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ANALOG DEVICES

EVAL-AD7176-2SDZ User Guide
UG-478

One Technology Way • P.O. Box 9106 • Norwood, MA 02062-9106, U.S.A. • Tel: 781.329.4700 • Fax: 781.461.3113 • www.analog.com

Evaluation Board for the AD7176-2—24-Bit, 250 kSPS Sigma-Delta ADC with 20 µs Settling

FEATURES

Full featured evaluation board for the AD7176-2
PC control in conjunction with the system demonstration platform (EVAL-SDP-CB1Z)
PC software for control and data analysis (time domain)
Standalone capability

ONLINE RESOURCES

Evaluation Kit Contents
EVAL-AD7176-2SDZ evaluation board
Evaluation software CD for the AD7176-2
Documents Needed
AD7176-2 data sheet
EVAL-AD7176-2SDZ (UG-478) user guide
Required Software
EVAL-AD7176-2SDZ evaluation software

EQUIPMENT NEEDED

EVAL-AD7176-2SDZ evaluation board
EVAL-SDP-CB1Z system demonstration platform
External 7 V to 9 V power supply
DC signal source
USB cable
PC running Windows with USB 2.0 port

GENERAL DESCRIPTION

The EVAL-AD7176-2SDZ evaluation kit features the AD7176-2 24-bit, 250 kSPS analog-to-digital converter (ADC). A 7 V to 9 V external bench top supply is regulated to 5 V and 3.3 V to supply the AD7176-2 and support all necessary components. The EVAL-AD7176-2SDZ board connects to the USB port of the PC by connection to the EVAL-SDP-CB1Z motherboard.

The EVAL-AD7176-2SDZ software fully configures the AD7176-2 device register functionality and provides dc time domain analysis in the form of waveform graphs, histograms, and associated noise analysis for ADC performance evaluation.

The EVAL-AD7176-2SDZ is an evaluation board that is designed to allow the user to evaluate the features of the ADC. The user PC software executable controls the AD7176-2 over the USB through the system demonstration platform board (EVAL-SDP-CB1Z).

FUNCTIONAL BLOCK DIAGRAM

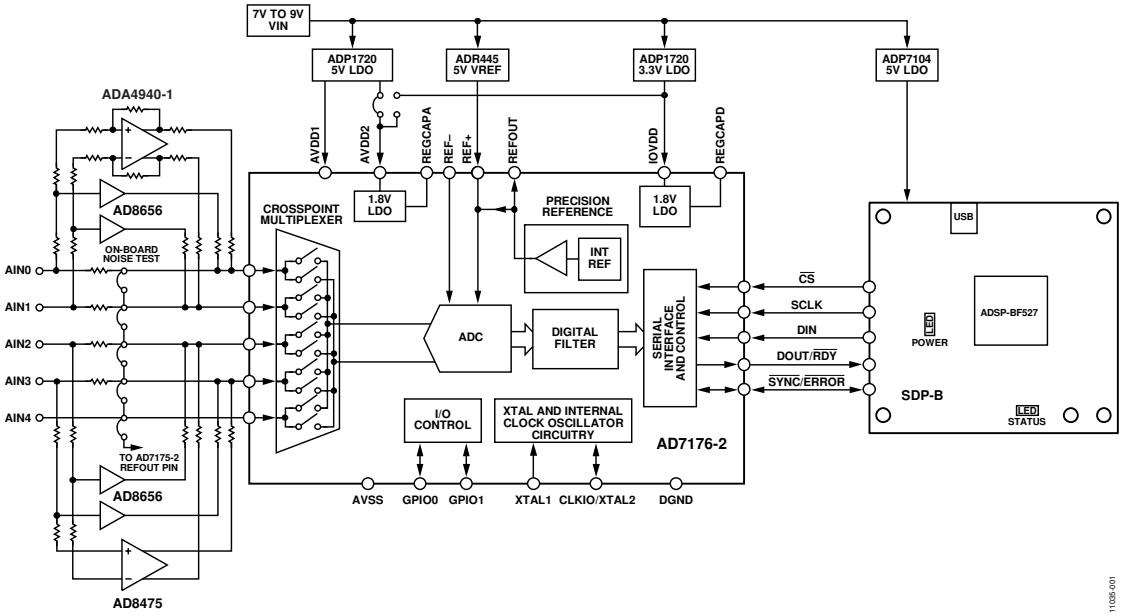

Figure 1. EVAL-AD7176-2SDZ Block Diagram

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REVISION HISTORY

4/14—Rev. 0 to Rev. A

Changes to the Reference Options Section 8

11/12—Revision 0: Initial Version

EVAL-AD7176-2SDZ QUICK START GUIDE

To begin using the evaluation board, do the following:

1. With the EVAL-SDP-CB1Z board disconnected from the USB port of the PC, install the AD7176-2 evaluation board software from the CD included in the evaluation board kit. The PC must be restarted after the software installation is complete. (For complete software installation instructions, see the Software Installation Procedures section.)
2. Connect the EVAL-SDP-CB1Z board to the EVAL-AD7176-2SDZ board as shown in Figure 2.
   a. Screw the two boards together using the plastic screw-washer set included in the evaluation board kit to ensure that the boards are connected firmly together.
3. Apply an external voltage in the range of 7 V to 9 V to the J4 or J5 connecter of the EVAL-AD7176-2SDZ board, as shown in Figure 2 (see Table 3 for more information). This provides the power supply for the board.
4. Connect the EVAL-SDP-CB1Z board to the PC using the supplied USB cable. If you are using Windows® XP, you may need to search for the EVAL-SDP-CB1Z drivers. Choose to automatically search for the drivers for the EVAL-SDP-CB1Z board if prompted by the operating system.
5. Launch the EVAL-AD7176-2SDZ software from the **Analog Devices** subfolder in the **Programs** menu.

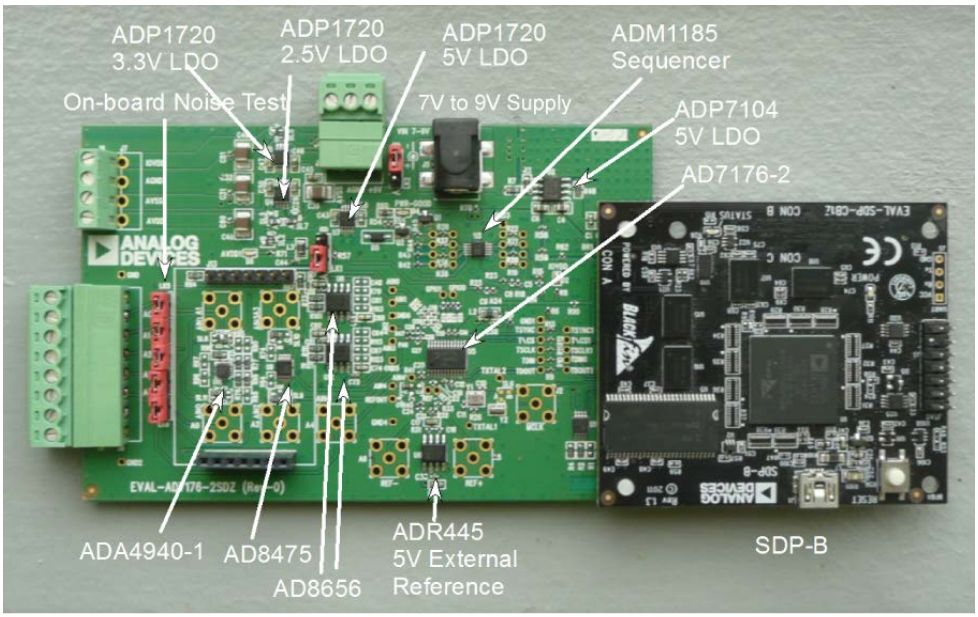


Figure 2. Hardware Configuration—Setting Up the EVAL-AD7176-2SDZ

EVALUATION BOARD HARDWARE

DEVICE DESCRIPTION

The AD7176-2 is a low noise, fast settling, multiplexed, 2-/4-channel (fully differential/pseudo differential) Σ-Δ ADC. The AD7176-2 has a maximum channel-to-channel scan rate of 50 kSPS (20 µs) for fully settled data. The output data rates range from 5 Hz to 250 kHz.

Complete specifications for the AD7176-2 are provided in the product data sheet and should be consulted in conjunction with this user guide when using the evaluation board. Full details about the EVAL-SDP-CB1Z are available on the Analog Devices, Inc., website.

HARDWARE LINK OPTIONS

The default link options are listed in Table 1. By default, the board is configured to operate from the external bench top power supply via Connector J4. The supply required for the AD7176-2 comes from the on-board ADP1720 LDOs, which generate their input voltage from J4.

Table 1. Default Link and Solder Link Options

Link No.	Default Option	Description
LK1	A	Connects the AVDD1 voltage to the power supply sequencer, ADM1185. When AVDD1 equals 5 V, LK1 must be in Position A. When AVDD1 equals 2.5 V, LK1 must be in Position B.
LK2	A	Selects the connector for the external 7 V to 9 V power supply. In Position A, this link selects the external 7 V to 9 V power supply to come from Connector J4. In Position B, this link selects the external 7 V to 9 V power supply to come from Connector J5.
LK5 to LK9	Inserted	Inserting LK5 to LK9 sets up the on-board noise test. In this mode, all inputs are shorted to the REFOUT pin.
SL1	A	Sets the voltage applied to the AVDD2 pin. In Position A, this link sets the voltage applied to the AVDD2 pin to be the same voltage applied to the AVDD1 pin. In Position B, this link sets the voltage applied to the AVDD2 pin to be a 3.3 V supply from the ADP1720-3.3 (U10) regulator or from an external voltage. AVDD2 cannot be set to 3.3 V when AVDD1 equals 2.5 V and AVSS equals −2.5 V.
SL2	A	Sets the voltage applied to the AVDD1 pin. In Position A, this link sets the voltage applied to the AVDD1 pin to be a 5 V supply from the ADP1720-5 (U7) regulator or a 2.5 V supply from the ADP1720 (U4) regulator. In Position B, this link sets the voltage applied to the AVDD1 pin to be supplied from an external voltage source via Connector J9. When AVDD1 equals 2.5 V, AVSS can be set to −2.5 V using an external supply connected to Connector J9. The AVSS to AGND solder links must be removed when a split power supply is used.
SL3, SL7	A, A	With SL3 and SL7 in Position A, AVDD1 is supplied with 5 V from ADP1720-5 (U7) regulator. With SL3 and SL7 in Position B, AVDD1 is supplied with 2.5 V from the ADP1720 (U4) regulator.
SL4	A	With this link in Position A, the AIN4 analog input on the AD7176-2 device is connected to Connector J8. With this link in Position B, the AIN4 analog input is connected to the REFOUT pin of the AD7176-2. With this link in Position C, the AIN4 analog input is connected to ground for use with four pseudo differential inputs, if required.
SL5	B	With this link in Position A, the IOVDD supply is provided from an external source via Connector J9. With this link in Position B, the 3.3 V supply is generated by the ADP1720-3.3 (U10) regulator. The evaluation system operates with 3.3 V logic.
SL6	Not Inserted	Allows an external crystal or clock to be used as the clock source for the AD7176-2. With SL6 not inserted, a crystal is connected to the AD7176-2. With SL6 in Position B, an external clock source can be supplied to the ADC.
SL8	B	With this link in Position A, the AIN1 analog input on the AD7176-2 device is connected to Connector J8. With this link in Position B, the analog input applied via Connector J8 is buffered using the AD8656 before being applied to the AIN1 pin. With this link in Position C, the analog input path includes the ADA4940-1 differential amplifier; therefore, in conjunction with AIN0, a single-ended to differential driver is implemented. With this link in Position D, AIN1 is connected to Header J10.

Link No.	Default Option	Description
SL9	B	With this link in Position A, the AIN2 analog input on the AD7176-2 device is connected to Connector J8. With this link in Position B, the analog input applied via Connector J8 is buffered using the AD8656 before being applied to the AIN2 pin. With this link in Position C, the analog input path includes the AD8475 amplifier; therefore, in conjunction with AIN3, an attenuating single-ended to differential driver is implemented.
SL10	B	With this link in Position A, the AIN3 analog input on the AD7176-2 device is connected to Connector J8. With this link in Position B, the analog input applied via Connector J8 is buffered using the AD8656 before being applied to the AIN3 pin. With this link in Position C, the analog input path includes the AD8475 amplifier; therefore, in conjunction with AIN2, an attenuating single-ended to differential driver is implemented.
SL11	B	With this link in Position A, the AIN0 analog input on the AD7176-2 device is connected to Connector J8. With this link in Position B, the analog input applied via Connector J8 is buffered using the AD8656 before being applied to the AIN0 pin. With this link in Position C, the analog input path includes the ADA4940-1 differential amplifier; therefore, in conjunction with AIN1, a single-ended to differential driver is implemented. With this link in Position D, AIN0 is connected to Header J10.
AVSS to AGND		When these links are inserted, AVSS is tied to AGND. When AVSS is set to −2.5 V, these links must be removed.

On-Board Connectors

Table 2 provides information about the external connectors on the EVAL-AD7176-2SDZ.

Table 2. On-Board Connectors

Connector	Function
J1	A 120-pin connector that mates with the EVAL-SDP-CB1Z (black colored controller board).
J4	Bench top power supply voltage input. Apply 7 V to 9 V and GND (0 V) to this connector to power the evaluation board.
J5	Wall wart (dc plug) power supply voltage input. Apply 7 V to 9 V and GND (0 V) to this connector to power the evaluation board.
J8	Main analog input connector. Connections to AIN0 to AIN4 are available, along with GND connections.
J9	Optional external connector, allowing external bench top or alternative supply for AVDD1, AVDD2, and VIO supplies. When split supplies are used, AVSS is supplied externally via J9.
J10	A 7-pin connector that can be used to connect an external amplifier to Pin AIN0 and Pin AIN1 of the AD7176-2.
J13	A 7-pin connector that allows connection to Pin AIN0 and Pin AIN1 of the AD7176-2.

POWER SUPPLIES

The evaluation board requires that an external power supply—either a bench top supply or a wall wart (dc plug) supply—be applied to J4 or J5 (see Table 3 for more information). Linear regulators generate the required power supply levels from the applied V_{IN} rail. The regulators used are the 5 V ADP1720 (U7) and the 2.5 V ADP1720 (U4), which supply 5 V and 2.5 V, respectively, to AVDD1/AVDD2 of the ADC. The 3.3 V ADP1720 (U10) delivers 3.3 V to the IOVDD pin of the AD7176-2.

When a split power supply is used, the AVSS voltage must be applied from an external source via Connector J9. AVDD1/AVDD2 and IOVDD can also be provided via Connector J9. However, the 7 V to 9 V supply is still required because the on-board reference (ADR445) is supplied from this power supply.

Each supply is decoupled at the point where it enters the board and again at the point where it connects to each device (see the schematics shown in Figure 25 to Figure 28 to identify decoupling points).

SERIAL INTERFACE

The AD7176-2 evaluation board connects via the SPI to the Blackfin® ADSP-BF527 on the EVAL-SDP-CB1Z. There are four primary signals: CS, SCLK, DIN, and DOUT/$\overline{\text{RDY}}$ (all are inputs, except for DOUT/$\overline{\text{RDY}}$, which is an output.)

If you wish to operate the EVAL-AD7176-2SDZ in standalone mode, the AD7176-2 serial interface lines can be disconnected from the 120-pin header by removing the 0 Ω links, R9 through R13. The test points can then be used to fly-wire the signals to an alternative digital capture setup.

ANALOG INPUTS

The EVAL-AD7176-2SDZ primary analog inputs can be applied in two ways:

- Using J8, the green screw in terminal connector on the right hand side of the board.
- Using the A0 to A4 SMB/SMA footprints on the evaluation board.

The AIN0 to AIN3 analog inputs are routed via the AD8656 buffers to the associated input pins on the AD7176-2, and the AIN4 analog input is connected to Connector J8 if LK5 to LK9 are removed, disabling the on-board noise test. The buffers are configured for a gain of 2.

The EVAL-AD7176-2SDZ software is set up to analyze dc inputs to the ADC.

Table 3. Required External Power Supply[1]

Power Supply (V_{IN}) Applied To	Voltage Range	Function
J4	7 V to 9 V	Bench top supply to the evaluation board. Supplies LDOs that create 5 V, 2.5 V, and 3.3 V rails. It also supplies the ADR445 external reference. Ensure that LK2 is set to Position A when the external power supply is applied to this connector.
J5	7 V to 9 V	Wall wart (dc plug) supply to the evaluation board. Supplies LDOs that create 5 V, 2.5 V, and 3.3 V rails. It also supplies the ADR445 external reference. Ensure that LK2 is set to Position B when the external power supply is applied to this connector.

[1] Only a single supply is required, either J4 or J5. This can be selected using LK2.

SOCKETS/CONNECTORS

Table 4. Connector Details

Connector	Function	Connector Type	Manufacturer/Part No.	Order No.
J1	Connector to EVAL-SDP-CB1Z	120-way connector, 0.6 mm pitch	Hirose FX8-120S-SV(21)	Farnell 1324660
J2	External MCLK (SMA/SMB)	Straight PCB mount SMB/SMA jack	Tyco 1-1337482-0	Not inserted
A0 to A4	Analog inputs to ADC	Straight PCB mount SMB/SMA jack	Tyco 1-1337482-0	Not inserted
J4	External bench top voltage supply for EVAL-AD7176-2SDZ	3-pin socket terminal block, 3.81 mm pitch	Phoenix Contact MC 1,5/ 3-G-3,81	Farnell 3704737
J5	External wall wart voltage supply (7 V to 9 V) for EVAL-AD7176-2SDZ	DC power connectors, 2 mm SMT power Jack	Kycon KLDX-SMT2-0202-A	Mouser 806-KLDX-SMT20202A
J8	Analog input screw terminal block; wired connection to external source or sensor	8-pin terminal header, 3.81 mm pitch, vertical	Phoenix Contact MC 1.5/ 8-G-3.81	Farnell 3704774
J9	External bench top voltage supply option for AVDD1/AVDD2 and IOVDD inputs on AD7176-2 device	Screw terminal block, 3.81 mm pitch	Phoenix Contact 1727036	Farnell 370-4592
J10	External amplifier connector	7-pin, SSW, 2.54 mm vertical socket	Samtec SSW-107-01-T-S	Farnell 1803478
J13	Connects to AIN0/AIN1 analog inputs of ADC	7-pin, SIP, 2.54 mm through hole header	Samtec TLW-107-05-G-S	Farnell 1668499

REFERENCE OPTIONS

The EVAL-AD7176-2SDZ includes an external 5 V reference (the ADR445) and an internal 2.5 V reference. The default operation on the AD7176-2 is to use the internal 2.5 V reference.

The reference used for a conversion is selected by choosing the reference in the SETUPCONx registers associated with Setup 1, Setup 2, Setup 3, and Setup 4.

Switch between using the internal reference and external reference by accessing the AD7176-2 register map via the evaluation software. Figure 3 shows how to select the reference source for Setup 1, Setup 2, Setup 3, and Setup 4. Figure 4 shows the ADCMODE register setting that enables the internal reference.

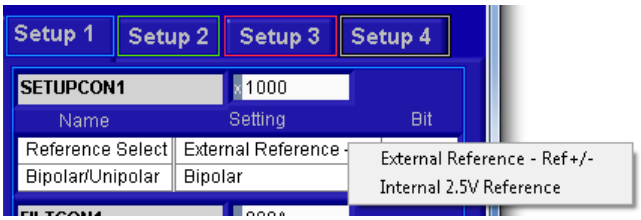


Figure 3. Selecting the Reference Source for Setup 1, Setup 2, Setup 3, and Setup 4

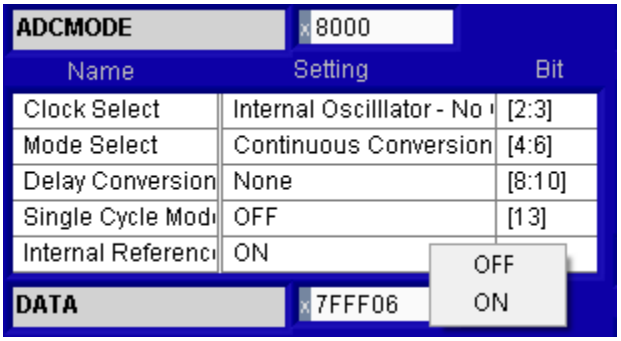


Figure 4. Turning On the Internal 2.5 V Reference

USING THE ON-BOARD AMPLIFIERS

The AD7176-2 evaluation board contains three front-end configurations. The AD8656 is provided for buffering the analog inputs of the AD7176-2. By default, it is configured for a gain of 2, and the front-end is selected on the evaluation board. The ADA4940-1 amplifier provides a single-ended to differential driver, whereas the AD8475 is configured to operate as an attenuating single-ended to differential driver. Figure 5 shows the location of the R and C components on the AD7176-2 evaluation board. Figure 6 and Figure 7 highlight the R and C components that are populated on the board for each amplifier, and Table 5 to Table 7 list the component values.

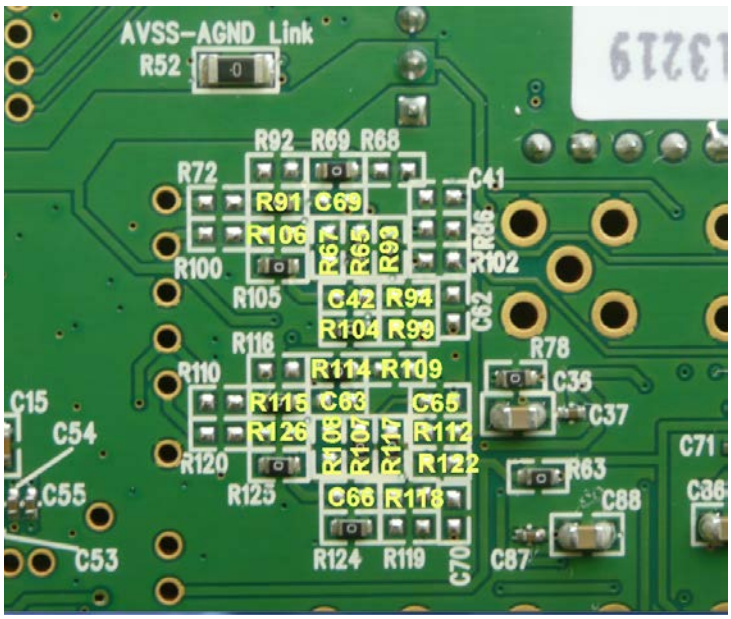


Figure 5. Identification of R/C Components for the Amplifiers

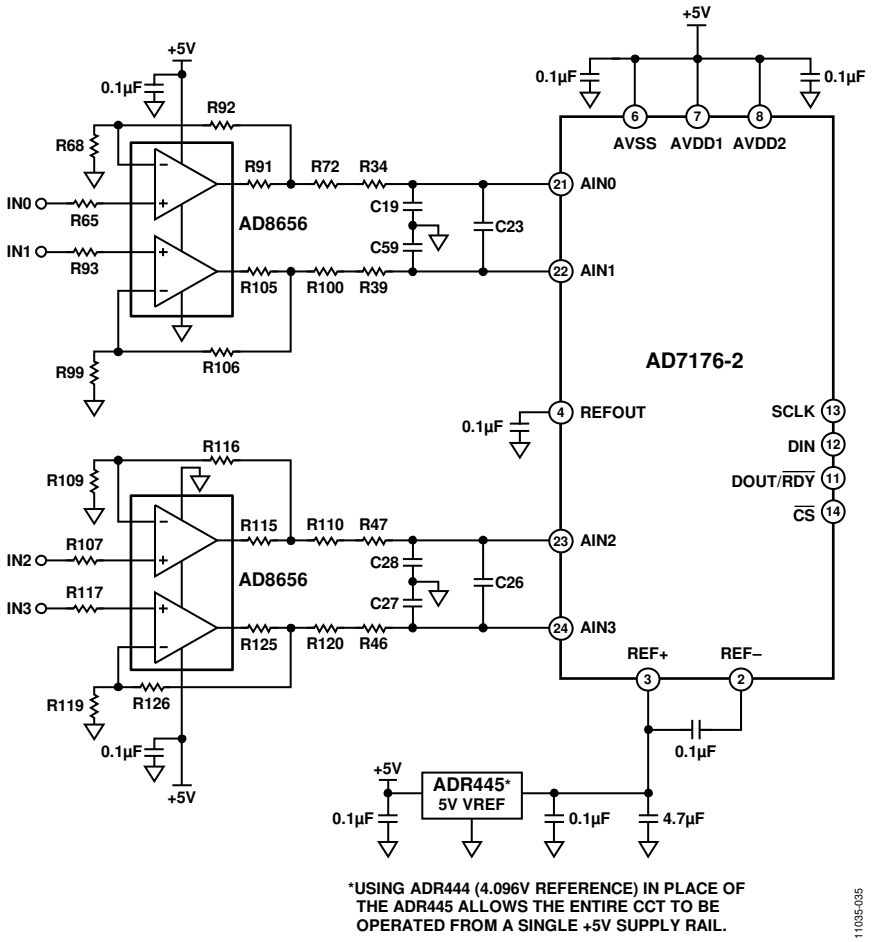


Figure 6. Setup for the AD8656 Amplifiers

Table 5. R/C Values Used with AD8656 Amplifiers (Gain = 2)

U8		U12	
Component	**Status**	**Component**	**Status**
R65	0 Ω	R107	0 Ω
R68	1 kΩ, 0.1%	R109	1 kΩ, 0.1%
R72[1]	0 Ω	R110[2]	0 Ω
R91	10 Ω	R115	10 Ω
R92	1 kΩ, 0.1%	R116	1 kΩ, 0.1%
R93	0 Ω	R117	0 Ω
R99	1 kΩ, 0.1%	R119	1 kΩ, 0.1%
R100[1]	0 Ω	R120[2]	0 Ω
R105	10 Ω	R125	10 Ω
R106	1 kΩ, 0.1%	R126	1 kΩ, 0.1%
R34	0 Ω	R46	0 Ω
R39	0 Ω	R47	0 Ω
C19	270 pF	C27	270 pF
C59	270 pF	C28	270 pF
C23	680 pF	C26	680 pF

[1] Remove R72 and R100 when connecting the ADA4940-1 to the AD7176-2.
[2] Remove R110 and R120 when connecting the AD8475 to the AD7176-2.

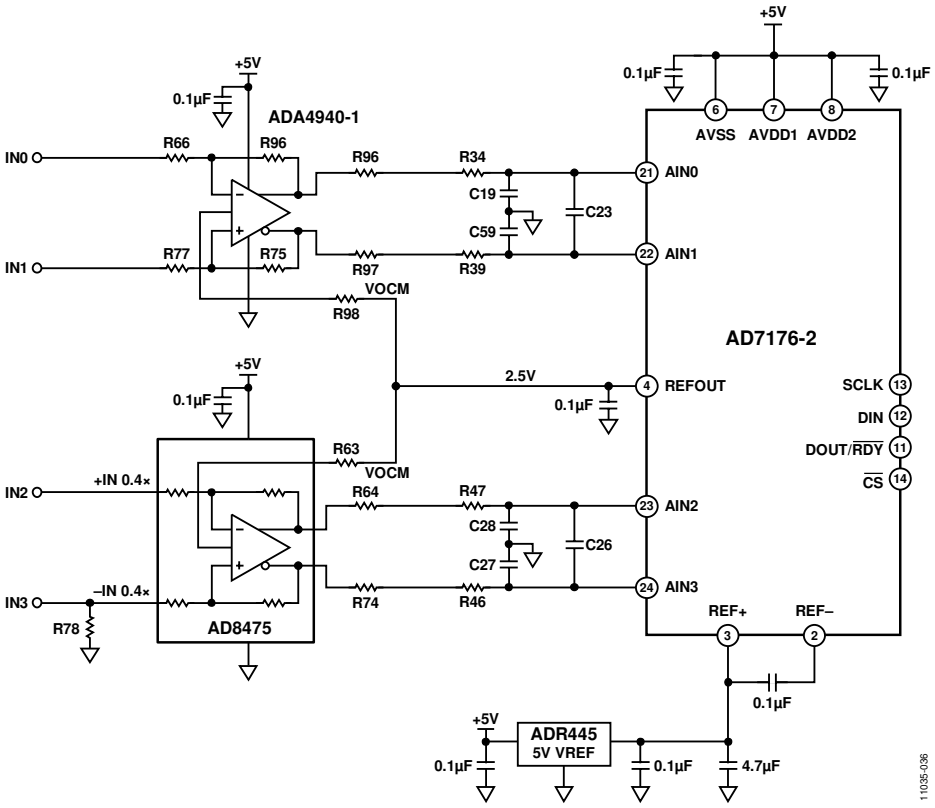


Figure 7. Setup for the ADA4940-1 and AD8475 Amplifiers

Table 6. R/C Components for ADA4940-1 (Single-Ended to Differential Driver)

Component	Status
R66	0 Ω
R75	0 Ω
R76	0 Ω
R77	0 Ω
R96[1]	Not inserted
R97[1]	Not inserted
R98	0 Ω
R34	0 Ω
R39	0 Ω
C19	270 pF
C59	270 pF
C23	680 pF

[1] Insert 0 Ω resistors in R96 and R97 to connect the ADA4940-1 to the AD7176-2, and place the SL8 and SL11 solder links in Position C. Ensure that the R72 and R100 resistors are removed.

Table 7. R/C Components for AD8475 (Attenuating Single-Ended to Differential Driver)

Component	Status
R63	0 Ω
R64[1]	Not inserted
R74[1]	Not inserted
R78	0 Ω
R46	0 Ω
R47	0 Ω
C27	270 pF
C28	270 pF
C26	680 pF

[1] Populate R64 and R74 with 10 Ω resistors to connect the AD8475 to the AD7176-2, and place the SL9 and SL10 solder links in Position C. Ensure that the R110 and R120 resistors are removed.

EVALUATION BOARD SETUP PROCEDURES

After following the instructions in the Software Installation Procedures section, set up the evaluation and SDP boards as detailed in this section.

Warning

The evaluation software and drivers must be installed before connecting the evaluation board and EVAL-SDP-CB1Z board to the USB port of the PC to ensure that the evaluation system is correctly recognized when it is connected to the PC.

Configuring the Evaluation and SDP Boards

1. Connect the EVAL-SDP-CB1Z board to Connector A or Connector B on the EVAL-AD7176-2SDZ board. Screw the two boards together using the plastic screw-washer set included in the evaluation board kit to ensure that the boards are connected firmly together.
2. Connect the power supplies to the EVAL-AD7176-2SDZ board. The EVAL-AD7176-2SDZ board requires an external bench top power supply in the range of 7 V to 9 V. Connect this supply to J4 on the EVAL-AD7176-2SDZ board. (For more information about the required connections and available options, refer to the Power Supplies section.)
3. Connect the EVAL-SDP-CB1Z board to the PC using the supplied USB cable.

EVALUATION BOARD SOFTWARE

SOFTWARE INSTALLATION PROCEDURES

The EVAL-AD7176-2SDZ evaluation kit includes a CD containing software to be installed on your PC before you begin using the evaluation board.

There are two parts to the installation:

- AD7176-2 evaluation board software installation
- EVAL-SDP-CB1Z system demonstration platform board drivers installation

Warning

The evaluation software and drivers must be installed before connecting the evaluation board and EVAL-SDP-CB1Z board to the USB port of the PC to ensure that the evaluation system is correctly recognized when it is connected to the PC.

Installing the AD7176-2 Evaluation Board Software

To install the AD7176-2 evaluation board software,

1. With the EVAL-SDP-CB1Z board disconnected from the USB port of the PC, insert the installation CD into the CD-ROM drive.
2. Double-click the **setup.exe** file to begin the evaluation board software installation. The software is installed to the following default location: **C:\Program Files\Analog Devices**AD7176-2.
3. A dialog box appears asking for permission to allow the program to make changes to your computer. Click **Yes**.

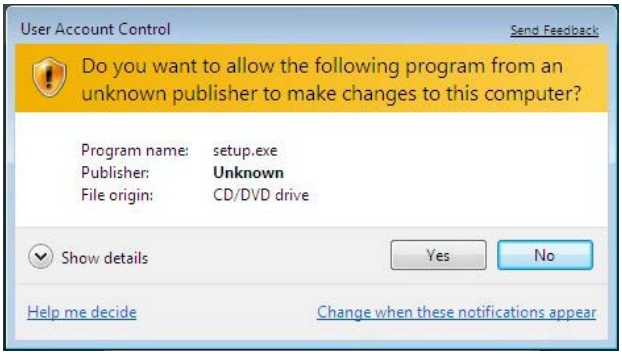


Figure 8. AD7176-2 Evaluation Software Installation: Granting Permission for the Program to Make Changes to Your Computer

4. Select the location to install the software, and then click **Next**. (Figure 9 shows the default locations, which are displayed when the window opens, but you can select another location by clicking **Browse**.)

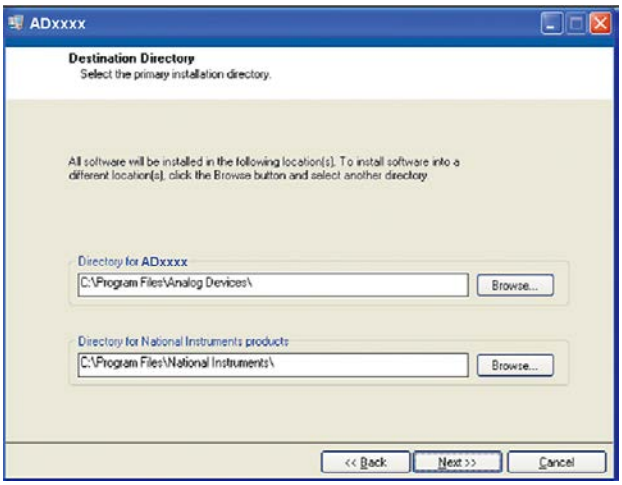


Figure 9. AD7176-2 Evaluation Software Installation: Selecting the Location for Software Installation

5. A license agreement appears. Read the agreement, and then select **I accept the License Agreement** and click **Next**.

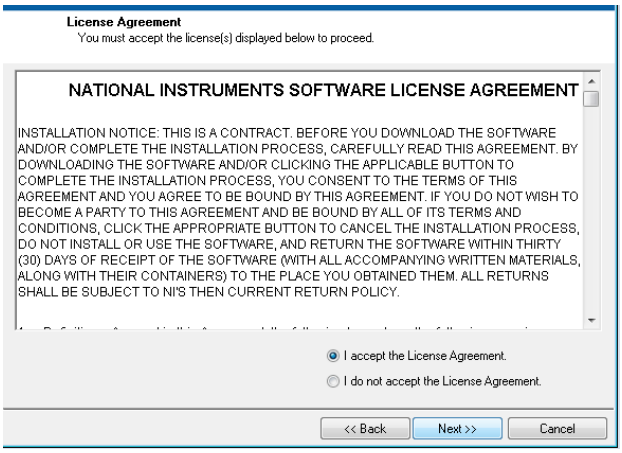


Figure 10. AD7176-2 Evaluation Software Installation: Accepting the License Agreement

6. A summary of the installation is displayed. Click **Next** to continue.

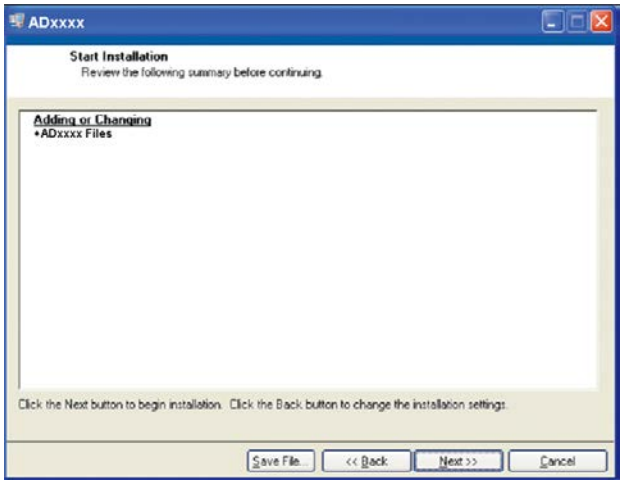


Figure 11. AD7176-2 Evaluation Software Installation: Reviewing a Summary of the Installation

7. A dialog box informs you when the installation is complete. Click **Next**.

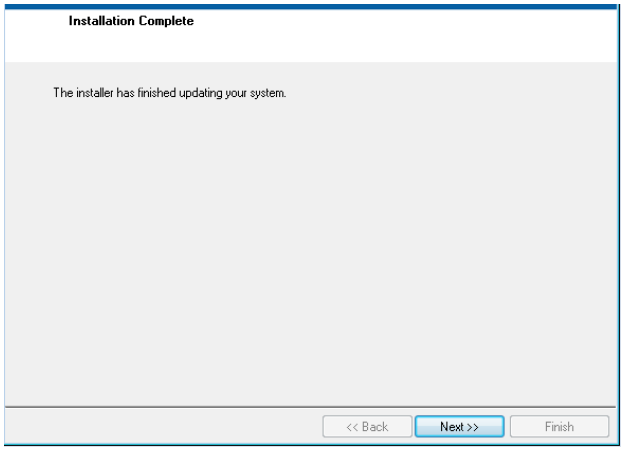


Figure 12. AD7176-2 Evaluation Software Installation: Indicating When the Installation Is Complete

Installing the EVAL-SDP-CB1Z System Demonstration Platform Board Drivers

After the installation of the evaluation software is complete, a welcome window is displayed for the installation of the EVAL-SDP-CB1Z system demonstration platform board drivers.

1. With the EVAL-SDP-CB1Z board still disconnected from the USB port of the PC, make sure that all other applications are closed, and then click **Next**.

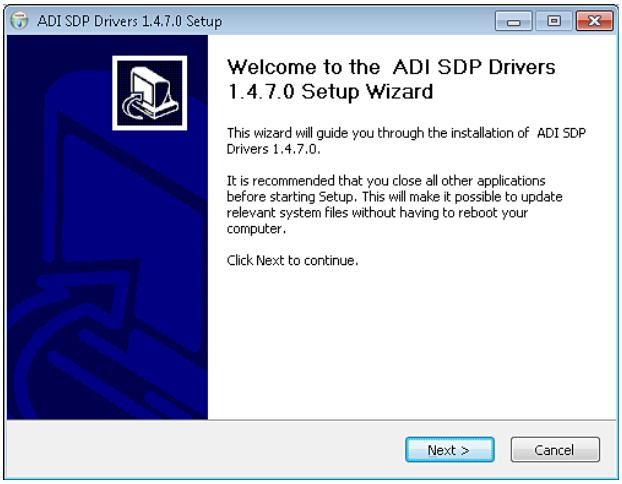


Figure 13. EVAL-SDP-CB1Z Drivers Setup: Beginning the Drivers Installation

2. Select the location to install the drivers, and then click **Next**.

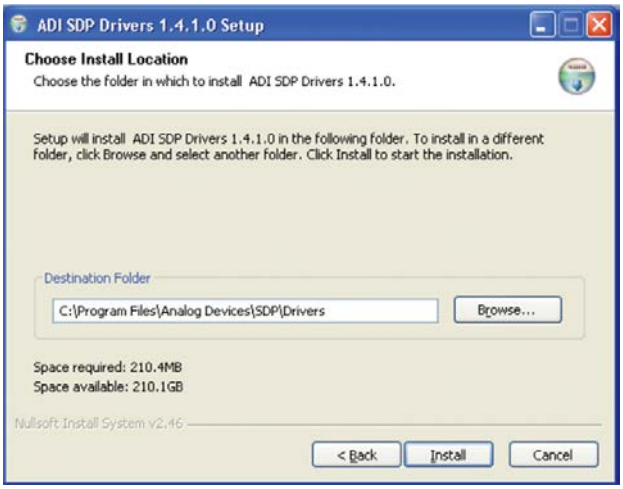


Figure 14. EVAL-SDP-CB1Z Drivers Setup: Selecting the Location for Drivers Installation

3. Click **Install** to confirm that you would like to install the drivers.

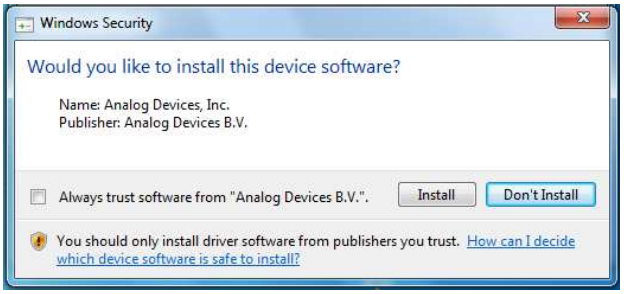


Figure 15. EVAL-SDP-CB1Z Drivers Setup: Granting Permission to Install Drivers

4. To complete the drivers installation, click **Finish**, which closes the installation wizard.

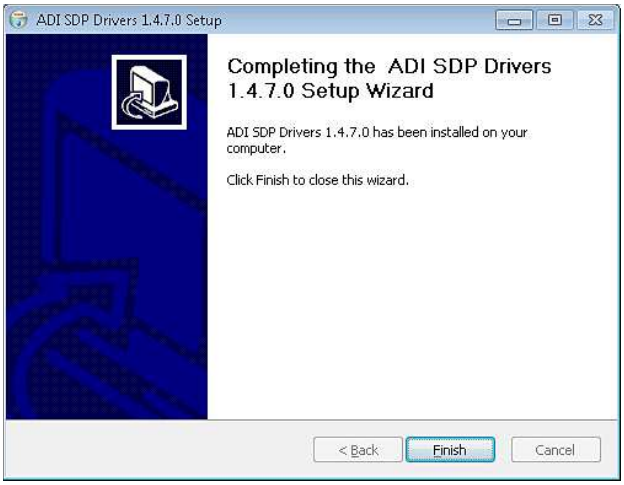


Figure 16. EVAL-SDP-CB1Z Drivers Setup: Completing the Drivers Setup Wizard

5. Before using the evaluation board, you must restart the computer.

Figure 17. EVAL-SDP-CB1Z Drivers Setup: Restarting the Computer

SETTING UP THE SYSTEM FOR DATA CAPTURE

After completing the steps in the Software Installation Procedures and Evaluation Board Hardware sections, set up the system for data capture as follows:

1. Allow the **Found New Hardware Wizard** to run after the EVAL-SDP-CB1Z board is plugged into your PC. (If you are using Windows XP, you may need to search for the EVAL-SDP-CB1Z drivers. Choose to automatically search for the drivers for the EVAL-SDP-CB1Z board if prompted by the operating system.)
2. Check that the board is connecting to the PC correctly using the **Device Manager** of the PC.
   a. Access the **Device Manager** as follows:
      i. Right-click **My Computer** and then click **Manage**.
      ii. A dialog box appears asking for permission to allow the program to make changes to your computer. Click **Yes**.
      iii. The **Computer Management** box appears. Click **Device Manager** from the list of **System Tools** (see Figure 18).
   b. The EVAL-SDP-CB1Z board should appear under **ADI Development Tools**. This indicates that the driver software is installed and that the board is connecting to the PC correctly.

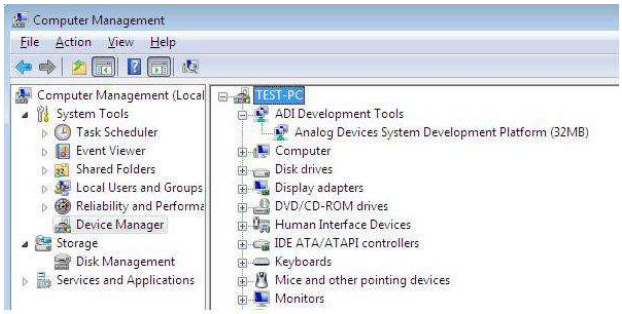


Figure 18. Device Manager: Checking That the Board Is Connected to the PC Correctly

Launching the Software

After completing the steps in the Setting Up the System for Data Capture section, launch the AD7176-2 software as follows:

1. From the **Start** menu, select **Programs** > **Analog Devices** > AD7176-2 > AD7176-2 **Evaluation Board Software**. The main window of the software then displays.
2. If the AD7176-2 evaluation system is not connected to the USB port via the EVAL-SDP-CB1Z when the software is launched, a connectivity error displays (see Figure 19). Connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and then follow the on-screen instructions.

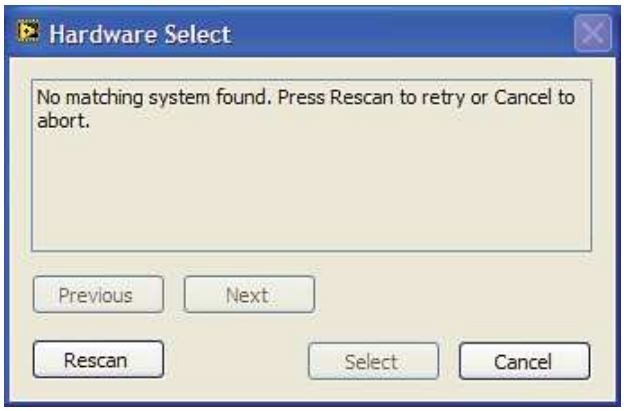


Figure 19. Connectivity Error Alert

When the software starts running, it searches for hardware connected to the PC. A dialog box indicates when the generic SDP attached to the PC is detected, and then the main window appears (see Figure 20).

SOFTWARE OPERATION

Overview of the Main Window

The main window of the software (see Figure 20) contains the significant control buttons and analysis indicators of the AD7176-2 software.

ADC Setup Button

Clicking **ADC Setup**, located near the top left of the main window (see Figure 20), opens the **AD7176-2 Register Interface** window.

Start Sampling Button

Clicking **Start Sampling**, located near the top right hand corner of the main window (see Figure 20), starts ADC sampling; results are reported in the graphs of the **DATA** and **ANALYSIS** sections of the main window.

Data Graph

The graph in the upper half, or **DATA** section, of the main window, shows each successive sample of the ADC output (input referred).

The indicators beside this graph show the latest data value, the channel being converted, and the flag for the error diagnostics of the AD7176-2. Navigation tools are provided to allow you to control the cursor, zooming, and panning (see Figure 20).

Analysis Graph

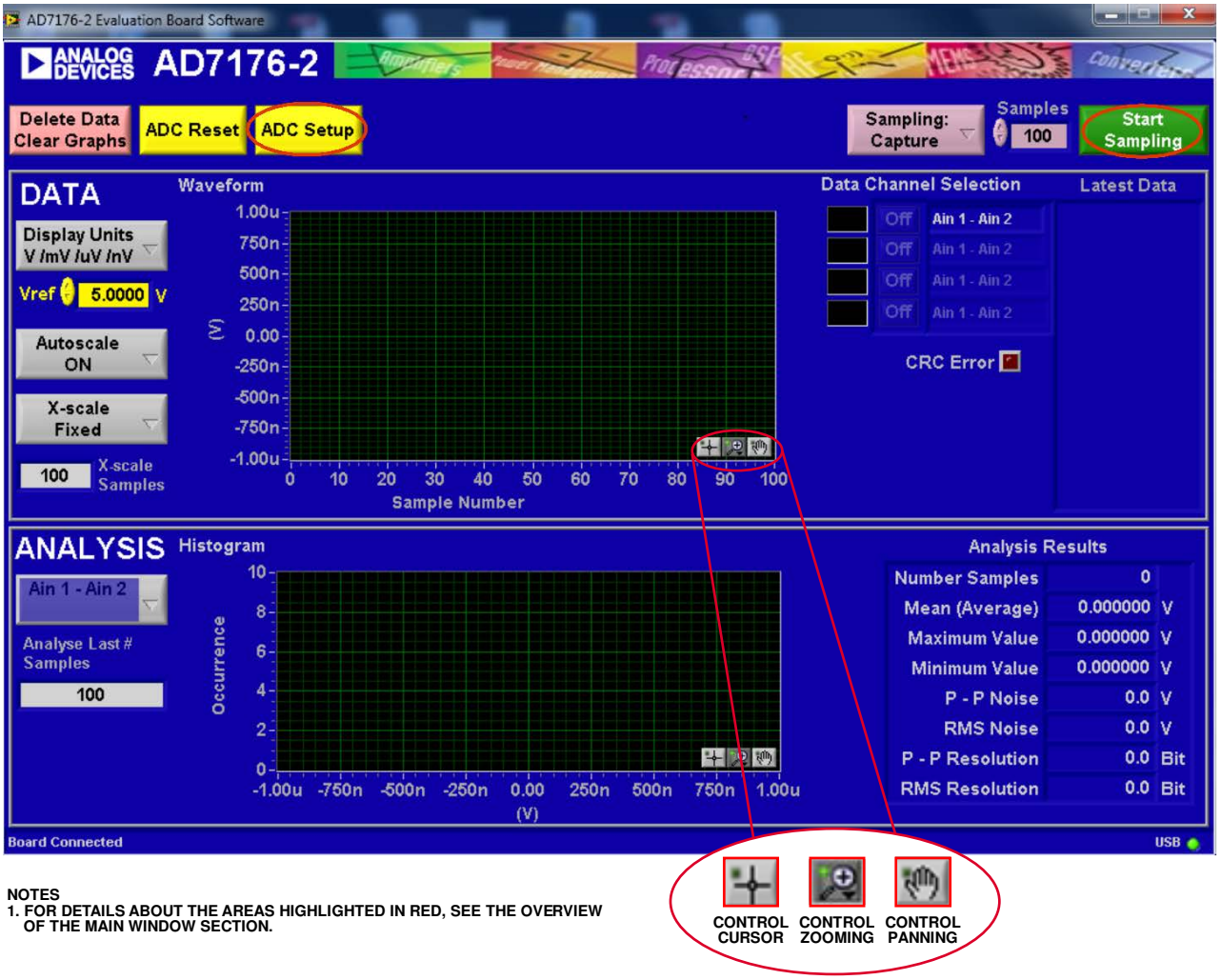
The graph in the bottom half, or **ANALYSIS** section, of the main window, shows the histogram analysis; to the right of the graph, the respective noise analysis on the indicator is shown. Navigation tools are provided to allow you to control the cursor, zooming, and panning (see Figure 20).

CRC Error Indicator

This LED icon illuminates when there has been a CRC error detected in the communications between the software and the AD7176-2. The CRC functionality on the AD7176-2 is disabled by default.

Exiting the Software

To exit the software, click the red X at the top right hand corner of the main window.



NOTES
1. FOR DETAILS ABOUT THE AREAS HIGHLIGHTED IN RED, SEE THE OVERVIEW OF THE MAIN WINDOW SECTION.

Figure 20. Main Window

Noise Test—Quick Start Demonstration

To perform a noise test using the AD7176-2 evaluation board, LK5 to LK9 should be inserted so that the analog inputs are connected together. The internal reference should be enabled and made available at the REFOUT pin. The internal reference biases the analog inputs to an appropriate voltage.

1. Click **ADC Setup** to open the **AD7176-2 Register Interface** window. The AD7176-2 should be configured as follows:
   a. In the ADCMODE register, the internal reference is enabled and outputs a buffered 2.5 V to the REFOUT pin.
   b. In the CHMAP1 register, AIN2 is connected to the positive input, AIN3 is connected to the negative input of the ADC for this channel, and Setup 1 is selected. Therefore, the AIN2 to AIN3 conversion is mapped using the Setup 1 configuration.
   c. Setup 1 is configured with the following register settings:
      i. In the SETUPCON1 register, the external reference is selected as the reference source for the ADC conversion.
      ii. In the FILTCON1 register, the output data rate is set to 1 kHz, and the fast settling filter (Sinc5 + Sinc1) is enabled.
      iii. In the OFFSET1 register, the default offset register value is selected.
      iv. In the GAIN1 register, the factory trimmed gain error value is selected.
2. Figure 21 shows the contents of this window and the state of the AD7176-2 registers. Click **OK** to return to the main window. Figure 22 shows an example of the main window after running a noise test.
3. Set the number of samples to be collected in each batch in the **Samples** box, which is located just to the left of **Start Sampling**, near the top right hand corner of the main window.
4. Click **Start Sampling** to acquire samples from the ADC.

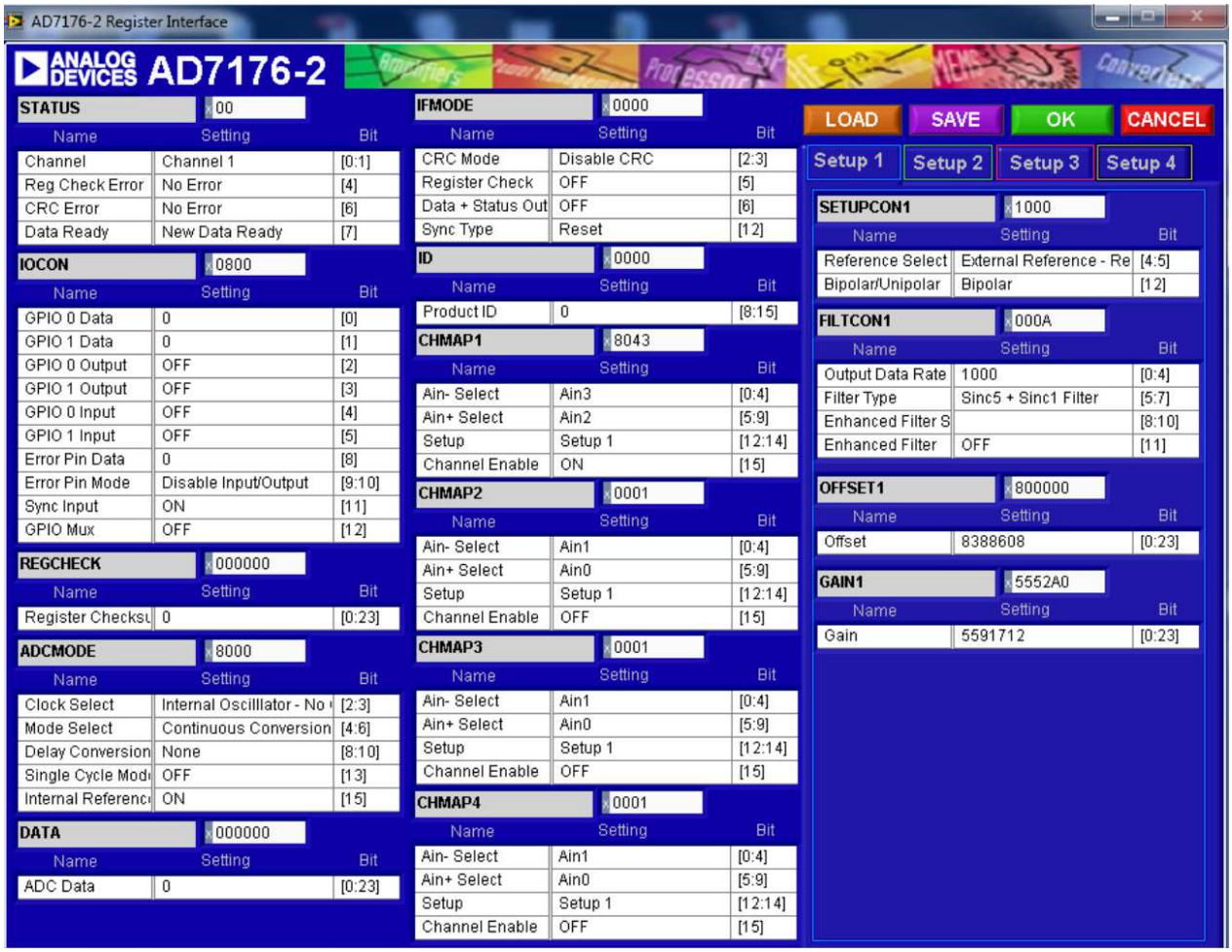


Figure 21. Configuration for Noise Test

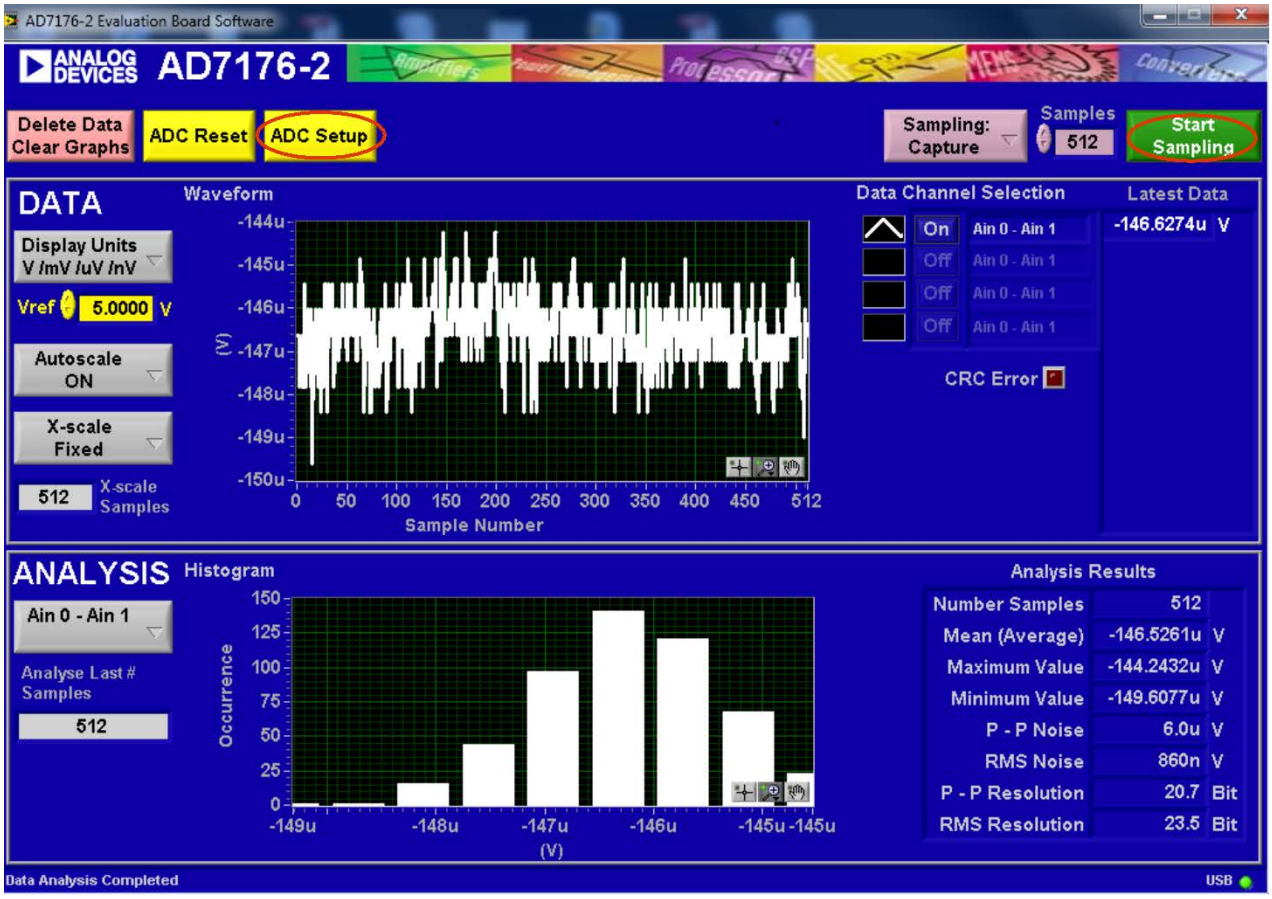


Figure 22. Example of the Main Window After Running a Noise Test

Reading Samples from the ADC

The evaluation board is set up to use the external 5 V on-board reference (ADR445). To read samples from the ADC,

1. The value in the **Vref** box is set to 5.0000 V by default to use the external 5 V on-board reference (ADR445). If a different reference is used, such as the 2.5 V internal reference, set the value in the **Vref** box accordingly. (The analysis results are based on the value set in this box.)
2. Select the number of samples to analyze in the **Samples** box. (Note that when performing a continuous capture, this number is limited to 65,536 samples.)
3. When **Sampling** is set to **Capture**, a batch of samples is read when **Start Sampling** is clicked, with the batch size being set by the value in the **Samples** box. When **Sampling** is set to **Continuous**, the software performs a continuous capture from the ADC when **Start Sampling** is clicked.
4. Click **Stop** to stop streaming data.
5. Use the navigation tools within each graph to control the cursor, zooming, and panning (see Figure 20).
6. If desired, save the current captured data for later analysis (see Figure 24 and the Save File section).

DC Waveform Capture

The waveforms resulting from the gathered samples are shown in the top graph of the window. The right hand side of the window indicates which channel is selected and the value of the last sample of the batch. The conversions can be displayed as codes or as volts.

DC Testing—Histogram

The histogram resulting from the gathered samples is shown in the bottom graph. Parameters such as peak-to-peak noise and rms noise are displayed to the right of the graph in the **Analysis Results** section for the current batch of samples.

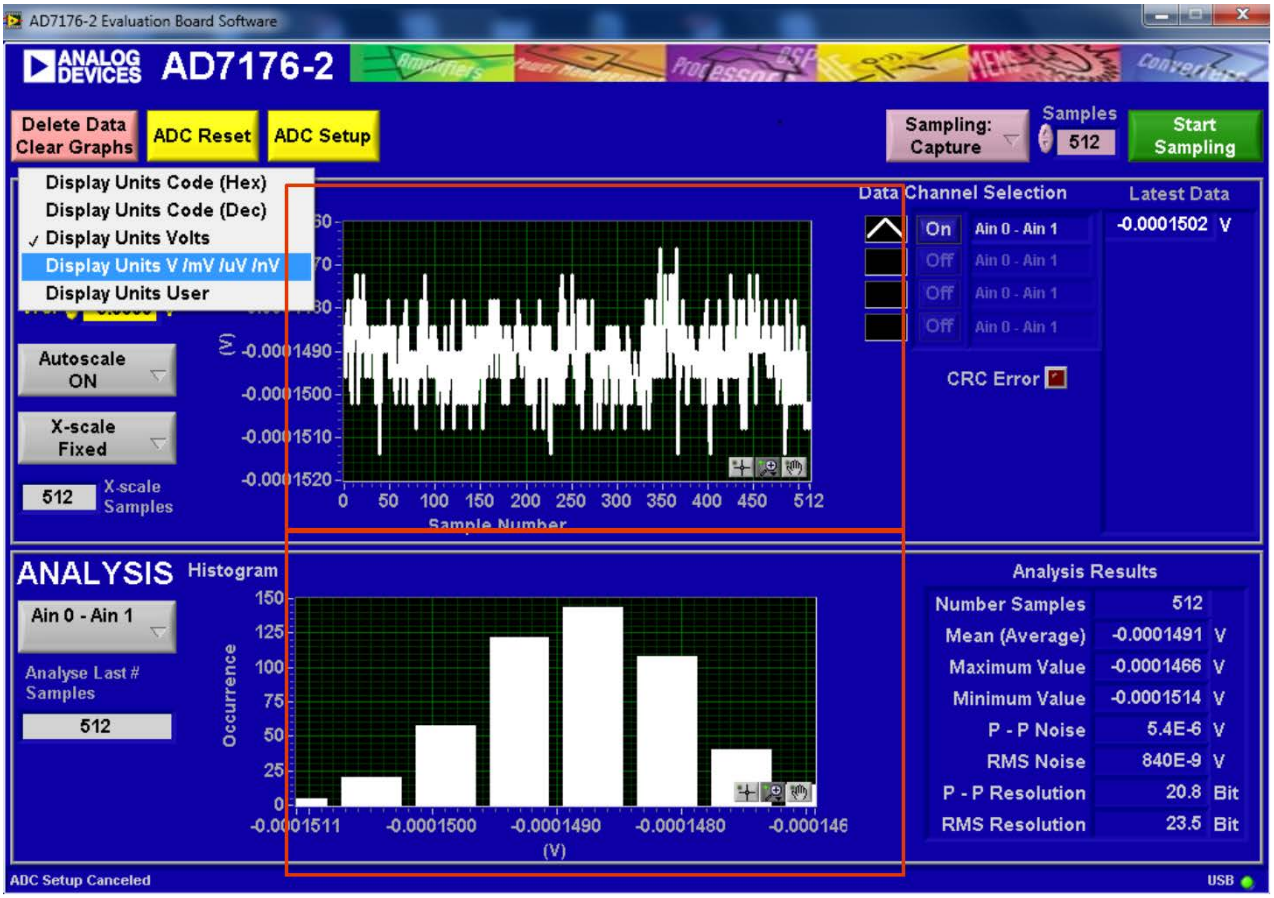


Figure 23. Waveform and Histogram Analysis

Save File

The software can save the current captured data for later analysis (see Figure 24).

1. Right-click on the waveform or histogram graph.
2. Select **Export Data** from the drop-down menu that appears.

A **Save** dialog box is displayed, prompting you to save the data to an appropriate folder location.

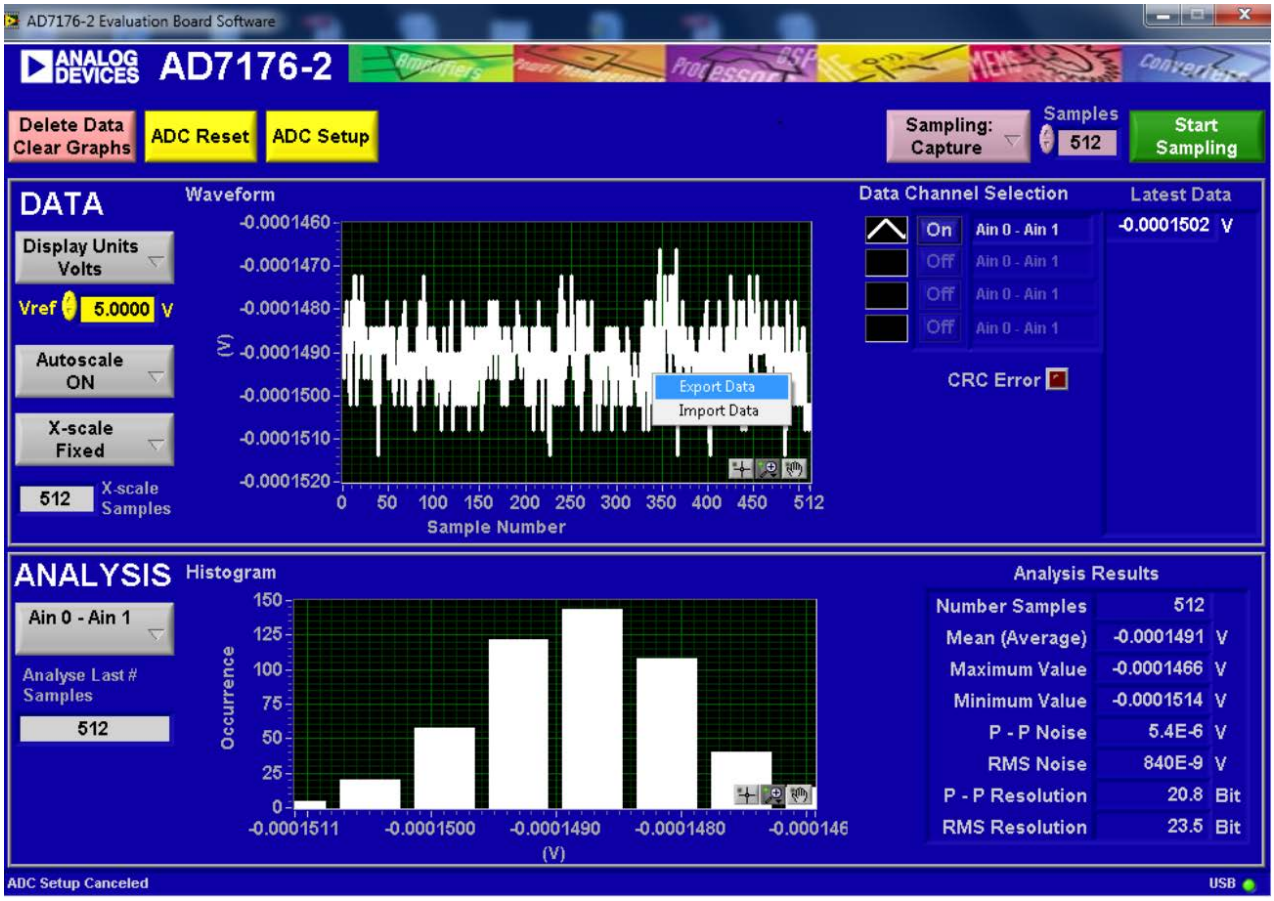


Figure 24. Exporting Data to Save Results

EVALUATION BOARD SCHEMATICS AND ARTWORK

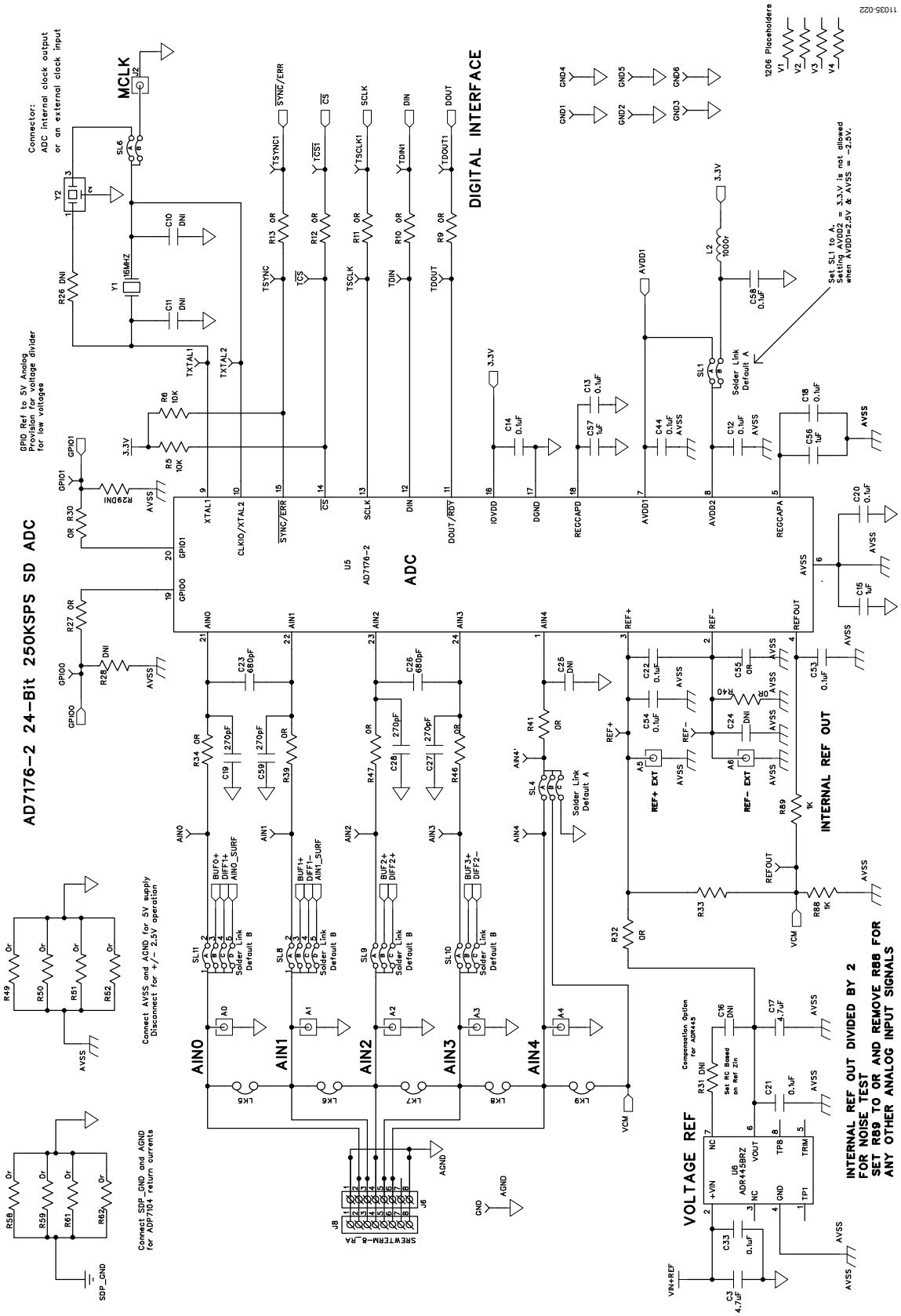


Figure 25. Schematic—AD7176-2

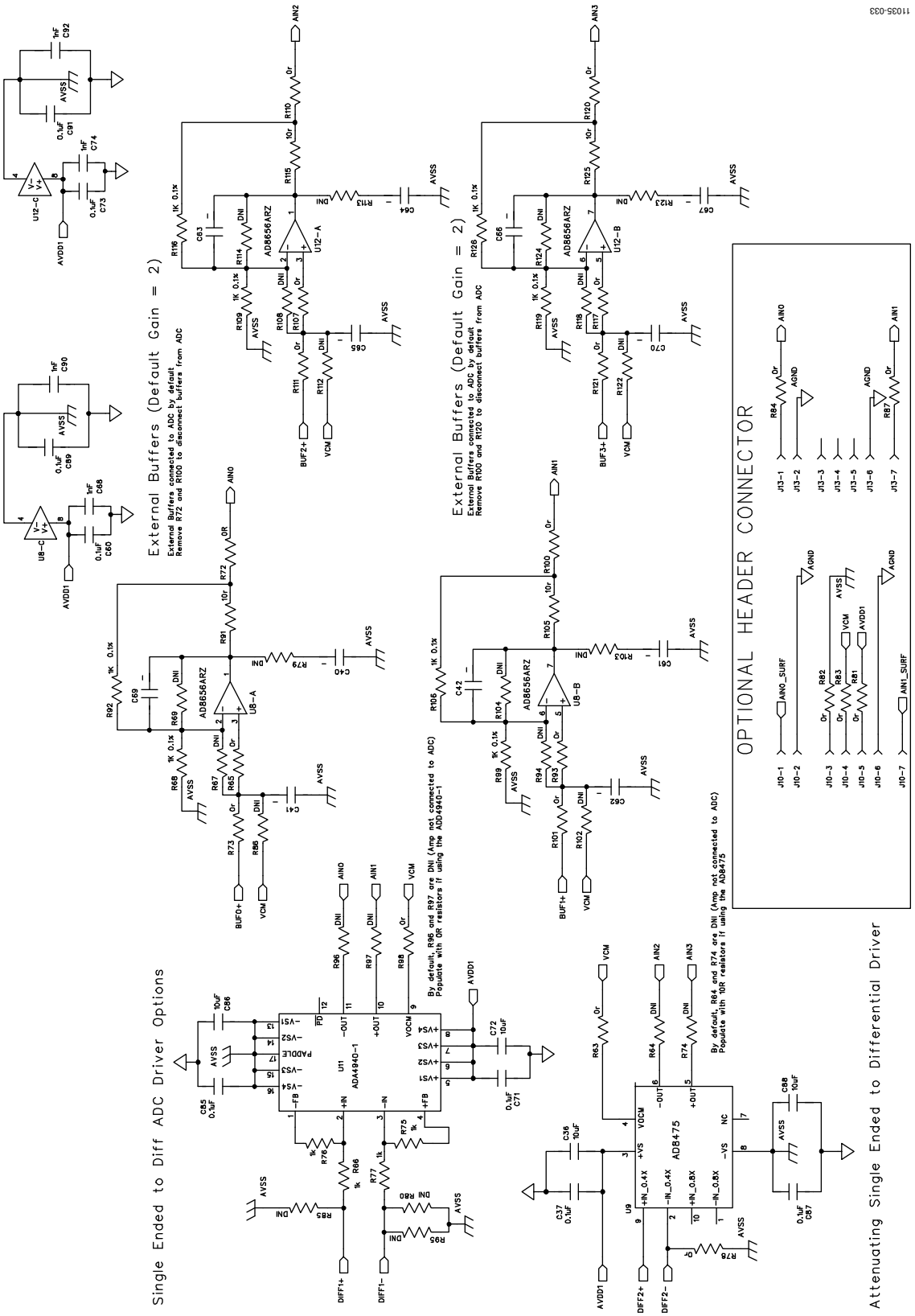


Figure 26. Schematic—Amplifiers

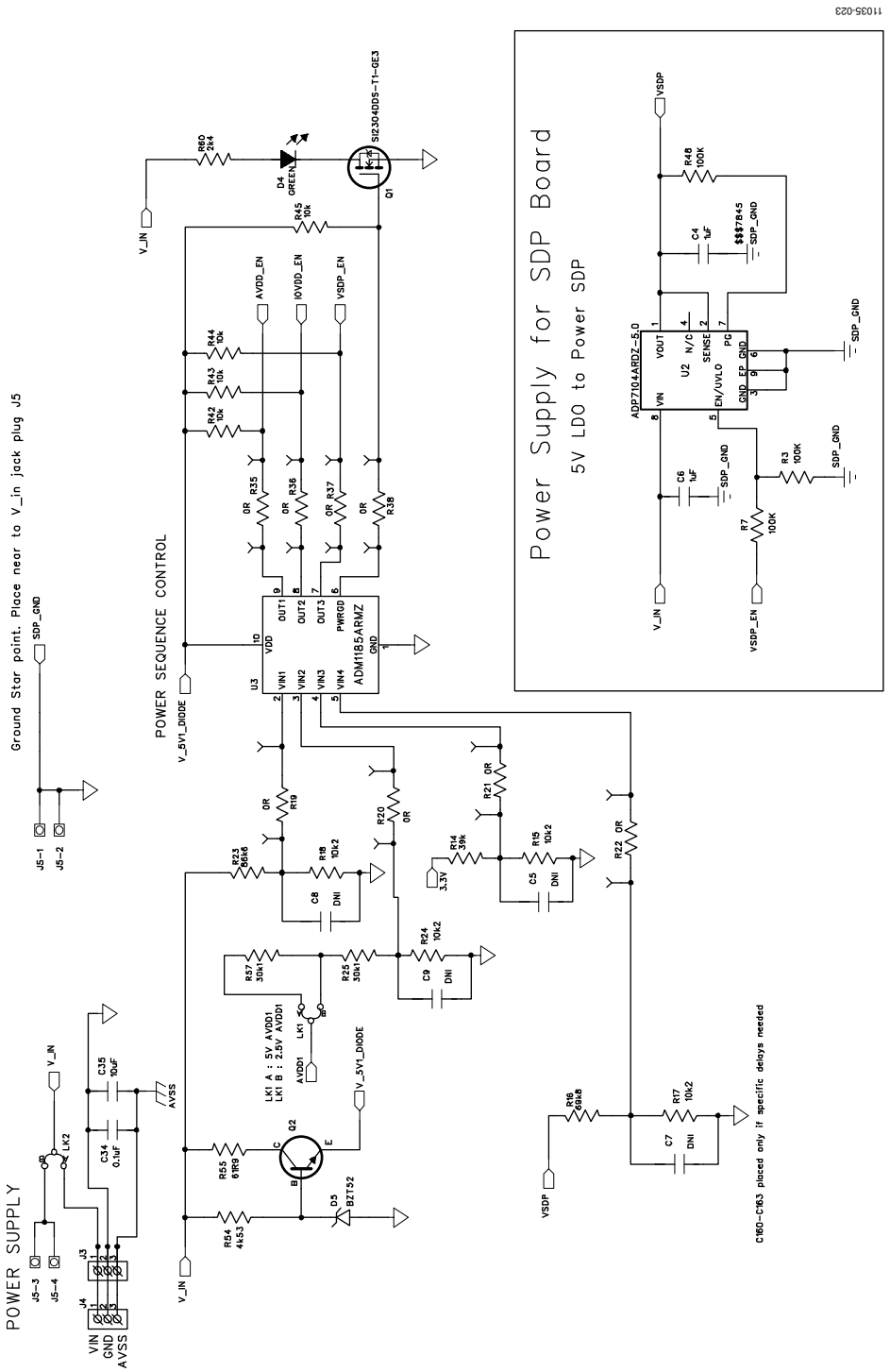


Figure 27. Schematic—Power Supply Sequencing

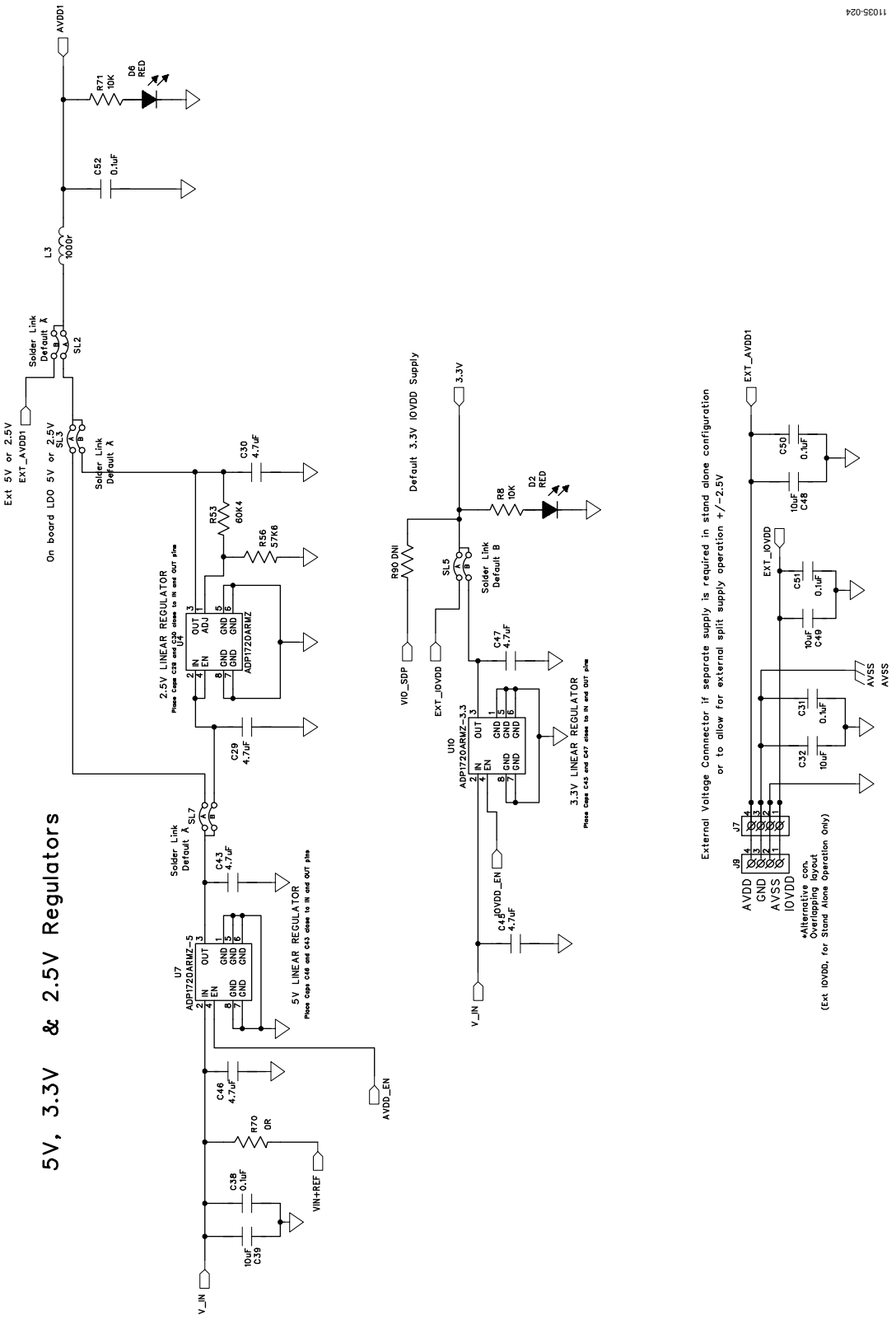


Figure 28. Schematic—Regulators

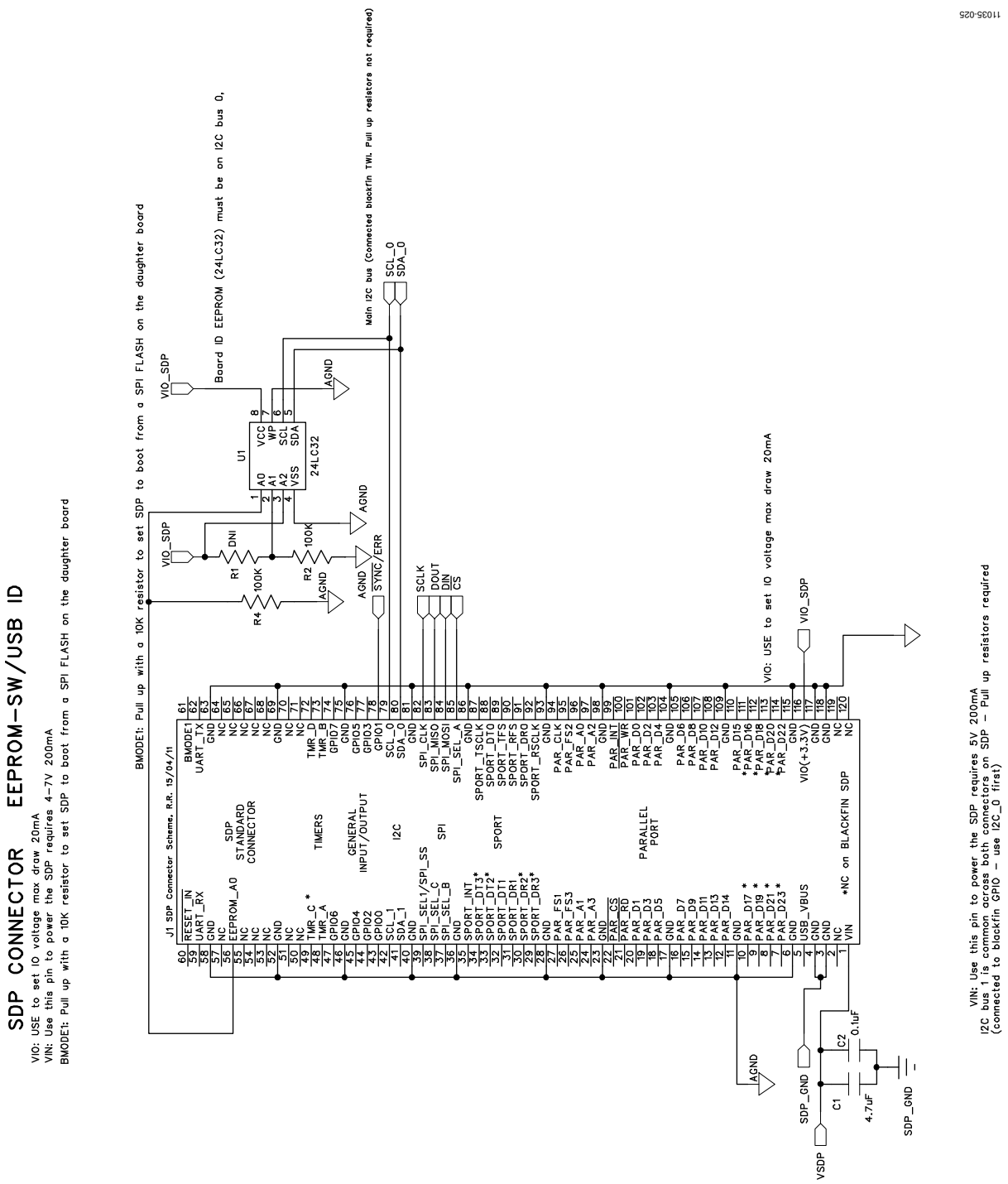


Figure 29. Schematic—SDP Connector