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EVAL-AD7173-8SDZ User Guide

UG-631

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

Evaluating the AD7173-8 24-Bit, 31.25 kSPS, Sigma-Delta ADC with 161 µs Settling and Integrated Analog Input Buffers

FEATURES

Full featured evaluation board for the AD7173-8
PC control in conjunction with the SDP (see EVAL-SDP-CB1Z from Analog Devices, Inc. for additional information)
PC software for control and data analysis (time domain)
Standalone capability

EVALUATION KIT CONTENTS

EVAL-AD7173-8SDZ evaluation board
AD717x Eval+ software CD
7 V to 9 V ac-to-dc adapter

EQUIPMENT NEEDED

DC signal source
PC running Windows® XP to Windows 10

GENERAL DESCRIPTION

The EVAL-AD7173-8SDZ evaluation kit features the AD7173-8, a 24-bit, 31.25 kSPS analog-to-digital converter (ADC) with integrated analog input buffers, on-board power supply regulation, and an external amplifier section for amplifier evaluation. A 7 V to 9 V ac-to-dc adapter is regulated to 5 V and 3.3 V; this supplies the AD7173-8 and support components. The EVAL-AD7173-8SDZ board connects to a USB port via the system demonstration platform (SDP) EVAL-SDP-CB1Z (SDP-B) controller board.

The AD717x Eval+ software fully configures the AD7173-8 device functionality via a user accessible register interface and provides dc time domain analysis in the form of waveform graphs, histograms, and associated noise analysis for ADC performance evaluation.

FUNCTIONAL BLOCK DIAGRAM

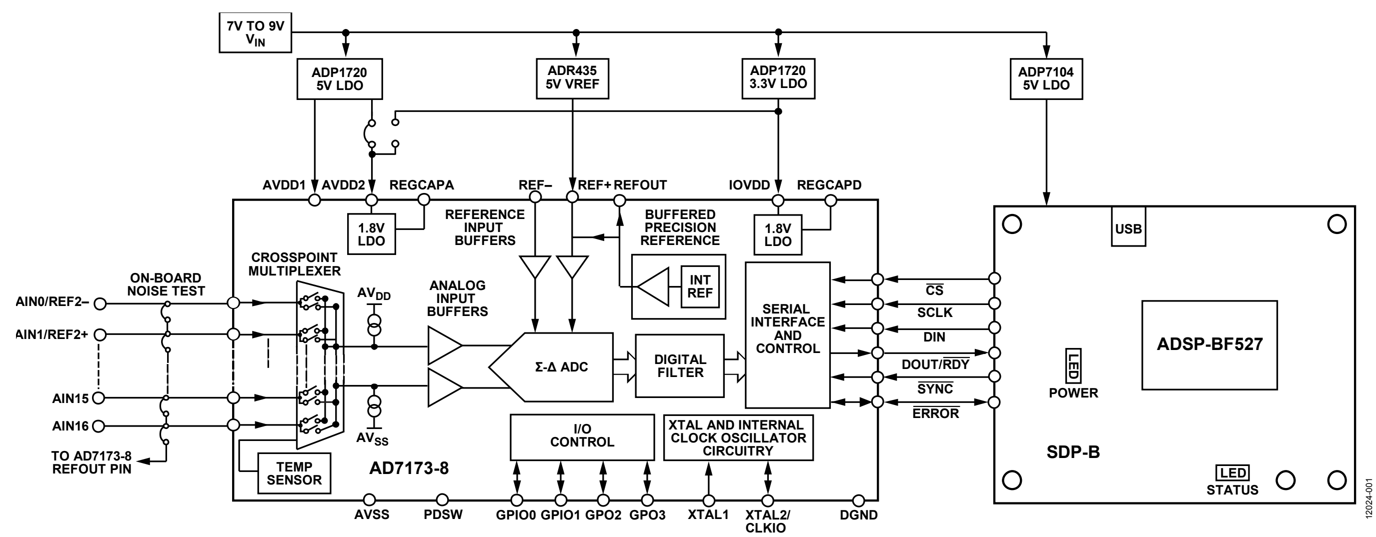

Figure 1. EVAL-AD7173-8SDZ Block Diagram

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REVISION HISTORY

1/2018—Rev. 0 to Rev. A

Changed EVAL-SDP-CB1Z to SDP-B ... Throughout
Changed EVAL-AD7173-8SDZ Evaluation Software to AD717x Eval+ Software ... Throughout
Changes to Evaluation Kit Contents and Equipment Needed ... 1
Change to Reference Option Section ... 6
Changes to Software Installation Software Section, Figure 3, Figure 3 Caption, Figure 4, and Figure 4 Caption ... 7
Added Figure 5 and Figure 6; Renumbered Sequentially ... 7
Added Figure 7 through Figure 11 ... 8
Added Setting Up the System for Data Capture Section ... 9
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Changes to Launching the Software Section, Figure 12, Figure 12 Caption, Figure 15 and Figure 15 Caption ... 9
Changed Software Operation Section to Evaluation Board Software Operation Section ... 10
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4/2014—Revision 0: Initial Version

EVAL-AD7173-8SDZ QUICK START GUIDE

RECOMMENDED QUICK START GUIDE

Follow these steps to set up the board:

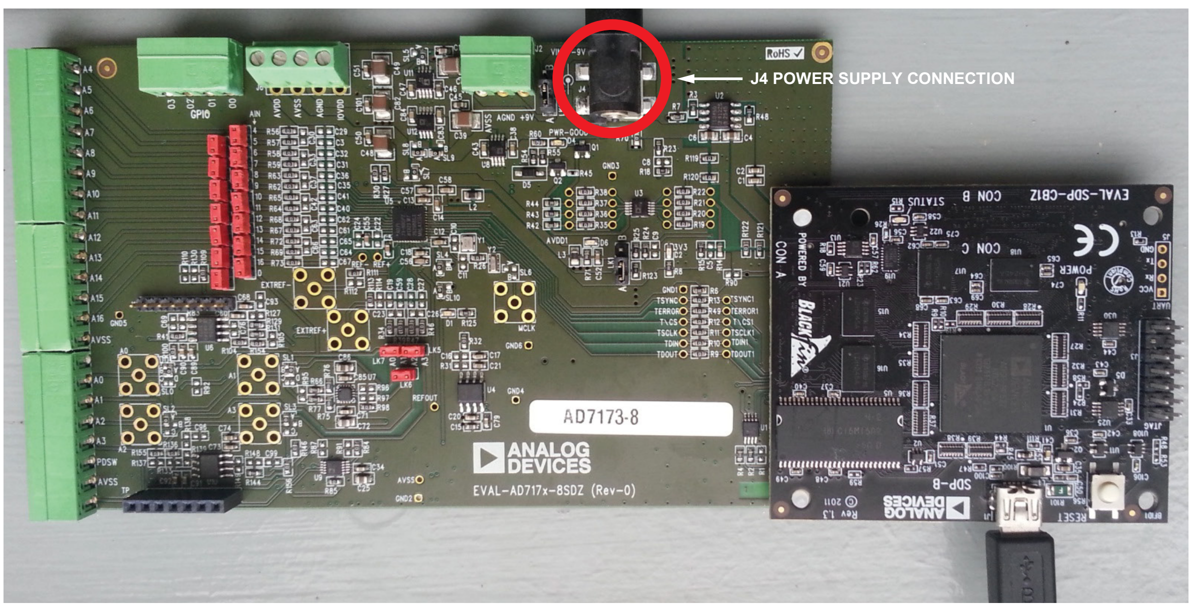
1. Disconnect the SDP-B board from the USB port of the PC. Install the AD717x Eval+ software from the enclosed CD. Restart the PC after installation.
2. Connect the SDP-B board to the EVAL-AD7173-8SDZ board, as shown in Figure 2.
3. Fasten the two boards with the enclosed plastic screw washer set.
4. Connect the external 9 V power supply to Connector J4 of the EVAL-AD7173-8SDZ board as shown in Figure 2. Set LK2 to Position B.
5. Connect the SDP board to the PC via the USB cable. For Windows® XP, you may need to search for the SDP drivers. Choose to automatically search for the drivers for the SDP-B board if prompted by the operating system.
6. Launch the AD717x Eval+ software from the Analog Devices subfolder in the **Programs** menu.

QUICK START NOISE TEST

Use the following procedure to quickly test the noise performance:

1. Insert Link LK5 to Link LK20 to initiate the noise performance test mode. In this mode, analog input channels short to the REFOUT pin via SL11.
2. Click **Start Sampling** to acquire samples from the ADC (see Figure 16).

The **Samples** numeric control in the top right corner of the main window sets the number of samples collected in each batch.



12024-002

Figure 2. Hardware Configuration, Setting Up the EVAL-AD7173-8SDZ

EVALUATION BOARD HARDWARE

DEVICE DESCRIPTION

The AD7173-8 is a highly accurate, high resolution, multiplexed, 8-/16-channel (full/pseudo differential) Σ-Δ ADC. The AD7173-8 has a maximum channel-to-channel scan rate of 6.21 kSPS (161 µs) for fully settled data The output data rates range from 1.25 SPS to 31.25 kSPS. The device includes integrated analog input and reference buffers, an integrated precision 2.5 V reference, and an integrated oscillator.

See the AD7173-8 data sheet for complete specifications. Consult the data sheet in conjunction with this user guide when using the evaluation board. Full details for the SDP-B are available on the Analog Devices website.

HARDWARE LINK OPTIONS

See Table 1 for default link options. By default, the board is configured to operate from the supplied 9 V ac-to-dc adapter connected to Connector J4. The 5 V supply required for the AD7173-8 comes from the on-board low dropout regulator (LDO). The ADP1720, with a 5 V fixed output voltage, receives its input voltage from J2 or J4 (depending on the position of LK2) and generates a 5 V output.

Table 1. Default Link and Solder Link Options

Link	Default Option	Description
LK1	A	Selects the voltage applied to the power supply sequencer circuit (U3); dependent on AVDD1. Place in Position A if using 5 V AVDD1, or Position B if using 2.5 V AVDD1.
LK2	B	Selects the external power supply from Connector J3 (Position A), or J4 (Position B).
LK5 to LK20	Inserted	Inserting these links sets up the on-board noise test. In this mode, all inputs short to the common voltage via SL11.
SL0	A	Routes A0 to: AIN0/REF2− pin on the AD7173-8 (Position A), Buffer U6 (Position B), U7 for use with a single-ended to differential driver circuit (Position C), or J15-1 (Position D).
SL1	A	Routes A1 to: AIN1/REF2+ pin on the AD7173-8 (Position A), Buffer U6 (Position B), U7 for use with a single-ended to differential driver circuit (Position C), or J15-7 (Position D).
SL2	A	Routes A2 to: AIN2 pin on the AD7173-8 (Position A), Buffer U10 (Position B), or U9 for use with a single-ended to differential driver circuit (Position C).
SL3	A	Routes A3 to: AIN3 pin on the AD7173-8 (Position A), Buffer U10 (Position B), or U9 for use with a single-ended to differential driver circuit (Position C).
SL4	A	Sets the voltage applied to the AVDD2 pin. Operates using the AVDD1 supply (default). Position B sets the AVDD2 voltage to 3.3 V supply from the ADP1720 (3.3 V) (U11) regulator.
SL5	B	Selects between an external or on-board IOVDD source. Supplies IOVDD from the ADP1720 (3.3 V) (U11) (default). The evaluation board operates with a 3.3 V logic.
SL6	Removed	Position A connects Crystal Y1 as an external MCLK clock source. Position B connects MCLK SMA/SMB connector for use as a clock input or an ADC internal clock output.
SL7	A	Selects between an external or on-board AVDD1 source. Supplies AVDD1 from the ADP1720 (5 V) (U8) (default).
SL8 to SL9	A	Selects between a 5 V and 2.5 V LDO supply for AVDD1. Supplies AVDD1 with 5 V (default).
SL10	A	Selects the voltage applied to the AVDD1 pin. Operates using the supply set up by Link SL8 to Link SL9 (default). When inserted in Position B, sets the AVDD1 voltage to 3.3 V supply from the ADP1720 (3.3 V) regulator.
SL11	A	Selects the voltage applied to analog input during on-board noise test (LK5 to LK20 inserted). Position A connects to the AD7173-8 REFOUT pin. Position B connects to GND. Position C connects to AVSS.
SL12 to SL15	Inserted	Connects AVSS and AGND for single-supply operation. To operate in split supply mode, remove these links.

SOCKETS AND CONNECTORS

Table 2. Connector Details

Connector	Function	Connector Type	Manufacturer	Manufacturer Number	Order Code[1]
J1	Connector to the SDP-B	120-way connector, 0.6 mm pitch	Hirose	FX8-120S-SV(21)	FEC1324660
A0 to A3	Analog inputs to ADC	Straight PCB mount SMB/SMA jack	Tyco	1-1337482-0	Not applicable
J3	External bench top voltage supply for the EVAL-AD7173-8SDZ	Power socket block, 3-pin, 3.81 mm pitch	Phoenix Contact	MC 1,5/ 3-G-3,81	FEC3704737
J4	External ac-to-dc adapter input for the EVAL-AD7173-8SDZ, 7 V to 9 V	DC power connectors, 2 mm SMT power jack	Kycon	KLDX-SMT2-0202-A	MOUSER 806-KLDX-SMT20202A
J5	External bench top voltage supply option for AVDD1/AVDD2 and IOVDD inputs on the AD7173-8	Screw terminal block, 3.81 mm pitch	Phoenix Contact	MKDS 1/4-3.81	FEC3704592
J8	GPIO terminal	Power socket block, 4-pin, 3.81 mm pitch	Phoenix Contact	MC 1,5/ 4-G-3,81	FEC3704749
J10 and J12	Analog input terminal block; wired connection to external source or sensor	Power socket block, 8-pin, 3.81 mm pitch	Phoenix Contact	MC 1,5/ 8-G-3,81	FEC3704774
J14	Analog input terminal block; wired connection to external source or sensor	Power socket block, 6-pin, 3.81 mm pitch	Phoenix Contact	MC 1,5/ 6-G-3,81	FEC3704762
J15	Optional header	7-way, 2.54 mm pin header	Samtec	SSW-107-01-T-S	FEC1803478
J16	Optional header	7-way, 2.54 mm socket	Samtec	TLW-107-05-G-S	FEC1668499

[1] Order codes starting with FEC are for Farnell.

SERIAL INTERFACE

The EVAL-AD7173-8SDZ evaluation board connects via the serial peripheral interface (SPI) to the Blackfin® ADSP-BF527 on the SDP-B. There are four primary signals: $\overline{\text{CS}}$, SCLK, and DIN (all inputs), and one output from the ADC, DOUT/$\overline{\text{RDY}}$.

To operate the EVAL-AD7173-8SDZ in standalone mode, disconnect the AD7173-8 serial interface lines from the 120-pin header by removing the 0 Ω R9 through R13 links. Use the test points to connect the signals to an alternative digital capture setup.

POWER SUPPLIES

Power the evaluation board from the ac-to-dc adapter connected to J4, or from an external bench top supply applied to J3 or J5. Linear LDOs generate the required voltages from the applied input voltage (V_{IN}) rail when using J3 or J4. Use J5 to bypass the on-board regulators. The regulators used are the 5 V fixed output voltage and 2.5 V adjustable output voltage ADP1720 devices, which supply the AVDD1 and AVDD2 rails to the ADC; the ADP1720 (3.3 V) supplies the IOVDD rail. Use the ADP7104 (5 V) to supply 5 V for the SDP-B controller board. Each supply is decoupled where it enters the board and again at each device in accordance with the schematic. Table 3 shows the various power supply configurations available, including split supply operation.

Table 3. Power Supply Configurations[1]

Configuration	Input Voltage Range	Description
Single Supply (Regulated)	7 V to 9 V	The 7 V to 9 V input is regulated to 5 V for AVDD1/AVDD2 and 3.3 V for IOVDD. This also powers the external 5 V reference. See the Single Supply (Regulated) section in the Power Supply Configurations section.
Single Supply (Unregulated)	7 V to 9 V, 5 V, and 3.3 V	The input is unregulated and connects directly to AVDD1/AVDD2 and IOVDD from J5. The 7 V to 9 V input powers the external 5 V reference. See the Single Supply (Unregulated) section in the Power Supply Configurations section.
Split Supply (Regulated)	7 V to 9 V and −2.5 V	The 7 V to 9 V input is regulated to 2.5 V for AVDD1/AVDD2 and 3.3 V for IOVDD. The 7 V to 9 V input powers the external 5 V reference, and the −2.5 V input is connected to AVSS directly (unregulated). See the Split Supply (Regulated) section in the Power Supply Configurations section.
Split Supply (Unregulated)	7 V to 9 V, ±2.5 V, and 3.3 V	The input is unregulated and connects directly to AVDD1/AVDD2 and IOVDD from J5. The 7 V to 9 V input powers the external 5 V reference. See the Split Supply (Unregulated) section in the Power Supply Configurations section.

[1] Only one configuration can be used at a time.

POWER SUPPLY CONFIGURATIONS

Single Supply (Regulated)

There are two available power supply options for the single supply (regulated) configuration.

- An ac-to-dc adapter (included) connected to J4. Set LK2 to Position B.
- A bench top power supply connected to J3. Set LK2 to Position A and ensure that AVSS = AGND = 0 V.

Set all other links and solder links to the default settings as outlined in Table 1.

Single Supply (Unregulated)

To set up the board, use the following procedure:

1. Move SL5 to Position A and SL7 to Position B.
2. Connect the two terminals of J5 labeled AGND and AVSS.
3. Connect 0 V (GND) to J5 at the terminal labeled AGND.
4. Connect 5 V to J5 at the terminal labeled AVDD.
5. Connect 3.3 V to J5 at the terminal labeled IOVDD.
6. Connect the 7 V to 9 V input to either J3 or J4.

Set all other links and solder links to the default settings as outlined in Table 1.

Split Supply (Regulated)

To set up the board, use the following procedure:

1. Remove SL12 to SL15. These links connect AVSS to AGND.
2. Connect a bench top power supply to J3 and set LK2 to Position A. Make sure that AVSS = −2.5 V in this case.
3. Set LK1 to Position B. This sets the input to the power monitor circuitry to work with the lower AVDD1 supply of 2.5 V.

Set all other links and solder links to the default settings as outlined in Table 1.

Split Supply (Unregulated)

To set up the board, use the following procedure:

1. Move SL5 to Position A and move SL7 to Position B.
2. Remove SL12 to SL15.
3. Connect 0 V (GND) to J5 at the terminal labeled AGND.
4. Connect 2.5 V to J5 at the terminal labeled AVDD.
5. Connect −2.5 V to J5 at the terminal labeled AVSS.
6. Connect 3.3 V to J5 at the terminal labeled IOVDD.
7. Connect 7 V to 9 V to either J3 or J4. Connect or disconnect the AVSS terminal of J3 to the AVSS terminal of J5.
8. Set LK1 to Position B. This sets the input to the power monitor circuitry to work with the lower AVDD1 supply of 2.5 V.

Set all other links and solder links set to the default settings as outlined in Table 1.

ANALOG INPUTS

The EVAL-AD7173-8SDZ primary analog inputs can be applied in two separate ways.

- J10, J12, and J14 connectors on the left side of the board
- A0 to A3 SMB/SMA footprints on the evaluation board

The analog inputs route directly to the associated analog input pins on the AD7173-8, provided that the LK5 to LK20 links (on-board noise test) are removed. The EVAL-AD7173-8SDZ software is set up to analyze dc inputs to the ADC. The AD7173-8 input buffers work for dc input signals.

REFERENCE OPTIONS

The EVAL-AD7173-8SDZ includes an external 5 V reference, the ADR445. The AD7173-8 includes an internal 2.5 V reference. The default operation is to use the external reference input, which is set to accept the 5 V ADR445 on the evaluation board.

Choose the reference in the SETUPCONx registers associated with Setup 0 to Setup 7 to select the reference used for conversions by the AD7173-8.

Change between the internal and external references by accessing the AD7173-8 register map in the evaluation software.

EVALUATION BOARD SOFTWARE

SOFTWARE INSTALLATION

The EVAL-AD7173-8SDZ evaluation kit includes software on a CD. Double-click the **setup.exe** file from the CD to run the installer. The default installation location for the software is **C:\Program Files\Analog Devices\AD717xEvak+\.**

Install the AD717x Eval+ software before connecting the evaluation board and SDP-B board to the USB port of the PC. This ensures that the evaluation system is correctly recognized when connected to the PC.

There are two parts to the installation.

1. AD717x Eval+ software installation.
2. AD717x Eval+ Dependencies
   a. SDP-B board drivers
   b. Ssrc SVG plug-in installation
   c. Microsoft .Net Framework v3.5

Warning

To ensure the PC correctly recognizes the evaluation system, the evaluation software drivers must be installed before connecting the EVAL-AD7173-8SDZ evaluation board and SDP-B boards to the USB port of the PC.

Installing the AD717x Eval+ Software

To install the AD717x Eval+ software take the following steps:

1. With the SDP-B disconnected from the USB port of the PC, insert the AD717x Eval+ software installation CD into the CD-ROM drive. Double-click the **setup.exe** file to begin the evaluation board software installation.
2. The default installation location for the software is **C:\Program Files\Analog Devices\AD717x Eval+\.**
3. A dialog box appears asking for permission to allow the program to make changes to the PC. Click **Yes** to proceed (see Figure 3).

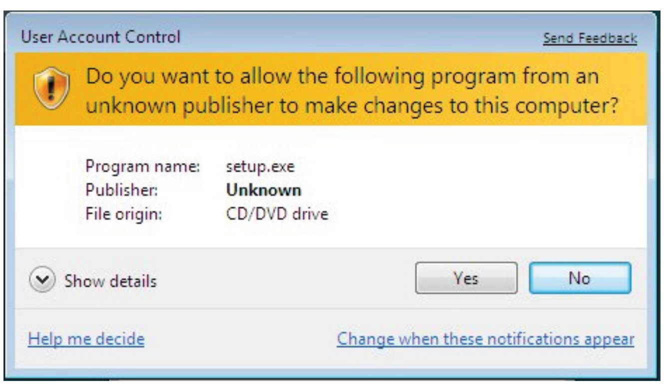


*Figure 3. AD7173-8 **User Account Control** Permission Dialog Box*

4. Select a location to install the software and click **Next**. Figure 4 shows the default locations displayed when the dialog box opens. To select another location click **Browse**.

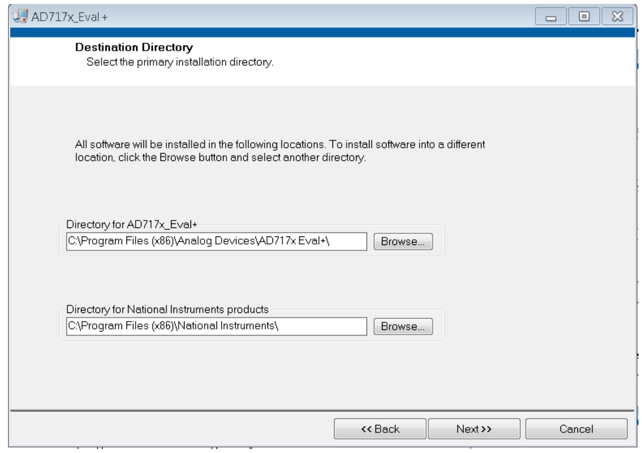


*Figure 4. **AD717x Eval+** Installation, Selecting the Location for Software Installation*

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

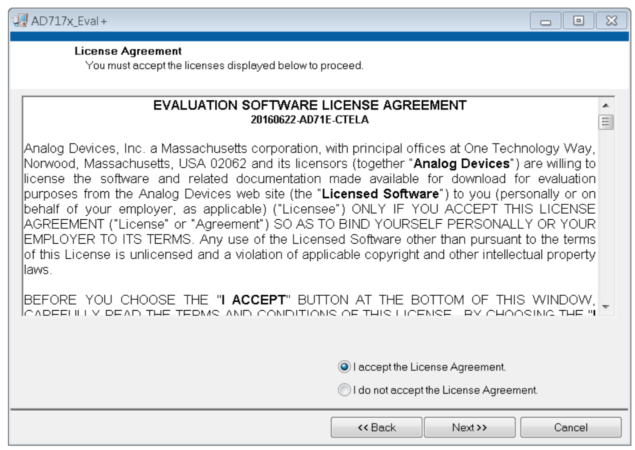


*Figure 5. **AD717x Eval+** Installation, Accepting the License Agreement*

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

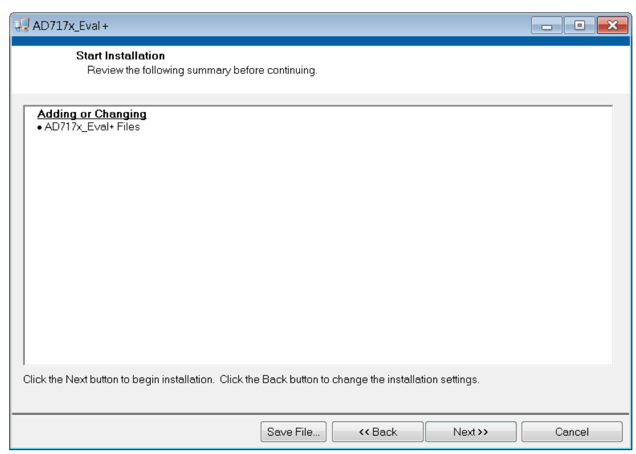


*Figure 6. **AD717x Eval+** Installation, Reviewing a Summary of the Installation*

7. The message in Figure 7 appears when the installation is complete.

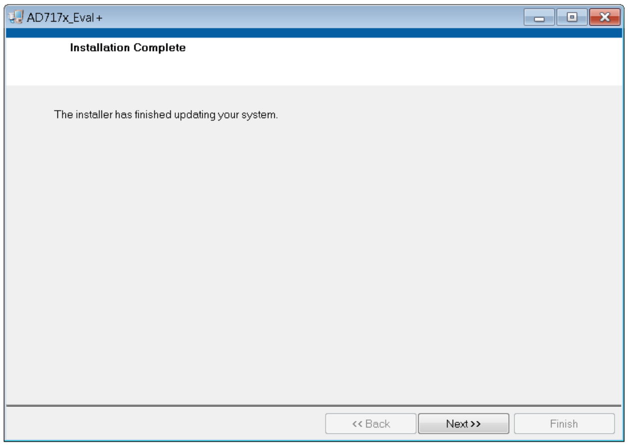


Figure 7. ***AD717x Eval+*** *Installation Complete*

Installing the Eval+ Dependencies

After installation of the evaluation software is complete, a welcome window displays to install the **Eval+ Dependencies**.

1. With the SDP-B board still disconnected from the USB port of the PC, make sure all other applications are closed, then click **Install**.

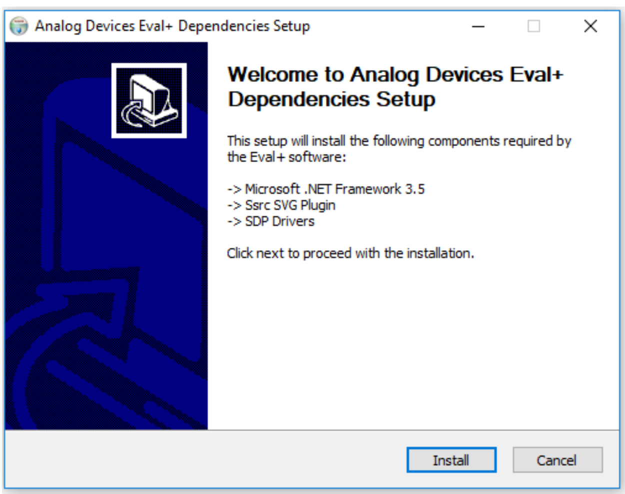


Figure 8. ***Eval+ Dependencies Setup****, Beginning the Drivers Installation*

2. The Ssrc SVG plug-in will install first, then the SDP-B drivers, and finally the .Net Framework.
3. If using Windows 8 or Windows 10 see the Installing the .Net Framework v3.5 on Windows 8 and Windows 10 section.
4. To complete the drivers installation click **Close**. This closes the installation setup wizard.

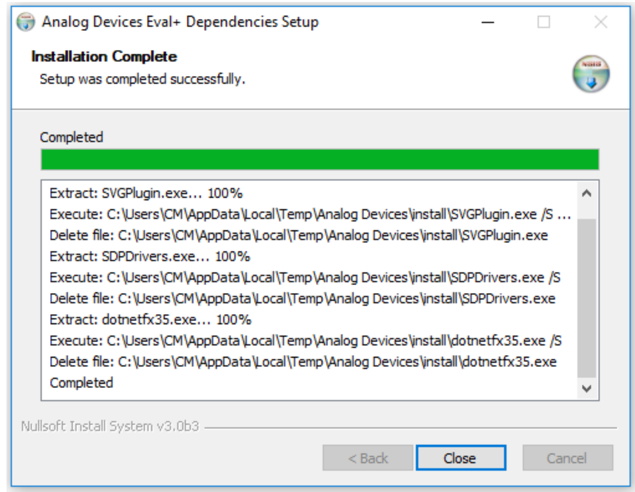


Figure 9. ***Eval+ Dependencies Setup****, Completing the Driver Setup Wizard*

5. Before using the evaluation board, the user must restart the PC.

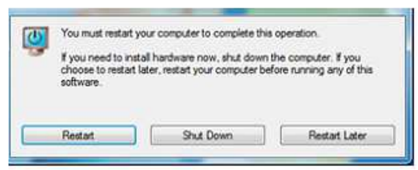


Figure 10. Restarting the PC

Installing the .Net Framework v3.5 on Windows 8 and Windows 10

Windows 8 and Windows 10 have a built in installer for the .Net Framework v3.5. In order to run this software the user will need an internet connection and may need administrator privileges. Complete the following steps to install the software. If unable to install the .Net Framework contact your system administrator.

1. When the Eval+ Dependencies installer reaches the .Net Framework, the window shown in Figure 11 will appear.

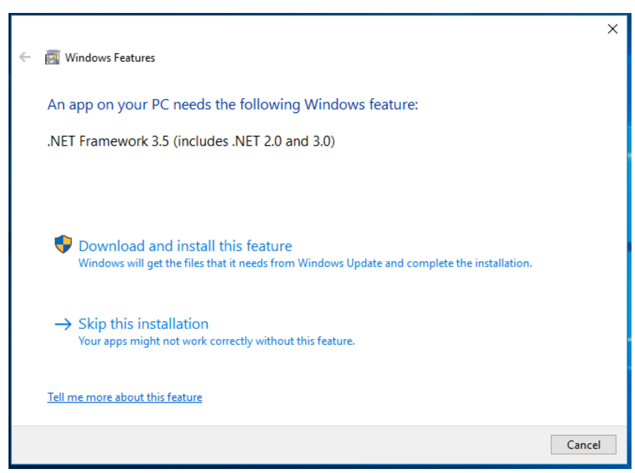


Figure 11. Restarting the PC

2. Follow the steps in the installation wizard to complete the installation.

3. If the window in Figure 11 does not appear; v3.5 may already be installed. To check if the software is already installed open **Control Panel** > **Programs** > **Programs and Features** and select **Turn Windows features on or off**. Check that the .Net Framework v3.5 is enabled.

SETTING UP THE SYSTEM FOR DATA CAPTURE

After completing the steps in the Software Installation section and the Evaluation Board Hardware section, set up the system for data capture using the following steps.

1. Allow the **Found New Hardware Wizard** to run after the SDP-B board is connected to the PC. (If using Windows XP, search for the SDP-B drivers. Choose to automatically search for the drivers if prompted by the operating system.)
2. Check that the board is connecting to the PC correctly using the **Device Manager**.
3. Access the **Device Manager** by right clicking **My Computer**, then **Manage**. A dialog box appears asking for permission to allow the program to make changes to the PC. Click **Yes**. The **Computer Management** box appears. Click **Device Manager** from the list of **System Tools** (see Figure 12).
4. The SDP-B board appears under **ADI Development Tools**. This indicates that the driver software has installed and the board is connected to the PC correctly.

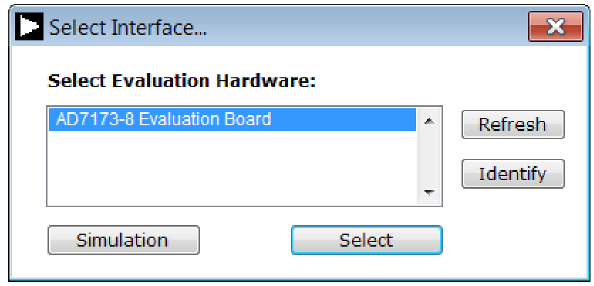
12024-112

Figure 12. Device Manager

LAUNCHING THE SOFTWARE

After completing the steps in the Setting up the System for Data Capture section, launch the AD717x Eval+ software using the following steps:

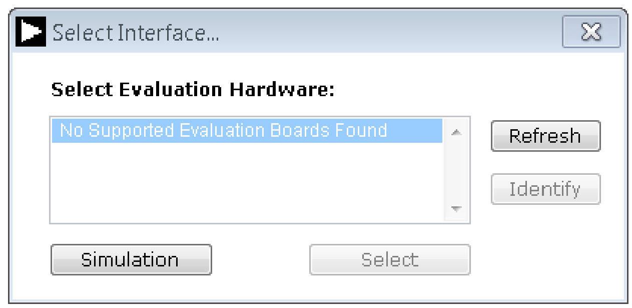
1. From the **Start** menu, click **Programs** > **Analog Devices** > **AD717x Eval+**.
2. The dialog box in Figure 13 appears, select **AD7173 Evaluation Board**. The main window of the software box displays as shown in Figure 16.



12024-113

Figure 13. AD7173-8 Evaluation Board Selection

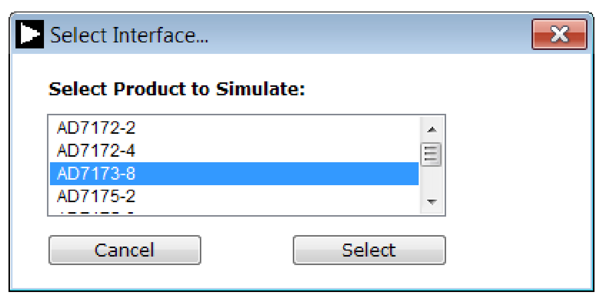
3. If the EVAL-AD7173-8SDZ evaluation system is not connected to the USB port via the SDP-B, when the software is launched the **Select Interface** dialog box appears (see Figure 14). Connect the evaluation board to the USB port of the PC, wait a few seconds, click **Refresh** and the option shown in Figure 13 appears.



12024-114

Figure 14. Evaluation Board Selection, No Board Connected

4. The AD717x Eval+ software can also be used without connecting hardware. Click the **Simulation** button and the options shown in Figure 15 appear. This simulation mode uses a model and allows the AD7172-2, AD7172-4, AD7173-8, AD7175-2, AD7175-8, AD7176-2, or AD7177-2 to be evaluated.



12024-115

Figure 15. Evaluation Board Selection Simulation

EVALUATION BOARD SOFTWARE OPERATION

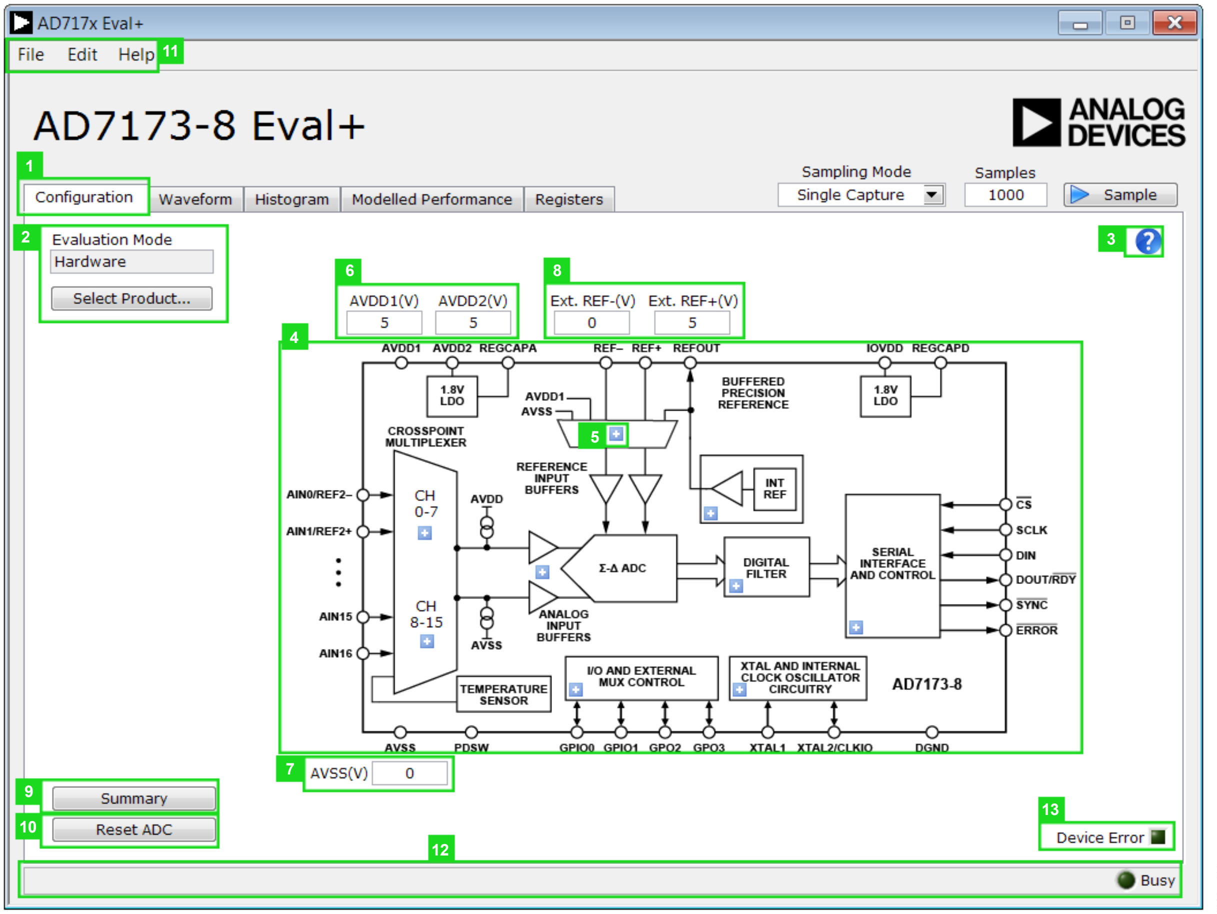


Figure 16. **Configuration** Tab of the AD7173-8 Eval+ Software in Hardware Mode

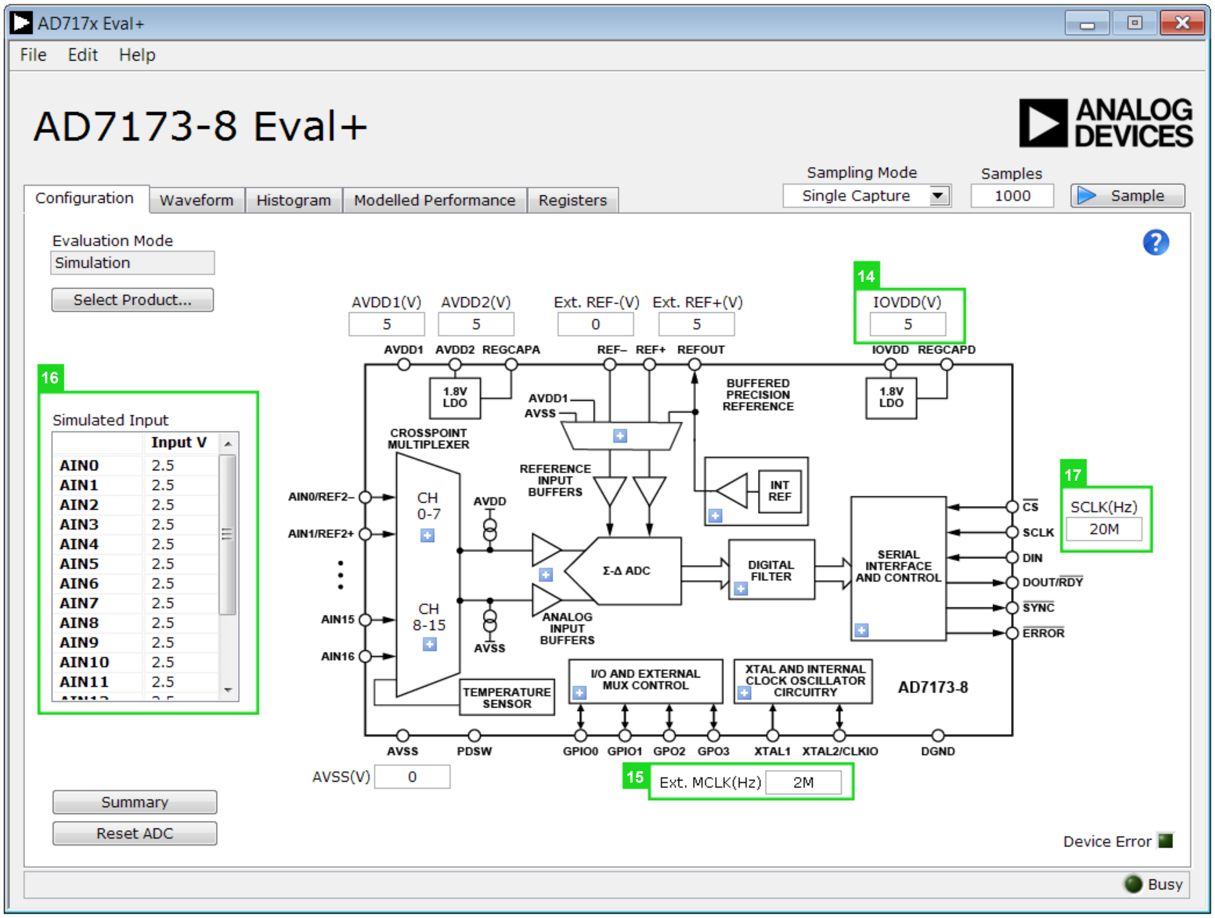


Figure 17. **Configuration** Tab of the AD7173-8 Eval+ Software in Simulation Mode

OVERVIEW OF THE MAIN WINDOW

The main window of the AD717x Eval+ software displays the significant control buttons and analysis indicators of the AD717x Eval+ software. The main window is divided into five tabs.

- Configuration
- Waveform
- Histogram
- Modelled Performance
- Registers

CONFIGURATION TAB (1)

Figure 16 shows the **Configuration** tab when **Hardware Mode** is selected and Figure 17 shows the **Configuration** tab when **Simulation** mode is selected. The controls highlighted in Figure 17 are only available in **Simulation** mode.

Evaluation Mode (2)

The Evaluation Mode indicator displays the current evaluation mode. To switch between modes, click the **Select Product** button and the dialog box shown in Figure 13 appears.

Tutorial Button (3)

Click the tutorial button to open a tutorial and access additional information on using the AD717x Eval+ software.

Functional Block Diagram (4)

The functional block diagram of the ADC shows each of the separate functional blocks within the ADC. Clicking a configuration pop-up button on any of the functional blocks opens the configuration pop-up window for the block selected. Not all blocks have a configuration button.

Configuration Pop-up Button (5)

Each configuration pop-up button opens a different window that allows the configuration of the relevant functional block.

Analog and Digital Supply Voltage (6, 7, and 14)

These input fields are used to take the supply voltage levels selected for the AD7173-8. Checks are performed to ensure the power supply voltage levels entered are within the specified limits. These power supply voltage levels are also used for the modelled performance to calculate the power dissipation.

External Reference (Ext. REF) (8)

The **Ext. REF** input fields set the positive and negative external reference voltage values. The difference is used for calculating the results for both the **Waveform** and **Histogram** tabs. The evaluation board has an external 5 V ADR445 reference, which can be bypassed by removing R32. Change the external reference values in **Ext. REF** to ensure correct calculation of results in the **Waveform** and **Histogram** tabs.

Register Configuration Summary(9)

Click the **Summary** button to display the selected configuration of the AD7173-8 this includes the channel configuration, information on each of the individual steps, and information on any error present.

Reset ADC (10)

Click the **Reset ADC** button to perform a software reset of the AD7173-8 . The AD7173-8 does not have a hardware reset pin, to perform a hard reset the power must be removed from the board. The software reset has the same effect as a hard reset.

Menu Bar (11)

The menu bar has three section: **File**, **Edit**, and **Help**.

File

There are three options available in the **File** drop-down menu: Save, Load, and Generate.

Save

Save allows the user to save register configurations or waveform data. Register configurations can be saved as a JSON file or a header file. If the configuration is only used in the AD717x Eval+ software environment then it is recommended to use the JSON setting. Waveforms are saved as .csv files and the user is prompted to save the register configuration as well.

Load

Load allows the user to load saved register configurations or waveform data. In order to load a header into AD717x Eval+ it must be in the same format as one that is saved from AD717x Eval+. The header file can be used when developing firmware. When loading the waveform data the user is prompted to load the register configuration. This allows the software to correctly analyze the data.

Edit

There are two options in the **Edit** drop-down menu; Change Product Selection and Reset ADC. Change Product Selection performs the same action as the **Select Product** button and Reset ADC performs the same action as the **Reset ADC** button.

Help

The **Help** drop-down menu provides links to extra information about the AD7173-8 , which includes links to the AD7173-8 product page, EVAL-AD7173-8SDZ evaluation board user guide, AD7173-8 datasheet, and No-OS Drivers. Selecting the AD717x Eval+ Tutorial opens the tutorial outlined in the Tutorial Button (3) section. For details on the current version of the software the **About** option opens a dialog box displaying the current version of the software and relevant licenses.

Status Bar (12)

The status bar displays the busy indicator and status updates, such as **Analysis Completed** and **Reset Completed** during software use.

Device Error (13)

The Device Error LED icon illuminates when an ADC error is detected or when a cyclic redundancy check (CRC) error occurs. The CRC functionality on the AD7173-8 is disabled by default and must be enabled for the Device Error indicator to work. Specific information on the error can be found in the Register Configuration Summary(9) section.

External MCLK Frequency (15)

This field sets the external MCLK frequency. External MCLK Frequency (15)] is only visible on the front panel when an external clock source is selected by the ADC. It is used by the functional model for modelled performance.

Analog Input Voltage (16)

These fields are only available when simulation mode is selected.These inputs allow the analog input voltages to be set and can be changed at any time while in simulation mode.

External SCLK Frequency (17)

This input field sets the external SCLK frequency for the SPI interface. This field is only available in simulation mode to determine if the SCLK frequency is within the permitted range.

WAVEFORM TAB (18)

Figure 18 shows the **Waveform** tab of the AD717x Eval+ software.

Sampling Mode (19)

This control is unrelated to ADC mode. The user can capture a defined sample set, single capture; or continuously gather batches of samples, repeated capture. The user can also select data logging that runs similar to repeated capture, but posts the results to a .csv file. When saving, the .csv file prompts the user to save the register configuration. This is necessary to load the data back into the software for analysis.

Samples (20)

The Samples field control sets the number of samples gathered per batch. Single capture returns the number enters into the Samples control. Repeated capture keeps returning batches of the number entered into the Samples control until stopped by the user.

Sample (21)

Click the **Sample** button to start gathering ADC results. Results appear in the waveform graph (22). See Figure 18.

Waveform Graph and Controls (22 and 23)

The data waveform graph shows each successive sample of the ADC output. Zoom in on the data using the control toolbar (labeled 23 in Figure 18). Click the x-axis and y-axis to change the scales on the graph.

Channel Selection (24)

The channel selection control allows the user to choose which channels display on the data waveform graph (23). These controls only affect the display of the channels and have no effect on the channel settings in the ADC register map.

Noise Analysis (25)

The **Noise Analysis** section displays the results of the noise analysis for the selected analysis channel, which includes both noise and resolution measurements.

Analysis Channel (26)

The **Noise Analysis** section and histogram graph show the analysis of the channel selected via the **Analysis Control** drop-down menu.

Display Units and Axis Controls (27)

Click the **Display Units** drop-down menu to select the unit displayed in the graph. This control affects both the waveform graph and the histogram graph. The axis controls can be switched between dynamic and fixed. When dynamic is selected, the axis automatically adjusts to show the entire range of the ADC results after each batch of samples. When fixed is selected, the user can program the axis ranges; the axis ranges do not automatically adjust after each batch of samples.

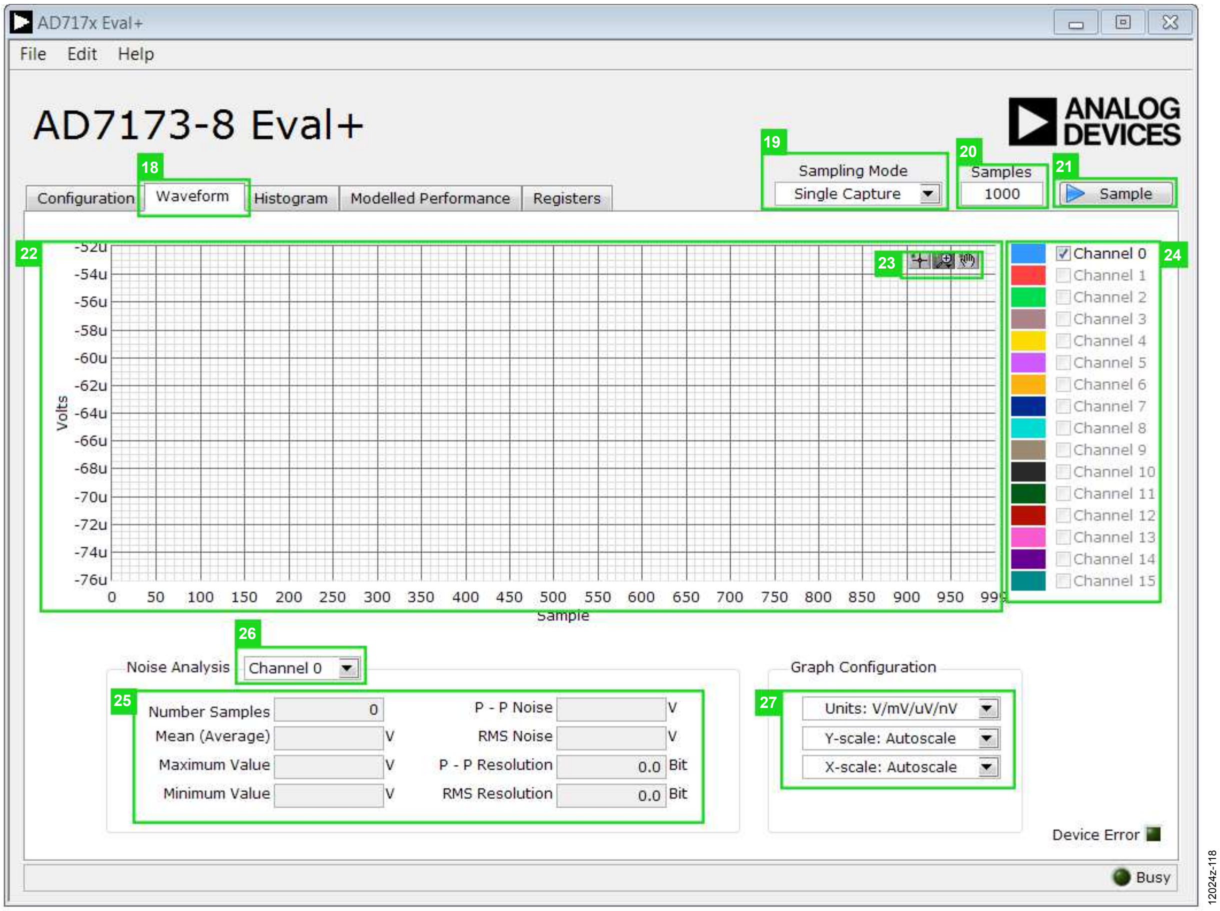


*Figure 18. **Waveform** Tab of the AD7173-8Evaluation Software*

HISTOGRAM TAB (28)

Figure 19 shows the **Histogram** tab of the AD717x Eval+ Software.

Histogram Graph and Controls (29 and 30)

The data histogram graph (29) shows the number of times each sample of the ADC output occurs. The control toolbar (30) in the histogram graph allows the user to zoom in on the data (see Figure 19). Click the x-axis and y-axis to change the scales on the graph (see Figure 19).

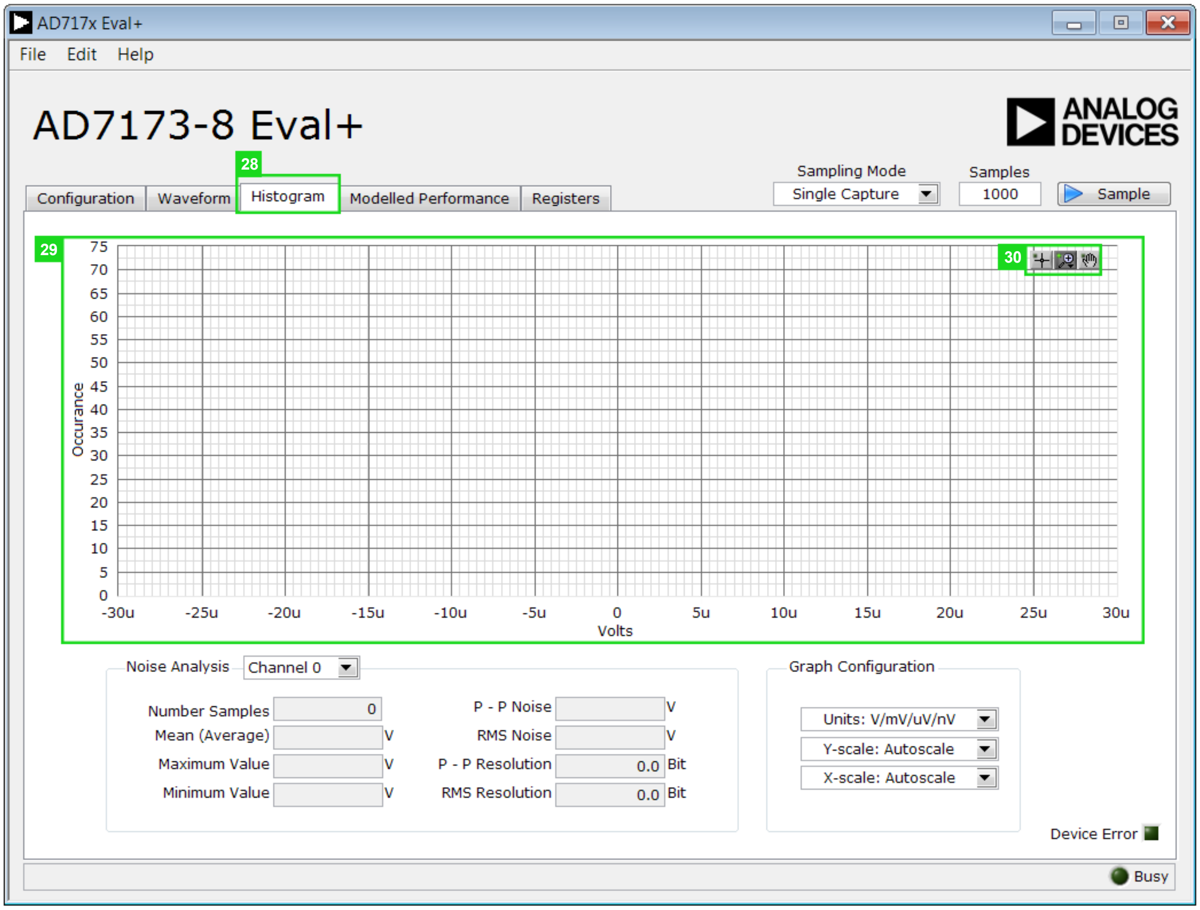
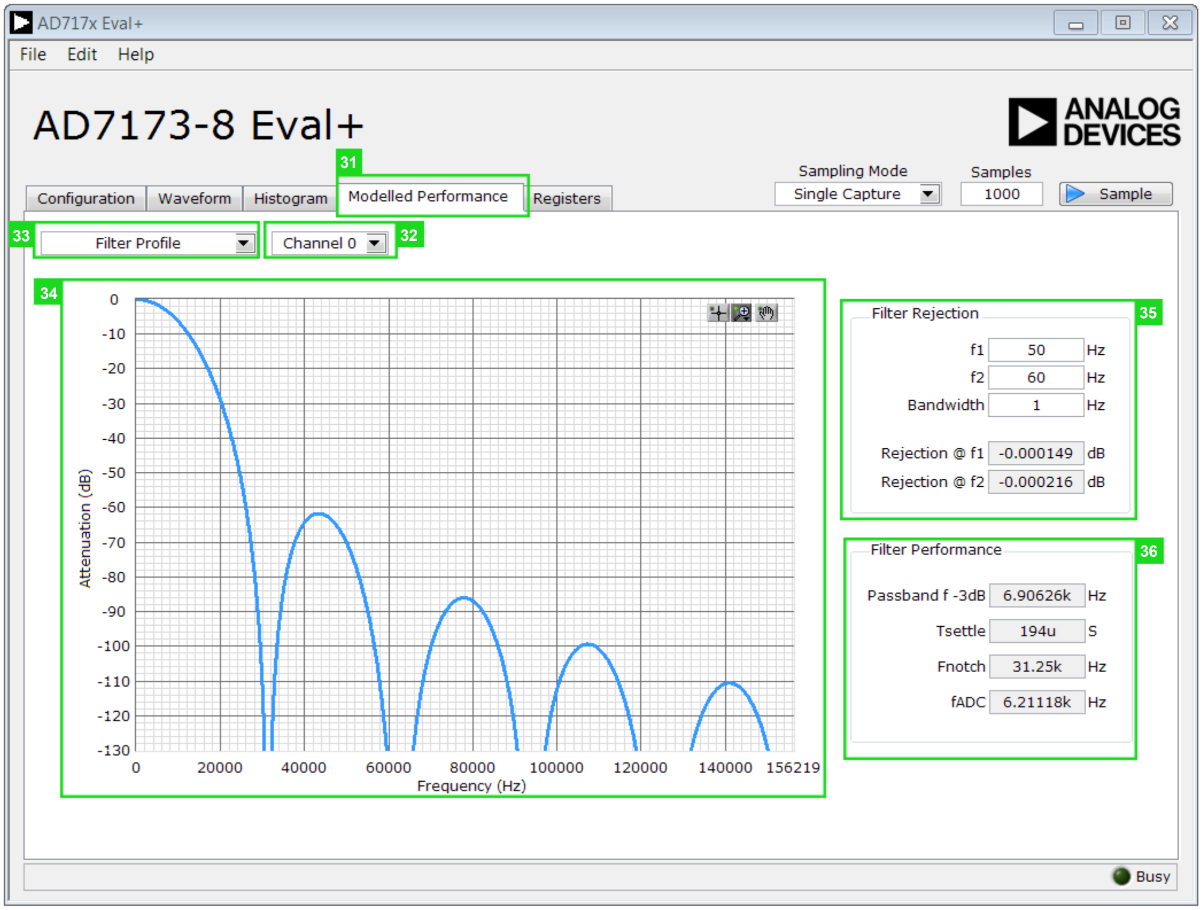


*Figure 19. **Histogram** Tab of the AD7173-8 Eval+ Software*



12024-120

Figure 20. Filter Profiles of the AD7173-8 Evaluation Software

MODELLED PERFORMANCE TAB (31)

The **Modelled Performance** tab shows a number of ADC performance parameters, which are calculated using the ADC functional model. There are three main sections to the **Modelled Performance** tab; Filter Profile, Filter Step Response, and Timing Diagram/Power. These can be selected using the drop-down menu (33).

Analysis Channel (32)

The **Analysis Channel** drop-down menu selects the channel to be evaluated by the functional model.

Filter Profile (33)

The **Filter Profile** drop-down menu allows the user to switch between the three sections of the **Modelled Performance** tab. Figure 20 shows the **Modelled Performance** tab when filter profile is selected.

Filter Profile Graph (34)

This graph shows the frequency response for the selected digital filter. The graph controls allows the user to zoom in on the data. Click the x-axis and y-axis to change the scales on the graph.

Filter Rejection (35)

This section shows the rejection/attenuation of the digital filter over the rejection bandwidth (Rej.BW) for f1 and f2 in decibels; f1, f2, and Bandwidth can be changed.

Filter Performance (36)

This section shows the timing information about the data rate of the selected output. It shows the ADC initial settling time (**Tsettle**), the first frequency notch (**Fnotch**), and the actual sampling frequency (**fADC**).

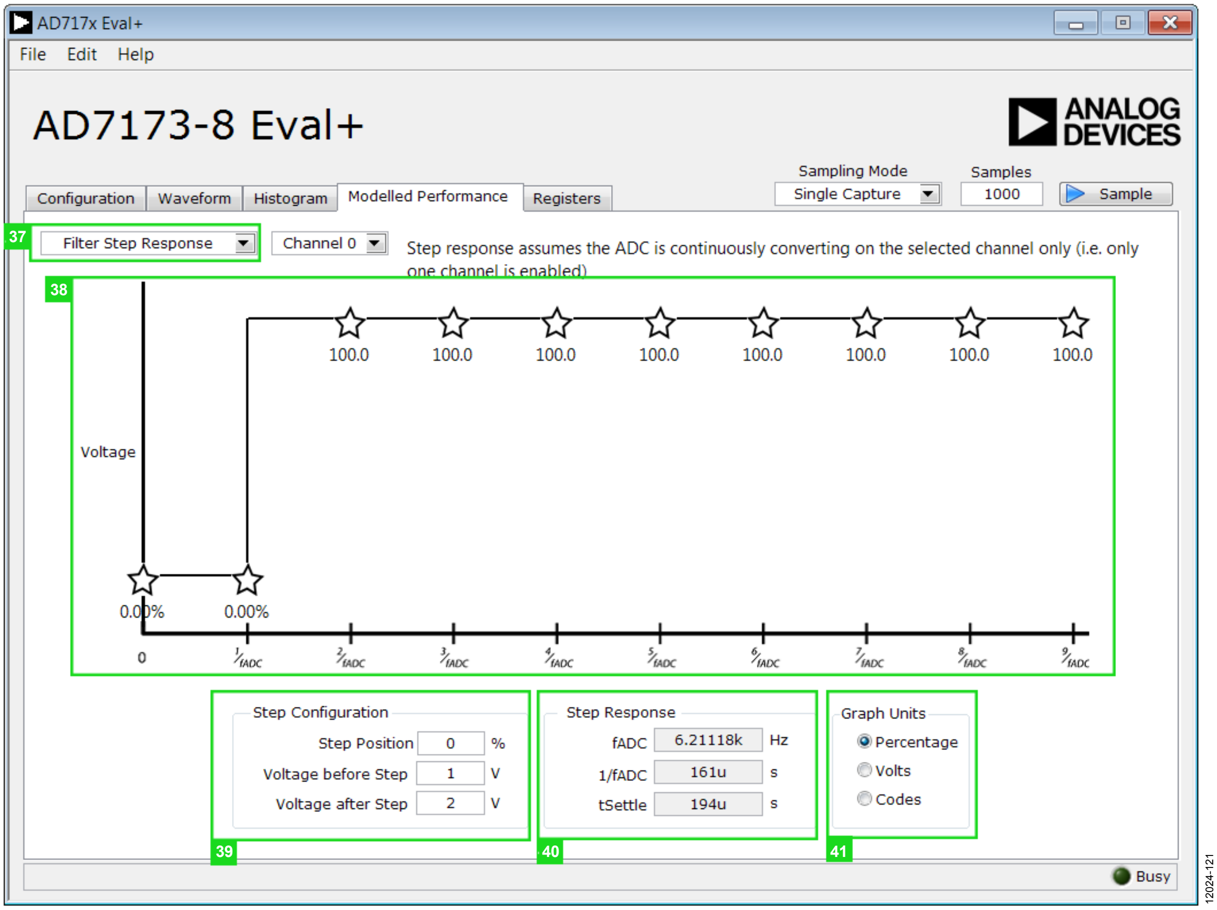


Figure 21. Filter Step Response of the AD7173-8 Evaluation Software

Filter Step Response (37)

This drop down menu allows the user to switch between the three sections of the **Modelled Performance** tab. Figure 21 shows the tab when Filter Step Response is selected.

Step Response Graph (38)

This graph shows how long the filter takes to settle when the voltage is stepped from one voltage to the next. For this analysis, it is assumed the ADC is continuously converting on only one channel.

Step Configuration (39)

Step Configuration allows the user to set the voltage before and after the step and the step position. Step position is set as a percentage where 0% is 1/fADC and 100% is 2/fADC.

Step Response (40)

This section shows timing information about the data rate of the selected output. It shows **fADC**, **Tsettle,** and the settling time between conversions, **1/fADC**.

Graph Units (41)

Use this control to switch the step response between percentages, volts, and codes.

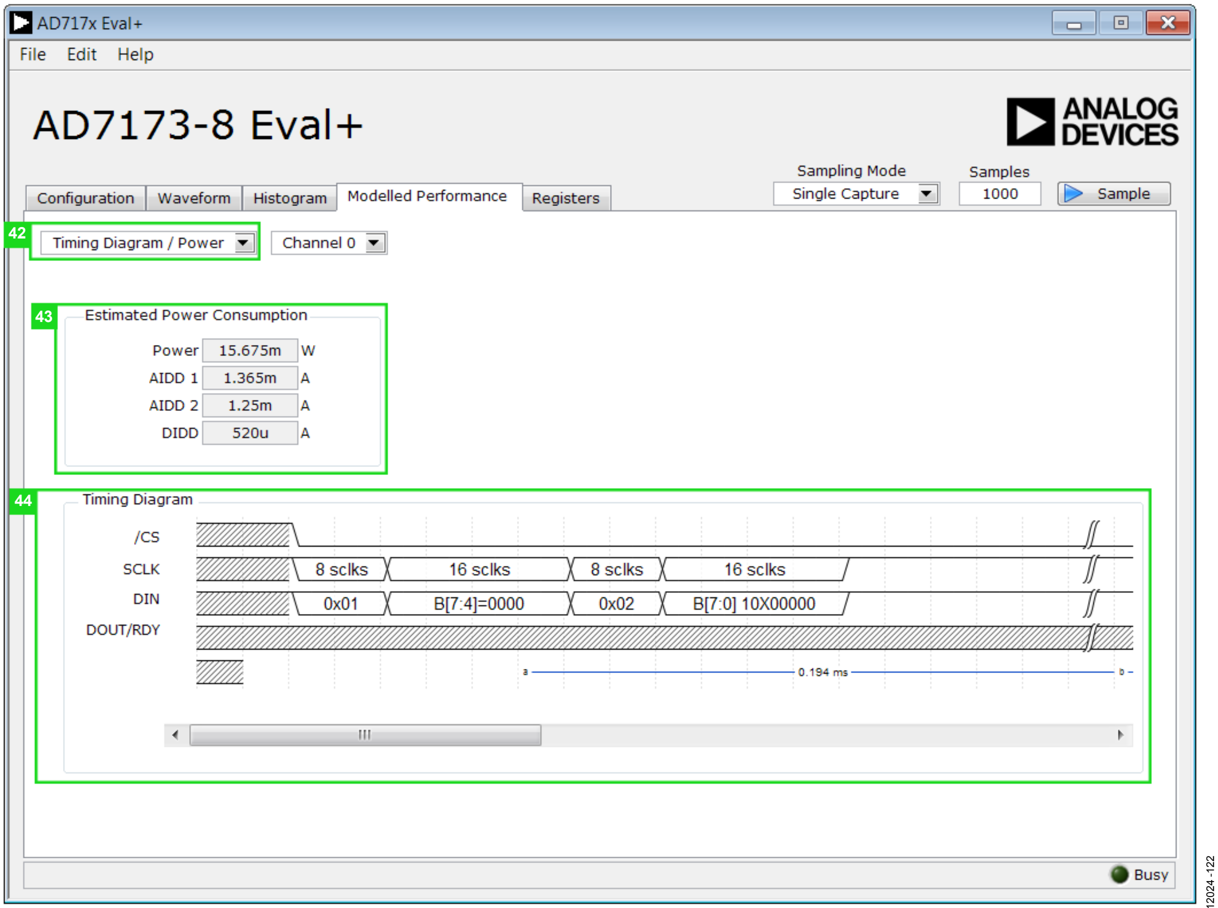


Figure 22. Timing Diagram/Power of the AD7173-8 Evaluation Software

Timing Diagram/ Power (42)

This drop down menu allows the user to switch between the three sections of the **Modelled Performance** tab. Figure 22 shows the **Modelled Performance** tab when Filter Step Response is selected.

Estimated Power Consumption (43)

This section shows the total power consumption of the device in the current configuration, as well as, the current consumption on each of the power supply rails. Please take note that the estimated power consumption is for continuous conversion mode only and no other mode of operation is supported.

Timing Diagram (44)

This graph shows the digital interface timing diagram for the current configuration. The graph shows the timing for both the configuration of the ADC, and the subsequent data reads from the ADC.

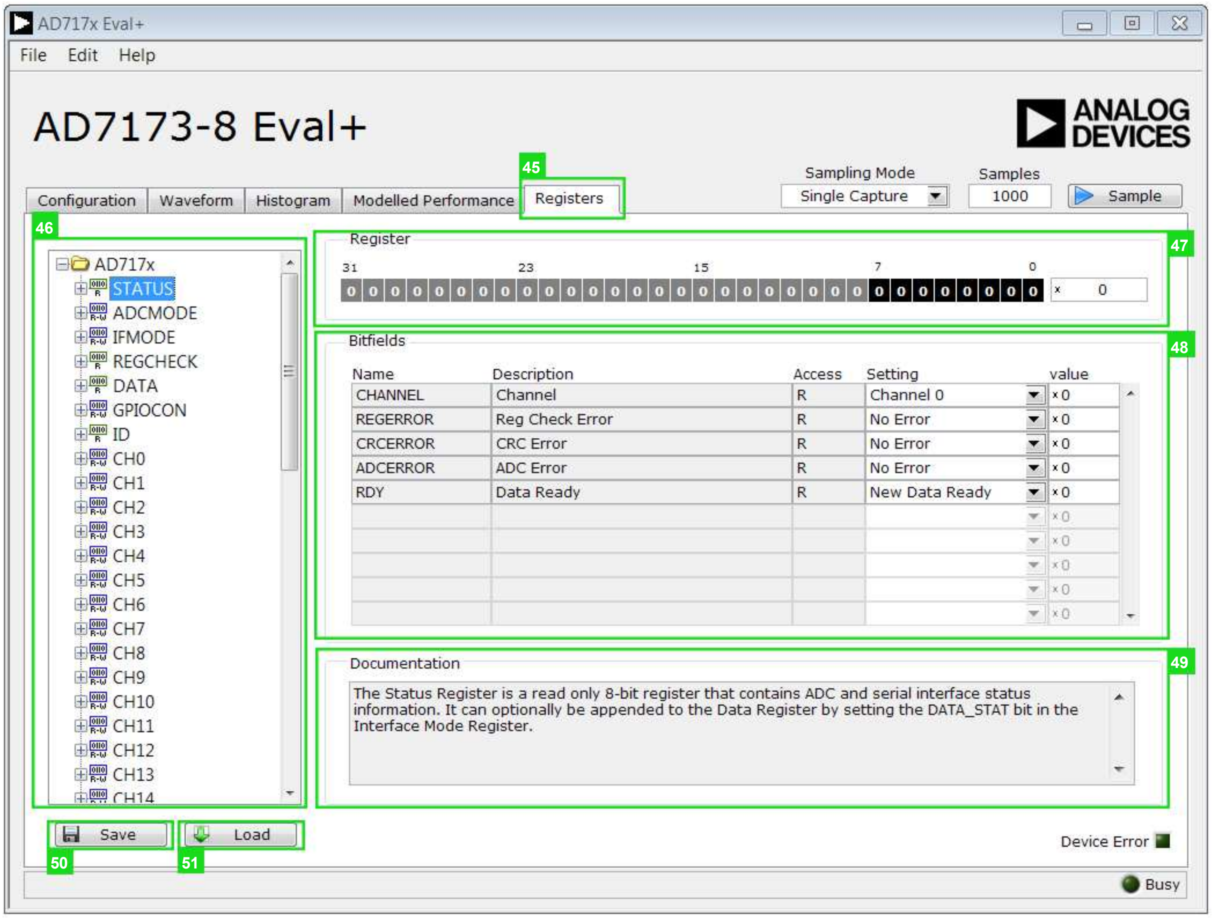


Figure 23. **Registers** Tab of the AD7173-8 Evaluation Software

REGISTERS TAB (45)

Figure 23 shows the **Registers** tab.

Register Tree (46)

This control shows the full register map in a tree control. Each register is shown; click the expand button next to each register to show all the bit fields contained within that register.

Register (47)

The **Register** control allows the user to change the individual bit of the register selected in the register tree (46) by clicking the bits or by programming the register value directly into the number control field on the right.

Bitfields (48)

This list shows all the bit fields of the register selected in the register tree (46). Change the values by using the drop-down box or by directly entering a value into the number control field on the right.

Documentation (49)

The **Documentation** field contains the documentation for the register or bitfield selected in the register tree (46).

Save(50) and Load (51)

The Save (50) and Load (51) buttons allow the user to save the current configuration of AD7173-8 by saving off the register map setting to a file and load the setting from that same file. When using these buttons the register configurations are saved and loaded as JSON files.

EXITING THE SOFTWARE

To exit the software, click the close button at the top right corner of the main window (see Figure 16).

EVALUATION BOARD SCHEMATICS AND ARTWORK

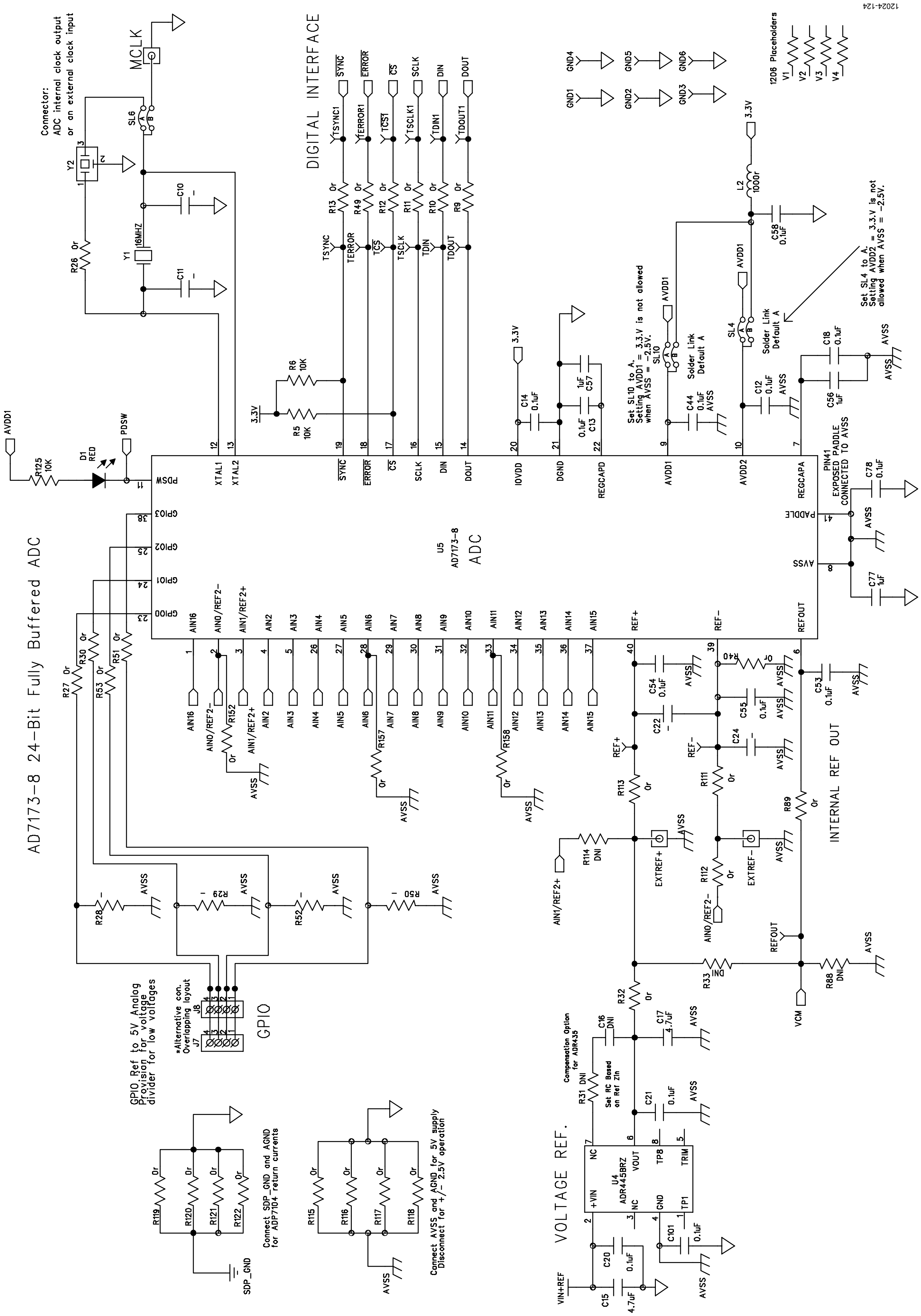


Figure 24. AD7173-8 Schematic

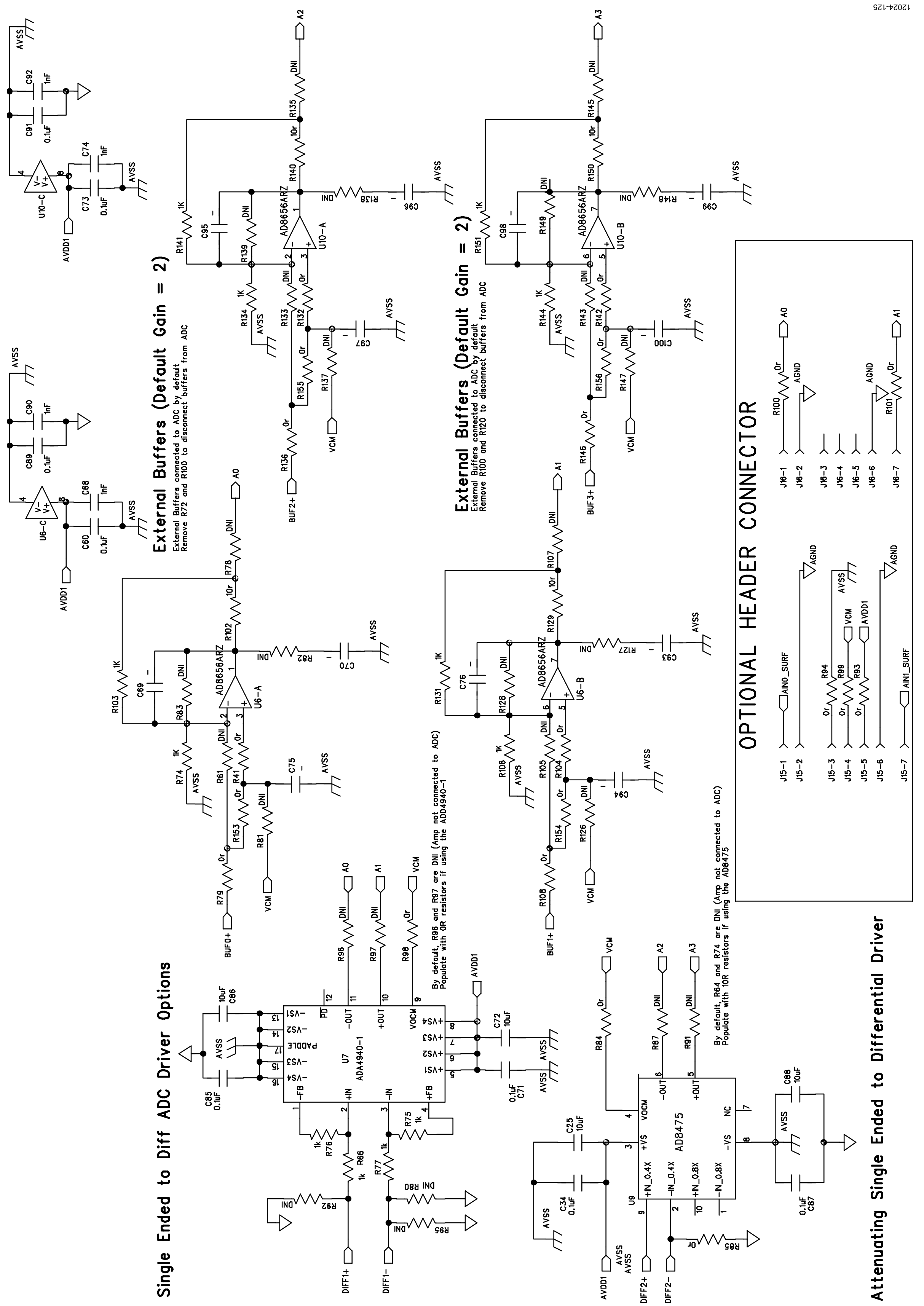


Figure 25. Amplifier Schematic

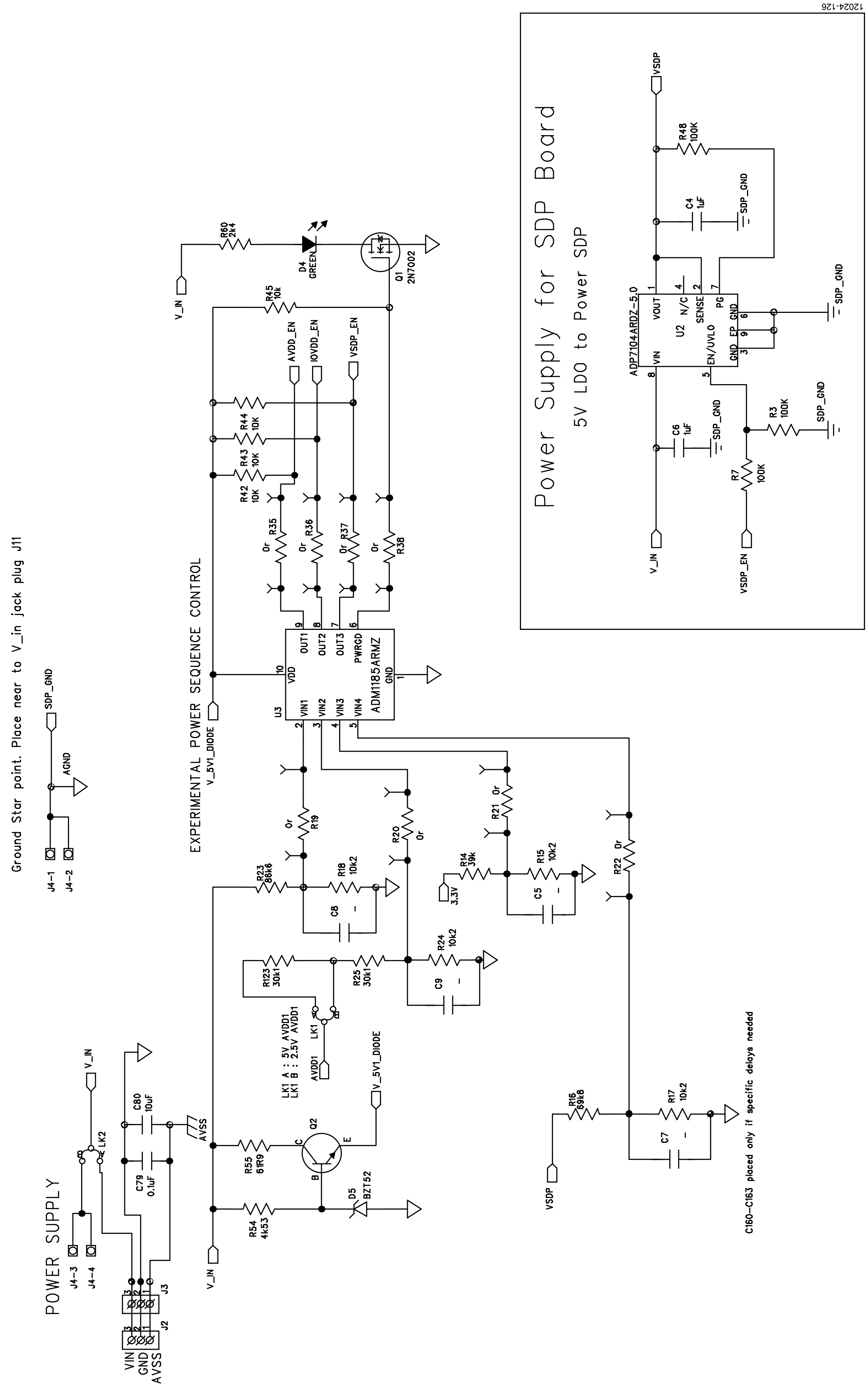


Figure 26. Power Supply Sequencing Schematic

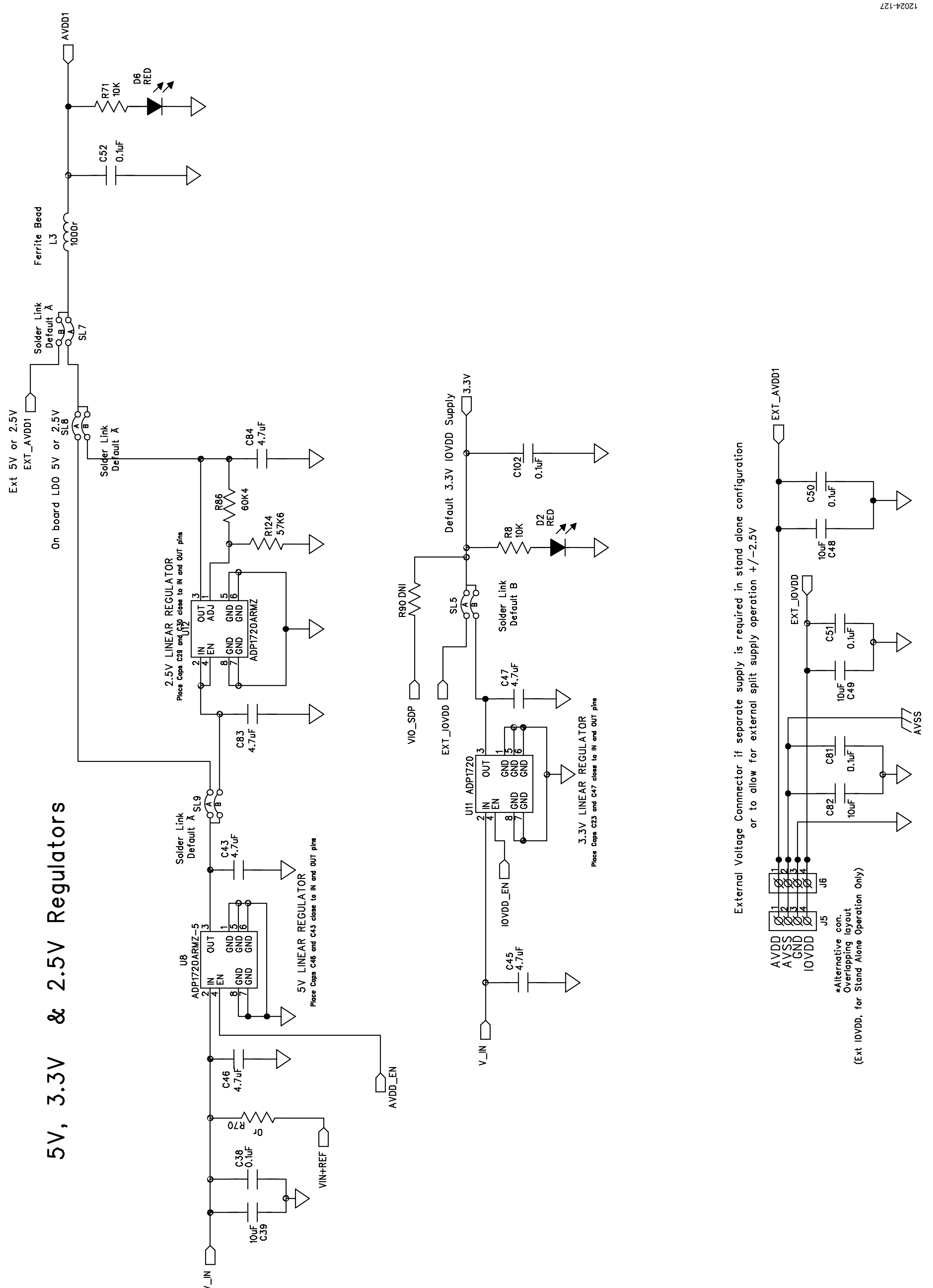


Figure 27. Regulator Schematic

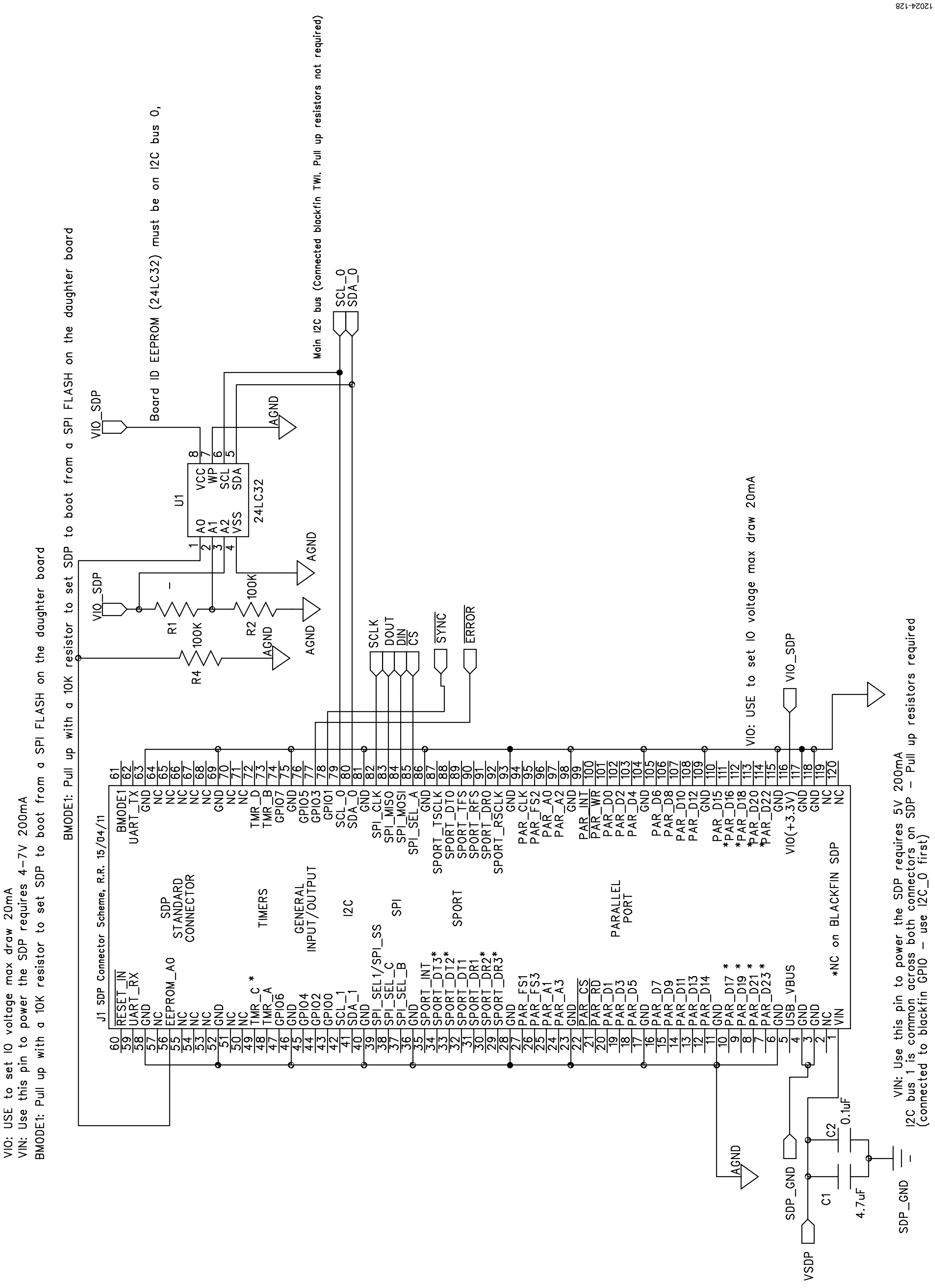


Figure 28. SDP-B Connector Schematic

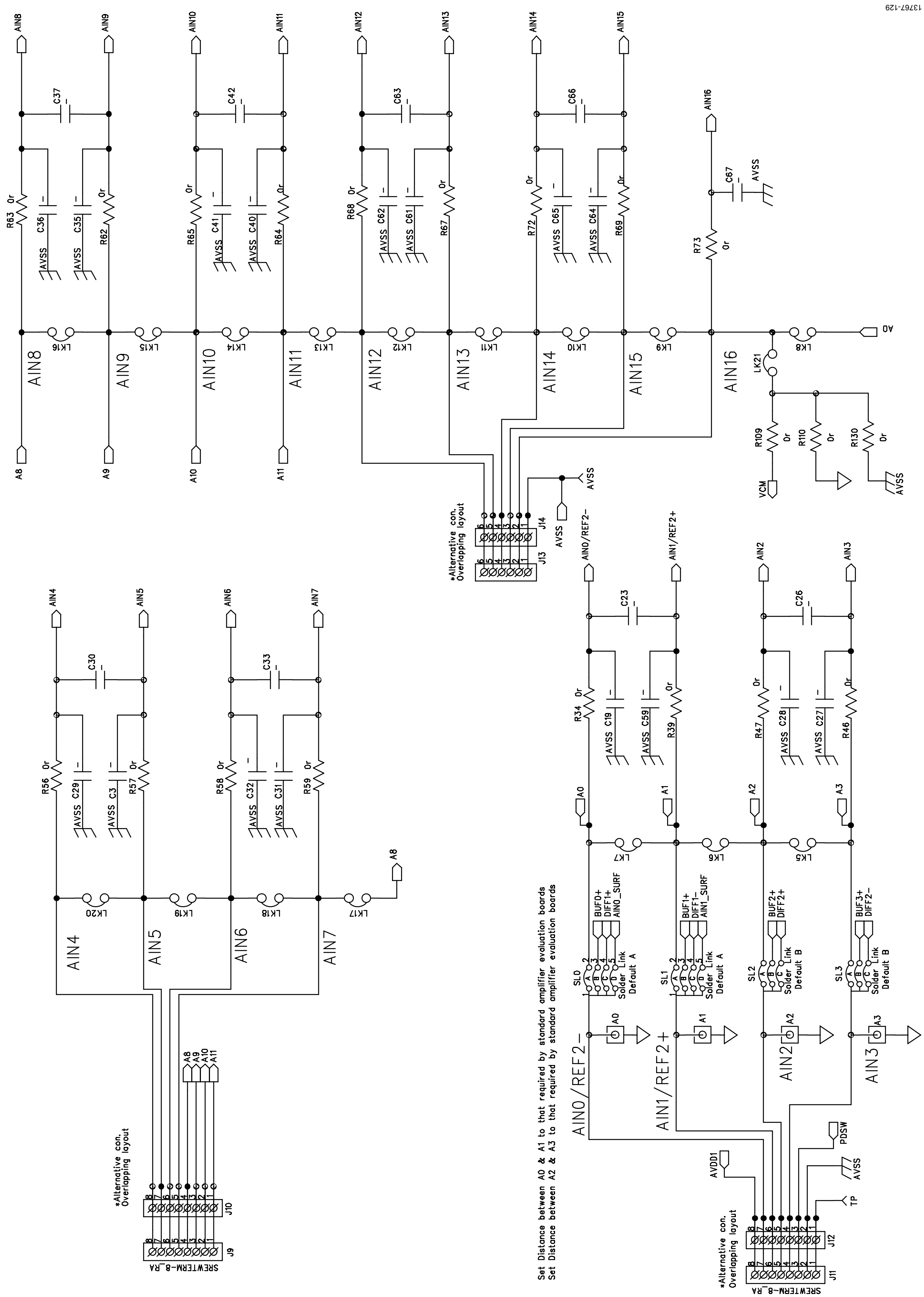


Figure 29. Analog Inputs Schematic