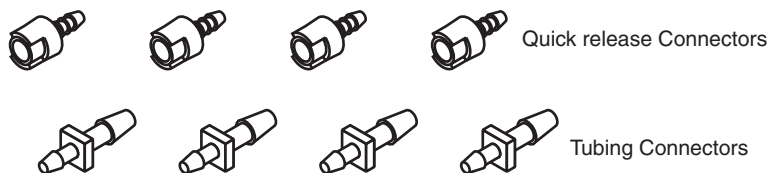
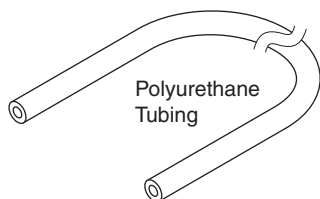
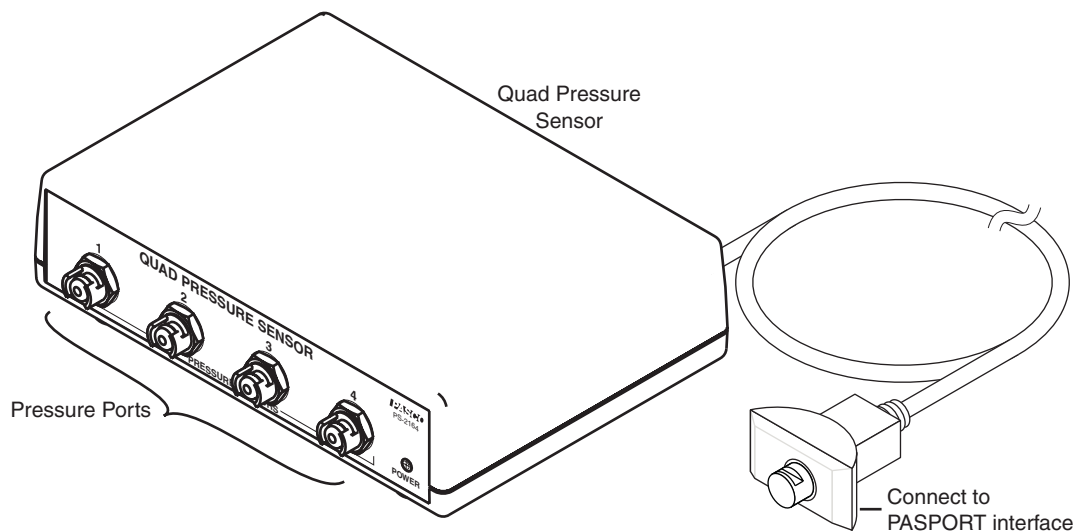


# Quad Pressure Sensor

PS-2164



## Included Equipment

Included Equipment	Part Number
Quad Pressure Sensor	PS-2164
Polyurethane Tubing (length 2.4 m)	640-023
Quick-release Connectors (qty. 4)	640-021
Tubing Connectors (qty. 4)	640-030

## Required Equipment

PASPORT Interface <sup>1</sup>	See PASCO catalog or <a href="http://www.pasco.com">www.pasco.com</a>
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<sup>1</sup>PASPORT interfaces include the AirLink (IW-4100 or PS-2005), Xplorer GLX (PS-2002), Xplorer (PS-2000), PowerLink (PS-2001), and USB Link (PS-2100)

## Introduction

The four-port Quad Pressure Sensor is a multi-sensor capable of reading up to four absolute pressures, or two differential pressures, or two gauge pressures. Dynamic variable over-sampling automatically reduces measurement noise at low sampling rates. Sample rates up to 1000 Hz make studies of both transient and steady-state pressure possible. The sensor measures pressure in units of kPa, N/m<sup>2</sup>, and pounds per square inch (psi).

## Setup

### Types of Pressure Measurements

To measure pressure in an apparatus, connect one or more of the four pressure ports using the included tubing and connectors. The way that you connect the Quad Pressure Sensor

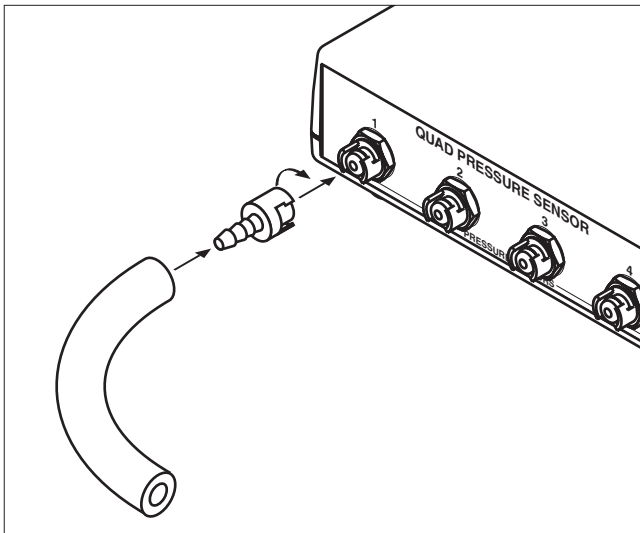
depends on whether you will measure absolute pressure, differential pressure, or gauge pressure:

**Absolute Pressure** The multi-sensor can measure up to four absolute pressures simultaneously. One connection is required for each measurement, and any of the pressure ports may be used.

**Differential Pressure** The multi-sensor measures differential pressure by determining the pressure difference between two ports. It can measure one or two differential pressures simultaneously, with two connections required for each measurement. Differential pressure can be measured between ports 1 and 2 or between ports 3 and 4 (or both).

**Gauge Pressure** Gauge pressure is a special case of differential pressure in which the second port of the pair is left unconnected. The multi-sensor measures the pressure difference between the first port (connected to the apparatus) and the second port (left open to the atmosphere). It can measure up to two gauge pressures simultaneously, with one connection required for each measurement. Gauge pressure can be measured by port 1 (with port 2 left open) and by port 3 (with port 4 left open).

## Sensor Setup



1. Cut a piece (or pieces) of tubing to the desired length.
2. Insert a quick-release connector into each piece of tubing.
3. Connect each piece of tubing to the multi-sensor by inserting the quick-release connector into one of the pressure ports and twisting clockwise.
4. Connect the free ends of the tubing to the apparatus using connectors supplied with the apparatus or the tubing connectors include with the Quad Pressure Sensor.

You can use the included tubing connectors to connect to a 5 mm ( $\frac{3}{16}$  inch) hole in a rubber stopper.


5. Connect the multi-sensor's cable to your PASPORT interface.

## DataStudio Setup

If you are using a computer, connect the PASPORT interface to the computer and start DataStudio. (Refer to the documentation that came with your PASPORT interface for instructions on connecting it to your computer.) In DataStudio, click the Start button to begin data collection; click the Stop button to stop data collection.

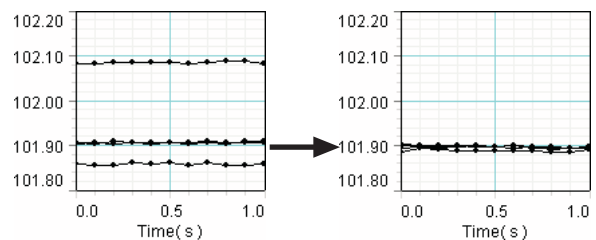
By default, DataStudio displays the absolute pressures measured by all four ports in a Graph display. To make the differential measurements available for display, click the **Setup** button to open the **Experiment Setup** window; in that window, select **1-2 Differential Pressure** or **3-4 Differential Pressure**. There you can also change the sampling rate (up to 1000 Hz) and select different units of measure. For more instructions on using DataStudio, press F1 to open DataStudio's on-line help.

## Xplorer GLX Setup

If you are using an Xplorer GLX in standalone mode, press  to start data collection. By default, the GLX displays the absolute pressure from port 1 (**Absolute Pressure 1**) in units of kPa, but you can select any of the other absolute or differential measurements for display. For more instructions on using the Xplorer GLX, refer to the GLX Users' Guide.

## Multiple-measurement Alignment

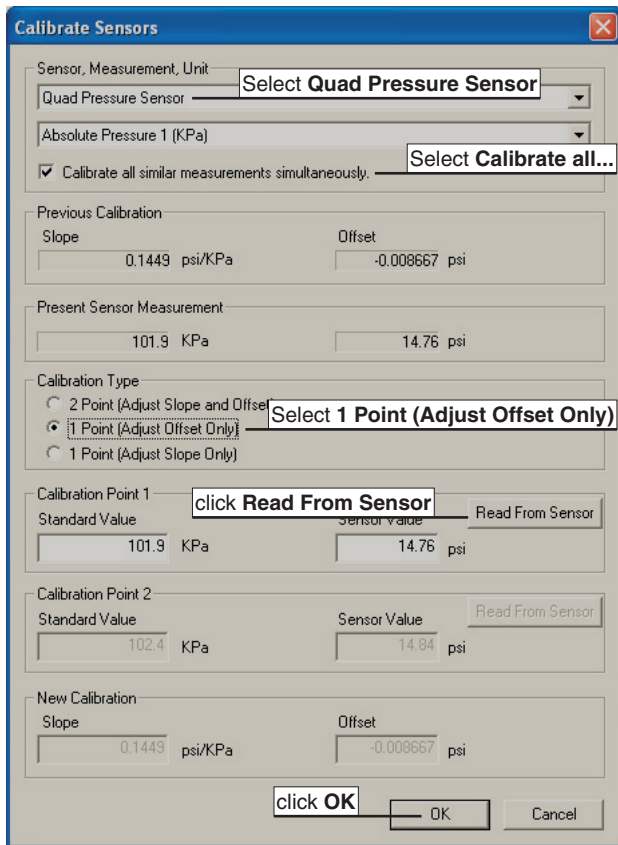
When you are using multiple pressure ports, you may find that their readings differ slightly when they are measuring the same thing. In the example illustrated below, measurements from four ports open to the atmosphere vary by about 0.2 kPa. The multiple-measurement alignment procedure adjusts the calibrations of the measurements so they agree more closely.



The procedure described here for DataStudio can also be performed on the Xplorer GLX. See the Xplorer GLX Users' Guide for detailed instructions.

1. Click the **Setup** button to open the Experiment Setup window. Click **Calibrate Sensors** to open the calibration dialog box.

- From the Sensor field, select the **Quad Pressure Sensor**. (See screenshot below.)



- Select the **Calibrate all similar measurements simultaneously** option.
- From the Calibration Type menu, select **1 Point (Adjust Offset Only)**.
- Apply the same pressure to all four ports (for instance by opening them to the atmosphere).
- Click the **Read From Sensor** button for Point 1.
- Click **OK** to accept the new calibration.

### One-point and Two-point Calibrations

Though it is usually not necessary, a one-point or two-point calibration can be performed on any of the absolute or relative measurements to make them more accurate. To do so, you must have a very accurate independent means of measuring pressure, such as a barometer. For step-by-step instructions refer to the documentation for DataStudio version 1.9.5, the Xplorer, or the Xplorer GLX.

### Over-sampling

The Quad Pressure Sensor uses dynamic variable over-sampling to reduce noise, produce smoother data, and improve the

measurement resolution. This effect is especially noticeable when very small pressure changes or differences are measured. The degree of dynamic variable over-sampling that takes place within the Quad Pressure Sensor depends on the sample rate. To maximize the over-sampling, set the sample rate as low as possible for a given application. Maximum over-sampling occurs at sampling rates of 1 Hz or slower.

## Specifications

<b>Range</b>	Absolute pressure: 0 to 200 kPa Differential pressure: -100 kPa to +100 kPa
<b>Resolution</b>	0.01 kPa at 10 Hz
<b>Repeatability</b>	1 kPa
<b>Units of Measure</b>	kPa, N/m <sup>2</sup> , psi
<b>Max. Sample Rate</b>	1000 Hz
<b>Included tubing</b>	Material: polyurethane Inside diameter: 3.2 mm ( 1/8 inch) Length: 2.4 m (8 feet)

## Technical Support

For assistance with any PASCO product, contact PASCO at:

Address: PASCO scientific  
10101 Foothills Blvd.  
Roseville, CA 95747-7100

Phone: 916-786-3800 (worldwide)  
800-772-8700 (U.S.)

Fax: (916) 786-3292

Web: [www.pasco.com](http://www.pasco.com)

Email: [support@pasco.com](mailto:support@pasco.com)

### Limited Warranty

For a description of the product warranty, see the PASCO catalog.

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