

**Identification and Overview**

**Zone Pressure Pickup Ports (ZPS Pressure Sensors)**

The Wall Pressure Pickup Port comes standard on a brushed stainless steel plate or in a Delta Style enclosure, both sized to fit a common 2" x 4" electrical box. A foam gasket seals the plate or enclosure to the wall to insure the integrity of the measured space. The Wall Plate and Delta Style Enclosure can be used for pressure alone or as a combination temperature sensor and pressure pickup port. We also offer a Ceiling Mount Cover designed to fit a standard 3/4" thick suspended ceiling tile. If additional protection is required in the ceiling, a second ceiling cover fits on a common 2" x 4" electrical box. The brass fitting on the back of all Pickup Ports accommodates standard 1/8" to 5/32" I.D. tubing.

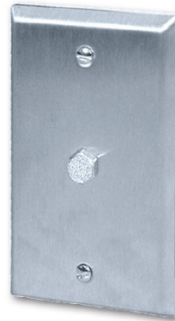


Figure 2: Wall Plate

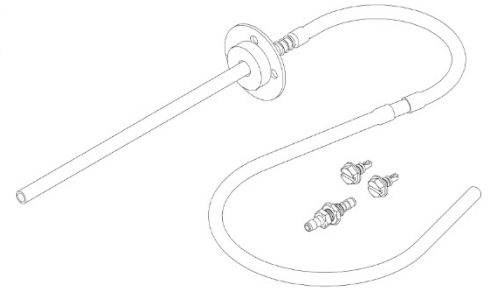


Figure 1: Duct Static Pressure Probe Assembly

**Part #s:**

- |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|
| NSB-ZPS-ACC01-A       | NSB-ZPS-ACC05-A       | NSB-ZPS-ACC07-A       |
| NSB-ZPS-ACC08-A       | NSB-ZPS-ACC10-A       | NSB-ZPS-ACC11-A       |
| NSB-ZPS-ACC20-A       | NSB-ZPS-LR-EZ-ST-IN-A | NSB-ZPS-LR-EZ-ST-PA-A |
| NSB-ZPS-SR-EZ-ST-IN-A | NSB-ZPS-SR-EZ-ST-PA-A | NSB-ZPS-SW2-A         |
| NSB-ZPS-SW3-A         | N1-ZPS-ACC01-102-A    | N1-ZPS-ACC12-A        |
| N1-ZPS-ACC13-A        | N1-ZPS-ACC14-A        | N1-ZPS-ACC15-A        |
| N1-ZPS-ACC18-A        |                       |                       |

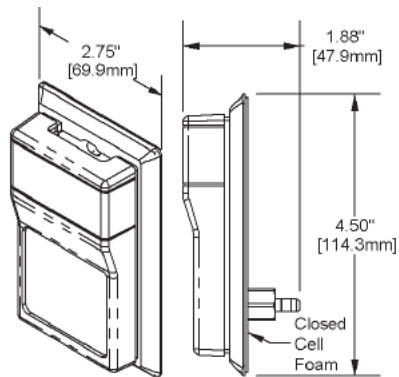
**Specifications**

**Environmental Operating Range:**

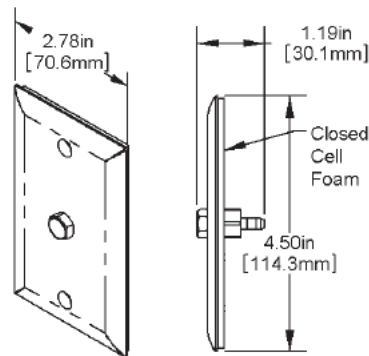
Wall Plates: 32 to 122°F (0 to 50°C) • 0% to 95% RH, non-condensing

**Material:** Wall Plate: Stainless Steel

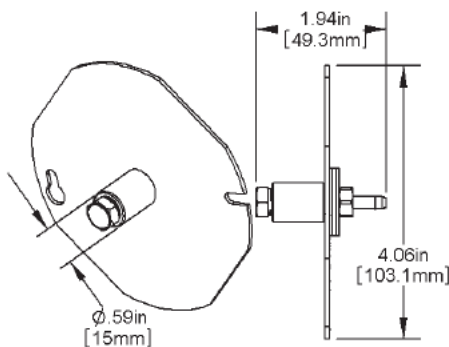
**Dimensional Drawing**



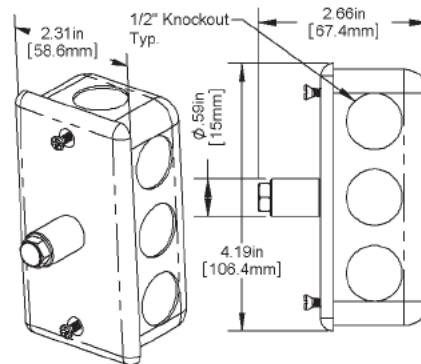
**Delta Enclosure (ZPS-ACC03)**



**Wall Plate (ZPS-ACC01)**



**Ceiling Mount Cover  
(ZPS-ACC05)**



**Ceiling Mount Cover & J-Box  
(ZPS-ACC06)**

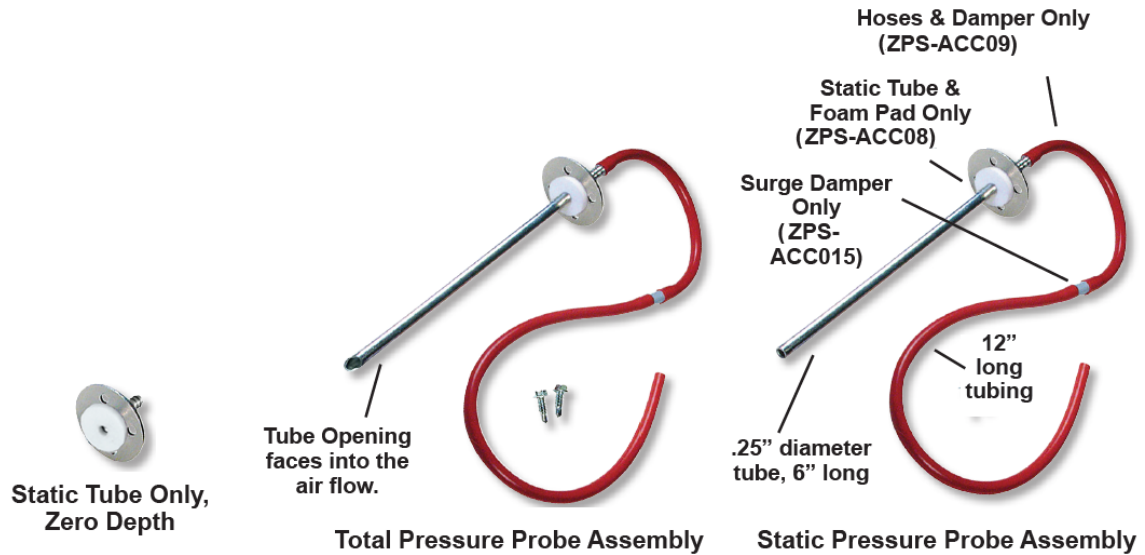
**Ordering Information**

- NSB-ZPS-ACC01-A .....2" X 4" Stainless Steel Wall Plate with Static Pickup
- NSB-ZPS-ACC01-102-A.....2" X 4" Stainless Steel Wall Plate with Static Pickup & 10K-2 Temp. Sensor
- NSB-ZPS-ACC05-A ..... Ceiling Mount Square Cover with Static Pickup
- NSB-ZPS-ACC07-A ..... Static Pressure Probe Assembly, 6" long
- NSB-ZPS-ACC08-A ..... Static Tube Only (6") with Circular Foam
- NSB-ZPS-ACC11-A ..... Pitot Pressure Probe Assy, 3.5" long (includes the Static & Total Probe Assy)
- N1-ZPS-ACC12-A ..... Pitot Pressure Probe Assy, 6" long (includes Static & Total Probe Assy)
- N1-ZPS-ACC13-A ..... Total Tube Only (3.5") w/ Circular Foam (doesn't include hoses & damper)
- N-1-ZPS-ACC14-A..... Total Tube Only (6") with Circular Foam (doesn't include hoses & damper)
- N1-ZPS-ACC15-A ..... Surge Damper Only, 5 micron
- N1-ZPS-ACC18-A ..... 2 Static Pressure Tube Assemblies, 6" Long

**Features and Options**

The Static Pressure Probe and Total Pressure Probe Assemblies connect to the Zone Pressure Sensor to provide duct static pressure or duct air velocity. The angled total probe faces into the airflow to sense the moving air's total pressure while the static probe senses static pressure.

Both probe assemblies include a tube and rubber hose with built in surge damper to smooth out variations in airflow for a more stable reading. The Static Pressure Probe is available individually while the Pitot Pressure Probe Assembly includes the total probe and the static probe assemblies.



**Mounting****Duct Static Pressure Probe**

Positioning the duct static pressure probe assembly to get the best results requires a little planning. Ideally the probe should be located 1/2 the distance from the fan to the end of the longest duct run. The probe should be a minimum of five duct diameters from any vanes, straighteners, reducers or bends. The probe may be placed within 1/2 duct diameter of a filter as long as the filter is five duct diameters from any other restriction.

1. Drill a 1/4 inch hole in the duct for the probe.
2. Insert the 6 inch long section of the probe into the duct work and rotate so the air flow arrow is pointing in the same direction as the air flow in the duct.
3. Using the two self drilling screws provided secure the probe to the duct. For round duct pick the two holes in the probe mounting flange that touch the duct surface.
4. Position the probe so that it is at a right angle to the duct surface or at right angles to a line tangent to the duct surface for round duct. Being off by +/- 5 degrees angle is acceptable.

Long runs of tubing will damp out quick pressure fluctuations. Where the ZPS unit must be located close to the static pressure tube use a pressure spike reducer. The pressure spike reducer provides a slight restriction in the tubing. The volume of tubing after the pressure spike reducer determines the time constant, the longer the tubing the greater the pressure spike reduction.

5. Place the 6" tube towards the pressure source.
6. Connect the 12" tube to your ZPS pressure transmitter. If you do not get the dampening that you desire, increase the tubing length from the blue plastic snubber to the pressure sensor.

**Tip**

- Condensation running down the interior of the tubing will damage the sensor. Forming a drip loop in the tubing just before it enters the ZPS transmitter is good practice.
- The distance from the bottom of the loop to the ZPS's pressure port should be one to two inches (2.5 to 5 cm) greater than the highest air pressure, including error conditions, in the duct system.

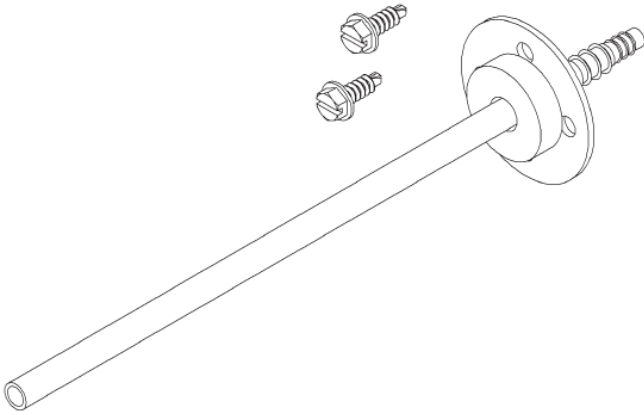


Figure 3: ZPS Static Tube

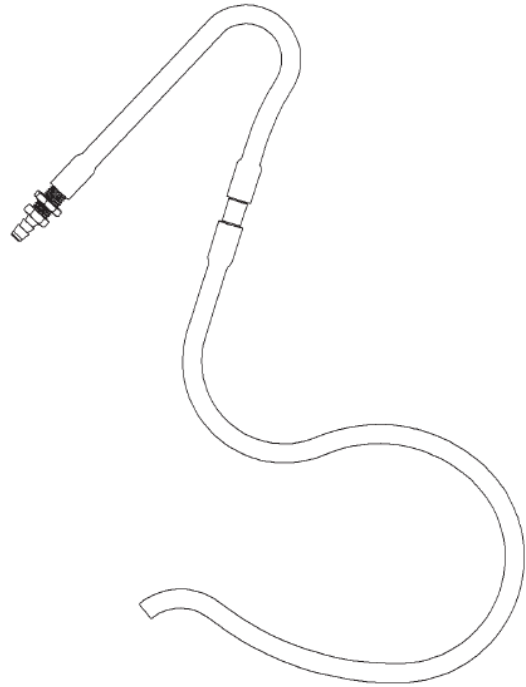


Figure 4: Hoses with Pressure Damper

### Pressure Pickup Ports

Mount the static pressure pickup port in an area that is representative of the zone near the center of the zone. Do not mount in a closet or other enclosed space, or in areas that are prone to drafts.

It is best to mount the wall pickup port using an electrical box. A simple hole in the wallboard may be used, but be sure that the foam gasket on the back of the pickup seals tightly against the wall. Attach tubing to the barbed fitting on the back of the pickup port and run the tubing to the pressure sensor, forming a drip loop in the tubing just before connecting to the pressure sensor.

The ceiling pickups are sized to fit through a standard 3/4-inch thick acoustic ceiling tile. Cut a 5/8 inch hole in the tile. Place the static pressure sensor on top of the tile with the filter into the hole. The filter should stick out slightly below the tile's room surface. Attach tubing to the barbed fitting on the back of pickup port and run the tubing to the pressure sensor, forming a drip loop in the tubing just before connecting the tubing to the pressure sensor.

**Typical Applications**

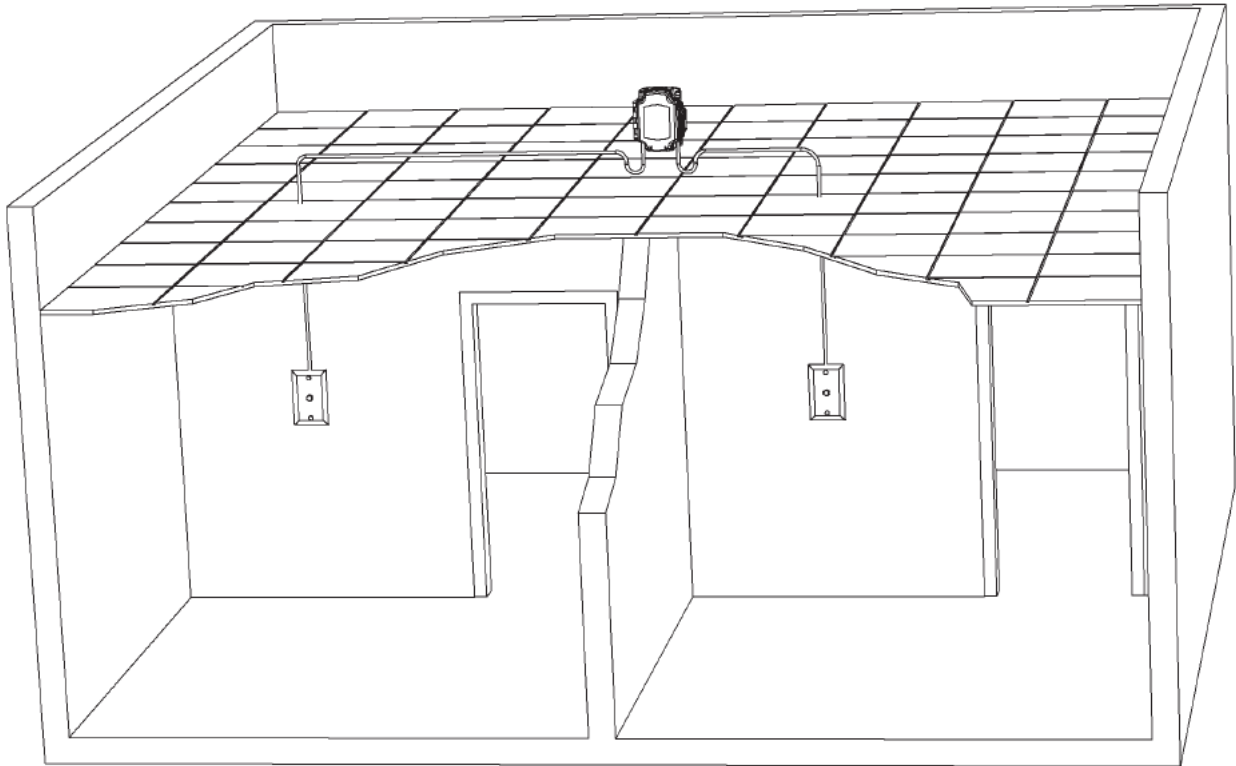


Figure 5: Measuring static pressure differences between two rooms using two wall plates and a Pressure Transmitter

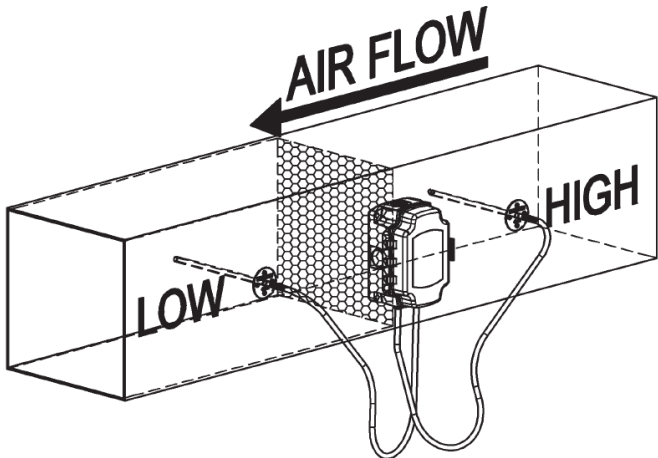


Figure 6: Measuring duct air filter pressure drop with pressure transmitter and two static pressure probes

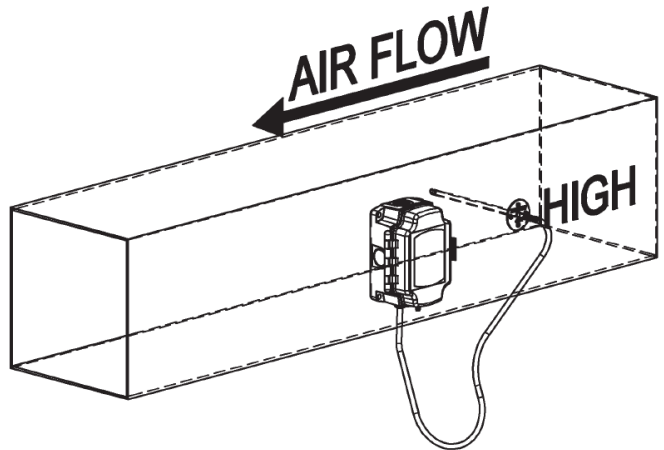


Figure 7: Measuring duct static pressure with pressure transmitter and static pressure probe

**Operation**

Air only moves due to pressure differences. Air flows from high pressure to low pressure. A fan mechanically increases the air pressure in ductwork. Air flows from the fan to the diffusers. The total pressure in the duct consists of two parts, the static pressure and the velocity pressure.

When you blow up a balloon and tie it off the static pressure in the balloon keeps it inflated. Static pressure pushes equally in all directions. If you replace the balloon with a closed off air duct and a fan the same phenomenon happens, static pressure pushes equally in all directions. As you open the damper at the end of the closed duct air starts to move and the static pressure lowers. The moving air converts a portion of the static pressure into the velocity pressure of the moving air.

A tube in the duct aligned into the airflow senses the velocity pressure as well as the static pressure (total tube). The air colliding with the total tube comes to rest and converts its moving pressure back into static pressure. The new static pressure at the opening of the total tube is the duct static pressure added to the velocity pressure of the moving air.

A tube in the duct at right angles to the airflow senses only the static pressure (static tube). The difference between the total pressure reading and the static pressure reading is the velocity pressure. ZPS is a true differential pressure transmitter, if you connect the total tube to the HIGH port on the ZPS and the static tube to the LOW port on the ZPS, then the transmitters out put will be the velocity pressure.

Velocity pressure is always a positive number applied in the direction of airflow. The airflow velocity can be calculated from the velocity pressure. Bernoulli's equation (shown below) is solved to find the relation between the airflow velocity and the velocity pressure. Airflow in cubic feet per minute is found by multiplying the velocity found above by the area of the duct in square feet.

The cooling or heating capacity of the airflow is proportional to its density. HVAC design is based on standard air at sea level. If the job site is in the mountains you may need to increase the airflow to satisfy the heating or cooling load. The increase is simply the ratio of air density at sea level to the air density at altitude. The ratio is know as the flow correction factor.

The data in the table below represents NASA's Standard Atmosphere (<http://www.pdas.com/e2.htm>). Altitude and sigma (air density at altitude divided by sea-level density) were in the NASA data, derived the Flow Correction Factor. For example, Denver, Colorado is at an altitude of 5,000 feet, so the air is about 86% (sigma) of the density of sea level air. Therefore you need to increase the flow from the calculated flow by 16% to compensate.

Altitude	sigma	Flow Correction Factor
-1000 ft	1.03	0.97
0 ft	1.00	1.00
1000 ft	0.97	1.03
2000 ft	0.94	1.06
3000 ft	0.92	1.09
4000 ft	0.89	1.13
5000 ft	0.86	1.16
6000 ft	0.84	1.20
7000 ft	0.81	1.23
8000 ft	0.79	1.27
9000 ft	0.76	1.31

**Troubleshooting**




**PROBLEM**

Velocity pressure reading is incorrect

**POSSIBLE SOLUTIONS**

- Make sure that the total tube is pointing directly upstream.
- Make sure that the static tube is perpendicular to the airflow.
- Make sure that the hoses from the static and total tubes do not have any kinks in them.
- Make sure that the total tube is connected to the high pressure port on the pressure transmitter and the static tube is connected to the low pressure port of the pressure transmitter.
- Troubleshoot the pressure transmitter.

**Appendix – Symbols Key**

 <b>Warning</b>	Potential for death, serious injury, or permanent damage to a system.
 <b>Caution</b>	Potential for injury, damage to a system, or system failure.
 <b>Tip</b>	Useful information not related to injury or system damage.