Evaluation Kit for SP Series Sensor (I2C)

Differential Pressure Sensor for Spirometry Applications

1. Overview

This evaluation kit is designed to exercise the programmable features of the SP-Series Pressure Sensors. It also allows exercising the data acquisition mode by the host (asynchronous/synchronous) and provides a mechanism to record a sensor output trace file.

The software supports commands to the three SP-Series products, SP110, SP210 and SP160.

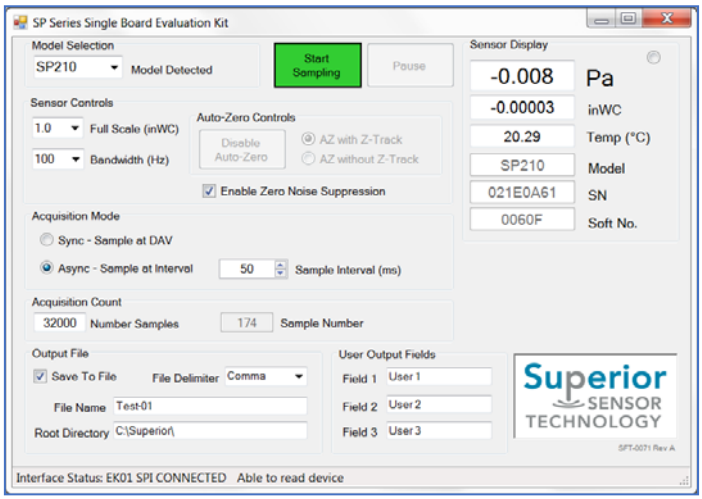
Additional features of the evaluation software include user defined data fields. These fields allow the user to enter in test conditions while data acquisition is paused. These entered values are recorded in the trace file so the user can easily coordinate the test data with the conditions of the test.

2. Contents

The following items are included in evaluation kit.

- Evaluation Hardware

- Evaluation Software



- Screw Driver Set

3. Setup

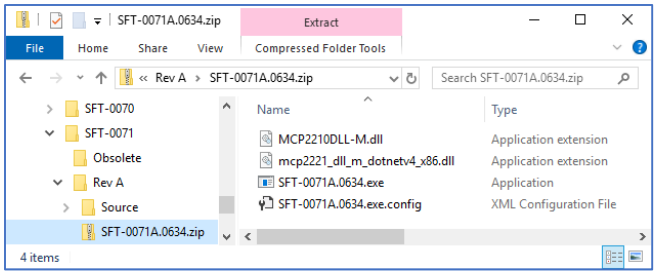
Outline

- Install Software
- Install Pneumatic Set
- Connect USB Cable
- Run Program

Software Installation

The contents include the evaluation executable and with associated DLLs (MCP2210 & mcp2221_dll_m_dotnetv4_x86.dll). Source code is also provided for the sake of making changes if desired.

A zip file ***SFT-0071A.0634.zip*** includes the executable and required files for running the application.



No specific installation is required, just transfer the contents of the zip file to a directory of your choice and double click on the executable. *NOTE: ALL FILES (OTHER THAN THE SOURCE DIRECTORY) ARE REQUIRED FOR THE APPLICATION TO RUN.*

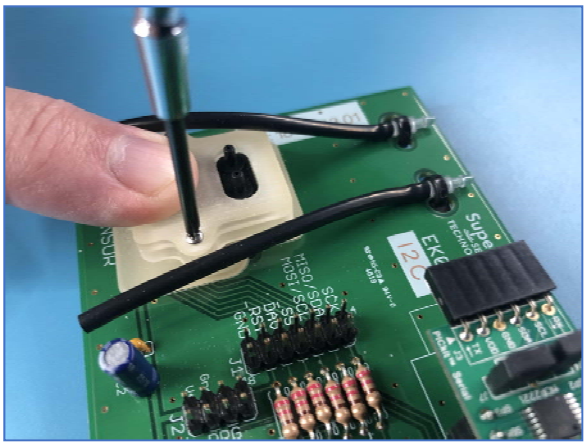
Source code is also provide for those having interest in customizing the application.

Sensor Installation/Removal

A pressure sensor comes pre-installed in the evaluation board. There is no requirement to install a sensor unless an alternate sensor is to be evaluated.

Install a sensor by removing the sensor fixture cover, placing the sensor into the fixture. While holding down the sensor and cover in place, screw the sensor cover down with both screws. It is not necesary to tighten the screws more than to a point where they seat since the sensor holder has integrated spring contacts.

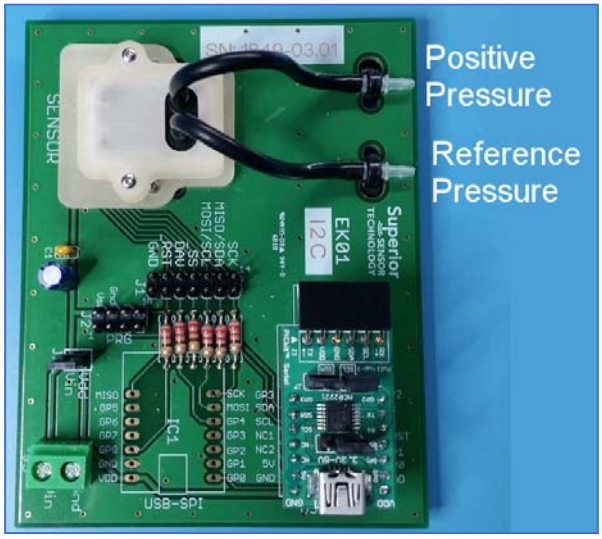
The sensor can be removed or replaced by following the above procedure in reverse.



Installing the Pneumatic Set

The black silicon tubing attaches to the pressure sensor ports (as shown). The tube guides next to the USB adapter can be used but are not necessary for functionality.

The opposite ends of the pressure sensor tubing connects to the port selection valve (Port A and Port B). The pressure sensor housing has the port identifiers molded into the housing for reference. Positive pressure is applied to Port B.



Connecting the USB Cable

Connect the USB cable as normal. The hardware should be recognized and automatically load the HID software.

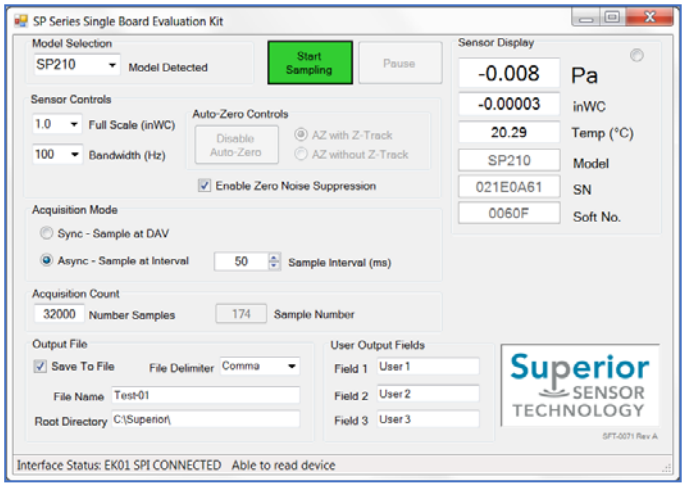
NOTE: IT HAS BEEN FOUND THAT THE INTERFACE ADAPTER HAS A CAPACITANCE LOAD ON THE USB POWER SUPPLY THAT IS IN EXCESS OF THE SPECIFIED 10UF LIMIT. THIS CAPACITANCE IN CONJUNCTION WITH THE SENSOR ON-BOARD CAPACITANCE CAN CAUSE THE USB DEVICE TO BE UNRECOGNIZED WHEN PLUGGED IN. THIS BEHAVIOR WILL DEPEND ON THE SPECIFIC USB CHIPSET USED IN THE TARGET COMPUTER. IF THIS IS THE CASE WITH YOUR INSTALLATION, IT IS SUGGESTED TO REMOVE JUMPER JP1 (POWER CONNECTION TO THE SENSOR), PLUG IN THE USB CABLE, THEN RE-INSTALL JP1. THIS WILL BRING THE CAPACITANCE LOAD UP IN SEQUENCE.

Running the Acquisition Application

Double click the application SFT-0071A.0634.exe to start the application. Again note, the provided DLL's must be in the same directory as the application.

4. Software Usage

The application is divided into control groups, a command button set and a pressure display region. In general, the application will only enable the controls which are available depending on the current state of the application. This is intended to help limit usage ambiguity by limiting the controls to only those available.



Model Selection Group

The Mode Selection group selects the specific sensor model being evaluated. The sensor model will appear in the Model Selection control upon being detected. If the sensor is not automatically detected, please select the appropriate sensor model so that the appropriate range and bandwidth information is communicated to the sensor.

Sensor Controls Group

The Sensor Controls group manages the byte sent to the sensor for setting the sensor Mode Register (see Control Registers section in DS-0002). This control manages the sensor full scale range, bandwidth, Noise Suppression and Auto-Zero Controls. Within Auto-Zero controls is a button for zeroing the part, and a "radio button" selection between Auto-Zero with "Z-Track" and without it. The Enable Auto-Zero button will work only while the part is being sampled. When the Enable Auto-Zero is pressed, the part is zeroed, and the type of Auto-Zero that is used is determined by the radio button selection: with Z-Track or without. The user will not be allowed to change the radio button settings until Auto-Zero has been disabled.

Acquisition Mode Group

The Acquisition Mode group manages the byte sent to the sensor for setting the Rate Control Register as well as the specific data acquisition mode used by the Evaluation Software. This group also has the control for setting the total number of samples to be acquired.

The Sync/Async radio buttons control the data acquisition mode of the evaluation application. When the Sync button is set, the application will wait until the DAV line is set high (indicating new data available) before acquiring the next sensor output reading. If the Async button is set, the application will time the data acquisition according to the Sample Interval up/down box. When the Sync button is set, the Sample Interval will be calculated according to the DAV setting, and displayed. It will not be enabled. When switching from Async to Sync, the DAV value will be calculated from the Sample Interval as a starting condition.

The DAV Divisor up/down box sets the value sent to the sensor for setting the Rate Control Register. This control is available in the Sync acquisition mode. The described above, the calculated sample interval will be shown, but disabled.

The Sample Interval up/down box controls the sample interval and is available in the Async acquisition mode.

The Number Samples control box sets the number of samples to be acquired before automatically stopping the acquisition.

Acquisition Count

The Acquisition count group contains two boxes. The box labeled "Number samples" contains the total number of samples that will be done before stopping sampling. The box labeled "Sample Number" tells the current number of samples already performed.

Output File Group

The Output File group allows the user to enable the saving of a trace file during acquisition and specifying both the root directory and file name of the trace file.

A file delimiter combo box is available to select either comma or semicolon delimited data trace file. The default is a comma delimited file.

The acquisition application automatically appends a ".csv" extension on the file name so no extension is necessary.

File User Fields Group

The File User Fields group allows the user to add user comments (or test conditions) to the trace file. The usage case for the fields would be to pause the data acquisition while the test conditions are being changed, enter in the desired information into the user fields (threee fields available) such as pressure, temperature and other comment, then resume the data acquisition. Since the user data fields are recorded in the trace file, it is easier to correlate the test conditions to the sensor output for analysis.

Control Buttons

- Start/Stop Sampling – Starts or Stops the sampling of data from the sensor using the current application settings.
- Pause - Pauses the data acquisition and allows the operator to change application settings. The pause button reverts to a Resume button for the resumption of data acquisition. Since the application controls can be changed when paused, a single trace file can have multiple full scale ranges, bandwidths or acquisition modes. *NOTE: SINCE A CHANGE IN THE SENSOR CONTROL REGISTERS TAKES ONE ACQUISITION CYCLE TO TAKE EFFECT, THE FIRST DATA ACQUISITION VALUE IS IGNORED AFTER RESUMING SAMPLING AND THE TRACE WILL SHOW THE SECOND SAMPLE ONWARD.*

Sensor Display

The Sensor Display box contains the data read from the sensor: Pressure in Pascals and inches of water, temperature in °C, the model type of the part, its serial number, and the firmware its running. A small circular icon in the upper right corner, indicates when the part is being read.

5. Other Considerations

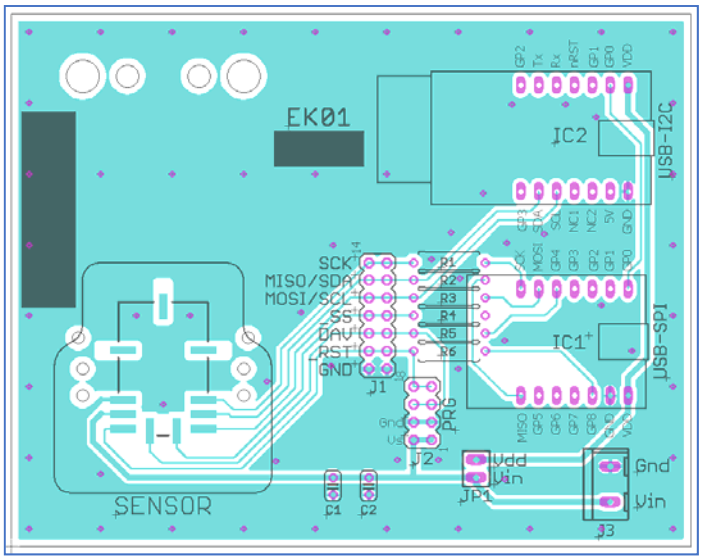
Alternate Power Supply

If it is desirable to use an external supply, the supply voltage can be applied to pins 1 and 2 of J3. In this case, remove jumper JP1 to isolate the external supply from the supply on the evaluation hardware.

Measuring Device Current

Sensor current can be measured by removing JP1 and inserting a current meter across the pins of JP1.

IR Sensitivity



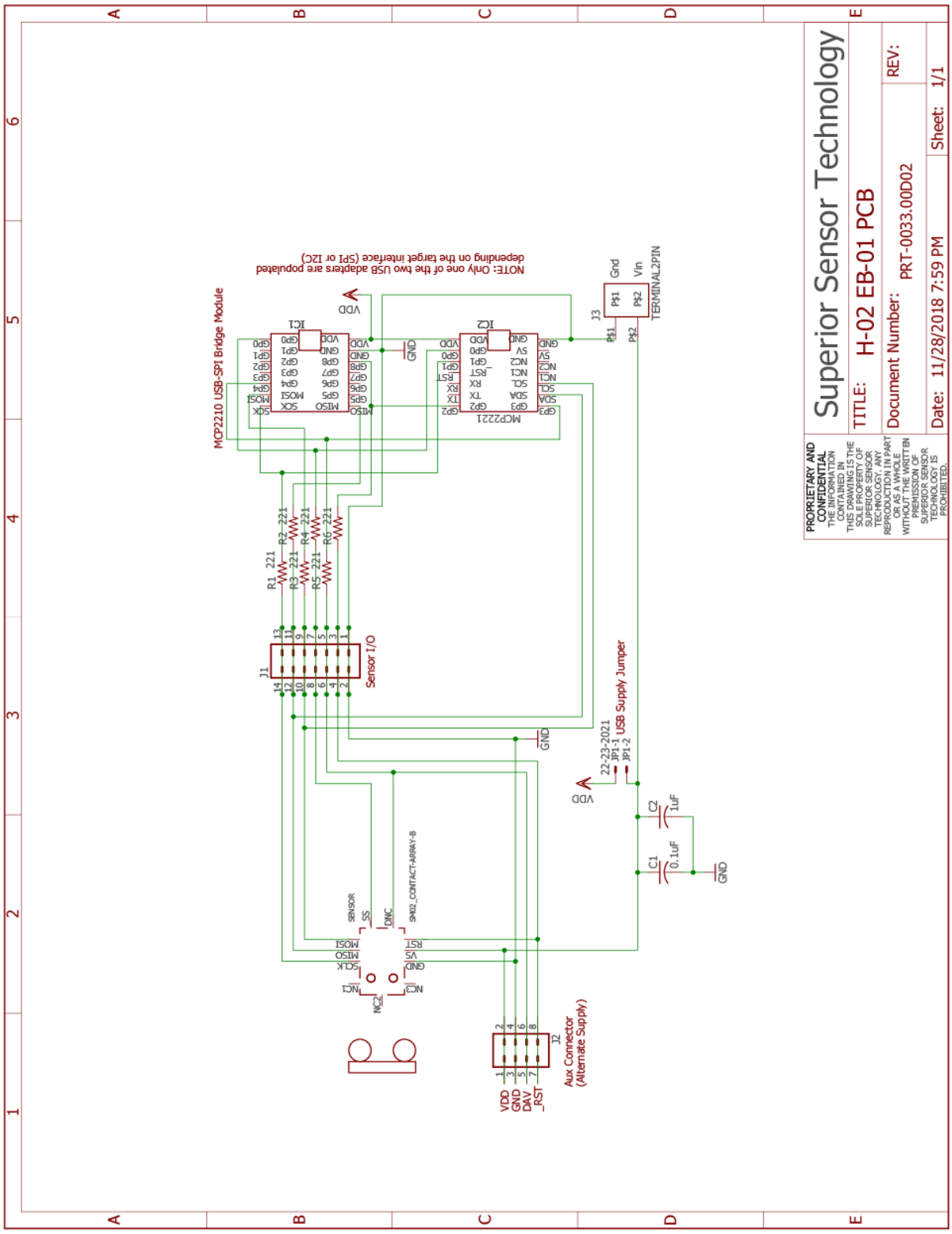
The black silicon tubing was selected to block the visible light from entering the ports. The light sensitivity of silicon piezoresistive pressure sensors is quite commonly known. Due to the high dynamic range of the sensor, light entering the ports while running the sensor on the bench can be observed. The black tubing is designed to mitigate this effect for bench testing.

6. Sensor Specifics

Refer to DS-0002 (included on the memory stick) for a system overview, interface details as well as technical specifications of the installed sensor.

Attachments

Att-01 Interface Adapter Schematic



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