

# Mid-West<sup>®</sup> Instrument

## Model 116 DPI Switch Installation and Operating Instructions



### INSPECTION

Before installation carefully check the Model Number on each instrument against the receiving paperwork and the intended application. Inspect for shipping damage and, if damaged, report it immediately. Verify when the unit is unpacked and in a vertical position that the pointer is on zero. **If the pointer is off zero see TROUBLE SHOOTING for instructions on zeroing the pointer.**

**NOTE:** **BEFORE ATTEMPTING REPAIRS, CONTACT YOUR LOCAL MID-WEST REPRESENTATIVE OR OUR FACTORY. FAILURE TO DO SO WILL VOID ANY WARRANTY.**



### CAUTION:

**Rapid pressurization can cause severe damage to the sensing element. Rapid pressure change (either increase or decrease) is a change in pressure occurring fast enough to drive the instrument full scale in one (1) second or less. See installation portion of this I.O.M. for guidance in how to prevent rapid pressurization.**

### PRODUCT DESCRIPTION

The Model 116 are all-metal differential pressure gauges capable of operating at low differential pressures for up to 500 PSI OR 1000 PSI (when specified) of line pressure.

The standard unit is equipped with one or two independently adjustable SPDT switches which can be set on decreasing or on increasing pressure. A switch adjust screw and a switch lock screw is accessible after removal of the lens and bezel (removal of 4 screws). The enclosure is weatherproof to the CSA Type 4 classification.

Interface to the snap acting micro-switch is via color coded 18 AWG flying leads and a 1/2" FNPT conduit connection. The assembly does not need power to operate.

The DPIS is also equipped with a Bi-directional Over Pressure Relief Valve (OPV). When the Differential Pressure exceeds 130% of the range the OPV equalizes the pressure between the Hi and Lo sides. Dual top and bottom connections and pressure snubbers are provided as standard. The pressure snubbers are installed into the bottom connections. The DPIS is also equipped with a pointer zero "micro-adjust". If necessary the pointer can be re-zeroed.

## INSTALLATION

All Mid-West "DPIS" alarm-controls are calibrated and tested prior to shipment and are ready for immediate installation. Use of the following installation procedures should eliminate potential damage and provide optimum trouble free operation.

- 1. CONNECTIONS** – Unit is equipped with dual ¼" FNPT connections top & bottom. Be sure that one "HI" and one "LO" pressure connection is plumbed through the pressure snubbers to the proper connection on your system. The pressure snubbers can be moved if necessary. The remaining two ports should either be plugged or plumbed as drains or bleeds depending whether the service is liquid or gas. Facing the front of the gauge, the "High" port is on the right.

**NOTE:** It is strongly recommended that a 3-valve manifold be used in plumbing your model 116 to your system. Properly used it should insure that your instrument is not over-ranged or damaged by pressure shocks during pressurization. It will facilitate later zeroing, ranging and calibration checking. It is good practice to purge or flush the instrument loop prior to connecting the instrument.


When pressurizing the instrument, the bypass valve open. Slowly open the high side and low side isolation valves. When the unit is pressurized close the bypass valve to obtain a DP reading.


When removing the instrument, open the bypass valve prior to closing the high side and low side isolation valves. Leave the bypass valve open when venting the instrument.

In some cases upon customer request the working pressure is stated as 1000 PSI. Note this reduces the overpressure design safety factor from 5X to 2.5X.

**Warning:** Lubricants and sealing compounds if used for Oxygen Service should only be sparingly used and shall be suitable for oxygen service.

- 2. ELECTRICAL** – Unit is supplied with a ½" FNPT Type conduit hub located at the bottom of the unit or an optional Type 4 Condulet enclosure. To maintain the Type 4 rating, an appropriate Type 4 weatherproof connector must be installed before making connections to the 18" color coded flying wire leads. Wire functionality is defined as follows with zero differential pressure applied to the instrument. For 2 switch units, the left switch will be identified as the low switch and the right switch will be identified as the high switch. The color coded leads will be marked 1 (for low) and 2 (for high).

| Single Switch |                 |   |
|---------------|-----------------|---|
| Color         | Function        | Label   |
| White         | Common          | 1-Com   |
| Black         | Normally Closed | 1-NC  |
| Red           | Normally Open   | 1-NO  |
| Green         | Earth Ground    |  |

| Double Switch |       |                 |   |
|---------------|-------|-----------------|---|
| Set           | Color | Function        | Label   |
| Low (Left)    | White | Common          | 1-Com   |
|               | Black | Normally Closed | 1-NC  |
|               | Red   | Normally Open   | 1-NO  |
| High (Right)  | White | Common          | 2-Com   |
|               | Black | Normally Closed | 2-NC  |
|               | Red   | Normally Open   | 2-NO  |
|               | Green | Earth Ground    |  |

**CAUTION:** Follow all local Electrical Code requirements.

**NOTE:** Install the front cover and bezel assembly after adjusting the switch and do not leave the unit outdoors without a connector in the electrical opening or the unit may be damaged from environmental conditions.

**SETPOINT ADJUSTMENT** For single switch units, the switch is adjustable for decreasing differential pressures from 3% to 90% of the full scale range of the gauge and on increasing pressure from 15% to 95% of the Full Scale range. (Unless otherwise specified the decal is located for decreasing pressure set points) For 2 switch units the set point adjustment span on increasing pressure is 20% - 95%. For decreasing pressure the set point adjustment span remains the same. The adjustment screw, the set point lock screw, the switch set feedback, and the switch set flag (optional) are located inside the enclosure to protect against unauthorized adjustment. Before opening the unit to make a set point adjustment, check plant operating procedures and electrical codes. For access, remove the (4) bezel screws and the bezel assembly.

**Setpoint Adjustment** (Bezel and lens removed)

**Switch Set: Decreasing Pressure:**

- Unlock the switch set by turning lock screw approximately ½ turn CCW. Adjust the set point adjust screw CW until the set point feedback is well below the desired switch point. Slowly turn switch adjust screw CCW until the Switch feedback is near the desired switch point.
- With an appropriate pressure source and switch continuity checker / meter, apply pressure to the unit and verify the switch set point. If a more precise set is required perform sequence 3.

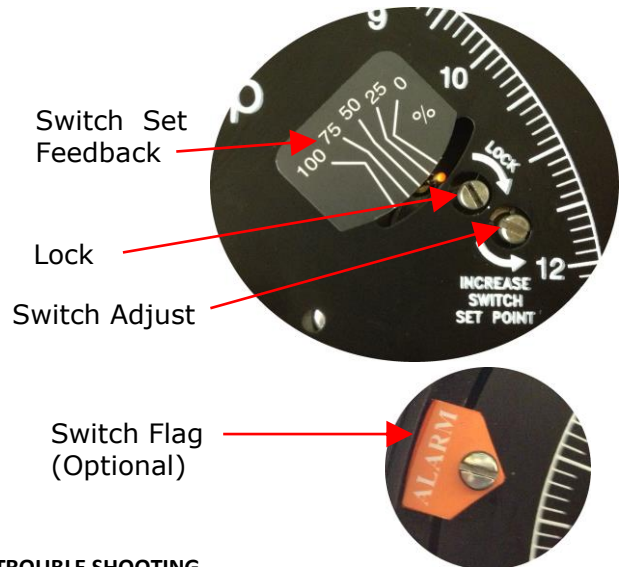
3. Apply pressure to the unit until the desired set point pressure is reached. If there is no continuity between the white and red wires, slowly reduce the set point of the switch (Turn CW) until there is continuity between the White and Red wires. If there is continuity between the white and red wires, slowly increase the set point (adjust CCW) until there is no continuity between the White and Red wires.
4. Tighten the lock mechanism (Rotate CW). Verify the switch set.
5. If ordered with a switch flag, loosen switch flag screw and manually adjust to actual switch setting. Retighten flag screw.

**Note:**

**In most cases the lock mechanism will increase the switch point 1-2% as the lock is engaged. For a more accurate set, set reduce your set pressure by 1-2% of the FSR when setting the switch.**

**Switch Set: Increasing Pressure:**

1. Unlock the switch set by turning lock screw approximately ½ turn CCW. Adjust the set point adjust screw CW until the set point feedback is well above the desired switch point. Slowly turn switch adjust screw CCW until the Switch feedback is near the desired switch point.
2. With an appropriate pressure source and switch continuity checker / meter, apply pressure to the unit and verify the switch set point. If a more precise set is required perform sequence 3.
3. Apply pressure to the unit until the desired set point pressure is reached. If there is continuity between the white and red wires, increase the set point of the switch (Turn CCW) until there is no continuity between the White and Red wires. If there was no continuity between the white and red wires, slowly decrease the set point (adjust CW) until there is continuity between the White and Red wires.
4. Tighten the lock mechanism (Rotate CW). Verify the switch set.
5. If ordered with a switch flag, loosen switch flag screw and manually adjust to actual switch setting. Retighten flag screw.
6. Replace the bezel assembly and screws.



**TROUBLE SHOOTING**

1. **Gauge does not indicate differential.**
  - A. Check for proper hook up, high to high and low to low.
  - B. Make certain that block valves are open and, if using a 3-valve manifold, that the equalizer (balance) valve is closed.
  - C. If A and B check out correctly, loosen or disconnect the high pressure line to determine if there is pressure to the instrument.
  - D. If there is pressure to the instrument, check to determine that there is a differential across the unit being monitored. If there is, contact the factory for assistance and for an "RGA" (returned goods authorization) number to return the instrument for repair or replacement.
2. **Indicating pointer off zero. (With block valves closed, equalizer valve open, or no system differential.)**
  - A. Tap gauge **lightly**.
  - B. Make certain block valves are closed and equalizer valve is open.
  - C. If A & B do not correct the "off zero" condition, remove the bezel and lens assembly by removing the (4) bezel screws. Grasp the pointer hub between the thumb and forefinger. Using a straight blade screw driver adjust the screw on the pointer clockwise to adjust the pointer upscale or counter clockwise to adjust the pointer downscale. Tap the gauge lightly to confirm the pointer is on zero. Reinstall the bezel and lens assembly.

**RECALIBRATION AND/OR REPAIR**

1. If recalibration or repair is required, secure an "RGA" (returned goods authorization) number from Mid-West Instrument and return the instrument to the factory.
2. If (1) is not practical, we recommend you discuss your problem with one of our customer service representatives and request a "technical service" manual. Please have both the model and serial numbers available before calling.

## Specification



**Industrial Control Equipment**

### ELECTRICAL

|   |                 |  |   |
|---|-----------------|--|---|
| <b>Input Voltage:</b>                                   | None required   |  |   |
| <b>Set Pointers:</b>                                    | Quantity:       | 1 or 2   |   |
|   | Adjust:         | 3% to 90 % of Full Scale<br>15% to 95% of Full Scale (Single Sw)<br>20% to 95% of Full Scale (Double Sw) | Set on Decreasing<br>Set on Increasing<br>Set on Increasing |
| <b>Output(s):</b>                                       | Contact(s):     | 1 or 2 SPDT  |   |
|   | Contact Rating: | 4 Amps Maximum<br>3 Amps maximum<br>5 Amps   | @ 30 VDC<br>@ 240 VAC<br>@ 120 VAC                          |
| <b>Temperature:</b>                                     | Operating:      | -20F to +185 F   |   |
| <b>Environment:</b>                                     | Standard:       | Weather-proof Housing  | CSA Type 4  |
| <b>Electrical:<br/>Interface</b>                        | Standard:       | 18" ., 18 Awg., 600V, 105 C,<br>color coded wire leads   | ½" FNPT   |
| <b>Gauge Accuracy:*</b><br><b>(Decreasing Pressure)</b> | 2%              | For all Single Switch Including effects of the switch, Double switch for ranges 200" H2O and above.      |   |
|   | 4%              | Double Switch units including effects of the switch. For ranges 80" – 199" H2O only.                     |   |
| <b>Switch Repeatability:*</b>                           | 2%              | Max. for all single switch units & all double switch units ranges 200" H2O and above.                    |   |
|   | 4%              | Double Switch units for ranges 80" – 199" H2O only.  |   |

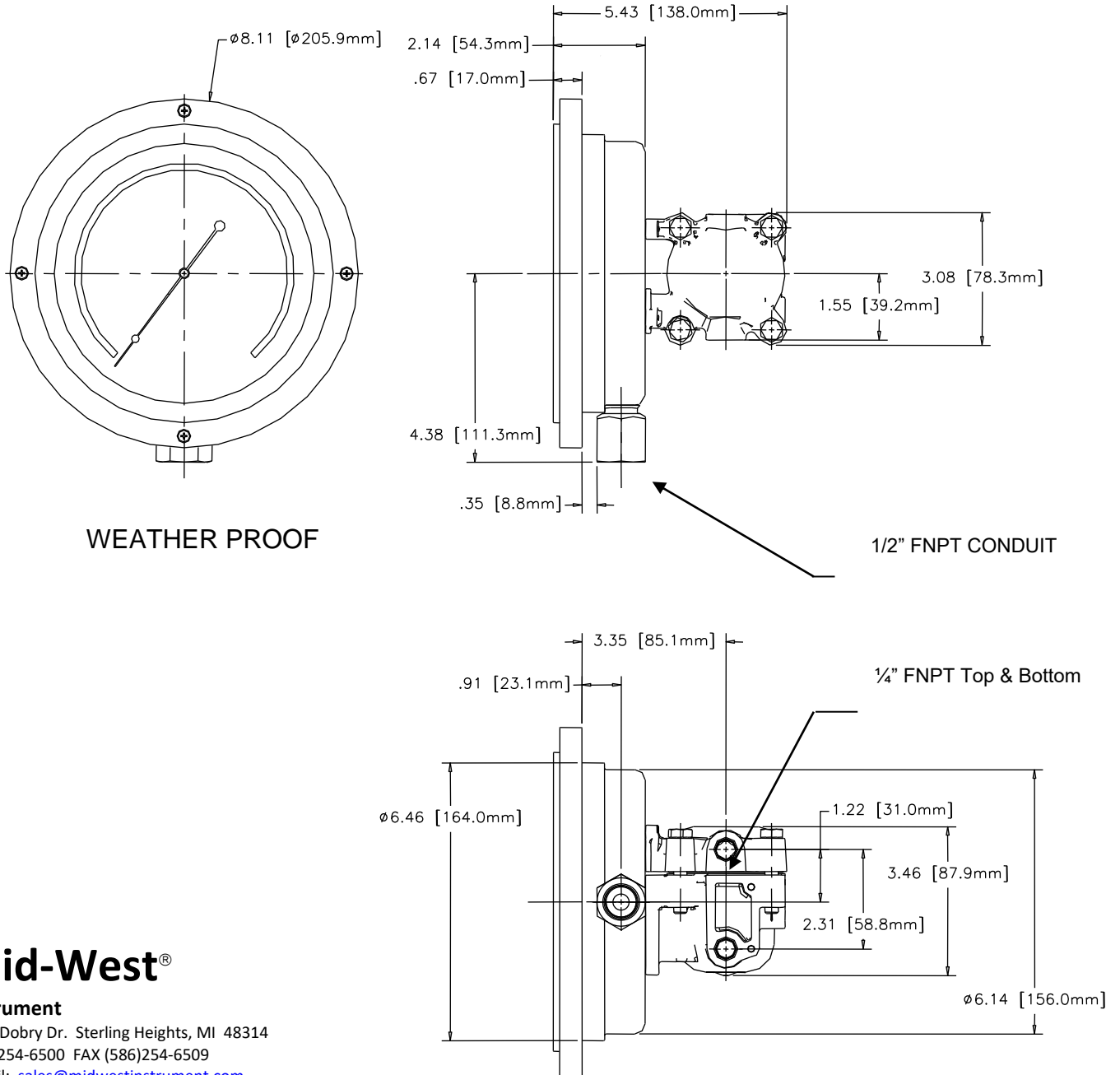
\* Accuracies and repeatability values for 2 switch units are based upon one switch set low (approx 25% FSR & one switch set High approx. 75% FSR.).

### MECHANICAL:

|                          |  |
|--------------------------|--|
| <b>Material:</b>         | Body; Brass<br>Moving Parts: 316/L SS, Ceramic, & Brass<br>Bezel, Housing: Anodized Al |
| <b>Ports:</b>            | ¼" FNPT Top & Bottom   |
| <b>Working Pressure:</b> | 500 PSID ./ 1000 PSID (when specified)   |
| <b>Proof Pressure:</b>   | 2500 PSI   |
| <b>Dial:</b>             | Black Aluminum with White Lettering; or White Aluminum with Black Lettering            |
| <b>Pointer:</b>          | White / Black Aluminum, micro adjust   |
| <b>Environmental:</b>    | CSA Type 4   |

**Standards:** C22.1 No.14-10 ; C22.2 No 94-M91 Type 4 enclosure

# FIGURE 2: DIMENSIONAL DATA



**Mid-West<sup>®</sup>**

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