>Allocation Byte<br>0x00-0x3F, 0xFF |
| 6 | Get | MAC ID Switch Changed (since last power-up/reset) | | BOOL | 0x00=No Change<br>0x01=Changed |
| 7 | Get | Baudrate Switch Changed (since last power-up/reset) | | BOOL | 0x00=No change<br>0x01=Changed |
| | | | | | |
| 8 | Get | MAC ID Switch Value | | USINT | 0x00 to 0x3F (4) |
| 9 | Get | Baudrate Switch Value | | USINT | 0x00 to 0x02 (5) |

Common Services - (**Instance**)

| Service Code (Hex) | Service Name | Description of service |
|---|---|---|
| 0x0E | Get_Attribute_Single | Returns the contents of the specified attribute |
| 0x10 | Set_Attribute_Single | Modifies the contents of the specified attribute |
| 0x4B | Allocate_Master/Slave | Request the use of the Predefined M/S Connection Set |
| 0x4C | Release_Master/Slave | Deallocate the Predefined M/S Connection Set |

MACID is settable through DeviceNet, if switch S1 positions 7 and 8 are both in the ON position. If switch S1 positions 7 and 8 are both ON and a MACID has been set through software (DeviceNet Object command) then the value returned will be the last value set, otherwise the value returned will be switch S1 positions 1 through 6.

Baud Rate is settable through DeviceNet only if switch S1 positions 7 and 8 are both in the ON position. See table below.

| Switch S1 | | Returned Value | Speed |
|---|---|---|---|
| Sw8 | Sw7 | | |
| OFF | OFF | 0x00 | 125 kbits |
| OFF | ON | 0x01 | 250 kbits |
| ON | OFF | 0x02 | 500 kbits |
| ON | ON | 0x00 (default)<br>or 0x01 to 0x02 | Default 125 kbits,<br>or last set via Set_Attribute_Single |

MACID Switch Value returned will be switch S1 positions 1 through 6 (ON means logic 1, OFF means logic 0)

| MSB | | Switch S1 | | | LSB | MacID |
|---|---|---|---|---|---|---|
| Sw6 | Sw5 | Sw4 | Sw3 | Sw2 | Sw1 | |
| OFF | OFF | OFF | OFF | OFF | OFF | 0 (0x00 Hex) |
| OFF | OFF | OFF | OFF | OFF | ON | 1 (0x01 Hex) |
| OFF | OFF | OFF | OFF | ON | OFF | 2 (0x02 Hex) |
| … | … | … | … | … | … | … |
| ON | ON | ON | ON | ON | OFF | 62 (0x3E Hex) |
| ON | ON | ON | ON | ON | ON | 63 (0x3F Hex) |

Baud Rate Switch Value returned will be switch S1 positions 7,8

| Switch S1 | | Returned Value | Speed |
|---|---|---|---|
| Sw8 | Sw7 | | |
| OFF | OFF | 0x00 | 125 kbits |
| OFF | ON | 0x01 | 250 kbits |
| ON | OFF | 0x02 | 500 kbits |
| ON | ON | Default 0x00 | Default 125 kbits, |