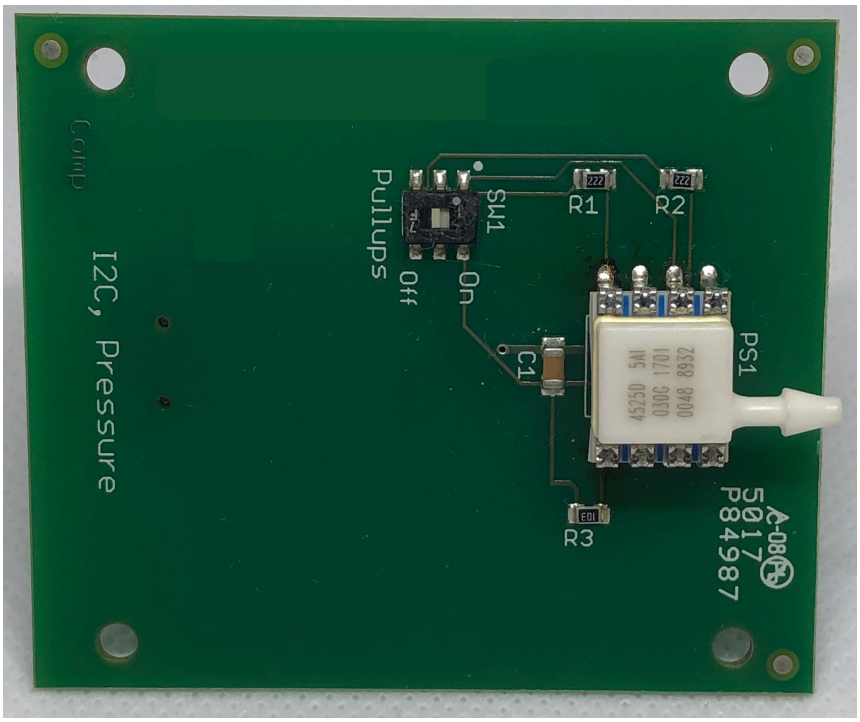
# Pressure1 Module

P/N: 81P-0110

Rev –
8 AUG 2019

Graves Electronics, LLC



Symbols used in this manual:

**CAUTION:** This indicates a situation where if certain requirements are not followed, damage or unsafe conditions may occur.

**WARNING: This indicates a situation where if certain requirements are not followed, damage or unsafe conditions WILL occur.**


If you are having problems getting the board to work properly, BEFORE calling the factory, please visit the FAQ page at http://www.graveselectronicsapps.com/faqs.html, and/or throughly read section 9.0 of this manual. If you are still having problems, please download the test code from http://www.graveselectronicsapps.com/downloads-.html and run the code. If you are still having issues after reading the help section and trying the test code, please contact the factory. We kindly ask that you please e-mail us at graveselectronics@gmail.com. Please clearly state your problem along with a call back phone number. One of our technicaians will call you after we have reviewed your issue and have come up with some solutions.

This manual, as well as test code, can be downloaded at http://www.graveselectronicsapps.com/downloads-.html.

Contact Information:

Customer Service, Sales, Technical Assistance

graveselectronics@gmail.com or call us at 860-295-3074

Warranty & Legal:

# Table of Contents

## 1.0 Overview

The Pressure1 module is an easy to use pressure sensor module that increases the functionality of the 81 controller board. The module utilizes Honeywell's SSC line of digital pressure sensors. The module plugs into either of the module ports on the 81 controller board. The Pressure1 module uses the I²C bus to communicate with the microcontroller on the 81 board. It has DIP switch to engage or disengage pull-up resistors for the I²C bus.

## 2.0 The Pressure Sensor

The pressure sensor is a 12-bit, piezoresistive silicon sensor, calibrated over the temperature range of -20°C to +85°C, with a Full Scale Span of ±0.25%. Total Error Band is 2%. The sensor measures 0-100 psi, gauge pressure. The sensor has a barbed port that is 0.194", which is suitable for most commercially available ¼" tubing.

### 2.1 Transfer Function

The transfer function defines the output of the sensor at a given pressure input. It is found by the following equation:

$$Output\ (\%\ of\ 2^{14}\ counts) = \frac{80\%}{P_{max} - P_{min}} * \left(Pressure_{applied} - P_{min}\right) + 10\%$$

*Table 2.1. Sensor Output at Significant Percentages*

| % Output | Digital Counts (decimal) | Digital Counts (hex) |
|---|---|---|
| 0 | 0 | 0x0000 |
| 10 | 1638 | 0x0666 |
| 50 | 8192 | 0x2000 |
| 90 | 14746 | 0x399A |
| 100 | 16383 | 0x3FFF |

## 3.0 I²C Address

The module uses I²C address 0x58. For more information on the I²C bus, please consult NXP document UM10204.

## 3.1 I²C Pull-Up Resistors

In order for the I²C bus to work correctly, it must have pull-up resistors on the SDA and SCL lines. The module makes that easy through the use of switch SW1. When the switch is in the "On" position (as labeled on the module), two 2.2K Ohm resistors are switched in to the I²C bus; one on the SDA line and one on the SCL line. When the switch is in the "Off" position, the pull-up resistors are switched out of the circuit. If only one module is being used, it must have the pull-up resistors switched on. If two modules are being used, only one module needs to have the I²C pull-up resistors switched on. It does not matter which module has the resistors switched on.

**CAUTION:** Failure to switch on the I²C pull-up resistors could result in erratic operation of the I²C bus, and consequently, erratic operation of the module!

**CAUTION:** If using two modules, switching on the I²C pull-up resistors on BOTH modules could result in erratic operation of the I²C bus, and consequently, erratic operation of the module! When using two modules, switch on only ONE I²C pull-up!

## 4.0 Installing the Module

Installation of the Pressure1 module is extremely easy. First, decide which module port on the 81 board the module will plug into. The module communicates over I²C to the microcontroller, so for communications purposes, it does not matter which module port is utilized. Pick the port that is most convenient for mechanical or aesthetic reasons. Remove the black protective header cap off of the header on the main board. Carefully align J1 of the module with the header on the module port. Push down until the module is fully seated onto the header. The module is fully seated when the module is touching the four standoffs on the module port. Use the four 4-40 x ¼ Philips pan head screws supplied with the module to secure the module. The tightening torque is a minimum of 2.6 in-lbs. and a maximum of 16.6 in-lbs. **DO NOT EXCEED 16.6 IN-LBS!**

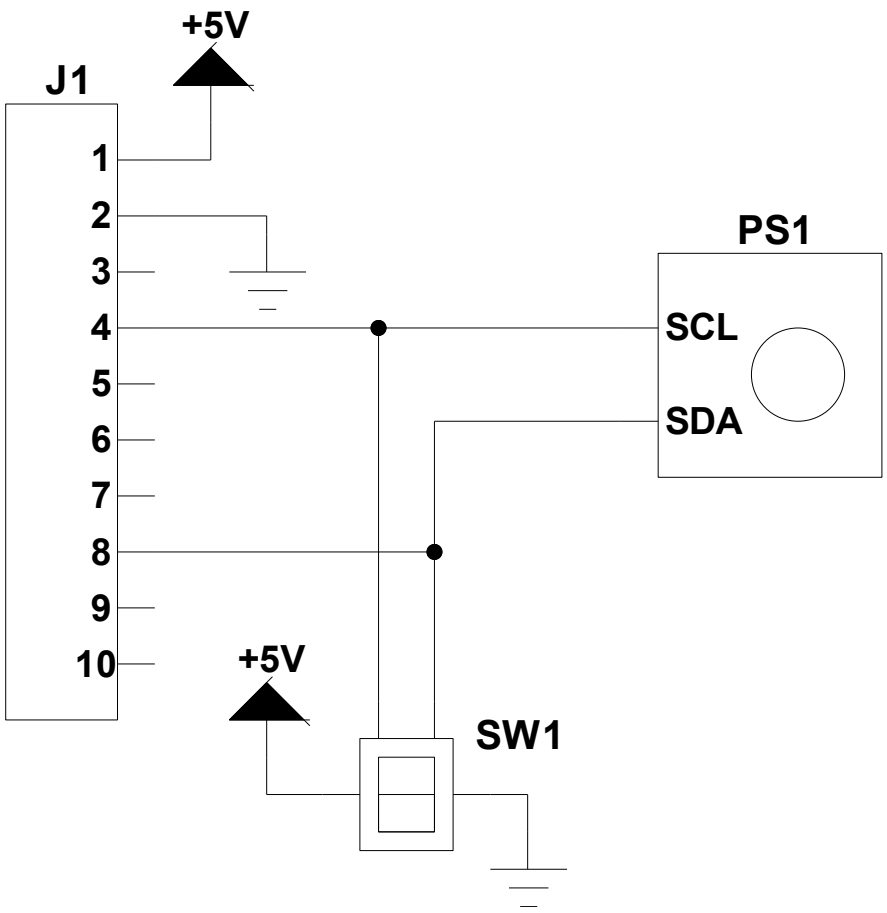
## 5.0 Specifications

| Symbol | Parameter | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $TEMP_{OP}$ [1] | Operating Temperature | - | -40 | - | +85 | °C |
| $TEMP_{COMP}$ [2] | Compensated Temperature Range | - | -20 | - | +85 | °C |
| $t_{START}$ | Start-up Time | Power up to data ready | - | - | 3 | ms |
| $t_{RESPONSE}$ | Response Time | Under pressure | - | 0.46 | - | ms |
| FSS [3] | Accuracy | Under pressure | - | - | ±0.25 | % |
| RESOLUTION | Output Resolution | - | 12 | - | - | Bits |
| $P_{MIN}$ | Pressure- Minimum | - | 0 | - | - | psi |
| $P_{MAX}$ | Pressure-Maximum | - | - | - | 100 | psi |
| $P_{OVER}$ | Over Pressure | Under pressure | - | - | 250 | psi |
| $P_{BURST}$ [4] | Burst Pressure | Under pressure | - | - | 250 | psi |

| | | | | | | |
|---|---|---|---|---|---|---|
| $FSS_{(TOTAL\ ERROR)}$ [5] | Total Error Band | Under pressure | - | - | ±2 | % |
| | Long Term Stability (% of FSS) | 1000 hrs @ 25°C | - | - | ±0.25 | % |

[1] Operating Temperature Range is the range over which the sensor will produce an output proportional to pressure.
[2] Compensated Temperature Range is the range over which the sensor will produce an output proportional to pressure within the specified performance limits.
[3] FSS (Full Scale Span) is the algebraic difference between the output signal when measured at Pressure (max) and Pressure (min).
[4] Once sensor is subject to burst pressure, the sensor should be considered damaged and must be replaced.
[5] Total Error Band is the maximum deviation from the ideal transfer function over the entire compensated range. It includes all errors due to offset, full scale span, pressure non-linearity, pressure hysteresis, repeatability, thermal effect on offset, thermal effect on span, and thermal hysteresis.

## 6.0 Block Diagram



## 7.0 Board Outline