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User Instructions for the
Sensor Evaluation Kit, SEK001, for Use with TruStability™ RSC Series and Digital Output Versions of the HSC Series and SSC Series Board Mount Pressure Sensors

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Issue B

1.0 OVERVIEW

The Sensor Evaluation Kit, SEK001, along with the readily-available components shown in Table 1, and the free evaluation software available on Honeywell's website, comprise a simple set of components used to evaluate Honeywell TruStability RSC Series and the digital output versions (SPI or I^2C) of the TruStability HSC Series and SSC Series Board Mount Pressure Sensors.

The SEK001 allows the user to obtain sensor readings without needing to develop any code. The sensor to be evaluated is mounted into the receiving sockets on the SEK001. The SEK001 is then plugged in as a shield board to the Arduino™ Uno Rev3 Microcontroller Board. Honeywell evaluation

software, downloaded to the user's PC, controls the Arduino Uno Rev3 to take sensor readings that are then displayed on the PC's screen.
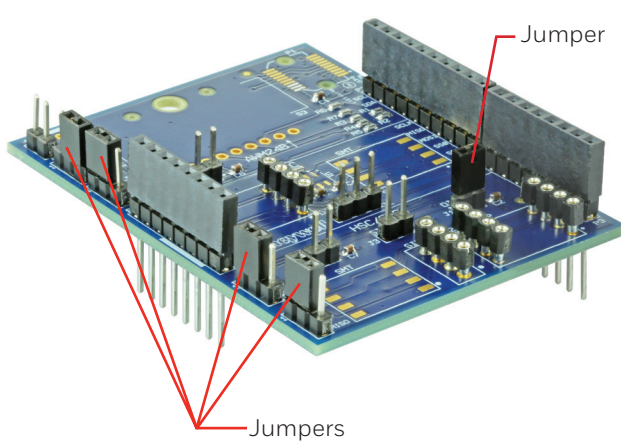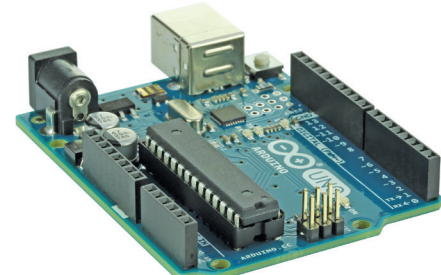
The readings may also be recorded to a .csv file for further analysis, and, in the case of the RSC Series, used in the equations found in the RSC Series datasheet.

In addition to being mounted directly on the SEK001, the sensor may also be remotely connected to the SEK001 via wire leads, allowing the sensor to be tested in adverse environments, or in a prototype product for proof of concept testing.

2.0 SEK001 AND USER–PROVIDED COMPONENTS

2.1 Assemble the components shown in Table 1.

Table 1. Sensor Evaluation Kit Contents and User–Provided Items[1]

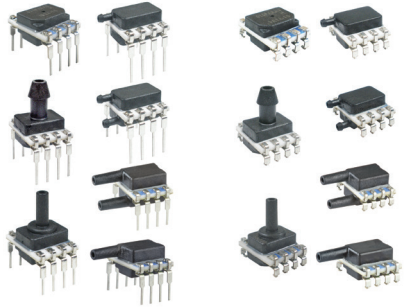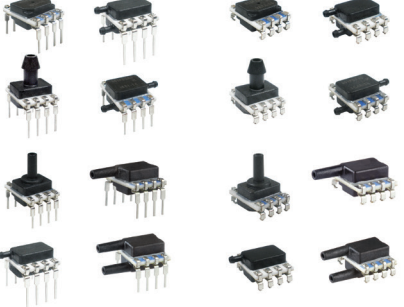| Honeywell Sensor Evalution Kit, SEK001	User–Provided Components
Includes: • Sensor Evaluation Board • Five jumpers for **HSCDRRN001ND2A5** preconfigured on board Jumper Jumpers	Arduino Uno Rev3 Microcontroller Board (A000066)
	USB Interface Cable (Type A Male to Type B Male)
	PC with Internet access *(Note: If using a docking station computer, ensure that the computer is not in its docking station when installing and running the software.)*

[1]The Honeywell RSC, HSC or SSC Series pressure sensor is not included with the SEK001. The user must purchase the sensor separately.

Sensing and Internet of Things

2.2 Choose the sensor to be evaluated. Click on the links to the specific series in Table 2 to access the product datasheets.

**Table 2. SEK001 Compatible Pressure Sensors**

RSC Series—High Resolution, High Accuracy, Compensated/Amplified	HSC Series—High Accuracy, Compensated/Amplified	SSC Series—Standard Accuracy, Compensated/Amplified
24-bit Digital SPI-compatible output	Digital output versions only	Digital ouptut versions only
DIP, SMT packages	**SPI, I²C:** DIP, SMT packages **I²C:** SIP packages	**SPI, I²C:** DIP, SMT packages **I²C:** SIP packages

2.3 Connect the sensor to be evaluated to the SEK001

The SEK001 is preconfigured with five jumpers in order to evaluate an HSC Series or SSC Series, I²C output, 5 Vdc sensor. For the purposes of these User Instructions, the part number being evaluated is **HSCDRRN001ND2A5.** *(Note: For the other compatible sensors, see Appendix C for the jumper selections and configure the jumpers accordingly.)*

Mount the **HSCDRRN001ND2A5** in the appropriate set of receiving sockets (S2) on the SEK001. The white dot on the socket set indicates pin 1 of the sensor (see Figure 1). *(Note: Only one sensor may be evaluated at a time.)*

**Figure 1. HSCDRRN001ND2A5 Mounted on the SEK001**
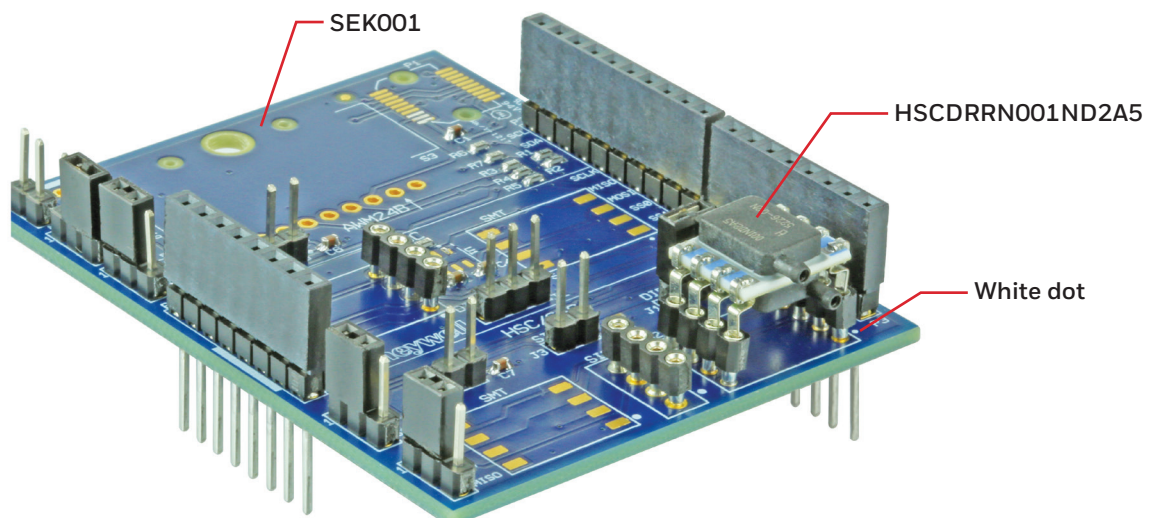
2.4 Connect the SEK001 to the Arduino Uno Rev3 to form the SEK001/Arduino Assembly

Place the SEK001 over the Arduino Uno Rev3 and align all pins and sockets. Gently, but firmly, press both boards together until the SEK001 is seated on top of the Arduino Uno Board (see Figure 2).

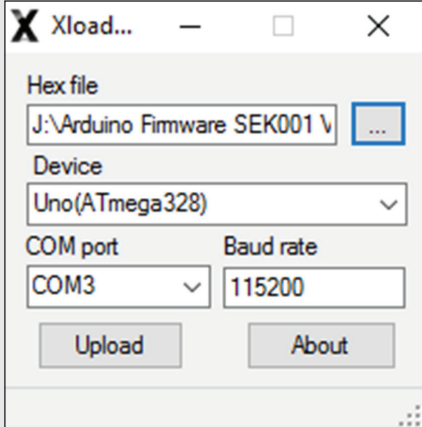**Figure 2. SEK001/Arduino Assembly**

HSCDRNN001ND2A5

SEK001

Arduino Uno Rev3
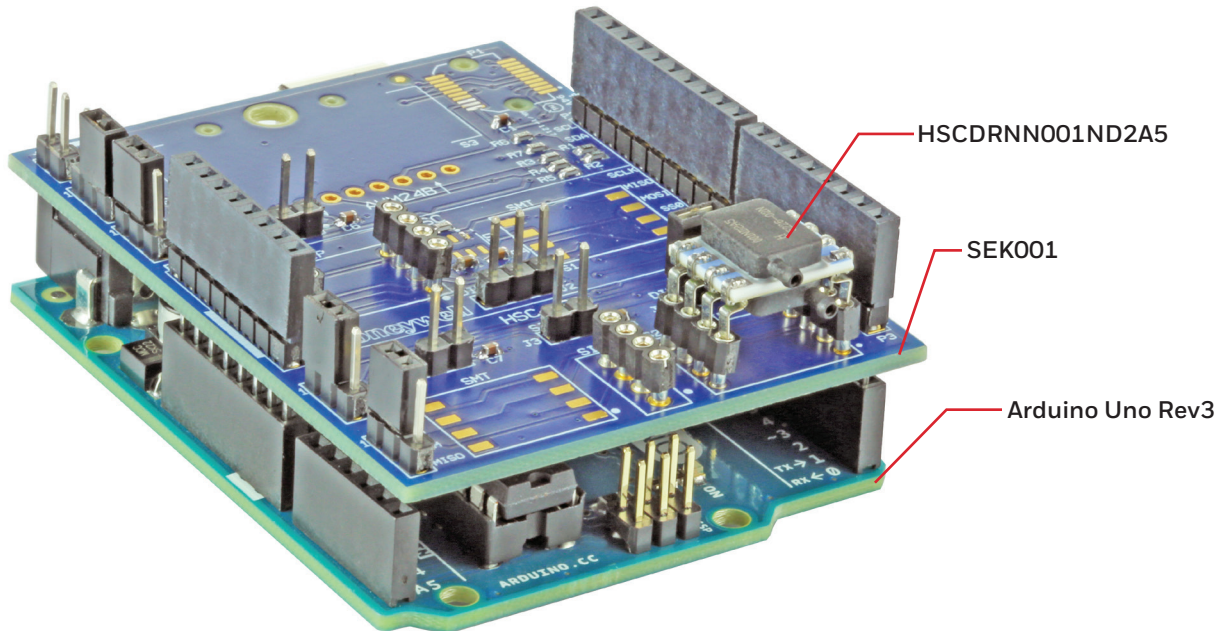
3.0 DOWNLOAD AND INSTALL SOFTWARE AND FIRMWARE

3.1 Follow the steps given in Table 3.
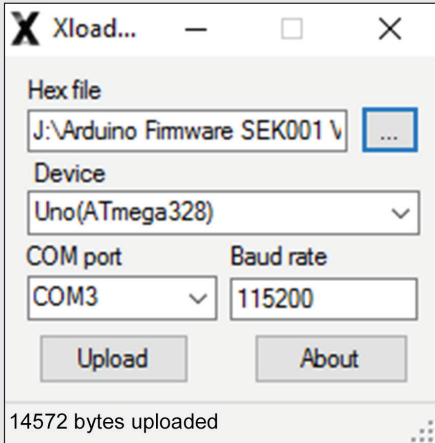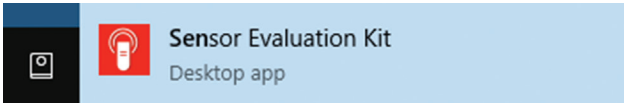
Table 3. Software and Firmware Download and Installation Process

Step	Procedure	Notes and Troubleshooting
1	Go to: http://sensing.honeywell.com/sensors/evaluation-kit and download the following three files to a location of your choice on your PC: a. **Sensor Evaluation Kit SEK001 Version 1.0.exe** b. **Arduino Firmware SEK001 Version 1.0.zip** c. **XLoader.zip**	a. *Windows application that also contains Virtual COM Port (VCP) drivers.* b. *Contains **Arduino Firmware SEK001 Version 1.0.hex** which is the Arduino firmware needed to drive the SEK001.* c. *Contains **XLoader.exe** which is used to flash **Arduino Firmware SEK001 Version 1.0.hex** to the SEK001/Arduino Assembly. (Also available at http://xloader.russemotto.com, which is made available from a third party and may be freely distributed.)*
2	Using the USB Cable, connect the SEK001/Arduino Assembly to your PC's USB port.	*See Appendix C for selecting an internal or external power supply. If using an external source, it must be connected <u>before</u> this step to avoid damaging the SEK001/Arduino Assembly.* *If using a docking station computer, ensure that the computer is not in its docking station when installing and running the software.*
3	Click on **Sensor Evaluation Kit SEK001 Version 1.0.exe** downloaded in Step 1.a. and run the software. Follow the InstallShield Wizard to complete the installation. If prompted for device drivers, install the VCP drivers also located in **Sensor Evaluation Kit Version 1.0.exe**. This step is required only when the SEK001 is connected to a USB port for the first time. • Go to your computer's Device Manager>Ports. • Ensure that the Arduino UNO Virtual UART (COM) is listed and note the COM Port number. • If it is not listed, look for "Unknown Device" and update the drivers with the VCPs referenced in Step 4.	*A new version of the software may be installed to replace an older version. However, if you desire to replace a newer version with an older version, you will first need to uninstall the newer version.* *If you have already connected and have used an Arduino Uno Board for another purpose, a suitable VCP driver may already be installed. In this case, you will not be prompted to install a device driver.*
4	This step flashes the firmware **Arduino Firmware SEK001 Version 1.0.hex** downloaded in Step 1.b to the SEK001/Arduino Assembly. a. Open **Xloader.zip** downloaded in Step 1.c, extract the files, and run **XLoader.exe**. Figure 3 will appear. **Figure 3. Firmware Screen** 	***XLoader.exe*** *Anti-virus software may block the XLoader.exe file from being extracted. You may need to temporarily disable your anti-virus software long enough to extract and run the XLoader software.* ***Device*** *The correct device must be selected. The XLoader software will default to "Device" ATMega1280 the first time it is used. Change this field to ATmega328 unless you are certain you are using a different Arduino Uno Board. Only the ATmega328 device has been available for testing as of this time.*

Table 3. Firmware and Software Download and Installation Process (continued)

Step	Procedure	Notes and Troubleshooting
4 (con't)	b. Ensure Figure 3 reads as follows: Hex file: **Arduino Firmware SEK001 Version 1.0.hex** file path Device: Uno/(ATmega328) COM port: COM39 Baud rate: 115200 c. Click on the "Upload" button. When successfully flashed, a message similar to "14572 bytes uploaded" will be displayed, as shown in Figure 4. **Figure 4. Firmware Screen Showing Successful Flash** 	*Ensure you are not using VCP driver version 1.2.3.0. This driver, which is known to have trouble with Xloader, may already be installed on your computer if you have used the Arduino Uno Board for another purpose. If version 1.2.3.0 is already installed, go to your computer's Device Manager to change the driver to version 1.2.2.0, which was downloaded in Step 1.a:* *a. Find the device in Device Manager and right click on it.* *b. Select "Update driver software".* *c. Choose "Browse my computer for driver software" and provide the path to the VCP driver contained in the software download in Step 1.a. The default path is C:\Program Files (x86)\Honeywell\SensorEvaluationKit\VirtualCOM. This will change the VCP driver to version 1.2.2.0, which you can then verify in the driver tab of the device settings.* *The port settings may have been set for a different baud rate when you installed your VCP driver. Use your computer's Device Manager to verify the port settings and to change the baud rate to 115200, if needed.* **Baud rate** *Ensure the baud rate in Figure 4 matches the baud rate selected in the Device Manager port settings.* **Bytes** *The number of bytes given in Figure 4 is an example only. The actual number may vary according to the specific **Arduino Firmware SEK001** version you downloaded. This byte count may change as this file is updated.*
5	Run the "Sensor Evaluation Kit" desktop app. 	–

4.0 SOFTWARE SCREENS

4.1 Sensor Selection Panel Screen (see Figure 5 and Table 4)

Figure 5. Sensor Selection Panel Screen

Table 4. Sensor Selection Panel Screen Functions

Function	Description
Sensor Type	Select **Pressure** from the drop-down menu. *(Note: Other selections are not currently available.)*
Sensor Series	Select **RSC Series**, **HSC Series**, or **SSC Series** from the drop-down menu. *(Note: Other selections are not currently available.)*
Part Number *(Note: The last eight digits are found on the sensor label.)*	<u>Slowly</u> begin to enter the part number of the sensor to be evaluated until all but the last several digits appear. Then, select the final part number from the remaining drop-down list. After the part number appears, click on the SUBMIT button. *(Note: Do not enter the entire Part Number or copy/paste it into the field. The Part Number must be selected from the drop-down list.)*
Serial Number	Not used.
RECENT SELECTIONS	If applicable, a part number may be selected from this list directly. It is not necessary to enter the Sensor Type or Series first.

4.2 Measurement Screens

4.21 Measurement Screen (see Figures 6, 7 and Table 5)

Figure 6. Measurement Screen for HSC, SSC Series Only
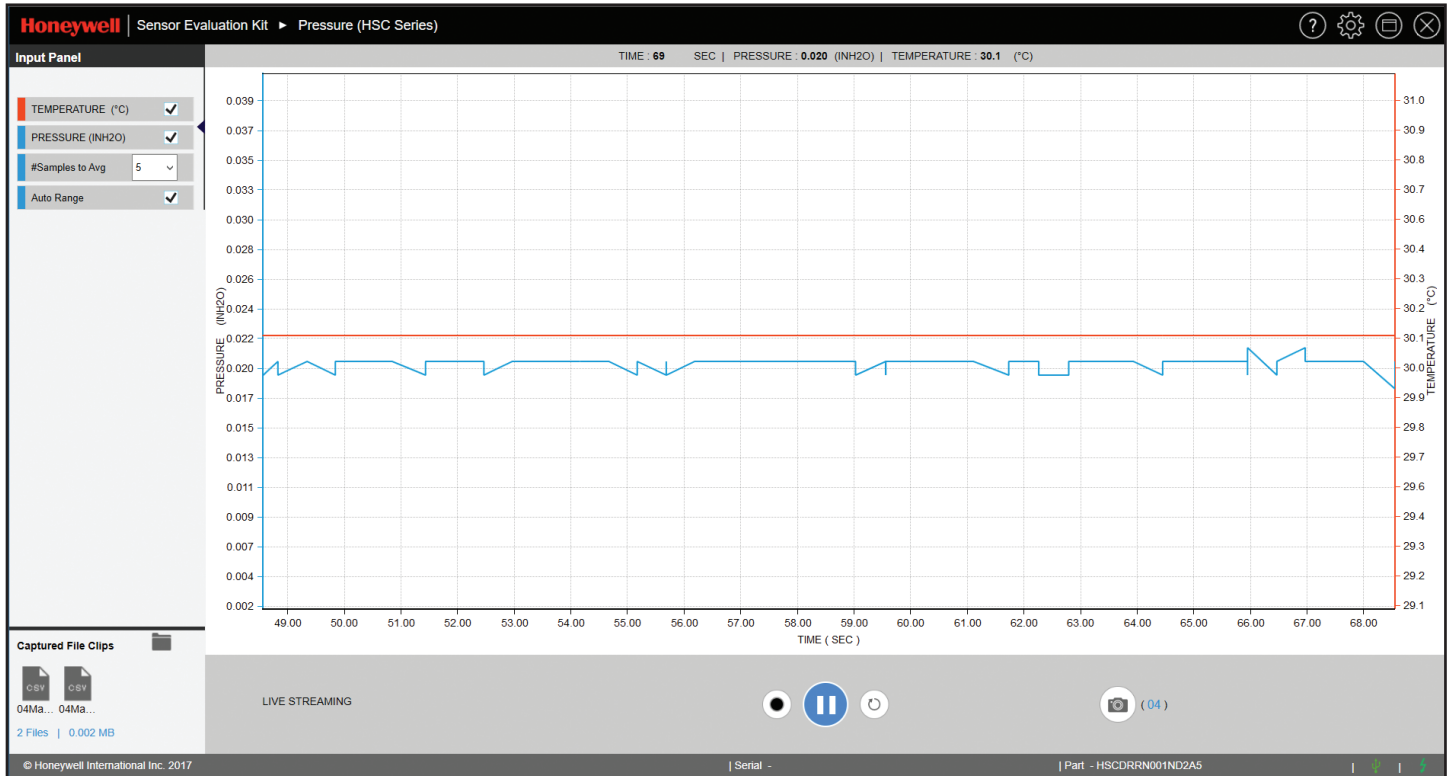

Table 5. Measurement Screen Functions for HSC, SSC Series Only

Function	Description
Input Panel:	Selects the desired graph parameters. Click on the "Play" button after making a selection to restart the evaluation.
Temperature	Displays °C or °F of the sensor's ASIC.
Pressure	Displays the sensor's pressure.
#Samples to Avg.	Select from the given number.
Auto Range	Select to automatically adjust to keep trace on screen.
Play/Pause	Starts/pauses the LIVE STREAMING function. Also used to restart an evaluation after changing any Input Panel characteristics.
Record	Records the measurements in a .cvs file in Excel for offline analysis.
Restart	Resets the time line to 0 sec.
Snap Shot	Saves a screenshot to a selected folder.
Saved Snaps Path	Opens the folder of recent file clips and snap shots.
Captured File Clips	Displays/provides access to recent .cvs files in Excel.
Part	Displays the part number of the sensor currently being evaluated.
Serial	Not displayed.

Figure 7. Captured File Clip Sample for HSC, SSC Series Only

4.22. Measurement Screen for RSC Series Only (see Figures 8, 9, 10 and Table 6)

Figure 8. Measurement Screen for RSC Series Only

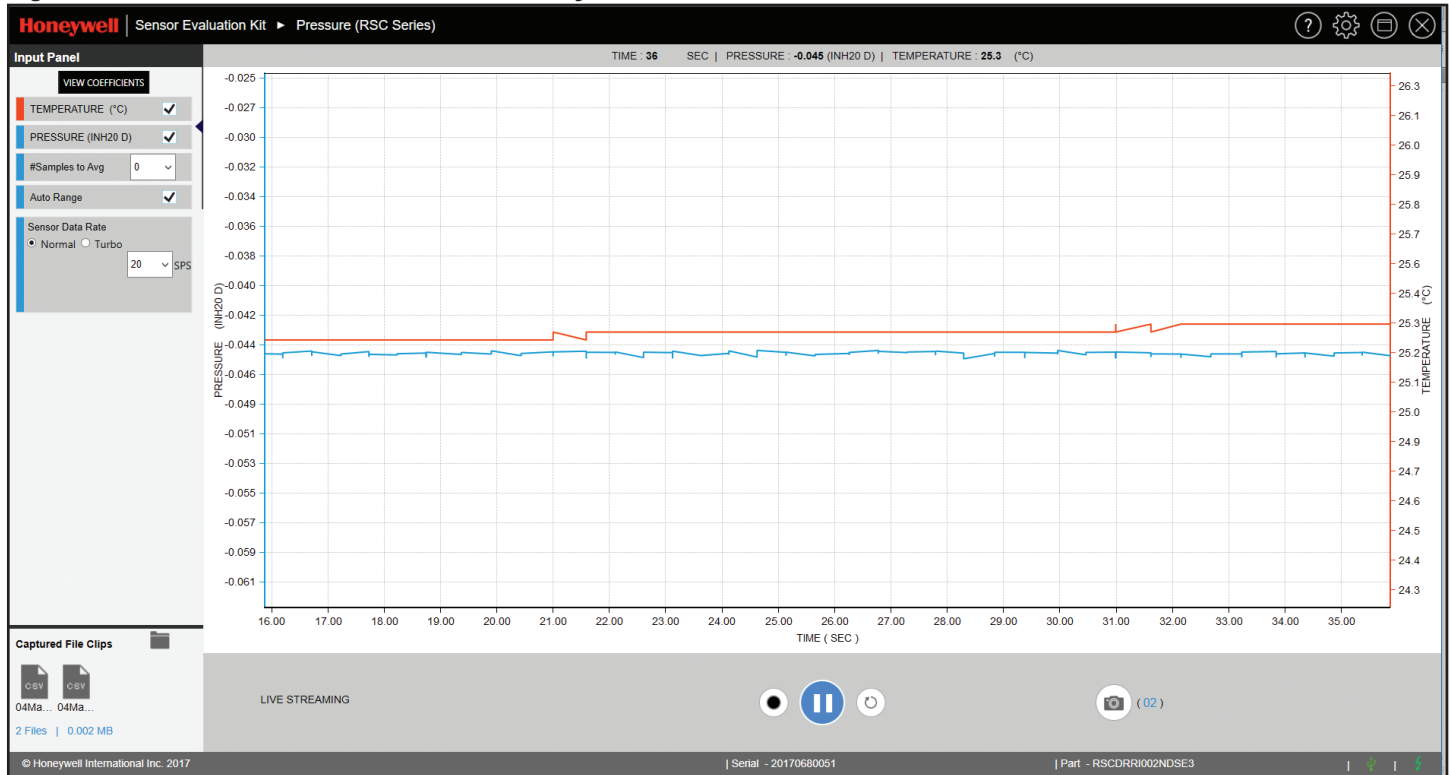**Table 6. Measurement Screen Functions for RSC Series Only**

Function	Description
Input Panel:	Selects the desired graph parameters. Click on the "Play" button after making a selection to restart the evaluation.
VIEW COEFFICIENTS	Displays 12 coefficients, as well as other data (see Figure 10).
Temperature	Displays temperature in °C or °F of the sensor's ASIC.
Pressure	Displays the sensor's pressure.
#Samples to Avg	Select from a given number.
Auto Range	Select to automatically adjust scale to keep trace on screen.
Sensor Data Rate	Select from a given number the rate at which the sensor is programmed to make successive readings.
Play/Pause	Starts/pauses the LIVE STREAMING function. Also used to restart an evaluation after changing any Input Panel characteristics.
Record	Records the measurements in a .cvs file in Excel for offline analysis.
Restart	Resets the time line to 0 sec.
Snap Shot	Saves a screen shot to a selected folder.
Saved Snaps Path	Opens the folder of recent file clips and snap shots.
Captured File Clips	Displays/provides access to recent .cvs files in Excel format.
Part	Displays the part number of the sensor currently being evaluated.
Serial	Displays the serial number of the sensor currently being evaluated.

Figure 9. Captured File Clip Sample for RSC Series Only

Figure 10. View Coefficients Screen for RSC Series Only

4.3 Configuration Screen (see Figure 11 and Table 7)

Figure 11. Configuration Screen

Table 7. Configuration Screen Functions

Function	Description
Data Format	Selects Engineering Units or raw Counts for pressure and temperature measurement.
Temperature	Displays temperature in °C or °F of the sensor's ASIC.
Sample Rate	Selects from a given numer of samples per second.
File Type	Default is a .csv file which displays in Excel.
File Name	Default is LOGDATA. Change by entering a different FIle Name.
File Path	Default is C:\ProgramData\SensorEvalKit\Report. *(Note: Drive location depends on the Windows installation location.)* Change by entering a different File Path or use BROWSE.
File Size Limit	Default is 1024 kB; may be adjusted for a single file.

4.4 Help Screen (see Figure 12 and Table 8)

Figure 12. Help Screen

Table 8. Help Screen Functions

Function	Description
About this Software	Provides software revision number and release date.
Getting Started	Provides links to User Instructions and online sensor product information, including datasheets, installation instructions, and applications notes.
Contact Support	Requests technical support from Honeywell.

APPENDIX A. SEK001 SPECIFICATIONS

Table A1. SEK001 Specifications

Characteristic	Parameter
Temperature range[1]	20°C to 30°C [68°F to 86°F]
Humidity range[1]	30 %RH to 70 %RH

Power supply:
    internal (Arduino Uno Rev3)
    external
	
	3.3 V or 5 V
	3.3 V or 5 V

Compatible sensors	RSC Series HSC Series (digital verions only) SSC Series (digital versions only)
Associated software	Sensor Evaluation Kit SEK001 Version 1.0.exe Arduino Firmware SEK001 Version 1.0.zip XLoader.zip

[1] See Appendix B. Remote Connection if evaluation conditions are different.

APPENDIX B. REMOTE CONNECTION

Use wire leads to connect a remotely-located sensor to either the sockets provided on the SEK001 or directly to the Arduino UNO board. See Tables B1 and B2 for the correlating sensor pins and SEK001 sockets.

Table B1. RSC Series Pinout

Sensor Pin	SPI Function (DIP, SMT)	SEK001 Socket
1	SCLK	13
2	DRDY	NC
3	DIN	11
4	CS_ADC	10
5	GND	GND
6	VCC	5V
7	CS_EE	9
8	VOUT	12

Table B2. HSC Series, SSC Series Pinouts

Sensor Pin	Function			SEK001 Socket
	SPI	I²C		
	DIP, SMT	DIP, SMT	SIP	
1	GND	GND	GND	13
2	VCC	VCC	VCC	NC
3	MISO	SDA	MISO	11
4	SCLK	SCL	SCLK	10
5	SS	NC	-	GND
6	NC	NC	-	5V
7	NC	NC	-	9
8	NC	NC	-	12

APPENDIX C. JUMPER CONFIGURATIONS

Power Supply Source (See Table C1)

Jumper J6 may be set for either an internal power supply (furnished on the Arduino Uno Rev3) or an external power supply (furnished by the user). Although the internal voltages are approximately 3.3 Vdc and 5 Vdc, they are not exact. The difference may affect sensor output due to self-heating on the pressure die, causing some ratiometricity error.

For very exacting measurements, use an external power supply to avoid this ratiometricity error. Set J6 to terminals 1 and 2 and connect the external power supply to P4. P4+ is then the positive supply terminal. (*Note: Make these connections prior to powering the Arduino Uno Rev3 through the USB cable in Table 3, Step 2. Ensure that the SEK001 terminals are not damaged when connecting the external power supply.*)

Table C1. Common Power Supply Selection for RSC, HSC, SSC Series

Voltage Source	Power Supply	
	3.3 V	**5 V**
Internal (Arduino Uno Rev3)	J7 (2-3), J6 (2-3)	J7 (1-2), J6 (2-3)
External	J6 (1-2)	J6 (1-2)

Table C2. RSC Series Jumper Locations According to Package Style and Digital Function

Characteristic	DIP	SMT
	SPI	
Part number	RSC**D**XXXXXXXX**S**EX	RSC**M**XXXXXXXX**S**EX
Sensor: position on SEK001 jumper selection	S5 J2 (2-3)	S1 J2 (1-2)

Table C3. HSC, SSC Series Jumper Locations According to Package Style and Digital Function[1]

Characteristic	DIP		SMT		SIP
	SPI	**I²C***	**SPI**	**I²C***	**I²C***
Part number	HSC**D**XXXXXXXX**S**XX SSC**D**XXXXXXXX**S**XX	SSC**D**XXXXXXXX**2**XX SSC**D**XXXXXXXX**2**XX	HSC**M**XXXXXXXX**S**XX SSC**M**XXXXXXXX**S**XX	HSC**M**XXXXXXXX**2**XX SSC**M**XXXXXXXX**2**XX	HSC**S**XXXXXXXX**2**XX SSC**S**XXXXXXXX**2**XX
Sensor: position on SEK001 jumper selection	S2 J1 (1-2)		S6 J5 (1-2)		S4 J3 (1-2)
Other jumper selections	J8 (2-3) J9 (2-3)	J8 (1-2) J9 (1-2)	J8 (2-3) J9 (2-3)	J8 (1-2) J9 (1-2)	J8(1-2) J9 (1-2)

[1] See Appendix D for board layout.
* Options for the I²C address (third digit from the end in the catalog listing) range from 2 (0x28) to 7 (0x78).

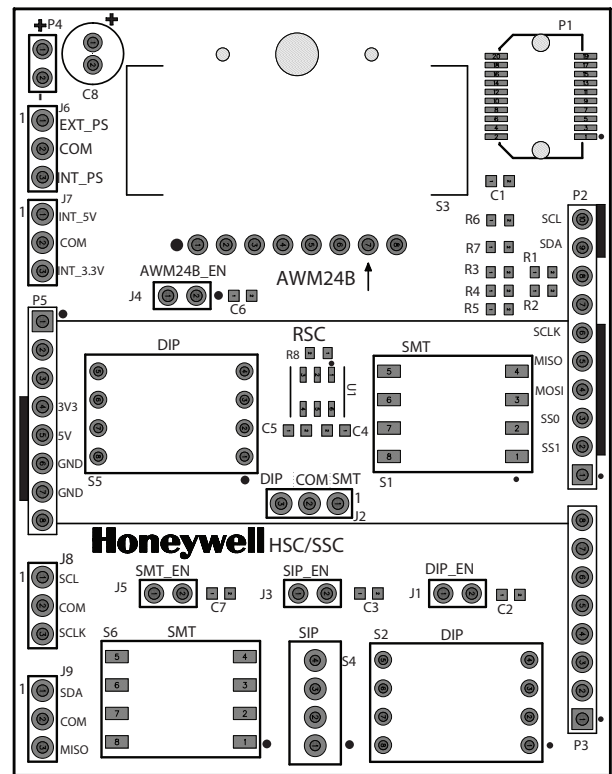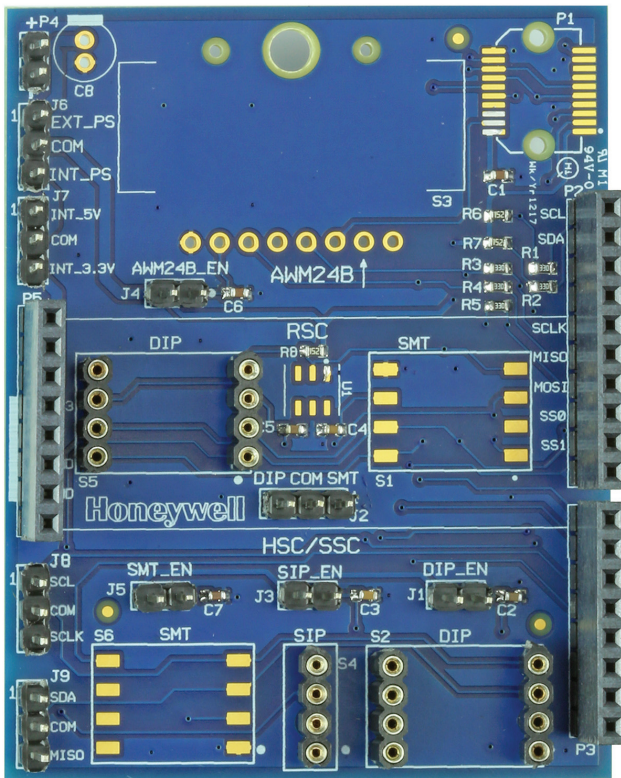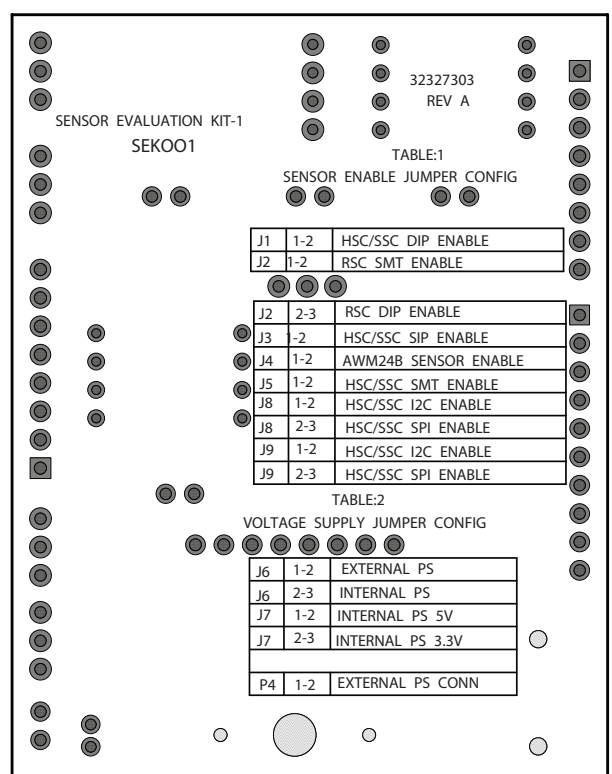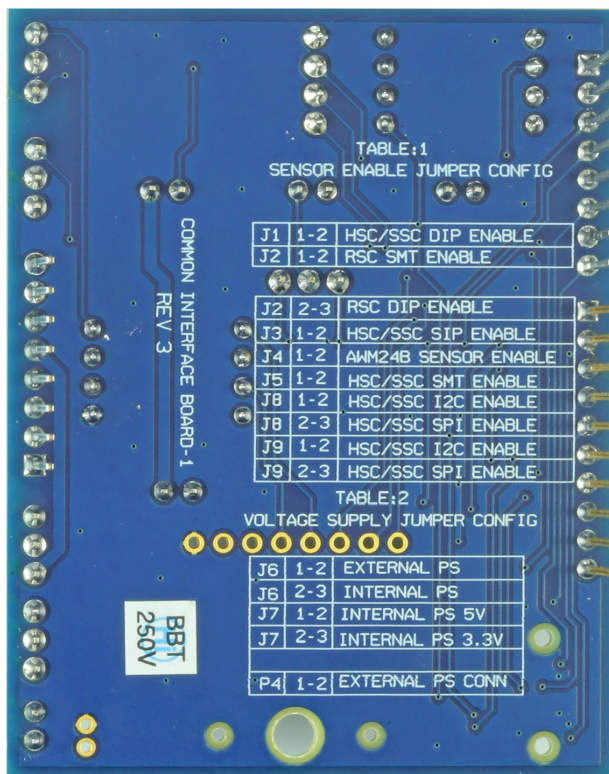**APPENDIX D. SEK001 EXTERNAL FEATURES AND DIMENSIONS**

Figure D1. SEK001 Board Layout *(Note: The AWM24B set of receiving sockets is not currently used.)*
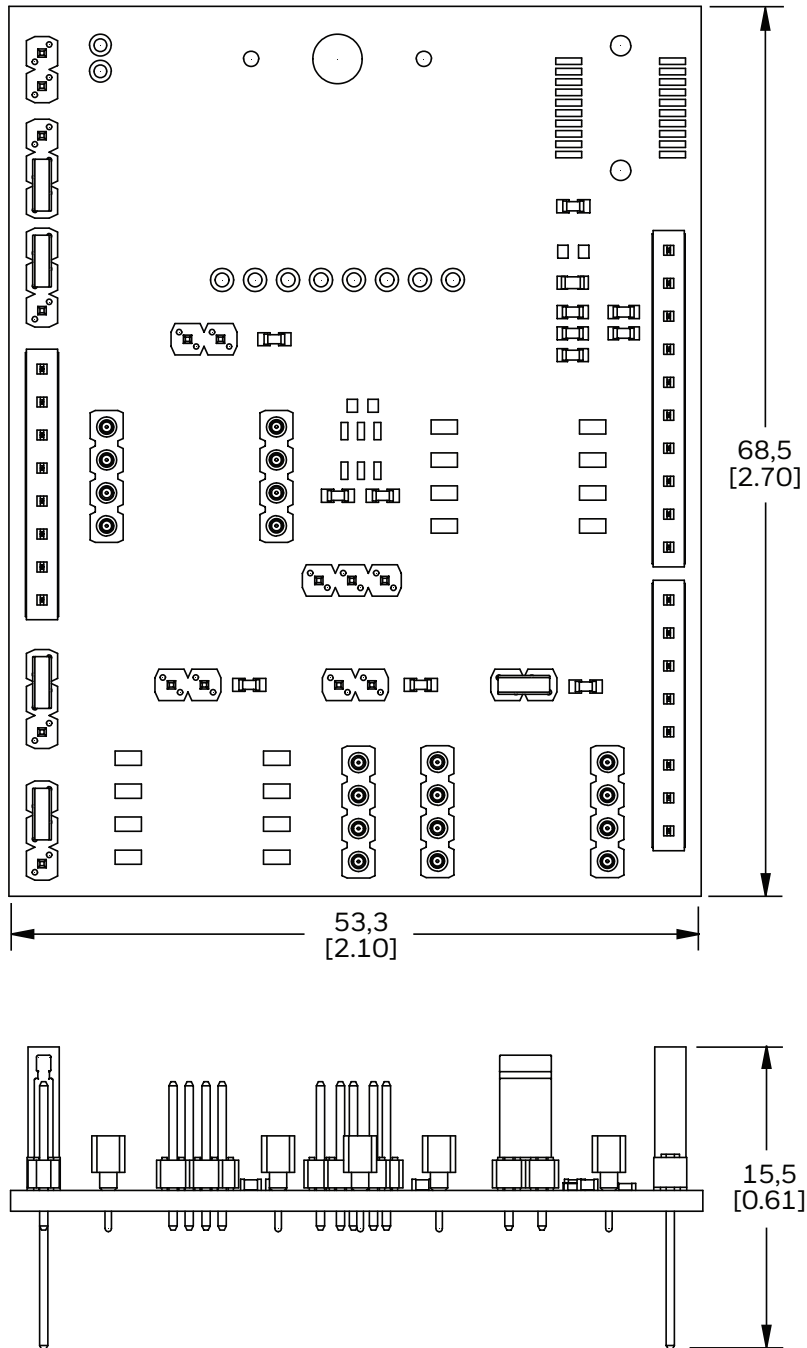
Front (no jumpers shown)

Back

APPENDIX D. SEK001 EXTERNAL FEATURES AND DIMENSIONS (continued)

Figure D2. SEK001 Dimensions (For reference only: mm/[in].)

68,5
[2.70]

53,3
[2.10]

15,5
[0.61]

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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