Evaluating the AD4170-4, 24-Bit, DC to 50 kHz Input Bandwidth, Multichannel, Low Noise Precision Sigma-Delta ADC with PGA

FEATURES

- Full featured evaluation board for the AD4170-4
- On-board 2.5 V ADR4525 and LTC6655 references
- SMB connectors for AC/DC inputs
- ADXL1002 on-board vibration sensor
- PC control in conjunction with Analog Devices, Inc., SDP (EVAL-SDP-CK1Z)
- PC software for control and data analysis (time domain and frequency domain)
- Compatible interface with ACE, IIO Scope, Python, and MATLAB

EVALUATION KIT CONTENTS

- EVAL-AD4170-4ARDZ evaluation board

ONLINE RESOURCES

- Documents needed
  - AD4170-4 data sheet
  - Evaluation board schematics
  - Bill of materials
- Required software
  - AD417x ACE plugin

EQUIPMENT NEEDED

- EVAL-AD4170-4ARDZ evaluation board
- EVAL-SDP-CK1Z (SDP-K1) system demonstration platform
- DC signal source
- USB cable
- PC running Windows with USB 2.0 port

EVALUATION BOARD PHOTOGRAPH

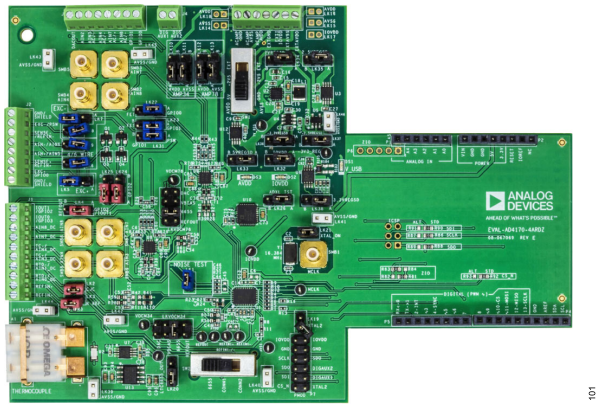

Figure 1. EVAL-AD4170-4ARDZ

GENERAL DESCRIPTION

The EVAL-AD4170-4ARDZ evaluation kit features the AD4170-4 which is a 24-bit, DC to 50 kHz input bandwidth, multichannel, low noise precision sigma-delta analog-to-digital converter (ADC).

The EVAL-AD4170-4ARDZ board connects to the USB port of the PC by connecting to the EVAL-SDP-CK1Z controller board. A 5 V USB supply via the PC is regulated to supply the AD4170-4 and support all necessary components.

The AD4170-4 analysis, control, evaluation (ACE) plugin fully configures the AD4170-4 device register functionality and provides DC time domain analysis in the form of waveform graphs and associated noise analysis for ADC performance evaluation. The AC analysis is also provided by the software such as a fast Fourier transform (FFT) displaying the first five harmonics of the following parameters: SNR, SFDR, S/N+D, and THD.

The EVAL-AD4170-4ARDZ is an evaluation board that allows the user to evaluate the features of the ADC. The user PC software executable controls the AD4170-4 over the USB through the EVAL-SDP-CK1Z system demonstration platform (SDP) board.

Full specifications on the AD4170-4 are available in the product data sheet, which must be consulted in conjunction with this user guide when using the evaluation board.

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REVISION HISTORY

7/2024—Revision 0: Initial Version

EVAL-AD4170-4ARDZ QUICK START GUIDE

To begin using the evaluation board, do the following:

1. With the EVAL-SDP-CK1Z board disconnected from the USB port of the PC, install the ACE software (can be downloaded at analog.com). Restart the PC after the software installation is complete. (For complete software installation instructions, see the Evaluation Board Software section.)
2. Download the **Board.AD417x** plugin on the ACE plugin manager.
3. Connect the EVAL-SDP-CK1Z board to the EVAL-AD4170-4ARDZ board using the Arduino connector (see Figure 2 right image).
4. Connect the EVAL-SDP-CK1Z board to the PC using the supplied USB cable. If you are using Windows® XP, you may need to search for the EVAL-SDP-CK1Z drivers. Choose to automatically search for the drivers for the EVAL-SDP-CK1Z board if prompted by the operating system.
5. From the **Programs** menu, go to the **Analog Devices** subfolder, and click **ACE** to launch the ACE software (see the Launching the Software section).

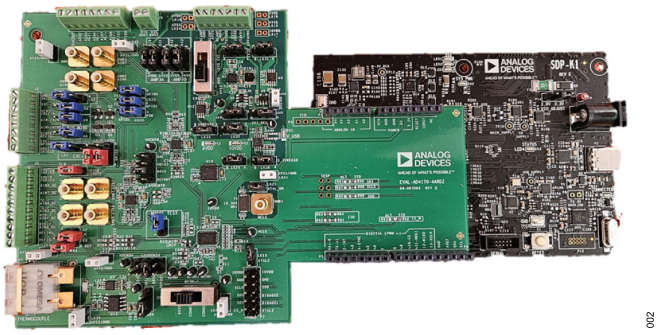

Figure 2. Hardware Configuration, Setting Up the EVAL-AD4170-4ARDZ Evaluation Board

EVAL-AD4170-4ARDZ BLOCK DIAGRAM

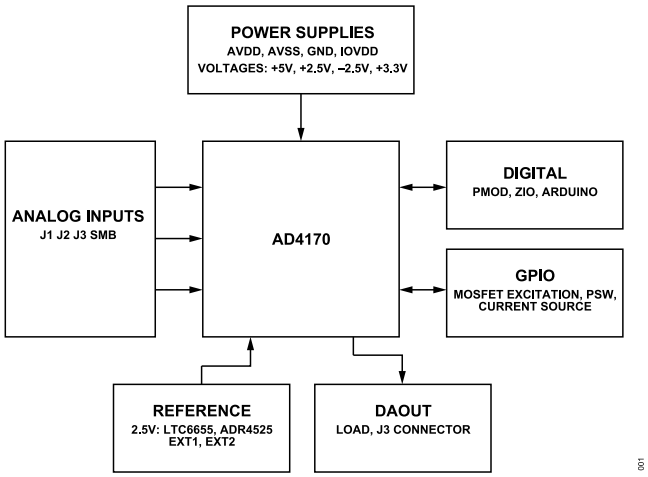

Figure 3. Block Diagram

EVALUATION BOARD HARDWARE

DEVICE DESCRIPTION

The AD4170-4 is a low noise, precision complete analog front end (AFE) for high precision measurement applications. It contains a low noise, 24-bit Σ-Δ ADC. The AD4170-4 can support four differential inputs, eight pseudodifferential or single-ended inputs. The on-chip low noise instrumentation amplifier means that signals of small amplitude can interface directly to the ADC. Other on-chip features include a low drift 2.5 V reference, excitation currents, reference buffers, multiple filter options, and many diagnostic features.

Complete specifications for the AD4170-4 are provided in the product data sheet and must be consulted in conjunction with this user guide when using the evaluation board. Full details about the EVAL-SDP-CK1Z are available at analog.com.

HARDWARE LINK OPTIONS

The default link options are listed in Table 1. By default, the board operates from the USB power supply via the EVAL-SDP-CK1Z. The 5 V default supply required for the AD4170-4 comes from the on-board LTC3129-1 low-dropout regulators (LDOs), which generate their voltages from the EVAL-SDP-CK1Z.

Table 1. Default Link and Solder Link Options

Link No.	Color	Default Option	Description	Pitch
LK1	Blue	Inserted	Noise test, Channel AIN5 + Channel AIN6	2 mm
LK2	Red	1 Pin	Thermocouple, cold junction resistor bypass	2 mm
LK3	Red	1 Pin	Precision reference resistor bypass	2 mm
LK4	Red	A	Position (pos) A: GPIO1 (IOUT1) to J1, Pos B: REFOUT	2.54 mm
LK5	Blue	B	Wire bridge EXC+ select, Pos A: MOSFET+, Pos B: AVDD	2.54 mm
LK6	Blue	1 Pin	Short EXC+/REFIN+: pos inserted = 4-wire bridge	2 mm
LK7	Blue	B	Wire bridge EXC− select, Pos A: MOSFET− Pos, B: power switch (GPIO1)	2.54 mm
LK8	Blue	1 Pin	Short EXC−/AVSS: pos inserted = 4-wire bridge	2 mm
LK9	Blue	1 Pin	Short EXC−/REFIN−: pos inserted = 4-wire bridge	2 mm
LK10	Black	A	ADA4945-1 AIN3 AIN4, AVDD select, Pos A: internal AVDD, Pos B: external AVDD	2.54 mm
LK11	Black	A	ADA4945-1 AIN3+ AIN4, AVSS select, Pos A: internal AVSS, Pos B: external AVSS	2.54 mm
LK12	Black	A	ADA4945-1 AIN7+ AIN8, AVDD select, Pos A: internal AVDD, Pos B: external AVDD	2.54 mm
LK13	Black	A	ADA4945-1 AIN7+ AIN8, AVSS select, Pos A: internal AVSS, Pos B: external AVSS	2.54 mm
LK14	N/A[1]	DNI	SCP connect external AC_AMP_AVSS and ground	2 mm
LK15	N/A[1]	DNI	SCP connect external AVSS and ground	2 mm
LK16	N/A[1]	DNI	SCP connect external AVDD and ground	2 mm
LK17	N/A[1]	DNI	SCP connect external IOVDD and ground	2 mm
LK18	N/A[1]	DNI	SCP connect external AC_AMP_AVDD and ground	2 mm
LK19	Black	1 Pin	XTAL2 to digital connector	2 mm
LK21	Black	1 Pin	Inserted: external crystal, uninserted: external clock	2 mm
LK22	Blue	A	GPIO0, Pos A: to connector J4, Pos B: MOSFET	2.54 mm
LK23	Blue	A	GPIO1, Pos A: to connector J4/J2 (LK31), Pos B: MOSFET	2.54 mm
LK24	Red	A	GPIO2, Pos A: to connector J1, Pos B: MOSFET	2.54 mm
LK25	Red	A	GPIO3, Pos A: to connector J1, Pos B: MOSFET	2.54 mm
LK26	Black	A	ADXL1001 test, Pos A: test, Pos B: standard	2.54 mm
LK31	Blue	A	GPIO1 connector select, Pos A: J2 (power switch), Pos B: J4	2.54 mm
LK32	Black	A	IOVDD select, Pos A: 3.3 V, Pos B: EXT	2.54 mm
LK33	Black	A	LT1962-5 power-down, Pos A: on	2.54 mm
LK34	Black	A	LTC3129 power-down, Pos A: on	2.54 mm
LK35	Black	A	LT1962-2.5 power-down, Pos A: on	2.54 mm

EVALUATION BOARD HARDWARE

Table 1. Default Link and Solder Link Options (Continued)

Link No.	Color	Default Option	Description	Pitch
LK36	Black	A	LTC1983 power-down, Pos A: on	2.54 mm
LK37	Black	A	ADP7182 power-down, Pos A: on	2.54 mm
LK38	Black	A	ADP150 power-down, Pos A: on	2.54 mm
LK39 to LK46	Gray	Inserted	AVSS − GND short	2 mm
LKVOCM34	Black	4525	VOCM ADA4945-1, Pos A: DACOUT, Pos B: VBIAS, Pos C: ADR4525, Pos D: REFOUT	2.54 mm
LKVOCM78	Black	4525	VOCM ADA4945-1, Pos A: DACOUT, Pos B: VBIAS, Pos C: ADR4525, Pos D: REFOUT	2.54 mm
R27, R40, R26, R39	N/A[1]	R27, R40 (Mounted) R26, R39 (Not Mounted)	AIN7 and AIN8 R27, R40 (Mount for AC input on J3 (default)) R26, R39 (Mount for DC input on J1 connector)	N/A[1]
R41, R110, R42, R111	N/A [1]	R41, R110 (Mounted) R42, R111 (Not Mounted)	AIN3 and AIN4 R41, R110 (Mount for AC input on J3 (default)) R42, R111 (Mount for DC input on J1 connector)	N/A[1]

[1] N/A means not applicable.

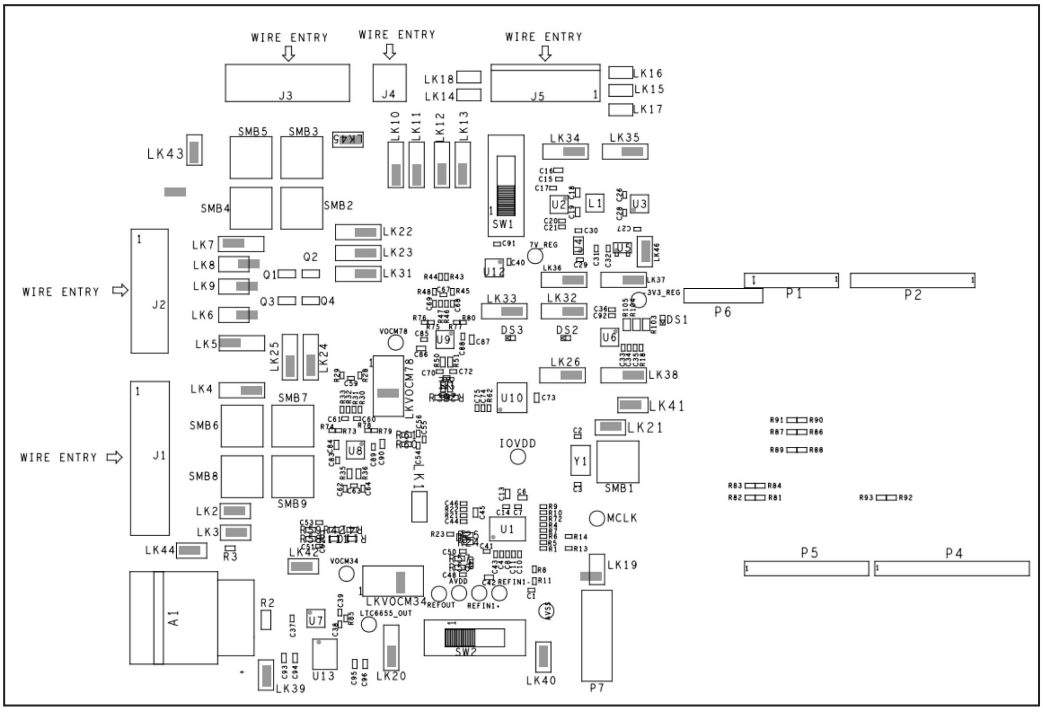

Figure 4. Silkscreen Showing Link Locations

EVALUATION BOARD HARDWARE

On-Board Connectors

Table 2 provides information about the external connectors on the EVAL-AD4170-4ARDZ.

Table 2. On-Board Connectors

Connector	Function	Pin No.	Pin Function
J1	DC analog inputs	1	IOUT1/GPIO2 excitation current for 3 wire RTD REFOUT
		2	IOUT0 GPIO3 excitation current for RTDs
		3	AIN8 with DC filtering
		4	AIN7 with DC filtering
		5	AIN4 with DC filtering (TC− connection)
		6	AIN3 with DC filtering (TC+ connection)
		7	AIN1 with DC filtering (RTD− connection); (Cold Junction− connection)
		8	AIN0 with DC filtering (RTD+ connection); (Cold Junction+ connection)
		9	External reference+ (REFIN1+)
		10	External reference– (REFIN1−)
J2	Analog inputs Wire bridge	1	Ground/shield connection
		2	Excitation− (MOSFET)/power switch function (GPIO1) for wire bridge
		3	External reference−/sense−
		4	AIN6 (AINN) with DC filtering (DNI) and noise test channel
		5	AIN5 (AINP) with DC filtering (DNI) and noise test channel
		6	External reference+/sense+
		7	Excitation+ (MOSFET)/AVDD supply for wire bridge
		8	Ground/shield connection
J3	AC analog inputs	1	GPIO0
		2	GPIO1
		3	AIN8 with AC filtering
		4	AIN7 with AC filtering
		5	AIN4 with AC filtering
		6	AIN3 with AC filtering
		7	AIN2 with DC filtering
		8	DACOUT with 2 kΩ load
J4	Digital outputs	1	DIGAUX1
		2	DIGAUX2
J5	External power	1	External AVDD connection
		2	External AVSS connection
		3	External IOVDD connection
		4	External GND connection
		5	External AVDD connection for amplifier
		6	External AVSS connection for amplifier
		7	External GND connection for amplifier
P1 to P5	Arduino connector	N/A[1]	N/A[1]
P6	PMOD connection	N/A[1]	N/A[1]

[1] N/A means not applicable.

EVALUATION BOARD HARDWARE

POWER SUPPLIES

The evaluation board receives power through the controller board when connected to the PC via USB. Linear regulators generate the required power supply levels from the applied USB voltage (see Table 3).

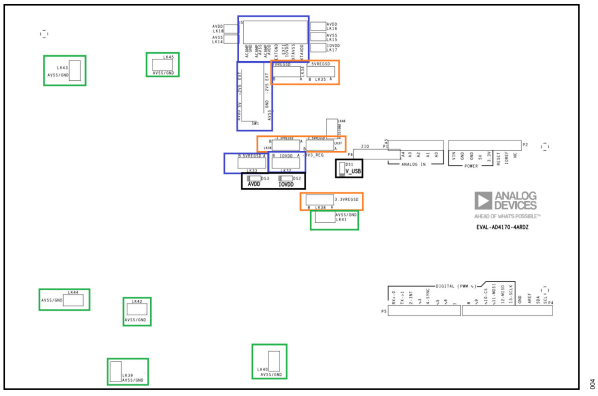

Figure 5. Power Supply Link Options

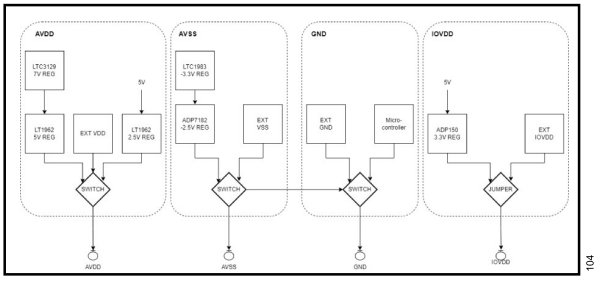

Figure 6. Block Diagram of Evaluation Board Power Supplies

Location of AVDD, AVSS, and IOVDD control links are highlighted in blue (Figure 5).

Each regulator can be shut down using their shutdown links highlighted in orange (Figure 5).

AVDD (LK30) and AVSS (LK33) selections are as follows:

- 5 V supply (default)
  - 5 V regulator supplies AVDD
  - AVSS tied to GND (LK43 to LK50 highlighted in green, Figure 5)
- ±2.5 V split supply
  - +2.5 regulator supplies AVDD
  - −2.5V regulator supplied AVSS
- External AVDD/AVSS
  - Connections on Connector J5

Table 3. AVDD/AVSS Regulators and Their Shutdown Links

Supply	Regulator	Shutdown Link (Orange)
+7 V regulator	LTC3129-1	LK34
+5 V regulator	LT1962-5	LK33
+2.5 V regulator	LT1962-2.5	LK35
−3.3 V regulator	LTC1983	LK36
−2.5 V regulator	ADP7182	LK37

IOVDD (LK32) selection is as follows:

- 3.3 V supply (default)
  - 3.3 V regulator supplies IOVDD
  - GND tied to AVSS (LK43 to LK50 highlighted in green, Figure 5)
- External IOVDD
  - Connections on Connector J5

Table 4. IOVDD Regulator and Shutdown Link

Supply	Regulator	Shutdown Link (Orange)
3.3 V regulator	ADP150A	LK34

SERIAL INTERFACE

There are four primary signals: $\overline{CS}$, SCLK, SDI, and SDO (all are inputs, except for SDO, which is an output). By default, the $\overline{RDY}$ function is also available on the SDO pin.

These are the following serial communication options:

- Arduino connection SDP-K1
- PMOD connector
- Standalone mode
  - Removing the R92, R86, R88, and R90 jumper resistors, and mounting them on R93, R87, R89, and R91, respectively, give exposure to SPI signals on the P3 connector. Using the pins from these links can then be used to flywire the signals to an alternative digital capture setup.

    See *Introduction to SPI Interface*.

REFERENCE OPTIONS

The AD4170-4 reference can be selected to be internal or external. The user can select the preferred reference by register settings or jumper/switch options as follows:

- On-board external references as follows:
  - Default: LTC6655(LN)
  - ADR4525
- External Reference Connector J1 as follows:
  - Option to use on board PT1000 precision resistor (R3) insert LK3
- External Reference Connector J2

EVALUATION BOARD HARDWARE

Selecting Reference Source

For software, follow these steps to set reference for Channel 0 and for Channel n or go to the AFE[n] register:

1. The board must be connected to ACE.
2. Open the AD417x memory map window.
3. Search for the AFE[0] register.
4. Set the data(control) to the desired reference source or the data(hex) to the relevant bits as follows:
   a. Dedicated reference pins REFIN1+/− (hex value 0)
   b. From GPIO0/1 REFIN2+/− (hex value 1)
   c. Internal reference REFIN_REFOUT (hex value 2)

For hardware, if REFIN1+/− is selected, the following options below are available using SW2 (see Figure 8)

- LTC6655(LN), REFIN− shorted to AVSS
- External Reference Connector J1
- External Reference Connector J2

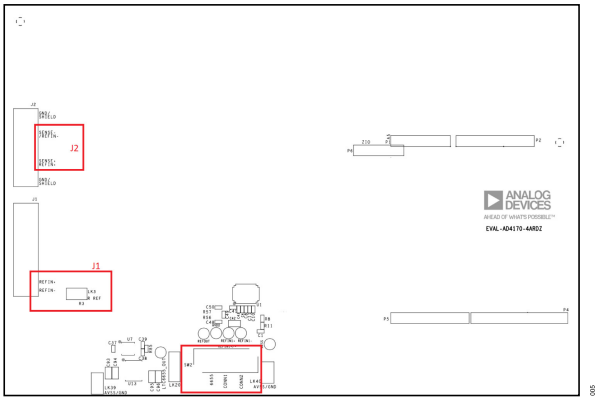

Figure 7. Reference Highlighted Silkscreen

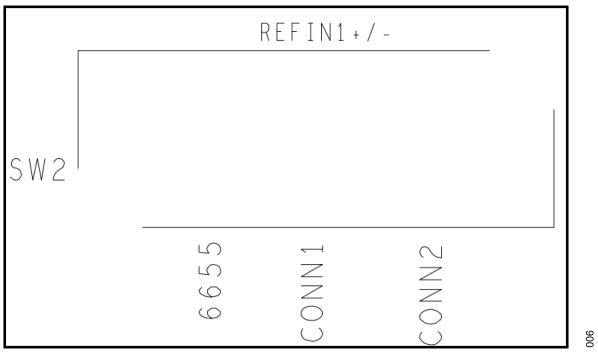

Figure 8. SW2 Reference Switch Zoomed in Silkscreen

EVALUATION BOARD SETUP PROCEDURE

After following the instructions in the EVAL-AD4170-4ARDZ Quick Start Guide section, set up the evaluation and SDP boards.

Warning

The evaluation software and drivers must be installed before connecting the EVAL-AD4170-4ARDZ evaluation board and the EVAL-SDP-CB1Z board to the USB port of the PC to ensure the PC correctly recognizes the evaluation system.

EVALUATION BOARD SOFTWARE

SOFTWARE INSTALLATION PROCEDURES

Each software is explained as follows:

- Evaluation software: plug and play board evaluation is provided by the Analog Devices ACE application. ACE is an evaluation platform and board specific support is installed as add-on called plugins from within the ACE software. For installation and documentation instructions, see www.analog.com/ace. ACE can configure the embedded software on supported controller boards and provides a quick and easy way to set up, configure the board, and start capturing signals or generating waveforms.
- Embedded software: the embedded software used for evaluation is typically built using open-source firmware examples, drivers, and hardware description language (HDL), which can be found in the software section on the relevant product page.

  Note that if the software you are looking for is not available, you can submit a request on the product page.

  Evaluation boards using Linux-based controller boards run a version of Analog Devices Kuiper Linux (www.analog.com/kuiper-linux). The evaluation kit ships with a fully configured SD card that can be used to set the system up and running. Note that in the event that there is an issue or updates are available for this SD card, the image can be found in the **Software** section on the relevant evaluation board page.
- Host PC software: the firmware and Linux embedded software stacks are based on an IIO architecture (industrial I/O). This enables the use of other tools such as Python and MATLAB with the platform. These tools can be found in the **Software** section of the product page. Other tools such as IIO oscilloscope and IIO command line tools that provide generic low level support and debug for an IIO-based platform are also available on the product page.

Detailed Description on Evaluation Board Usage with ACE Software

Download the ACE software from the ACE software page. Install ACE on a PC before using the EVAL-AD4170-4ARDZ.

The ACE installation process in the Installing the ACE Software section includes the ACE software installation and the SDP driver installation.

Install the ACE software and SDP drivers before connecting the EVAL-AD4170-4ARDZ and the SDP board to the USB port of the PC to ensure that the evaluation system is properly recognized when it is connected to the PC.

Installing the ACE Software

To install the ACE software, take the following steps:

1. Download the ACE software to a Windows®-based PC.
2. Double click the **ACEInstall.exe** file to begin the installation. By default, the software is saved to the following location: **C:\Program Files (x86)\Analog Devices\ACE**.
3. A dialog box opens asking for permission to allow the program to make changes to the PC. Click **Yes** to begin the installation process.
4. In the **ACE Setup** window, click **Next >** to continue the installation (see Figure 9).

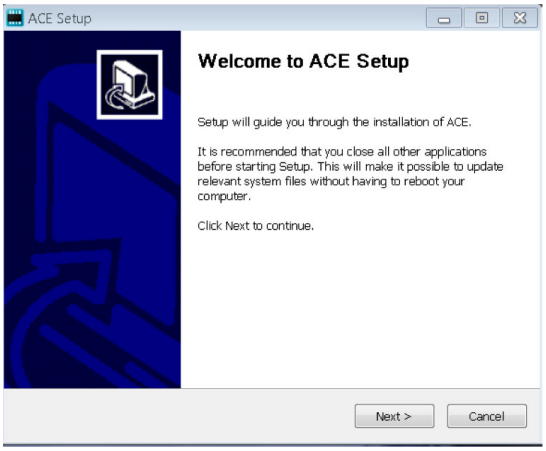

Figure 9. ACE Software Installation Confirmation

5. Read the software license agreement and click **I Agree** (see Figure 10).

Figure 10. License Agreement

6. Click **Browse...** to choose the installation location and then click **Next >** (see Figure 11).

EVALUATION BOARD SOFTWARE

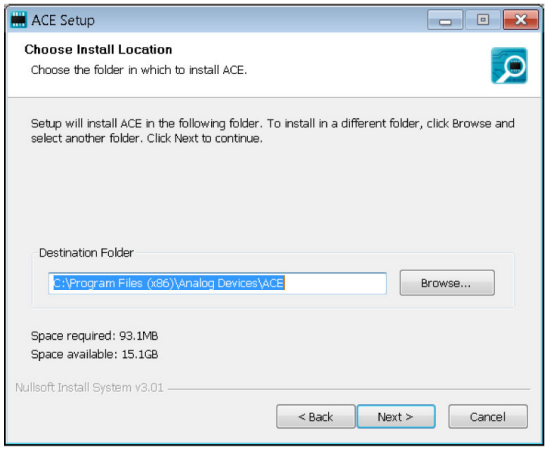

Figure 11. Choose Installation Location

7. The ACE software components to install are preselected (see Figure 12). Click **Install**.

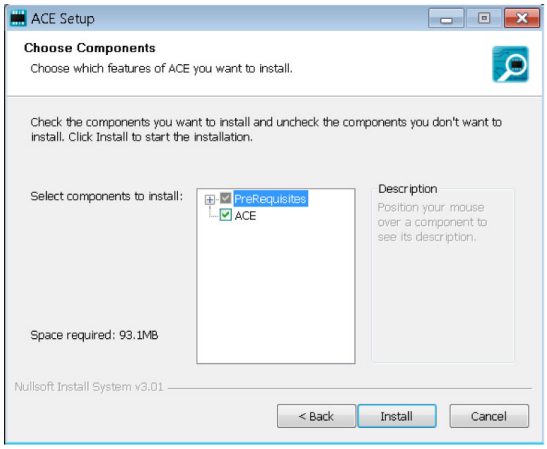

Figure 12. Choose Components

8. The **Windows Security** window opens (see Figure 13). Click **Install**. Figure 14 shows the installation in progress. No action is required.

Figure 13. Windows Security Window

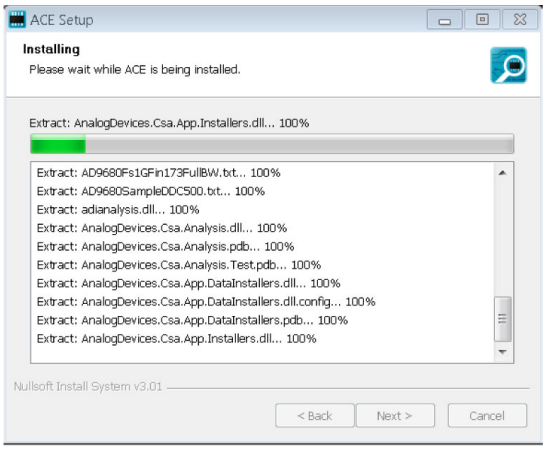

Figure 14. Installation in Progress

9. When the installation is complete, click **Next >** (see Figure 15), and then click **Finish** to complete the installation process.

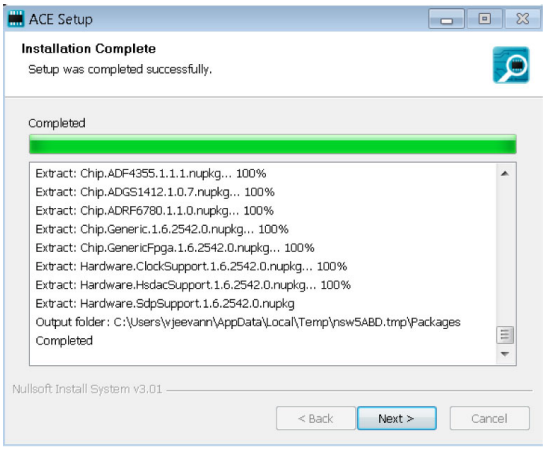

Figure 15. Installation Complete

EVALUATION BOARD SETUP PROCEDURES

The EVAL-AD4170-4ARDZ connects to the SDP-K1. The SDP-K1 is the communication link between the PC and the EVAL-AD4170-4ARDZ. Figure 2 shows a diagram of the connections between the EVAL-AD4170-4ARDZ and the SDP-K1.

Connecting the EVAL-AD4170-4ARDZ and the SDP-K1 to a PC

After the ACE software is installed, take the following steps to set up the EVAL-AD4170-4ARDZ and the SDP-K1:

1. Ensure that all configuration links are in the appropriate positions, as detailed in Table 1.
2. Connect the EVAL-AD4170-4ARDZ to the Arduino header on the SDP-K1 (see the Evaluation Board Setup Procedure section for more details). The EVAL-AD4170-4ARDZ does not require an external power supply adapter.
3. Connect the SDP-K1 to the PC via the USB cable included in the SDP-K1 kit.

EVALUATION BOARD SOFTWARE

Verifying the Board Connection

After connecting the power and the USB cable from the SDP-K1 to the PC, take the following steps to verify the board connection:

1. After connecting the SDP-K1 to the PC, allow the **Found New Hardware Wizard** to run. Choose to automatically search for the drivers for the SDP-K1 if prompted by the operating system.
2. Navigate to the **Device Manager** window on the PC (see Figure 16).
3. A dialog box may open asking for permission to allow the program to make changes to the computer. Click **Yes**.
4. The **Computer Management** window opens. From the list labeled **System Tools**, click **Device Manager**. If the SDP-K1 driver is installed and the board is properly connected to the PC, **Analog Devices System Demonstration Platform SDP-K1** is shown in the **ADI Development Tools** list in the **Device Manager** window, as shown in Figure 16.

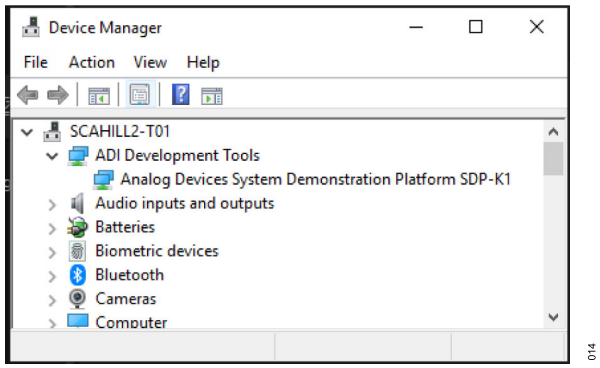

Figure 16. Device Manager Window

Disconnecting the EVAL-AD4170-4ARDZ

Disconnect power from the SDP-K1, or press the reset tact switch on the SDP-K1, before removing the EVAL-AD4170-4ARDZ from the SDP-K1.

AD4170-4 ACE PLUGIN DOWNLOAD AND INSTALL

The **Board.AD417x** plugin can be installed through the following steps:

1. From the **Start** menu of the PC, select **All Programs** > **Analog Devices** > **ACE** > **ACE.exe** to open the ACE software main window shown in Figure 17.
2. Click the **Plug-in Manager** tab on the top left panel in ACE.
3. Expand **Available Packages** and click on **All**. In the search bar on the left side of the panel, enter **AD417x**.
4. Select **Board.AD417x** and click on **Install Selected** at the bottom of the panel.
5. The plugin for the EVAL-AD4170-4ARDZ evaluation board is installed.

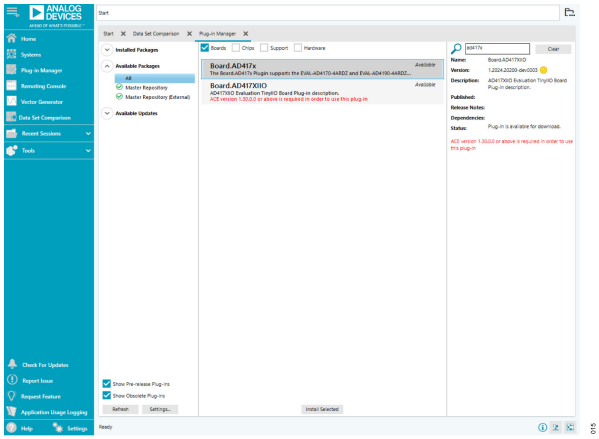

Figure 17. ACE Software Main Window

ACE SOFTWARE OPERATION

LAUNCHING THE SOFTWARE

After the EVAL-AD4170-4ARDZ and SDP-K1 are properly connected to the PC, launch the ACE software by taking the following steps:

1. From the **Start** menu of the PC, select **All Programs** > **Analog Devices** > **ACE** > **ACE.exe** to open the ACE software main window shown in Figure 18.

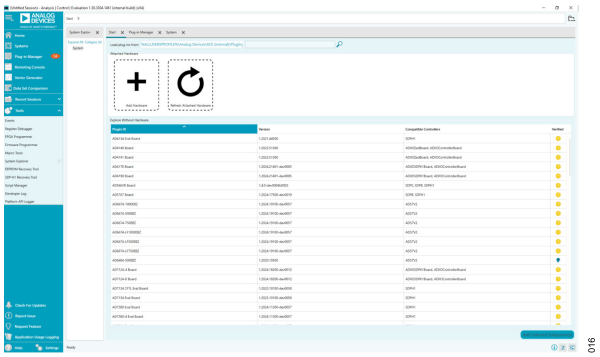

Figure 18. ACE Home Page

2. If the EVAL-AD4170-4ARDZ is not connected to the USB port via the SDP-K1 when the software launches, the **AD4170 Board** icon does not appear in the **Attached Hardware** section in ACE (see Figure 18).To make the **AD4170 Board** icon appear, connect the EVAL-AD4170-4ARDZ and the SDP-K1 to the USB port of the PC, click **Refresh Attached Hardware**, wait a few seconds, and then follow the instructions in the dialog box that opens.
3. Double click the **AD4170 Board** icon to open the **AD4170 Board** view window shown in Figure 19.

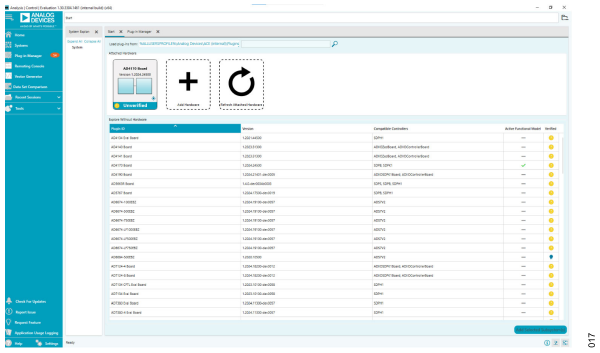

Figure 19. AD4170-4 Evaluation Board Connected

4. Double click the **AD4170** chip icon in the **AD4170 Eval Board** view window to open the **AD4170** chip view window shown in Figure 20.

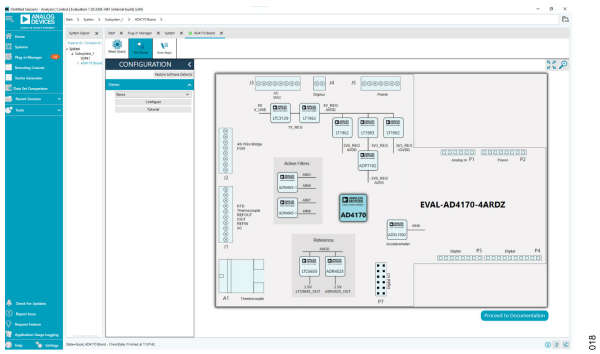

Figure 20. AD4170-4 Evaluation Board View

5. Click **Software Defaults** and then click **Apply Changes** to apply the default settings to the AD4170-4 (see Figure 21).

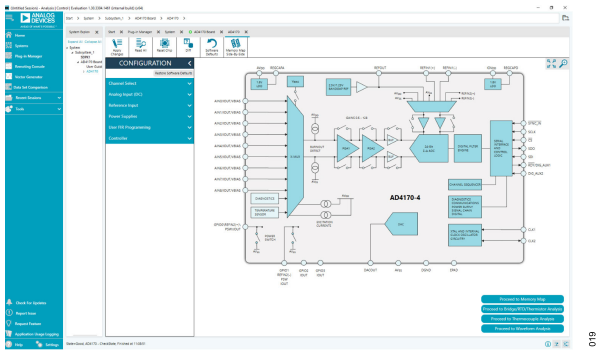

Figure 21. AD4170-4 Chip View

DESCRIPTION OF CHIP VIEW WINDOW

After completing the steps in the Software Installation Procedures section and the Evaluation Board Setup Procedures section, set up the system for data capture by using the following buttons:

- The **Proceed to Memory Map** button brings the user to the memory map of the AD4170-4. This allows the user to configure the AD4170-4.
- The **Proceed to Bridge/RTD/Thermistor Analysis**, **Proceed to Thermocouple Analysis**, and **Proceed to Waveform Analysis** buttons bring the user to the **Analysis** tab, which allows the user to see the performance results of the AD4170-4 and displays the data.

WAVEFORM TAB

The **Waveform** tab graphs the conversions gathered and processes the data, calculating the peak-to-peak noise, RMS noise, and resolution (see Figure 22).

Waveform Graph and Controls

The data waveform graph (Label 1, Figure 22) shows each successive sample of the ADC output. Zoom in on the data in the graph using the scroll wheel on your mouse or by selecting the magnifying glass.

ACE SOFTWARE OPERATION

Analysis Channel

The **Results** section (Figure 22) shows the analysis of the channel selected (Label 2, Figure 22). Multiple channels can be selected or deselected as desired.

Samples

The **Sample Count** numeric control (Label 3, Figure 22) sets the number of samples gathered per batch. This control is unrelated to the ADC mode.

Capture

Click the **Run Once** button (Label 4, Figure 22) to start gathering ADC results. The number of samples in the batch is defined by the samples value set (Label 3, Figure 22). Click the **Run Continuously** button (Label 4, Figure 22) to start continuously gathering batches of ADC results. Results appear in the waveform graph (Label 1, Figure 22).

Display Units and Axis Controls

Click the **Codes** dropdown menu (Label 5, Figure 22) to select whether the data graph displays in units of voltages or codes. The axis controls are fixed. When selecting **Fixed**, the axis ranges can be programmed. However, these ranges do not automatically adjust after each batch of samples.

Noise Analysis

The noise analysis section (Label 2, Figure 22) displays the results of the noise analysis for the selected analysis channel, including both noise and resolution measurements.

AC Analysis

The **Analysis Type** dropdown menu (Label 6, Figure 22) controls the DC or AC analysis. **AC Analysis** allows for use of the **FFT** plot (Label 7, Figure 22).

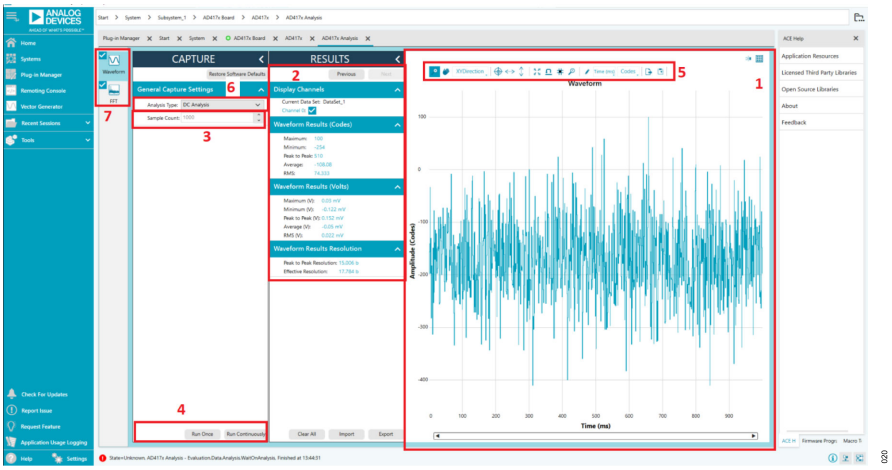

Figure 22. Waveform Tab of the AD4170-4 ACE Plugin

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MEMORY MAP TAB

Use the **AD417x Memory Map** tab to access the registers of the AD4170-4. Figure 23 shows the **AD417x Memory Map** tab. This tab changes register settings and shows additional information about each bit in each individual register.

Export Button

The **Export** button (Label 1, Figure 23) on the **Registers** map tab allows the user to save and load register settings. Click **Save** to save all the current register settings to a file for later use. Click **Load** to load a previously saved register map.

Registers

The **Registers** section (Label 2, Figure 23) shows the value that is set in the selected register. Check the value of the register in this window by clicking on the bits.

Clicking any individual bit changes the bit from 1 to 0 or 0 to 1, depending on the initial state of the bit. The register value can also be changed by writing the hexadecimal value in the input field to the right of the individual bits.

Bitfields

The bitfields section (Label 3, Figure 23) shows the individual bitfield of the selected register. The register is broken by name into its bitfields, name of the bitfields, a description of each bitfield, and access information. Show each individual bitfield by pressing the **Show Bitfields** button (Label 4, Figure 23).

Apply these changes using **Apply Changes** (Label 5, Figure 23). Search for specific registers using the **Registers** section (Label 6, Figure 23).

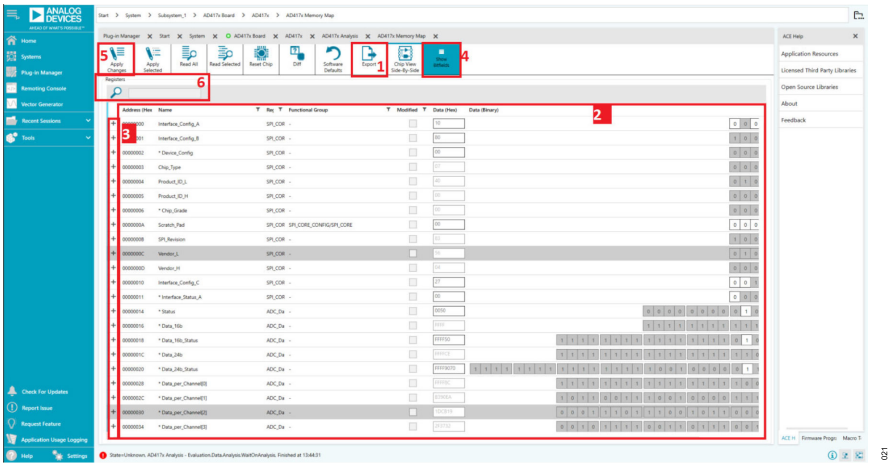

Figure 23. Register Map Tab of the AD4170-4 ACE Plugin

NOISE TEST—QUICK START DEMONSTRATION

To perform a noise test, take the following steps:

1. Double click the **AD4170 Board** icon to open the **AD4170 Board** view window. **CONFIGURATION** is on the left, either as shown in Figure 24 (Label 1) or already expanded. Expand **CONFIGURATION** by clicking the arrow (Label 2, Figure 24).

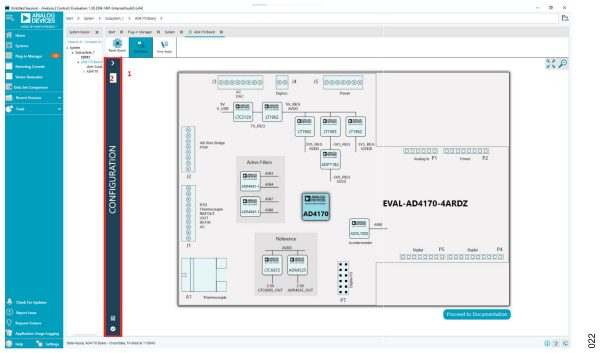

Figure 24. ACE Plugin Configuration

2. The settings required for the demo can be seen by clicking **Tutorial** before writing to the AD4170-4 (Label 3, Figure 25). Click **Configure** (Label 2, Figure 25) to write these settings to the board.

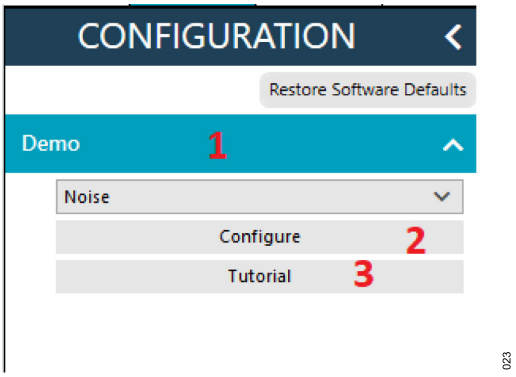

Figure 25. Configuration (Expanded View)

3. The summary is then displayed once the write is complete. From the displayed summary, navigate to the chip view by double clicking the **AD4170-4** chip (Figure 26). To make further changes to the configuration, double click the **Proceed to Memory Map** button (Label 1, Figure 26). To begin capturing data, double click the **Proceed to Waveform Analysis** button (Label 2, Figure 26).

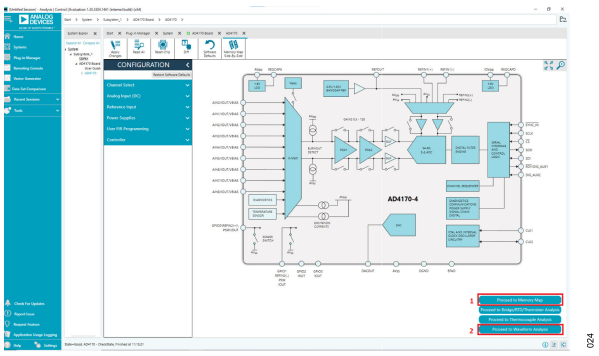

Figure 26. Chip View, Noise Test

4. To gather samples, change **Sample Count** (Label 1, Figure 27) to the number of samples required, then click the **Run Once** button (Label 2, Figure 27) to acquire the samples from the ADC. Figure 27 shows an example of the **Waveform Analysis** window after running a noise test.

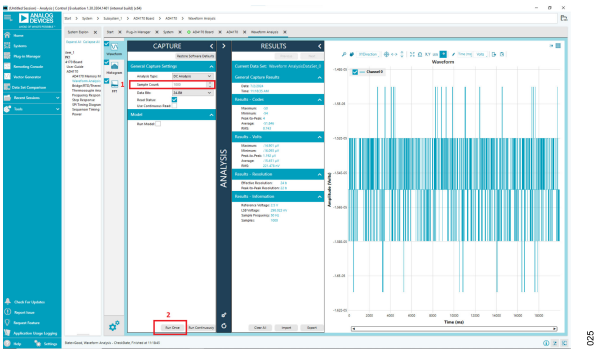

Figure 27. Noise Test Waveform Display

NOISE TEST—QUICK START DEMONSTRATION

NOTES

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.