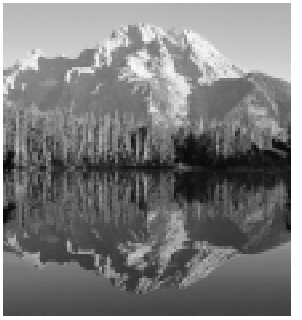

In-Situ Inc.
Helping monitor the earth's resources

PXD-261
Pressure Transducer
Operator's Manual

February 1998

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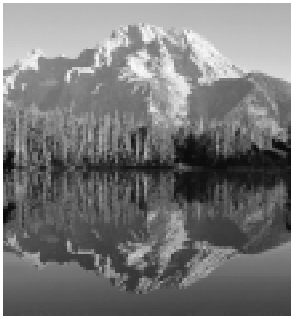
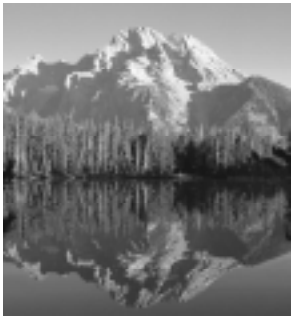


Contents

Guidelines and Precautions

- *The PXD-261 will not read past its designated range. If the range is exceeded, the value displayed by the data logger will remain constant.*
- *Never submerge the PXD-261 more than two times its range.*
- *When a slug test is planned, be sure that the transducer's range is sufficient to withstand the pressures it will be subjected to.*
- *Don't let the transducer "free fall" into a well or onto a water surface. Lower it gently.*
- *Be sure connectors are clean and dry before installing them.*
- *Be sure the vented cable is not kinked or blocked.*
- *Allow at least 30 minutes for the PXD-261 to stabilize to the water temperature before collecting data.*
- *When using the PXD-261 to measure water levels with a HERMIT 1000 or 2000 data logger, don't forget to set a Reference. A Reference number left in the data logger from an earlier test will probably be meaningless. Be sure to install the transducer in the water first.*
- *Secure the transducer cable so it doesn't slip during operation.*
- *When the PXD-261 is being used in a pumping well, install it above the pump.*
- *Do not attempt to disassemble the PXD-261 body. Doing so may severely damage the transducer and will void the warranty.*
- *Finally, the PXD-261 pressure transducer is a delicate electronic instrument. Please give it the care it deserves.*



1 Introduction

The PXD-261 is an accurate, stable, fully submersible pressure transducer for monitoring changes in water level. It collects fast, accurate time-drawdown data from pump and slug tests, including the recovery phase. Its small diameter permits access to 1" wells. Its Quick-Connect™ cable is easy to install, and long cable lengths do not compromise accuracy. The PXD-261 is ideal for both short-term testing and long-term monitoring.

The standard PXD-261 is a PSIG type transducer, and its cable is vented to the atmosphere. An "absolute" PSIA version on unvented cable is also available.

Operating Principle

A pressure transducer senses changes in pressure, measured in pounds per square inch (PSI), exerted by a column of water or other fluid above an internal strain gauge. This is translated electronically to a 4-20 mA signal sent to the data logger. Software calibration coefficients unique to each transducer enable the data logger to convert the 4-20 mA output to meaningful results in the desired measurement units.

PSIA and PSIG

PSIA stands for "pounds per square inch absolute," measured with respect to zero pressure. PSIA transducers measure all pressure forces detected by the strain gauge, including atmospheric pressure.

PSIG stands for "pounds per square inch gauge," measured with respect to atmospheric pressure. PSIG transducers thus exclude the atmospheric pressure component.

This difference may be represented by a simple equation:

$$P_{gauge} = P_{abs} - P_{atmos}$$

Unpacking and Inspection

Your PXD-261 was carefully inspected before shipping and is ready to operate right out of the box. Check for any physical damage during shipment. Notify In-Situ and file a claim with the carrier if there is any such damage. If your transducer didn't come as ordered, please contact In-Situ immediately.

The "proof" or over-range pressure is two times (2X) the full-range pressure and should <u>never</u> be exceeded or the transducer may be permanently offset, damaged, or destroyed.

Description

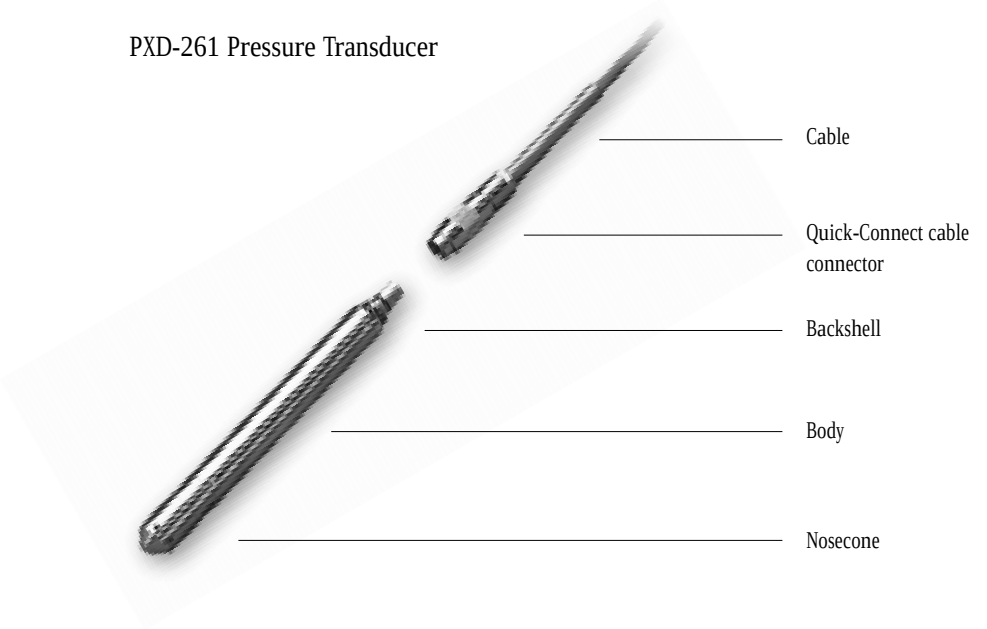
The body of the PXD-261 is 0.86 inch (22 mm) in diameter and constructed of 316 stainless steel. Seals are Viton®. The principal parts are shown in the photo below.

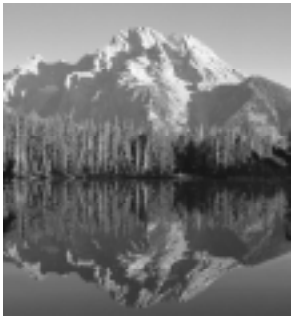
Calibration Documentation

Documents provided with the PXD-261 describe In-Situ's calibration process and contain the transducer's unique calibration coefficients. For convenient reference, the coefficients are printed on the PXD-261 data tag, along with the following information:

- Serial Number and Calibration Date
- Range of accurate measurement (PSI)
- Proof: maximum over-range pressure (PSI)
- Linearity, Scale, Offset: calibration coefficients that enable the logger to convert the transducer's 4-20 mA output to meaningful results

PXD-261 Pressure Transducer





2 Installation

The only removable parts of the PXD-261 are the nosecone and cable. Do not take the body apart, as this may severely damage the transducer and will void the warranty.

Installation requires four steps:

- Install the cable.
- Connect the cable to the data logger.
- Install the PXD-261 in the water.
- Program the data logger to identify the PXD-261.

These steps can be performed in any order. You might want to program the data logger in the office, then take it all to the field and set it up, or vice-versa.

Connection and installation in the water are covered in this section. Programming the data logger is summarized in Section 3.

Installing the Cable

Attach the Quick-Connect cable to the PXD-261 as follows:

1. Remove the protective caps from the PXD-261 backshell and the Quick-Connect connector on the cable.

   Don't discard the caps. Set them aside for later use to protect the contacts when the probe and cable are not in use. The backshell cap may display the probe's serial number and calibration coefficients—important numbers you'll need when programming the data logger.

2. Slide back the sleeve of the Quick-Connect connector.
3. Align the tab in the PXD-261 backshell with the slot inside the cable connector.
4. Slide the two parts together and press tightly. They should slip together easily, without forcing.
5. Tighten the locking sleeve hand-tight.

Proper operation of a transducer depends on a clean, dry connection to the data logger. Make sure the connectors are clean and dry before trying to install them.

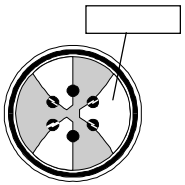
Connecting to the Logger

Transducers can be installed at any of the input channels on the connector panel of a HERMIT. If more than one transducer is being used, they should be installed consecutively beginning at channel one.

The Well Sentinel transducer connector is on the bottom of the instrument. Since it is not a weight-bearing connector, strain relief must be provided. Refer to the Well Sentinel *Operator's Manual* for suggestions.

Transducers mounted on reels are supplied with a jumper cable for convenient connection to the instrument. Transducers on cable without a reel connect directly to the instrument without a jumper cable.

To install connectors:



1. Remove the protective caps from the data logger connector and the cable.
2. Orient the connector patterns so that the large tab in the cable connector aligns with the V-shaped notch in the instrument connector.
3. Gently press the connector halves together. Excessive force should not be required.
4. Tighten the connector's lock ring to establish a tight connection and water-resistant seal.

Remove a connector as follows:

1. Loosen the connector's lock ring.
2. Gently pull the connector halves apart.
3. Replace all protective caps. Store the transducer in its original container or where it will be safe from damage to the contacts.

Installing in the Water

Installing a transducer is not difficult, but it should be done with care. Here are some recommendations to bear in mind.

Vertical Installation

DON'T let a transducer "free fall" into a well or onto a water surface because of the likelihood of a pressure wave breaking the strain gauge (the "waterhammer" effect).

DO position the transducer below the lowest anticipated water level, but not so low that the range of the transducer might be exceeded at the highest anticipated level. Maximum depths in feet and meters are shown in the table on the opposite page.

For example: A 10 PSI transducer will measure 23.1 feet of change in water level. If the water level is going to drop, the transducer should be placed not more than 23.1 feet below the static (starting)

Range (PSI)	Max.Usable Depth Feet	Meters
10	23.1 ft	7.03 m
15	34.6 ft	10.5 m
20	46.1 ft	14.1 m
30	69.2 ft	21.1 m
50	115.3 ft	35.2 m
100	230.7 ft	70.3 m
250	576.7 ft	175.8 m

water level. A 10 PSI transducer positioned 18 feet below the surface will measure change from the beginning water level to a drop of 18 feet—at which time it will be out of the water. At the same position it will also measure a rise in water level up to 5.1 feet (23.1 - 18.0) from the starting water level.

Pressure Limitations. The PXD-261 will not read data above full-range pressure (the "Range" number on the data tag). Above this limit the data logger's reading will remain constant. The transducer will not be damaged as long as the pressure is less than two times the full-range pressure (the "Proof" number on the data tag). Never submerge a transducer more than two times the full-range pressure or it will be permanently offset, damaged, or destroyed.

If a transducer is subjected to excess pressure but still appears to function normally, the calibration should be verified by In-Situ. See "To Obtain Repair Service" in Section 5.

To prevent damage to the vent tube, don't allow the cable to kink or bend tightly. The minimum recommended bend radius is one inch. This caution doesn't apply to the PSIA version of the PXD-261, as it has no vent tube.

DON'T block or crimp the vent tube—a small polyethylene tube inside the transducer cable. The vent tube provides for equalization of air pressure on the water surface and inside the transducer. When a change in barometric pressure causes a change in water level (e.g., in confined aquifers), the change will not be distorted by a doubled reading caused by unequal pressure. If the vent tube becomes kinked, the internal components can be damaged without any visible harm to the outside of the cable.

DON'T set a pressure transducer below the level of the pump in a pumping well. The pressure transients generated by the pump will cause false level readings. Large pumps can swallow the transducer and cause permanent damage to both the transducer and the pump.

DO attach the transducer cable securely to the wellhead or other stationary object. If the transducer slips during the test, it will be impossible to tell from the data record whether the water level changed, the transducer moved, or both. A secure transducer placement is critical to accurate measurement.

DO allow at least a half-hour for the transducer to stabilize to the water conditions before starting a test or setting the Reference. Longer stabilization is always desirable,

Always remove the cable before screwing the PXD-261 into a pipe.

especially in long tests. Even though the cable is shielded, temperature stabilization and minor stretching can cause apparent changes in the reading. If you expect to monitor water levels to the accuracy of the transducer, it's worth allowing the extra time for the transducer to stabilize to the test environment.

Check Readings. After the transducer has been installed in the water and the data logger has been programmed, it's a good idea to take a reading of the transducer depth and then move the transducer and take another reading to be sure that the transducer is giving a reasonable reading and showing change. A transducer might not be located where you think it is—for example, it could be wedged against the casing with a loop of cable hanging below it. A transducer in such a position may become dislodged and move during the test, giving a false change in level. The data logger Operator's Manual tells how to take a preliminary reading.

Piping Installations

With the nosecone removed, the PXD-261 can be installed in any 1/4" NPT threaded pipe to monitor flow. Always remove the cable before screwing the transducer body into the NPT.

To install the PXD-261 in a pipe fitting:

1. If the cable is attached, remove it. To do so, unscrew the locking sleeve and gently pull the transducer and cable connector apart.

2. Unscrew the nosecone by hand and remove it.

3. Using a 7/8" open end wrench and the wrench flats on the transducer body, screw the PXD-261 onto any 1/4" NPT threaded nipple, tee, or elbow, depending on plumbing at the wellhead.

   - Apply your wrench to the wrench flats, not to the spanner holes at the back end of the transducer.
   - Thread sealing (compound or tape) may be used if necessary.

4. Reattach the cable.

Accuracy of the electronics may be affected by temperature fluctuations. Therefore, for long-term tests (several weeks), we recommend you insulate the transducer to ensure a thermally stable environment.

Using the PXD-261 with Other Equipment

This information is designed to help you interface the PXD-261 with third-party instrumentation. To make proper use of this information you should be prepared to

- Read and understand a schematic diagram
- Research other equipment manuals for interface details
- Run to an electronics store for parts
- Use a soldering iron and other small tools for electronic assembly

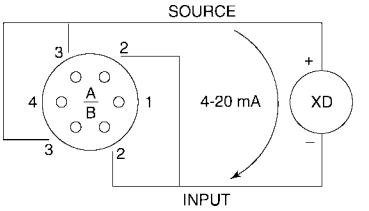
If any of these resources are not available to you, contact In-Situ's customer service personnel for assistance, or quotes on custom cables and interfaces.

The PXD-261 provides a linear current output that is proportional to the applied pressure. This output is a 4-20 mA change corresponding to a full-scale change in pressure. The voltage required by the transducer is 12-30 VDC.

In-Situ does not warrant the PXD-261 against damages caused by use with devices not provided by In-Situ.

Any data logger that provides the necessary voltage and can read the 4-20 mA current output can be used with the PXD-261. To insure accuracy, power should be applied for a minimum of 50 milliseconds prior to any reading.

The wiring of the PXD-261 is shown here. It is a standard 2-wire, 4-20 mA transducer.



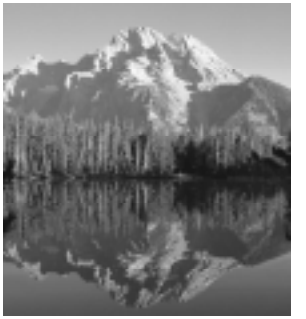
Any mating connectors needed must be ordered separately from In-Situ. *Do not use any other type of connector* as this will compromise the integrity of waterproof operation. Also, remember that the vent tube in the cable must remain unobstructed to assure that the transducer is insensitive to barometric pressure changes. See Section 4, Transducer Maintenance, for additional details.

When a slug test is planned, be sure that the transducer can withstand the pressures it will be subjected to.

Level Mode Application: Slug Tests

When conducting a slug test, caution must be used so that the amount of water slugged does not over-pressure the transducer.

For example: You have a 20 PSI transducer down a test hole with 4-inch casing. Say the water surface is 100 ft. from the top of the casing, and the transducer is set 23 ft. below the surface of the water. (This corresponds to a transducer reading of 10 PSI.) If the hole is instantaneously slugged with 20 gallons of water, an additional pressure of 33.2 PSI would be created. Thus, the transducer would be subjected to an instantaneous pressure of 43.2 PSI, which is greater than the 40 PSI (2X) it can withstand without damage.



3 Programming the Data Logger

The process of collecting data from the PXD-261 with In-Situ's data loggers is referred to as "running a test." This has three steps:

- Enter the test conditions into the data logger.
- Enter the transducer characteristics into the data logger.
- When the data logger is programmed and the PXD-261 is in place, the test can be started.

How you carry out these steps depends on the data logger you are using. This section briefly highlights some of the differences among data loggers. Depending on the logger, the questions or "prompts" for input may be worded slightly differently. More complete information can be found in the Operator's Manual for the data logger.

When in doubt about a programming step, please consult the Operator's Manual for your data logger.

Definitions of Terms

Type

also called input type, channel type, probe type, transducer type, XD type, data type, measurement type

This is important because it tells the data logger how to power up, and take a reading from, the transducer connected to an input channel. The type also determines the data reduction equations that are used to convert the 4-20 mA output of the transducer to meaningful results in the desired units.

Linearity, Scale, & Offset

These "calibration coefficients" are unique to each transducer and may be found on a data tag and also in the probe calibration documentation.

The PXD-261 requires 50 mSec warmup time.

Warmup

also called delay, warmup delay

This is the time required for the logger to power and read the transducer. The PXD-261 requires 50 milliseconds (mSec).

Specific Gravity

Pure water has a specific gravity of 1.0. A ten PSI transducer will measure 23.1 feet of change in a fluid that has a specific gravity of 1.0 (10 PSI × 2.30667 ft./PSI).

One PSI—either PSIA or PSIG—is equal to 2.30667 feet of water.

If the working fluid is not water, some situations may require that you determine its specific gravity to obtain accurate test results. Most In-Situ data loggers let you specify the fluid's specific gravity through a simple menu option. When monitoring in water, the specific gravity should usually be set to 1.0.

Mode & Reference

Remember: When you choose surface mode—even if monitoring in a well—when the water level goes up, your numbers will go up; when the water level goes down, the numbers will go down.

When measuring water levels, the Mode setting determines whether the displayed values increase or decrease in response to changes in water level. The Reference is a user-specified starting point for all the test measurements. See the box opposite.

The data loger substitutes your Reference for the transducer's raw pressure reading at the moment you enter it (HERMIT 1000, HERMIT 2000, LTM3000) or optionally at the start of the test (HERMIT 3000, LTM3100).

HERMIT 1000C

HERMIT software is integral to the data logger. Each step is performed through its own menu:

1. Set up the test in the Enter Data menu. Refer to Section 4 of the *HERMIT 1000C Operator's Manual* for details.

   Type. Select "Level" for water levels or "Func" for direct pressure readings.

2. Set up the transducer(s) in the Enter XD menu (operator's manual Section 5).

   Scale, Offs(et), Lin(earity). Enter values from the PXD-261 data tag.

   Note: With an older model HERMIT (1000B or earlier), use the "Linear" or "BFSL" coefficients printed in the calibration documentation.

   Delay. Enter 50 (milliseconds).

   For Level types—

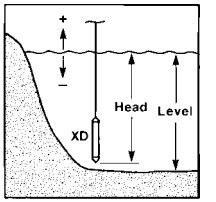
   Ref. Skip the Reference your first time through the menu. Go back and enter it after the transducer is installed.

   Dsp. Combination of Units & Display Mode. Choose from

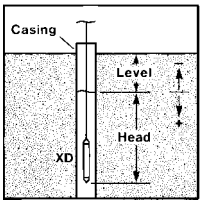
En: toc	Feet, Top of Casing mode
En: Sur	Feet, Surface mode
SI: toc	Meters, Top of Casing mode
SI: Sur	Meters, Surface mode

Mode & Reference

The Surface Mode is "positive up." In other words, *increasing* water levels will result in *increasing* readings. *Decreasing* water levels correspond to *decreasing* readings. This mode is often used to monitor surface waters such as streams and lakes, or in wells to use pressure head data directly.



The TOC (Top of Casing) Mode is "positive down." That is, *decreasing* water levels correspond to *increasing* readings, because the water level is getting further from the top of the well casing. *Increasing* water levels result in *decreasing* readings. This mode is useful when monitoring drawdown and readings referenced to the top of the well casing are required.



The Reference field provides a built-in linear offset for your data. The Reference is used to base the displayed readings on a known, user-specified starting point. (In Win-Situ, the Reference is optional, and can be changed or even removed later, when the data are displayed.) With a careful choice of Reference, you will never have to recalculate your data at the end of a test. However, it is important to understand the effect of different References. The table below shows some examples:

With this Mode...	And this Reference...	The data will be displayed as...
Surface	Present depth (e.g., a lake)	Depths
Surface	Altitude of water surface	Altitudes
Surface	Zero	Changes from the initial water level: When numbers get lower, the level is dropping, when numbers get higher, the level is rising
Surface	Present sensor depth*	Height of the column of water above the sensor
Top of Casing	Distance from TOC to starting water level	Distance from the top of the casing to the present water level
Top of Casing	Zero	Changes from the initial water level: When numbers get higher, the level is dropping, when numbers get lower, the level is rising
Head	*Not appalicable*	Height of the column of water above the sensor

* *In Win-Situ, you can read the sensor depth by pressing the Read button.*

See page 11 or the operator's manual for illustrations of each mode.

3. Install the PXD-261 in the water and let it stabilize (30-40 minutes). Enter the Reference for Level type.

4. Start the test. Details are in Section 7 of the operator's manual.

When measuring water levels with a HERMIT 1000 or 2000, it is crucial to enter a Reference for each level type input, with the transducer connected and set, before starting a test. This is because the data logger calculates the water level as you instructed it to do (up or down from your reference datum) at the moment you enter the Reference and press ENTER.

HERMIT 2000

HERMIT software is integral to the data logger. Each step is performed through its own menu:

1. Set up the test in the Test Setup menu. Refer to Section 4 of the *HERMIT 2000 Operator's Manual* for details.

   Type. Select "Level" type for water level, "Func" type for direct pressure readings, or "Flow" type to measure flow rates.

2. Set up the transducer(s) in the XD menu. See Section 5 of the operator's manual.

   Lin(earity), Scale, Offs(et). Enter the values on the PXD-261 data tag.

   Delay. Enter 50 mSec (milliseconds).

   For Level types—

   Ref. Skip the Reference your first time through the XD menu. Go back and enter it after the transducer is installed and stabilized to the water temperature.

   SG (Specific gravity). Use 1.0 for water.

   Units. Select Feet or Meters.

   Mode. Choose Surface or TOC. Refer to page 11 or the *HERMIT 2000 Operator's Manual*.

3. Install the PXD-261 in the water and let it stabilize (30-40 minutes). Enter the Reference for Level type.

4. Start the test. Details are in Section 7 of the operator's manual.

HERMIT 3000

You can set up tests and probes for the eight-channel HERMIT 3000 in two ways—

- use the HERMIT's keypad to access its own internal menus, or
- connect to a PC and use Win-Situ™, In-Situ's data acquisition software for Windows®, as described on page 13 for the LTM3100.

Keypad

1. First, define the probe(s) using the Probe Menu. Refer to Section 3 of the *HERMIT 3000 Operator's Manual* for details.

HERMIT 3000 users can choose gauge or absolute barometric pressure compensation regardless of whether the PXD-261 cable is vented or non-vented.

Probe Type. Select Pressure.

Linearity, Scale, Offset. Enter the coefficients on the PXD-261 data tag.

Warmup seconds. Should be zero.

Warmup millisecs. Enter 50.

Compensation. Select Gauge for PSIG (normal with vented cable) or Absolute for PSIA (non-vented cable). For complete information see Section 3 of the *HERMIT 3000 Operator's Manual.*

Specific Gravity. Use 1.0 for water.

Mode. To measure water levels choose Surface or Top of Casing. See page 11 for descriptions and illustrations of each mode. Choose Head to measure the pressure (or height) of the column of water above the pressure sensor.

Reference. User-specified starting point for Surface or Top of Casing mode. The default reference of 0 is equivalent to "zeroing" the probe.

Manual Read. Displays a head reading to show where the probe is located.

When to Reference. Now: Measurements will be relative to the water level at the time of probe definition. Start of Test: Measurements will be relative to the water level at the time the test starts.

2. After the probe or probes are defined, use the Test Menu to define a test. Refer to Section 4 of the operator's manual.

3. Start the test.

LTM3100

The four-channel Well Sentinel LTM3100 uses Win-Situ™, In-Situ's data acquisition software for Windows®.

1. Use the *Define* button in Win-Situ's Probe Facility to set up the "external" probe. See Section 4 of the *Win-Situ User's Guide.*

   Linearity, Scale, Offset. Enter the values on the PXD-261 data tag.

   Warmup. Enter 50 milliseconds.

   Type. Choose Pressure/Level.

   Specific Gravity. Use 1.0 for water.

   Mode. To measure water levels choose Surface or Top of Casing. See page 11 or the *Win-Situ User's Guide* for descriptions and illustrations of each. Choose Head to measure the pressure (or height) of the column of water above the sensor.

   Reference. User-specified starting point for Surface or Top of Casing mode. A reference of 0 is equivalent to "zeroing" the probe.

Take reference reading. Now: Measurements will be relative to the water level at the time of probe definition. Start of test: Measurements will be relative to the water level at the time the test starts.

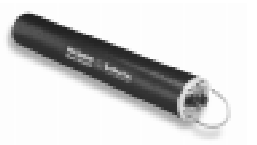
2. Use the Test Facility to set up the test. Details are in Section 5 of the *Win-Situ User's Guide*.

3. A Scheduled start test will start by itself; or you can press the Start button to start a Manual test.

With Win-Situ, many of the initial probe setup parameters can be changed later, after the test, when you display, graph, or print the test data.

LTM3000

The one-channel Well Sentinel LTM 3000 uses SituCom, a separate DOS-based program to communicate with a PC. All three steps are performed through one menu option:



1. Select "Program and Activate a Test" from the main menu to enter the test and transducer information, and to start the test. See Section 5 of the *LTM 3000 Operator's Manual* for details.

XD Type. Only the Level type is available.

Units. Toggle between Metric (meters) and English (feet).

SG (Specific gravity). Use 1.0 for water.

Linearity, Scale, Offset. Enter the coefficients from the PXD-261 data tag.

XD Mode. Toggle between Top of Casing and Surface. See page 11 above for details.

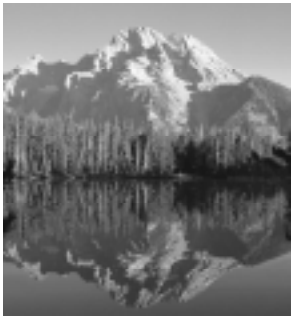
Reference. Enter the Reference after the transducer is installed in the water and stabilized (30-40 minutes).

The pressure reading is calculated using the quadratic formula

$$P = LX^2 + SX + O$$

where
- P = Pressure in PSI
- X = Normalized* transducer value (0-1)
- L = Linearity value from probe data tag
- S = Scale value from probe data tag
- O = Offset value from probe data tag

**Transducer reading (in milliAmps) minus 4 divided by 16*



4 Transducer Maintenance

The only removable parts of the PXD-261 are the nosecone and cable. Do not take the body apart, as this may severely damage the transducer and will void the warranty.

Never attempt to dig foreign matter from the cavity under the filter. If you have questions concerning cleaning, please contact Customer Service.

Vent Tube

The pressure sensor of the standard (PSIG) PXD-261 is specifically designed to be insensitive to barometric pressure changes. A vent tube incorporated into the transducer cable assures that atmospheric pressure is the reference pressure to the sensor diaphragm. *For proper operation the vent tube should not be bent, kinked, or blocked.* Such obstructions will cause barometric pressure fluctuations to appear in measurements, and may also introduce large, varying errors due to thermal expansion and contraction of air within the vent tube and probe body.

The cable of the PSIA version of the PXD-261 does not have a vent tube.

Filter

A small mesh filter protects the pressure sensor from dirt and other foreign objects. It is held in the end of the NPT threads by a small Teflon sleeve and can be seen when the nosecone is removed. The filter appears opaque when clean. If it becomes clogged with silt, try flushing it gently with a couple of squeezes from a water bottle. If this doesn't do the trick, contact Customer Service as described on page 18.

Nosecone

If the holes in the nosecone become plugged, take the nosecone off and clean the holes with a swab or brush. To replace the nosecone, first put the wavy spring washer over the threads, then screw on the nosecone hand-tight.

Quick-Connect Cable

The PXD-261's Quick-Connect cable connector permits easy cable removal when changing to a different cable, installing the PXD-261 in a pipe fitting, or storing the probe.

For optimum performance, keep the threads on both halves of the cable connector clean.

To attach the cable:

1. Remove the protective caps from the PXD-261 backshell and the Quick-Connect connector on the cable.
2. Slide back the sleeve of the Quick-Connect connector.
3. Align the tab in the PXD-261 backshell with the slot inside the cable connector.
4. Slide the two parts together and press tightly. They should slip together easily, without forcing.
5. Tighten the locking sleeve hand-tight.

If you have questions about cleaning the cable, please contact Customer Service.

To remove the cable:

1. Unscrew the sleeve.
2. Gently pull the transducer and cable connector apart.
3. Replace the protective caps.

The jacket of the standard transducer cable is Teflon®. This material was selected for its toughness, abrasion resistance, and ability to stand up to harsh chemical environments. It is important not to expose the cable to sharp edges common to well casings.

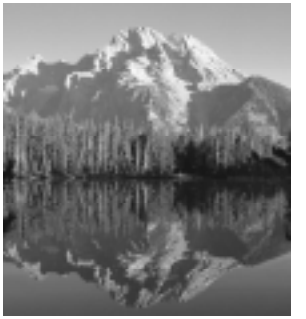
A cable jacket made of polyurethane is also available. It is more flexible at low temperatures than Teflon. The same precaution as to sharp edges should be observed.

All cables are internally sealed to protect the transducer in the event that the cable is cut. Don't attempt to repair, splice, or seal any cuts found without first consulting In-Situ Customer Service personnel, as described in the next section.

Calibration

Your PXD-261 is designed to maintain its accuracy specifications through its useful service life, although annual recalibration will keep it operating at peak efficiency. Accuracy can be adversely affected by improper care and handling, exceeding operating pressure and temperature limits, physical damage or abuse.

Contact In-Situ Customer Service for information on periodic check-ups and recalibration. See page 18.



5 Warranty & Service Information

Warranty Provisions

In-Situ Inc. warrants all products sold, excluding batteries sold with such products, against defects in materials and workmanship under normal operating conditions. Such products include data loggers, probes, and accessories, and are warranted for the following periods: TROLLs for five years; Multi-Parameter TROLLs for two years; HERMIT 3000 data loggers for two years; probes for one year; and all other products, including accessories and cable, for ninety days. The warranty period for all products begins on the day the product is first delivered to the customer.

During the warranty period, In-Situ will repair, or, at its option, replace at no charge, components that have proven to be defective during the period of warranty, provided that the warranted product is shipped, pre-paid, to In-Situ Inc. In-Situ's Customer Service staff must be contacted for shipping instructions prior to shipment.

These warranties do not apply if the warranted product has been damaged by common negligence, accident or misuse. These warranties do not apply to any product that has been repaired, serviced, or modified by an unauthorized person.

THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH EXTEND BEYOND THE FACE HEREOF. NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE ARE MADE BY IN-SITU INC.

In-Situ Inc.'s obligation and liability under this warranty is expressly limited to repairing and replacing, at In-Situ Inc.'s option, any product found to be defective or otherwise not in conformity with this warranty. The obligation to repair or replace shall terminate when the warranty expires.

In-Situ Inc.'s maximum liability in damages to customer, from whatever source, including any breach of contract, shall be limited to the difference between the delivery price of the product and the market price of such product at Customer's destination at the time of such breach. IN NO EVENT SHALL IN-SITU INC. BE LIABLE FOR PERSONAL INJURY, PROPERTY DAMAGE, LOSS OF PROFIT, DELAY OR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES WHETHER ARISING FROM CONTRACT, BREACH OF CONTRACT, TORT, IN-SITU INC.'S NEGLIGENCE, STRICT LIABILITY OR

THE BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

To Obtain Repair Service

If you suspect that the transducer is malfunctioning and repair is required, you can help assure efficient servicing by following these guidelines:

1. Call In-Situ Customer Service toll-free at 1-800-446-7488.
2. Be prepared to describe in detail the exact nature (symptoms) of the problem, including how the transducer was being used and the conditions noted at the time the malfunction occurred.
3. If service is required, obtain an RMA (Return Material Authorization) number from service personnel.
4. Write a description of the symptoms for service personnel, indicating whether the malfunction occurs intermittently or constantly. Save printouts or other materials that illustrate the problem.
5. Clean the probe and cable. Decontaminate thoroughly if the probe has been used in a toxic or hazardous environment.
6. Pack the PXD-261 in its original shipping box if possible. Include your write-up of the symptoms, a statement certifying that the probe has been decontaminated, and any other supporting documentation.
7. Send the package, shipping prepaid, to:

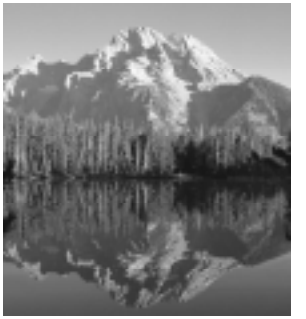
   In-Situ, Inc.
   Customer Service
   ATTN: RMA # _(assigned no. here)_
   210 South 3rd Street
   Laramie, WY 82070

Please . . . call us before you return equipment, and remember to put the RMA number on the label.

The warranty does not cover damage during transit. In-Situ recommends the customer insure all shipments. Warranty repairs will be shipped back prepaid.

Serial Number

Each PXD-261 carries an individual serial number engraved on the body. It is recommended that owners keep a separate record of this number. Should your transducer be lost or stolen, the serial number is often necessary for tracing and recovery, as well as any insurance claims. If necessary, In-Situ maintains complete records of original owner's names and serial numbers.



Appendix: Specifications

General

Wetted materials	316 Stainless steel, Viton®
Transduction principle	Integrated silicon strain gauge bridge
Dimensions	0.86" dia., 8.5" long (2.2 x 21.6 cm)
Weight	1 lb. (0.45 kg)
Operating temperature	5º to 30ºC (41º to 86ºF)
Storage temperature	-40º to 125ºC (-40º to 257ºF)

Accuracy

At 15ºC (59ºF)	±0.05%

Electrical

Signal current	4-20 mA (typical throughout pressure range)
Min. warmup time	50 milliseconds

Ranges

Standard	10 PSI (23 ft. / 7m water)
	15 PSI (35 ft. /11 m water)
	20 PSI (46 ft. /14 m water)
	30 PSI (69 ft. /21 m water)
	50 PSI (115 ft. /35 m water)
	100 PSI (231 ft. /70 m water)
	250 PSI (577 ft. /176 m water)

Overpressure tolerance	2X full range

Cable

Wetted materials	Teflon®, polyurethane
Size	0.26” (6.7 mm) OD nominal
Maximum length	4500 ft (1372 m)
Weight	Polyurethane: 3.3 lb./100 ft. (1.5 kg/30 m)
	Teflon: 4.4 lb./100 ft. (2.0 kg/30 m)
Reels	ABS Plastic: up to 350 ft. (107 m) capacity (standard)
	Small Steel: up to 550 ft. (168 m) capacity
	Large Steel: up to 1500 ft. (457 m) capacity

Due to continuing product development this information is subject to change without notice.