ANALOG DEVICES

EVAL-AD7490SDZ User Guide
UG-446

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 AD7490 Successive Approximation ADC

FEATURES

Full featured evaluation board for the AD7490
PC control in conjunction with the system demonstration platform (EVAL-SDP-CB1Z)
PC software for control and data analysis (time and frequency domain)
Standalone capability

EVALUATION KIT CONTENTS

EVAL-AD7490SDZ evaluation board
Evaluation software CD for the AD7490
9 V mains power supply adapter

ADDITIONAL EQUIPMENT NEEDED

EVAL-SDP-CB1Z system demonstration platform
Precision analog signal source
SMB cables
USB cables
PC running Windows XP SP2, Windows Vista, or Windows 7 with USB 2.0 port

ONLINE RESOURCES

Documents
AD7490 data sheet
EVAL-AD7490SDZ user guide
Required Software
EVAL-AD7490SDZ evaluation software

GENERAL DESCRIPTION

The EVAL-AD7490SDZ is a full featured evaluation board that can be used to easily evaluate all features of the AD7490. The AD7490 is a 12-bit, high speed, low power, successive approximation ADC. The device operates from a single 2.7 V to 5.25 V power supply and features throughput rates of up to 1 MSPS. The device contains a low noise, wide bandwidth, track-and-hold amplifier that can handle input frequencies of greater than 1 MHz.

The evaluation board can be controlled via the system demonstration platform (SDP). The EVAL-SDP-CB1Z board allows the evaluation board to be controlled via the USB port of a PC using the AD7490 evaluation software. The EVAL-AD7490SDZ generates all required power supplies on board and supplies power to the EVAL-SDP-CB1Z controller board. On-board components include the following:

- AD8034: low cost, 80 MHz *FastFET*™ op amp
- ADP1613: step-up PWM dc-to-dc switching converter
- ADP3303-5: high accuracy anyCAP® 200 mA low dropout linear regulator
- ADP7104: 20 V, 500 mA, low noise, CMOS LDO
- ADM1185: quad voltage monitor and sequencer
- ADP190: logic controlled, high-side power switch
- ADG3308: low voltage, 1.15 V to 5.5 V, 8-channel, bidirectional logic level translator
- ADR3425: micropower, high accuracy voltage reference
- REF192: precision micropower, low dropout, low voltage reference

FUNCTIONAL BLOCK DIAGRAM

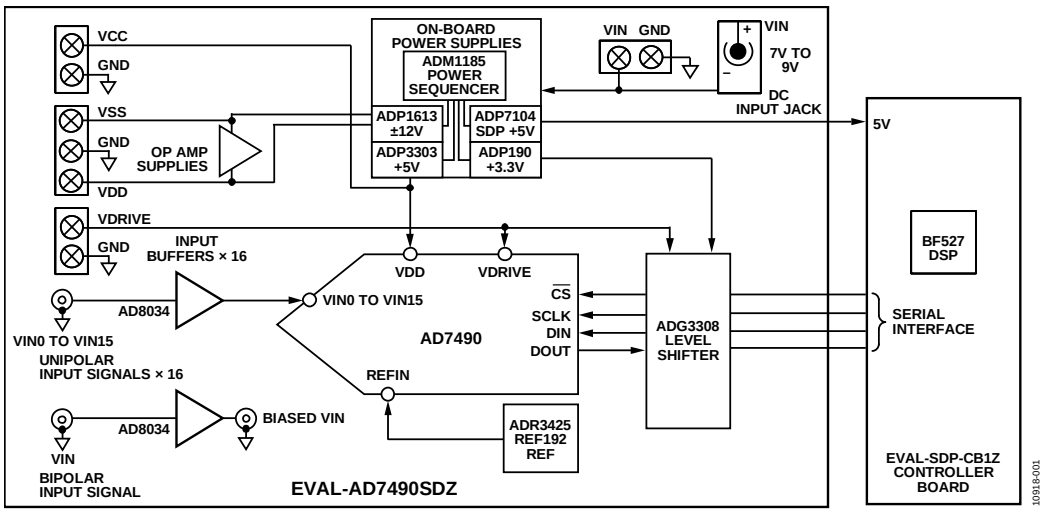


Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

12/14—Rev. 0 to Rev. A

Changes to Standalone Mode Section ... 12

3/13—Revision 0: Initial Version

GETTING STARTED

QUICK START STEPS

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 AD7490 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-AD7490SDZ board as shown in Figure 2. Screw the two boards together using the nylon screw-nut set included in the evaluation board kit to ensure that the boards are connected firmly together.
3. Connect the 9 V power supply adapter included in the evaluation board kit to Connecter J702 on the EVAL-AD7490SDZ 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-AD7490SDZ software from the **Analog Devices** subfolder in the **Programs** menu.

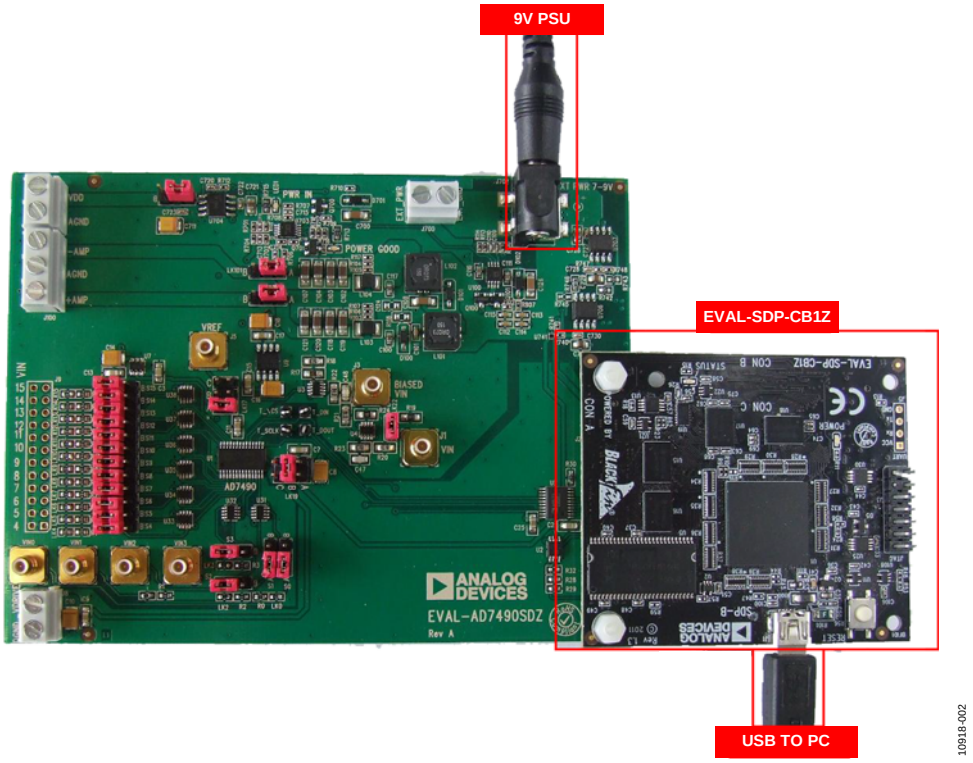


Figure 2. Hardware Configuration—Setting Up the EVAL-AD7490SDZ (EVAL-AD7490SDZ on Left and EVAL-SDP-CB1Z on Right)

SOFTWARE INSTALLATION PROCEDURES

The EVAL-AD7490SDZ 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:

- AD7490 evaluation board software installation
- EVAL-SDP-CB1Z system demonstration platform board drivers installation

Warning

The evaluation board 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 AD7490 Evaluation Board Software

To install the AD7490 evaluation board software,

1. With the EVAL-AD7490SDZ 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\AD7490**.
3. A dialog box appears asking for permission to allow the program to make changes to your computer. Click **Yes**.

Figure 3. AD7490 Evaluation Board Software Installation: Granting Permission for Program to Make Changes

4. Select the location to install the software, and then click **Next**.

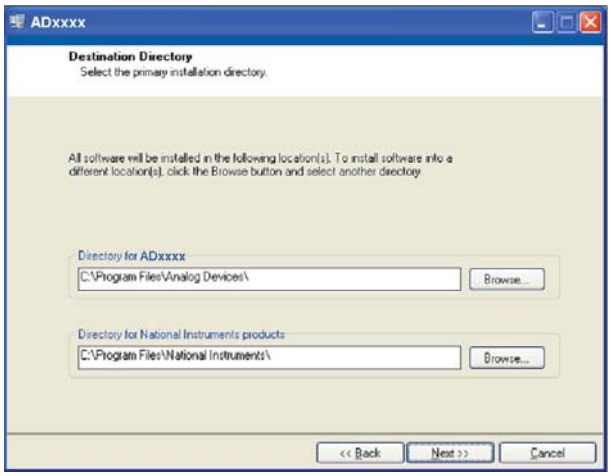


Figure 4. AD7490 Evaluation Board Software Installation: Selecting the Location for Software Installation

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

Figure 5. AD7490 Evaluation Board Software Installation: Accepting the License Agreement

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

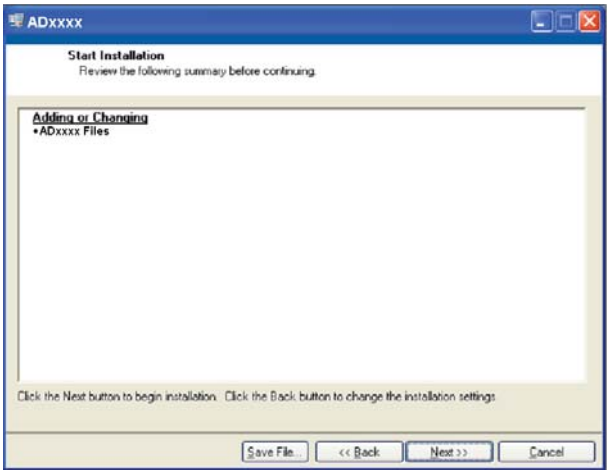


Figure 6. AD7490 Evaluation Board Software Installation: Reviewing a Summary of the Installation

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

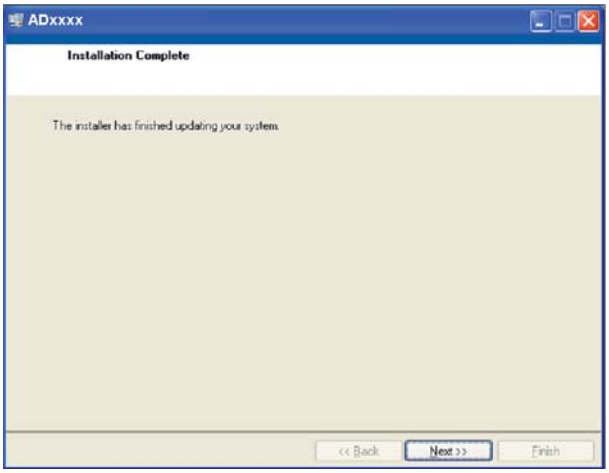


Figure 7. AD7490 Evaluation Board Software Installation: Indicating When the Installation Is Complete

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

After the installation of the evaluation board software is complete, a welcome window displays 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 8. EVAL-SDP-CB1Z Drivers Setup

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

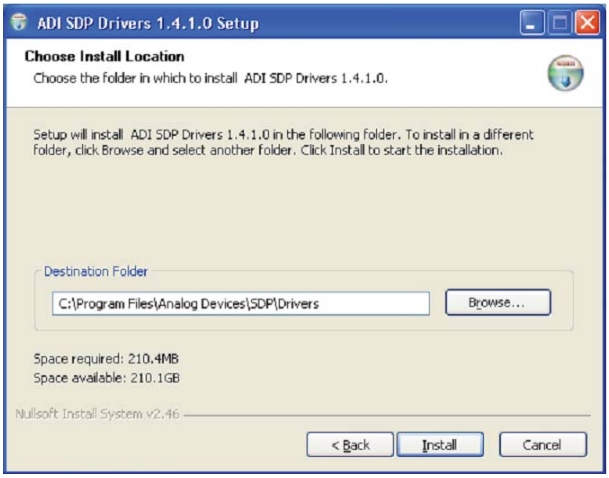


Figure 9. EVAL-SDP-CB1Z Drivers Setup: Selecting the Location for Drivers Installation

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

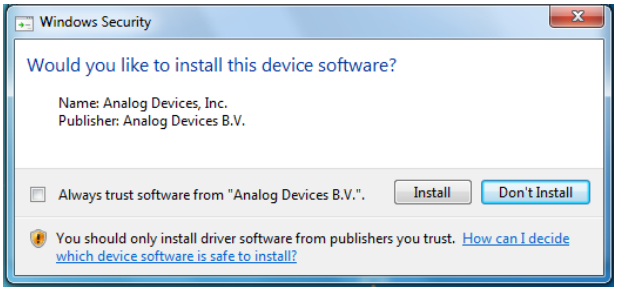


Figure 10. EVAL-SDP-CB1Z Drivers Setup: Granting Permission to Install Drivers

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

Figure 11. EVAL-SDP-CB1Z Drivers Setup: Completing the Drivers Setup Wizard

5. Before using the evaluation board, you must restart your computer. A dialog box opens, giving you the following options: **Restart**, **Shut Down**, or **Restart Later**. Click the appropriate button.

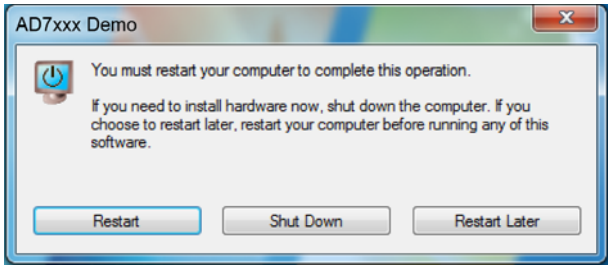


Figure 12. EVAL-SDP-CB1Z Drivers Setup: Restarting the Computer

EVALUATION BOARD SETUP PROCEDURES

The AD7490 evaluation board connects to the EVAL-SDP-CB1Z system demonstration board. The EVAL-SDP-CB1Z board is the controller board, which is the communication link between the PC and the main evaluation board. Figure 2 shows a photograph of the connections made between the AD7490 daughter board and the EVAL-SDP-CB1Z board.

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-AD7490SDZ board to Connector A or Connector B of the EVAL-SDP-CB1Z board (see Figure 2).
   a. Screw the two boards together using the nylon screw-nut set included in the evaluation board kit to ensure that the boards are connected firmly together.
2. Connect the 9 V power supply adapter included in the evaluation board kit to Connecter J702 of the EVAL-AD7490SDZ board. (Alternatively, a bench power supply can be used to power the EVAL-AD7490SDZ via Connecter J700. See Table 1 for more information about the connections and options for the required power supplies.)
3. Connect the EVAL-SDP-CB1Z board to the PC using the supplied USB cable.

EVALUATION BOARD HARDWARE

AD7490 DEVICE DESCRIPTION

The AD7490 can interface to microprocessors or DSPs, and an extended performance version of the device, AD7490-EP, is available that supports defense and aerospace applications (AQEC). For more information about the AD7490 or AD7490-EP, refer to the AD7490 or AD7490-EP data sheet, which should be consulted in conjunction with this user guide.

POWER SUPPLIES

The EVAL-AD7490SDZ can be used in two modes: SDP controlled mode and standalone mode (see the Modes of Operation section for more information).

When the EVAL-AD7490SDZ board is used in conjunction with the EVAL-SDP-CB1Z board (SDP controlled mode), connect the ac transformer to Connector J702 on the EVAL-AD7490SDZ board. The V_{DD}, V_{DRIVE}, and op amp supplies are generated on board. When the EVAL-AD7490SDZ board is used in standalone mode, the V_{DD}, V_{DRIVE}, and op amp supplies must be sourced from external sources (see Table 1).

In SDP controlled mode and standalone mode, each supply is decoupled on the EVAL-AD7490SDZ using 10 µF and 0.1 µF capacitors. A single ground plane is used on this board to minimize the effect of high frequency noise interference.

Table 1. External Power Supplies Required

Power Supply	Connector	Voltage Range	Purpose
V_{IN}[1]	J700 or J702	7 V to 9 V	Supplies all on-board power supplies, generating all required voltages to run the evaluation board
+12 V	J100	+12 V to +16.5 V	Supplies the positive rail of the amplifier
−12 V	J100	−12 V to −16.5 V	Supplies the negative rail of the amplifier
V_{DD}	J703	2.7 V to 5.25 V	Supplies the ADC
V_{DRIVE}	J3	2.7 V to 5.25 V	Supplies the digital interface circuitry

[1] When V_{IN} is supplied, all other power supplies are available on board. If the V_{IN} supply is not used, all other power supplies must be sourced from an external source.

LINK CONFIGURATION OPTIONS

There are multiple jumper (LKx) and solder link (SWx) options that must be set correctly to select the appropriate operating setup before using the evaluation board. The functions of these options are outlined in Table 2.

SETUP CONDITIONS

Before applying power and signals to the evaluation board, ensure that all link positions are as required by the operating mode. There are two modes in which to operate the evaluation board. The evaluation board can be operated in SDP controlled mode to be used with the SDP board, or the evaluation board can be used in standalone mode.

Table 3 shows the default positions in which the links are set when the evaluation board is packaged. When the board is shipped, it is assumed that the user is operating with the SDP board (SDP controlled mode).

Table 2. Link Option Functions

Link No.	Function
LK0	When inserted, this link connects the VIN0 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK1	When inserted, this link connects the VIN1 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK2	When inserted, this link connects the VIN2 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK3	When inserted, this link connects the VIN3 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK4	When inserted, this link connects the VIN4 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK5	When inserted, this link connects the VIN5 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK6	When inserted, this link connects the VIN6 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK7	When inserted, this link connects the VIN7 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK8	When inserted, this link connects the VIN8 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK9	When inserted, this link connects the VIN9 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK10	When inserted, this link connects the VIN10 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK11	When inserted, this link connects the VIN11 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK12	When inserted, this link connects the VIN12 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK13	When inserted, this link connects the VIN13 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK14	When inserted, this link connects the VIN14 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK15	When inserted, this link connects the VIN15 input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
SW0	VIN0 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW1	VIN1 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW2	VIN2 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW3	VIN3 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW4	VIN4 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW5	VIN5 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW6	VIN6 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW7	VIN7 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW8	VIN8 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.

Link No.	Function
SW9	VIN9 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW10	VIN10 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW11	VIN11 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW12	VIN12 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW13	VIN13 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW14	VIN14 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
SW15	VIN15 signal selection. In Position A, the input signal is passed to the input buffer amplifiers. In Position B, the buffer amplifier input is switched to 0 V.
LK17	REF_{IN} signal selection. In Position A, REF_{IN} is sourced from U7 (ADR3425). In Position B, REF_{IN} is sourced from U9 (REF192). Position C, REF_{IN} is sourced externally via J5 (V_{REF}).
LK19	V_{DRIVE} signal selection. In Position A, $V_{DRIVE} = V_{DD}$ (5 V). In Position B, V_{DRIVE} = 3.3 V. Position C, V_{DRIVE} is set externally via Pin 2 of Socket J6.
LK22	When inserted, this link connects the VIN input to a 51 Ω input resistor tied to ground. The input is floating when this link is not inserted.
LK101[1]	Op amp negative rail source selection. In Position A, −12 V is supplied from the on-board −12 V supply. In Position B, the negative rail is supplied from an external source via J100 Terminal 1.
LK102[1]	Op amp positive rail source selection. In Position A, +12 V is supplied from the on-board +12 V supply. In Position B, the positive rail is supplied from an external source via J100 Terminal 3.
LK701	V_{DD} signal selection. In Position A, V_{DD} is supplied from the on-board 5 V supply. In Position B, V_{DD} is supplied from an external source via J703 Terminal 1.

[1] Ensure that LK101 and LK102 are always in corresponding positions (that is, both in Position A or both in Position B).

Table 3. Default Link Positions for Packaged EVAL-AD7490SDZ

Link No.	Position	Function
LK0 to LK15	Inserted	The VIN0 to VIN15 signal inputs are set to 51 Ω.
SW0 to SW15	A	The input signals are passed to the input buffer amplifiers.
LK17	A	REF_{IN} is sourced from the ADR3425.
LK19	B	The V_{DRIVE} pin of the AD7490 is set to 3.3 V.
LK22	Inserted	The V_{IN} signal input is set to 51 Ω.
LK101	A	V_{SS} is supplied from the on-board −12 V supply.
LK102	A	V_{DD} is supplied from the on-board +12 V supply.
LK701	A	V_{CC} is supplied from the on-board 5 V supply.

EVALUATION BOARD CIRCUITRY

ANALOG INPUTS

The analog inputs on the EVAL-AD7490SDZ are filtered and buffered by the AD8034 low cost, 80 MHz *FastFET* op amp.

The VIN0 to VIN3 inputs allow a signal to be connected to the board via SMB connectors. The default link positions of the EVAL-AD7490SDZ set the input impedance of these four channels to 51 Ω (see the Bias-Up Option section for more information). These signals can alternatively be connected via Header J1. For best signal quality on the VIN0 to VIN3 inputs, however, it is recommended to use the SMB connections to evaluate the performance of the AD7490.

Each analog input of the EVAL-AD7490SDZ allows a 51 Ω load to be placed on the input if required (see Table 2 for details).

BIAS-UP OPTION

There is an on-board, bias-up circuit available on the EVAL-AD7490SDZ that accepts a bipolar input and converts it to a unipolar signal, which can then be connected to any of the first four inputs, VIN0 to VIN3. The output power of this bias-up circuit is limited; therefore, the input impedance of these inputs increases from 51 Ω to 1051 Ω to allow full-scale signals to be generated.

LK0 to LK3 can be replaced with 0 Ω resistors if this function is not required.

REFERENCE OPTIONS

The following two on-board reference supplies are available:

- ADR3425: micropower, high accuracy voltage reference
- REF192: precision micropower, low dropout, low voltage reference

Alternatively, an external reference voltage can be applied to J3.

SOCKETS/CONNECTORS

Table 4. Socket/Connector Functions

Socket	Function	
VIN0	Analog Input VIN0. Buffered to $V_{IN}0$ on the AD7490.	
VIN1	Analog Input VIN1. Buffered to $V_{IN}1$ on the AD7490.	
VIN2	Analog Input VIN2. Buffered to $V_{IN}2$ on the AD7490.	
VIN3	Analog Input VIN3. Buffered to $V_{IN}3$ on the AD7490.	
J1	VIN. Apply a bipolar signal to this pin. This signal is biased up on J3.	
J2	Socket for EVAL-SDP-CB1Z evaluation controller board.	
J3	Biased VIN. Unipolar version of signal applied to J1.	
J5	V_{REF}. External reference voltage.	
J8	V_{DRIVE}. External screw connection for V_{DRIVE}.	
J9	Analog Input VIN4 to Analog Input VIN15. Buffered to $V_{IN}4$ to $V_{IN}15$ pins of the AD7490.	
	Odd Pins	**Even Pins**
	Pin 1—$V_{IN}4$	Pin 2—AGND
	Pin 3—$V_{IN}5$	Pin 4—AGND
	Pin 5—$V_{IN}6$	Pin 6—AGND
	Pin 7—$V_{IN}7$	Pin 8—AGND
	Pin 9—$V_{IN}8$	Pin 10—AGND
	Pin 11—$V_{IN}9$	Pin 12—AGND
	Pin 13—$V_{IN}10$	Pin 14—AGND
	Pin 15—$V_{IN}11$	Pin 16—AGND
	Pin 17—$V_{IN}12$	Pin 18—AGND
	Pin 19—$V_{IN}13$	Pin 20—AGND
	Pin 21—$V_{IN}14$	Pin 22—AGND
	Pin 23—$V_{IN}15$	Pin 24—AGND
J100	Op amp power supply screw terminal connectors. Supply rails for op amps.	
J700	7 V to 9 V dc screw terminal connector.	
J702	7 V to 9 V dc transformer power connector.	
J703	V_{DD} screw terminal connector.	

MODES OF OPERATION

SDP CONTROLLED MODE

The AD7490 uses a high speed serial interface that allows sampling rates of up to 1 MSPS. For more information about the operation of the serial bus, refer to the AD7490 data sheet.

The EVAL-AD7490SDZ communicates with the EVAL-SDP-CB1Z board using level shifters. The EVAL-SDP-CB1Z operates at a 3.3 V logic level, which allows V_{DRIVE} voltages that exceed 3.3 V to be used without damaging the SDP interface.

STANDALONE MODE

The EVAL-AD7490SDZ can also be used without the EVAL-SDP-CB1Z controller board. In this case, the EVAL-AD7490SDZ is connected to the digital interface using the test points.

HOW TO USE THE SOFTWARE FOR EVALUATING THE AD7490

SETTING UP THE SYSTEM FOR DATA CAPTURE

After completing the steps in the Software Installation Procedures and Evaluation Board Setup Procedures 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 connected 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 13).
   b. **Analog Devices System Development Platform (32MB)** should appear under **ADI Development Tools**, indicating that the EVAL-SDP-CB1Z driver software is installed and that the board is connected to the PC correctly.

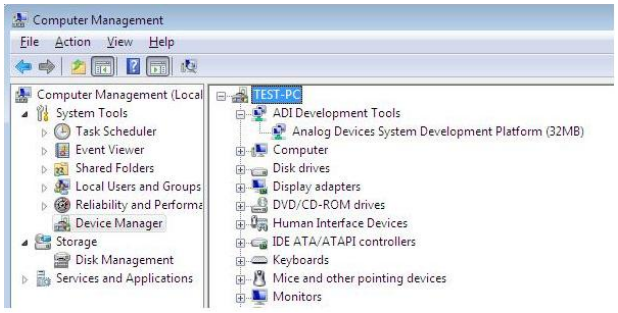


Figure 13. Device Manager:
Checking that the Board Is Connected to the PC Correctly

Launching the Software

After completing the steps in the Setting Up the System for Data Capture section, launch the AD7490 software as follows:

1. From the **Start** menu, click **Programs** > **Analog Devices** > **EVAL-AD790SDZ**. The main window of the software then displays.
2. If the EVAL-AD7490SDZ 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 14). Connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and follow the on-screen instructions.

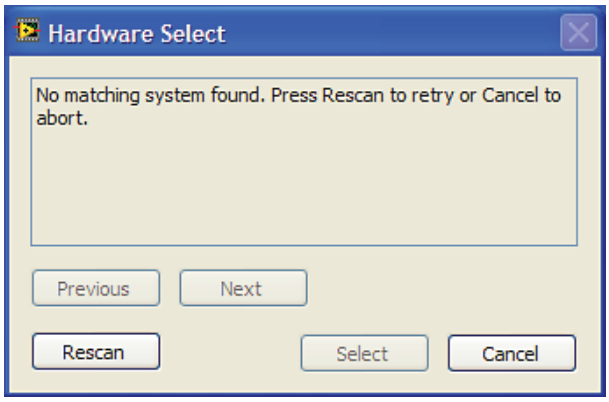
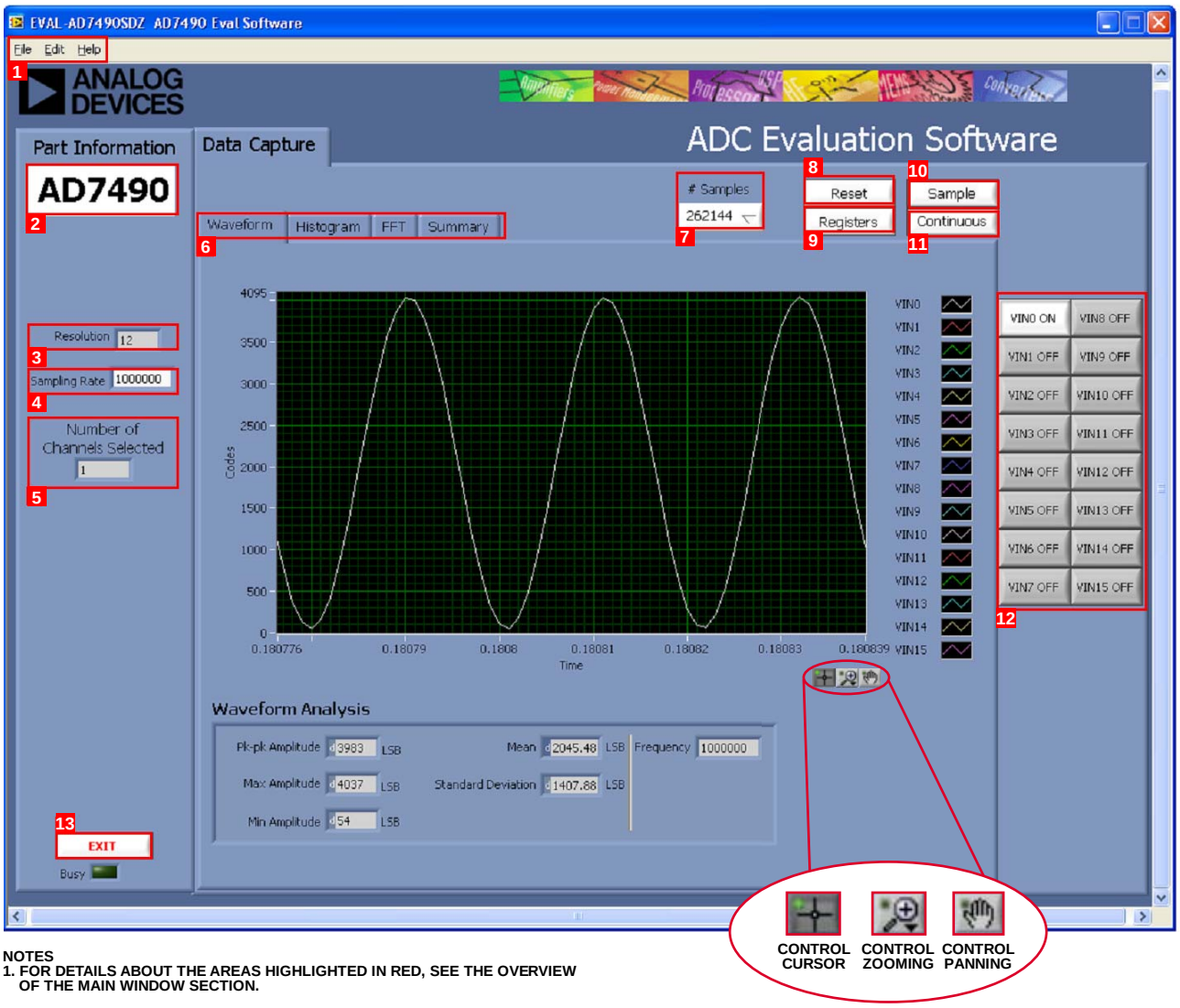


Figure 14. Connectivity Error Alert

When the software starts running, it searches for hardware connected to the PC. A dialog box indicates when the evaluation board attached to the PC is detected, and then the main window appears (see Figure 15).



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

Figure 15. Evaluation Software Main Window

OVERVIEW OF THE MAIN WINDOW

The main window of the software is shown in Figure 15 and has the features described in this section.

File Menu (Section 1)

The **File** menu (labeled 1 in Figure 15) offers the choice to

- **Load data**: load previously captured data or example files in .tsv (tab separated values) format for analysis (see Figure 16). (The default location for the example files is **C:\Program Files\Analog Devices\AD7490\examples**.)
- **Save Data as .tsv**: save captured data in .tsv format for future analysis (see Figure 17).
- **Print Front Panel Picture**: print the main window to the default printer.
- **Save Picture**: save the current screen capture.
- **Exit**: quit the application.

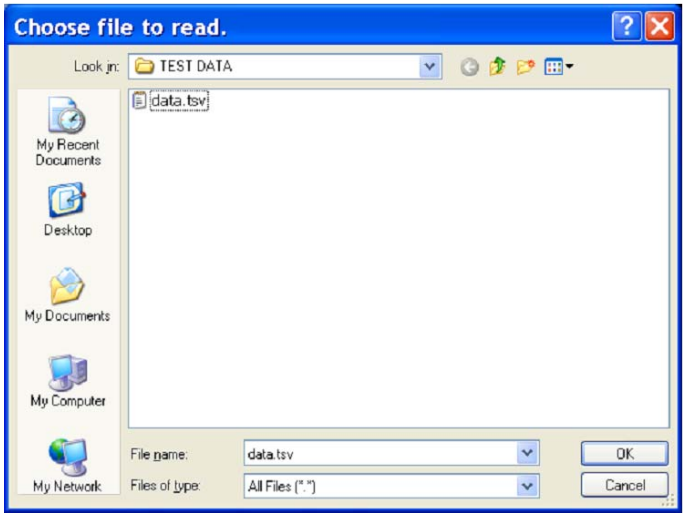


Figure 16. Load File Dialog Box: Loading Previously Captured Data or Example Files in .tsv Format

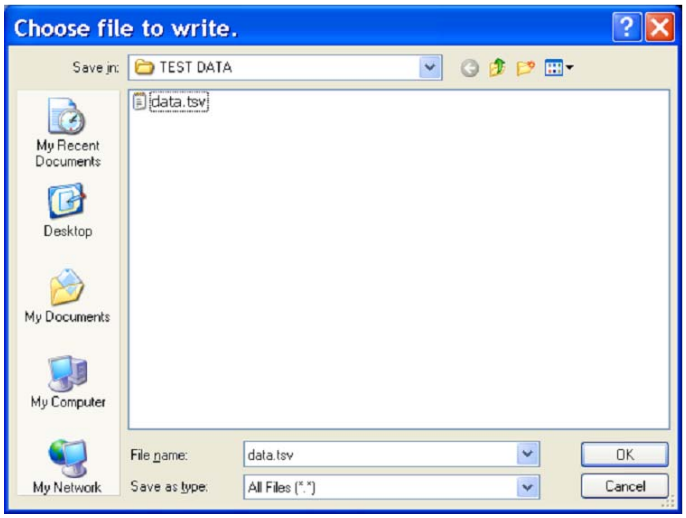


Figure 17. Save File Dialog Box: Saving Data as .tsv

Part Information Box (Section 2)

The **Part Information** box (labeled 2 in Figure 15) displays the generic being evaluated and is for informational purposes only.

Resolution Box (Section 3)

The **Resolution** box (labeled 2 in Figure 15) displays the resolution of the AD7490 in bits.

Sampling Rate Box (Section 4)

The default sampling frequency in the **Sampling Rate** box (labeled 4 in Figure 15) matches the maximum sample rate of the ADC selected from the drop-down menu. Although you can adjust the sampling frequency, there are limitations in terms of the sample frequencies that can be entered. If an unusable sample frequency is input, the software automatically adjusts the sample frequency accordingly. Units can be entered as, for example, 10k for 10,000 Hz. The software automatically adjusts the sample frequency according to the ability of the ADC being evaluated. For example, if you enter a value that is beyond the ability of the device, the software indicates this and reverts to the maximum sample frequency.

Number of Channels Selected Box (Section 5)

The **Number of Channels Selected** box (labeled 5 in Figure 15) displays the number of channels being sampled. Multiple channels can be sampled in sequence.

Tabs Area (Section 6)

There are four tabs available in the tabs area (labeled 6 in Figure 15) of the main window: **Waveform**, **Histogram**, **FFT**, and **Summary**. These tabs display the data in different formats. Navigation tools are provided within each tab to allow you to control the cursor, zooming, and panning (see Figure 15) within the graphs displayed.

Each tab is described in more detail in the Generating a Waveform Analysis Report; Generating a Histogram of the ADC Code Distribution; Generating a Fast Fourier Transform of AC Characteristics; and Generating a Summary of the Waveform, Histogram, and Fast Fourier Transform sections.

 # Samples Box (Section 7)

The **# Samples** box (labeled 7 in Figure 15) allows you to select the number of samples to analyze. When **Sample** or **Continuous** is clicked, the software requests this number of samples to be taken. This is the total number of samples taken on all channels.

Reset Button (Section 8)

Clicking **Reset** (labeled 8 in Figure 15) sets the AD7490 to a known setup (see Figure 18).

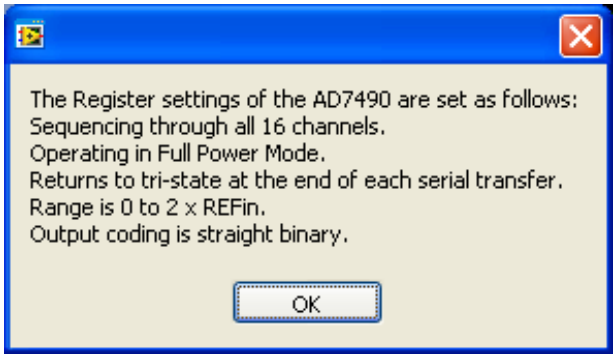


Figure 18. Resetting AD7490 to a Known Setup

Registers Button (Section 9)

Clicking **Registers** (labeled 9 in Figure 15) opens the **Control Register** dialog box (see Figure 19).

Figure 19. Control Register Dialog Box

Sample Button (Section 10)

Clicking **Sample** (labeled 10 in Figure 15) performs a single capture, acquiring a set number of samples at the selected sampling rate.

Continuous Button (Section 11)

Clicking **Continuous** (labeled 11 in Figure 15) performs a continuous capture from the ADC. Clicking **Continuous** a second time stops sampling.

Channel Display Buttons (Section 12)

Clicking the buttons in this area (labeled 11 in Figure 15) allows you to display multiple channel reads. (Note that for FFT analysis, you can select only one channel to be displayed.)

Exit Button (Section 13)

Clicking **Exit** (labeled 13 in Figure 15) closes the software. Alternatively, you can click **Exit** from the **File** menu.

GENERATING A WAVEFORM ANALYSIS REPORT

Figure 20 shows the waveform capture tab for a 48 kHz sine wave input signal.

The **Waveform Analysis** area (labeled 1 in Figure 20) reports the amplitudes recorded from the captured signal and the frequency of the signal tone.

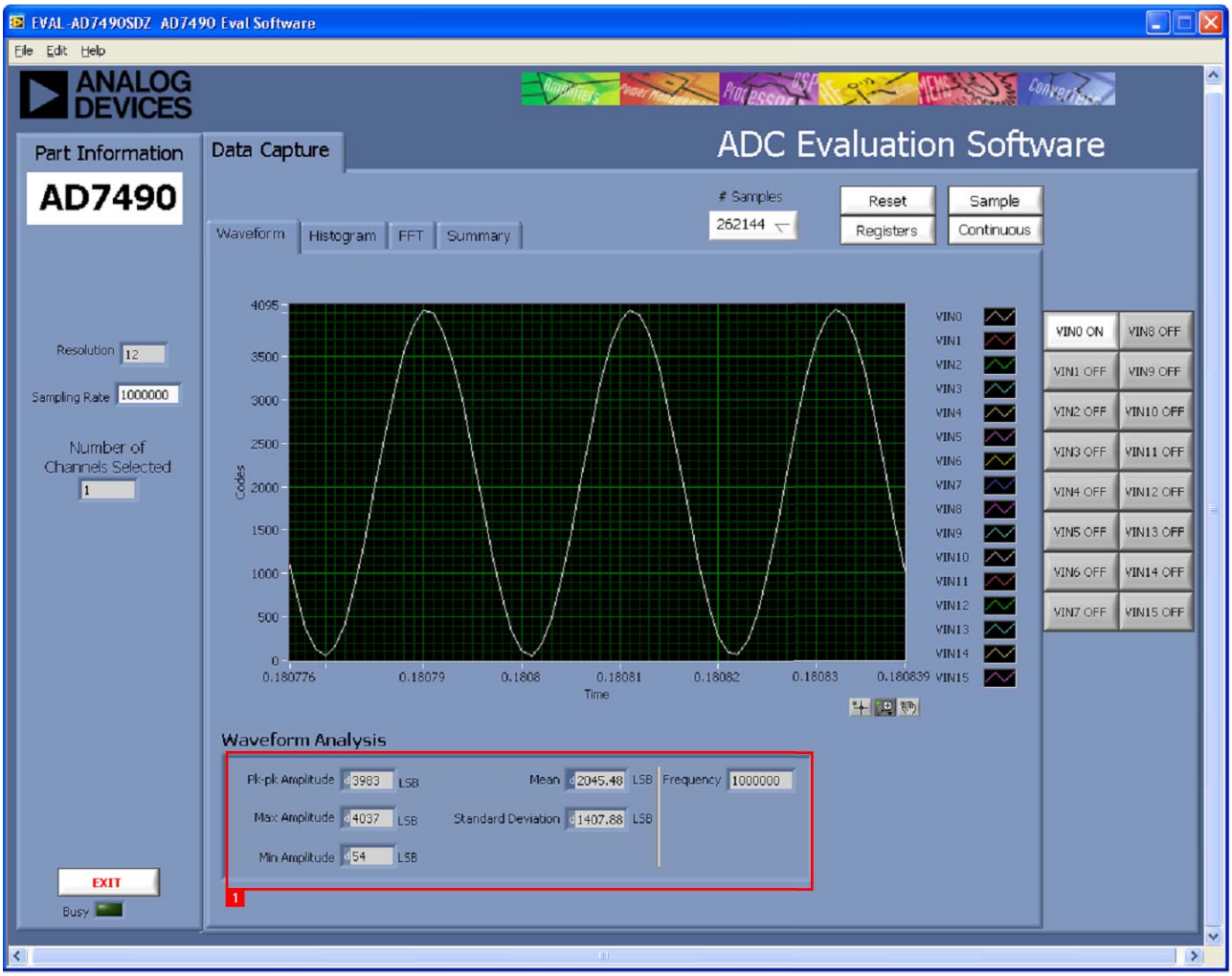


*Figure 20. **Waveform** Tab*

GENERATING A HISTOGRAM OF THE ADC CODE DISTRIBUTION

The **Histogram** tab can be used to perform ac testing or, more commonly, dc testing. This tab shows the ADC code distribution of the input and computes the mean and standard deviation, which are displayed as **Mean** and **Transition Noise**, respectively, in the **Histogram Analysis** area (labeled 1 in Figure 21).

Figure 21 shows the histogram with ac input for a 48 kHz sine wave applied to the ADC input and the resulting calculations.

AC Input

To perform a histogram test of ac input,

1. Apply a signal source to the selected analog input on the board.
2. Click the **Histogram** tab from the main window.
3. Click **Sample**.

Raw data is then captured and passed to the PC for statistical computations, and various measured values are displayed in the **Histogram Analysis** area.

DC Input

A histogram test of dc input can be performed with or without an external source because the evaluation board has a buffered $V_{REF}/2$ source at the ADC input.

To perform a histogram test of dc input,

1. If an external source is being used, apply a signal source to the selected analog input. It may be required to filter the signal to ensure that the dc source is noise-compatible with the ADC.
2. Click the **Histogram** tab from the main window.
3. Click **Sample**.

Raw data is then captured and passed to the PC for statistical computations, and various measured values are displayed in the **Histogram Analysis** area.

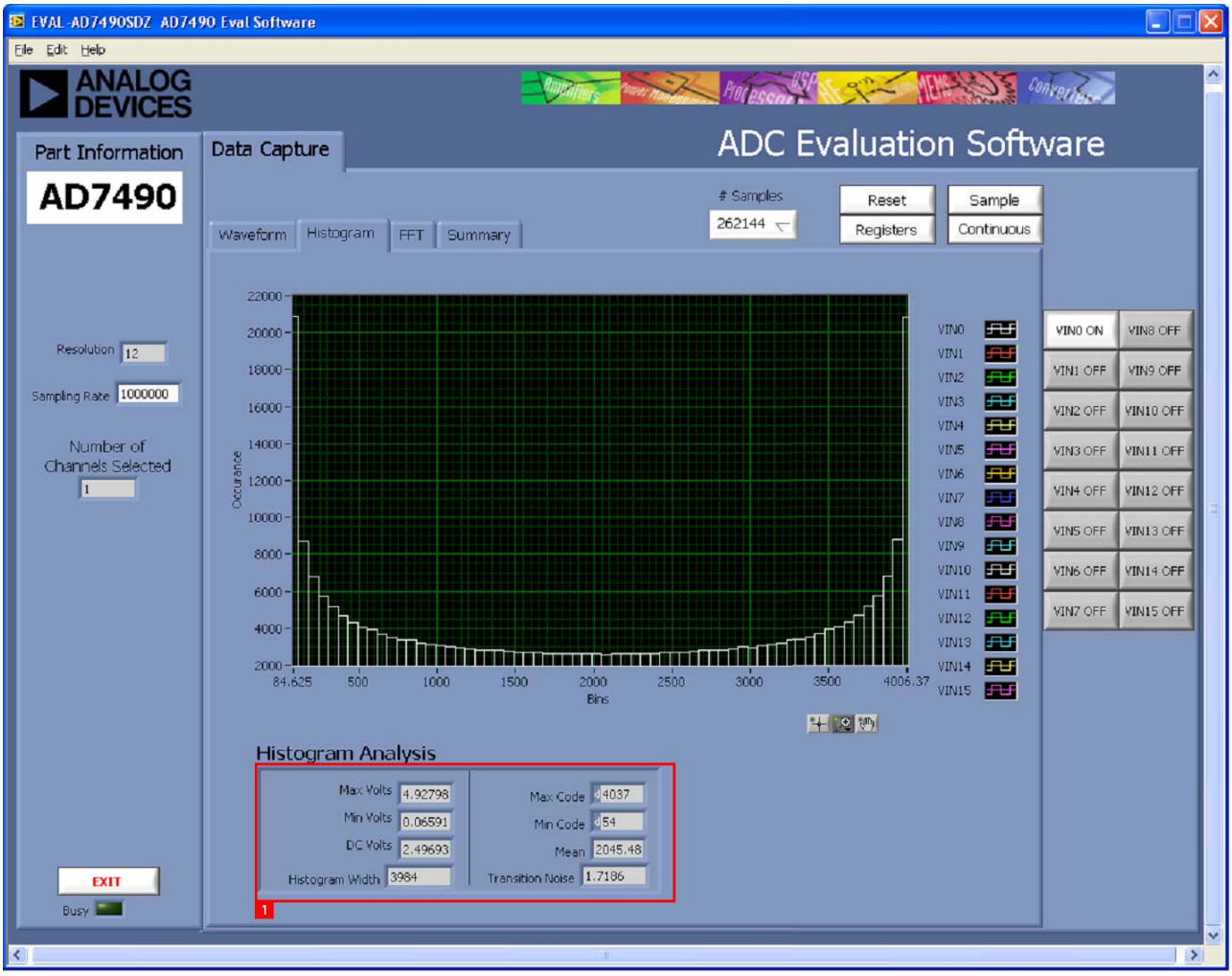


*Figure 21. **Histogram** Tab*

GENERATING A FAST FOURIER TRANSFORM OF AC CHARACTERISTICS

Figure 22 shows the **FFT** tab. This feature tests the traditional ac characteristics of the converter and displays a fast Fourier transform (FFT) of the results.

To perform an ac FFT test,

1. Apply a sinusoidal signal with low distortion (better than 115 dB) to the evaluation board at the selected analog input. To attain the requisite low distortion, which is necessary to allow true evaluation of the device, one option is to
   a. Filter the input signal from the ac source. Choose an appropriate band-pass filter based on the sinusoidal signal applied.
   b. If a low frequency band-pass filter is used when the full-scale input range is more than a few volts peak-to-peak, use the on-board amplifiers to amplify the signal, thus preventing the filter from distorting the input signal.
2. Click the **FFT** tab from the main window.
3. Click **Sample**.

As in the histogram test, raw data is then captured and passed to the PC, which performs the FFT and displays the resulting SNR, THD, and SINAD.

The **Spectrum Analysis** box displays the results of the captured data.

- The area labeled 1 in Figure 22 shows the input signal information.
- The area labeled 2 in Figure 22 displays the fundamental frequency and amplitude in addition to the second to fifth harmonics.
- The area labeled 3 in Figure 22 displays the performance data, including the SNR, THD, and SINAD.

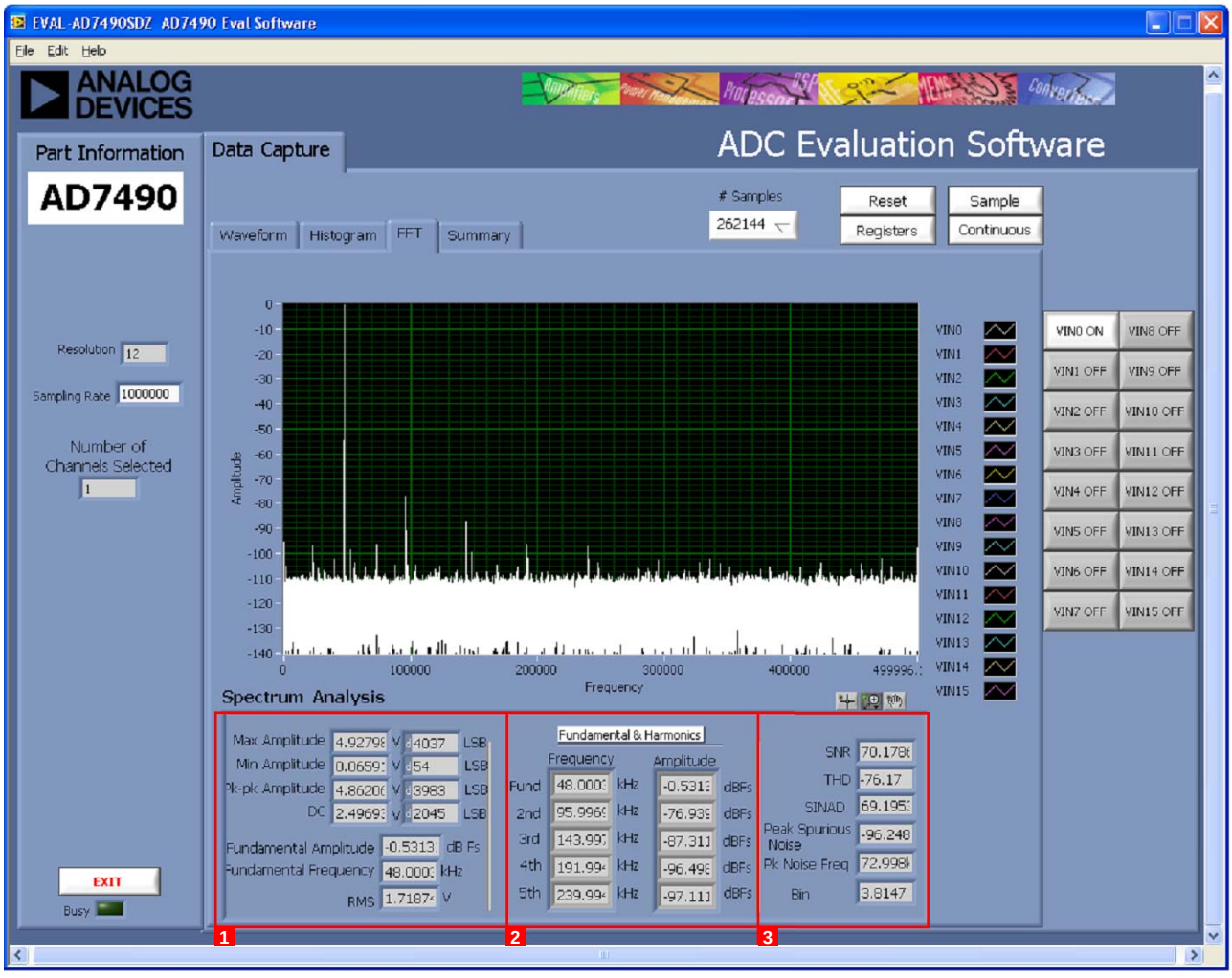


*Figure 22. **FFT** Tab*

GENERATING A SUMMARY OF THE WAVEFORM, HISTOGRAM, AND FAST FOURIER TRANSFORM

Figure 23 shows the **Summary** tab. The **Summary** tab captures all the display information and provides it in one panel with a synopsis of the information, including key performance parameters such as SNR and THD.

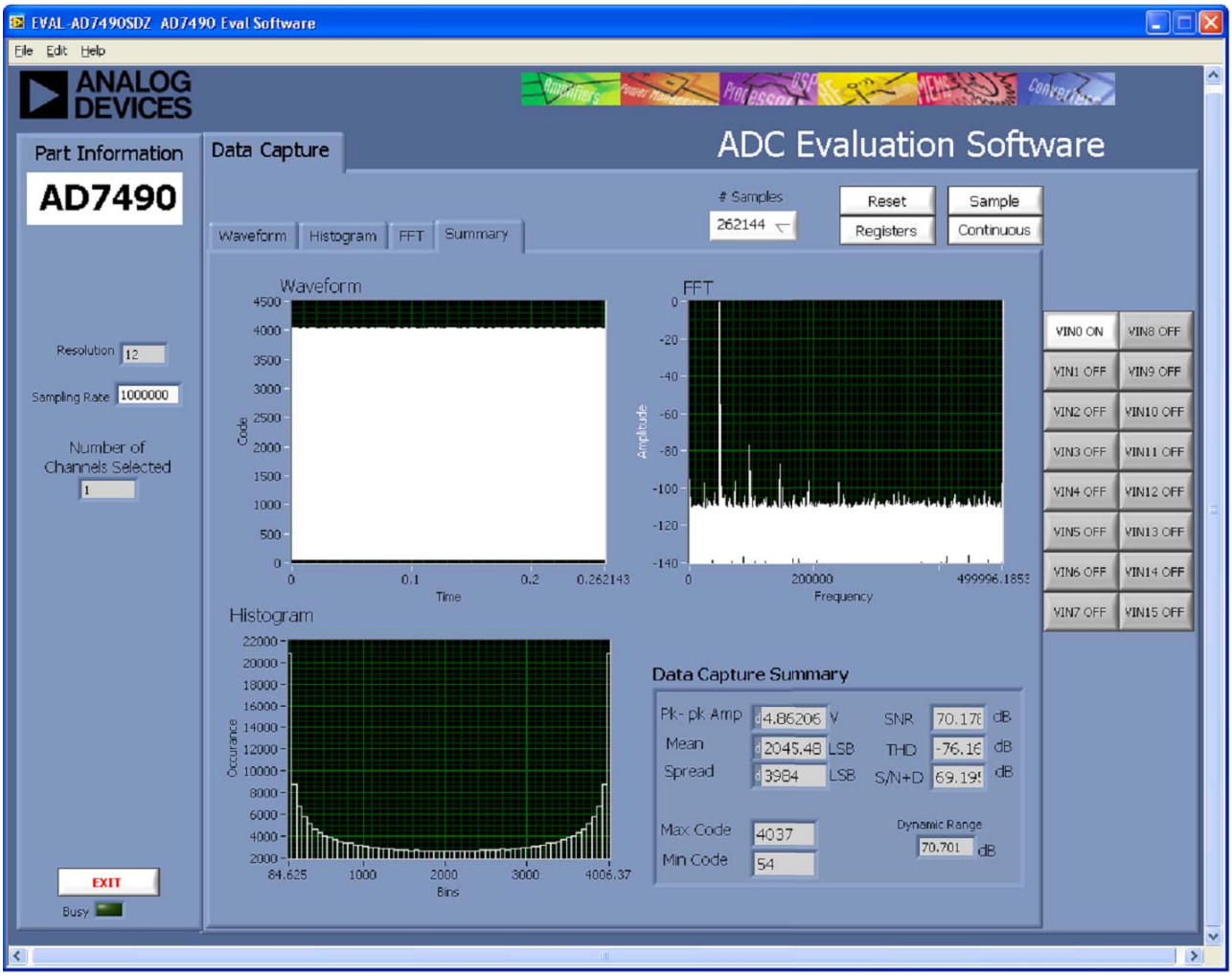


*Figure 23. **Summary** Tab*

RELATED LINKS

Resource	Description
AD7490	Product Page: 16-Channel, 1 MSPS, 12-Bit ADC with Sequencer in 28-Lead TSSOP
AD8034	Product Page: Low Cost, 80 MHz *FastFET* Op Amp
ADP1613	Product Page: Step-Up PWM DC-to-DC Switching Converter
ADP3303-5	Product Page: High Accuracy anyCAP 200 mA Low Dropout Linear Regulator
ADP7104	Product Page: 20 V, 500 mA, Low Noise, CMOS LDO
ADM1185	Product Page: Quad Voltage Monitor and Sequencer
ADP190	Product Page: Logic Controlled, High-Side Power Switch
ADG3308	Product Page: Low Voltage, 1.15 V to 5.5 V, 8-Channel, Bidirectional Logic Level Translator
ADR3425	Product Page: Micropower, High Accuracy Voltage Reference
REF192	Product Page: Precision Micropower, Low Dropout, Low Voltage Reference
EngineerZone	Online Community: Analog Devices, Inc., Online Technical Support Community
Circuits from the Lab	Reference Circuits: Circuit Designs that Have Been Built and Tested to Ensure Function and Performance and that Address Common Analog, RF/IF, and Mixed-Signal Design Challenges by Applying Analog Devices' Vast Applications Expertise

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.

UG10918-0-12/14(A)

www.analog.com