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## Evaluating the **AD7405** 16-Bit Isolated Sigma-Delta ADC

### FEATURES

Full featured evaluation board for the **AD7405**  
 On-board power supplies  
 Standalone capability  
 System demonstration platform (SDP-H1) compatible  
 (EVAL-SDP-CH1Z)  
 PC software for control and data analysis

### EVALUATION KIT CONTENTS

**EVAL-AD7405FMCZ** evaluation board  
 CD containing evaluation software for the **AD7405**

### ADDITIONAL EQUIPMENT NEEDED

**EVAL-SDP-CH1Z**, includes a USB cable and 12 V wall wart  
 Signal source  
 PC running Windows XP SP3, Windows Vista, or Windows 7  
 with USB 2.0 port

### ONLINE RESOURCES

#### Documents Needed

[AD7405](#) data sheet  
[EVAL-AD7405FMCZ](#) user guide

#### Required Software

[EVAL-AD7405FMCZ](#) evaluation software  
[FAQs](#) and [Troubleshooting](#)

### EVALUATION BOARD DESCRIPTION

The **EVAL-AD7405FMCZ** is a full featured evaluation board designed to allow the user to easily evaluate all features of the **AD7405** isolated analog-to-digital converter (ADC). The evaluation board can be controlled by the **EVAL-SDP-CH1Z** via the FMCZ connector (J9). The SDP-H1 board (**EVAL-SDP-CH1Z**) allows the evaluation board to be controlled through a USB port of a PC using the evaluation board software available for download from the product page or from the included installer CD included in the evaluation board kit.

On-board components include the following:

**ADuM6000**: isolated *iCoupler*® 5 kV, dc-to-dc converter  
**ADP2441**: 36 V, 1 A, synchronous, step down dc-to-dc regulator  
**ADP7104ARDZ-5.0**: 5 V low noise LDO

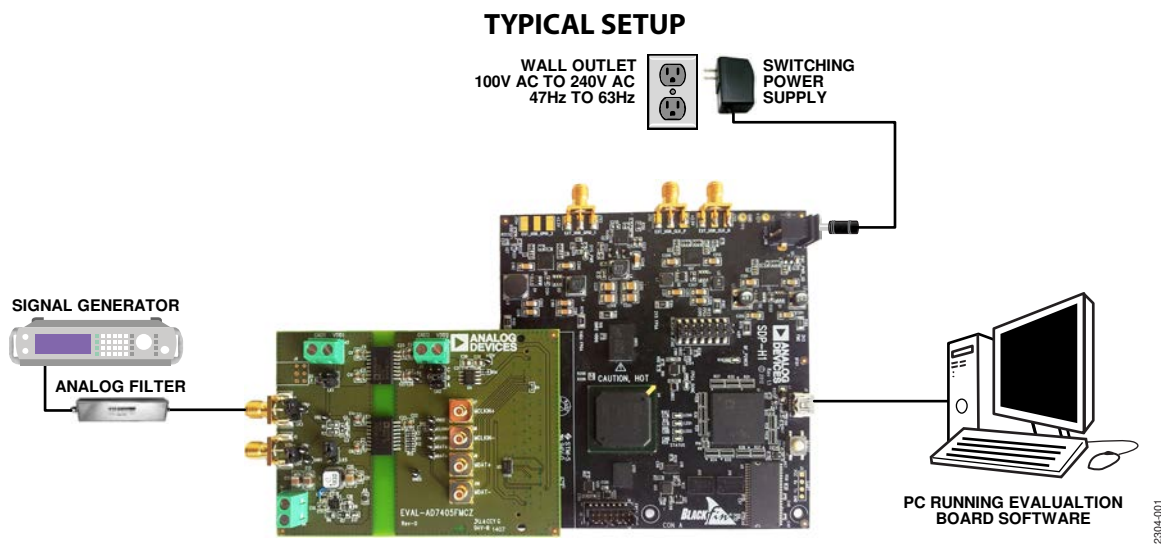


Figure 1. Typical Setup (EVAL-AD7405FMCZ on Left and EVAL-SDP-CH1Z on Right)

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**REVISION HISTORY**

9/14—Revision 0: Initial Version

## QUICK START GUIDE

Follow these steps to quickly evaluate the [AD7405](#) ADC:

1. Install the evaluation software from the [AD7405](#) product page or from the included CD. Ensure that the [EVAL-SDP-CH1Z](#) board is disconnected from the USB port of the PC while installing the software. (The PC may need to be restarted after the installation.)
2. Ensure that the various link options are configured as outlined in Table 2.
3. Connect the [EVAL-SDP-CH1Z](#) board to the evaluation board as shown in Figure 2.
4. Connect the [EVAL-SDP-CH1Z](#) board to the PC via the USB cable. For Windows® XP, you may need to search for the [EVAL-SDP-CH1Z](#) drivers. Choose to automatically search for the drivers for the [EVAL-SDP-CH1Z](#) board if prompted by the operating system.
5. Power up the [EVAL-SDP-CH1Z](#) by inserting the 12 V dc barrel jack (included with [EVAL-SDP-CH1Z](#)), into the barrel connector labeled +12V\_VIN on the [EVAL-SDP-CH1Z](#).
6. Launch the evaluation software from the **Analog Devices** subfolder in the **Programs** menu.
7. Connect an input signal via the VIN+, J1 connector.

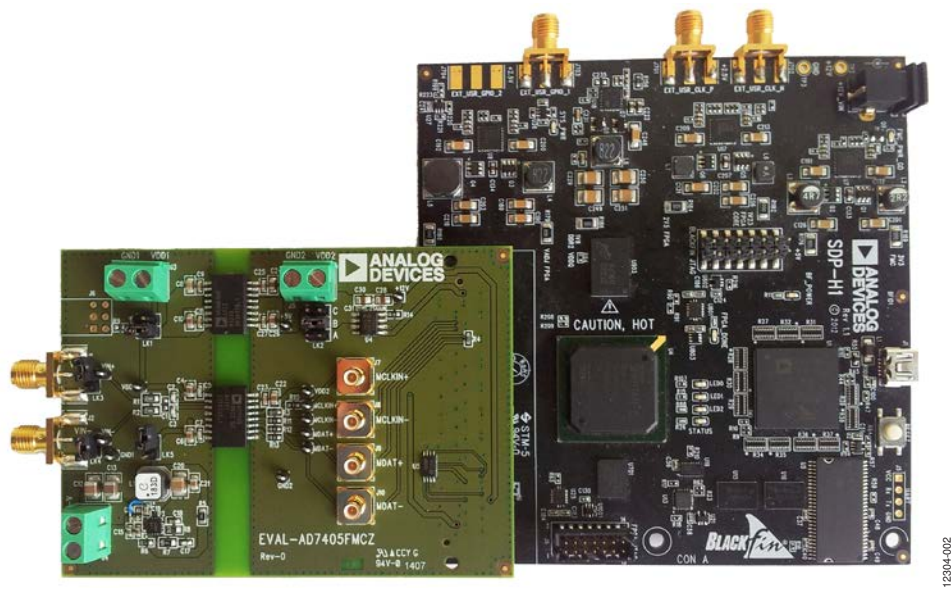


Figure 2. [EVAL-AD7405FMCZ](#) (Left) Connected to the [EVAL-SDP-CH1Z](#) Board (Right)

**SOFTWARE INSTALLATION PROCEDURES**

The EVAL-AD7405FMCZ evaluation kit includes a CD containing evaluation software to be installed on your PC before you begin using the evaluation board.

There are two parts to the installation:

- EVAL-AD7405FMCZ evaluation software installation
- EVAL-SDP-CH1Z system demonstration platform board driver installation

**Warning**

The evaluation board software and drivers must be installed before connecting the evaluation board and EVAL-SDP-CH1Z 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 EVAL-AD7405FMCZ Evaluation Software**

To install the EVAL-AD7405FMCZ evaluation software,

1. Insert the included evaluation software installation CD into the CD drive of a Windows-based PC, and open the contents of the CD.
2. Double-click the **setup.exe** file to begin the installation. By default, the software is saved to the following location: **C:\Program Files\Analog Devices\AD740X\**
3. A dialog box appears asking for permission to allow the program to make changes to your computer. Click **Yes** to begin the installation process (see Figure 3).

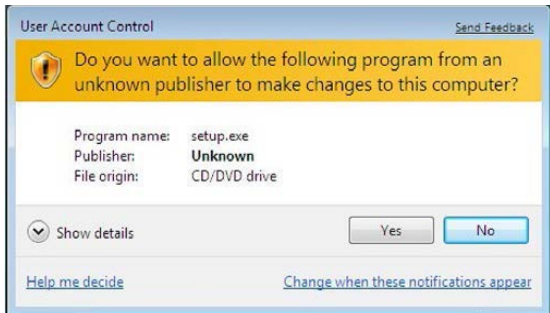


Figure 3. Evaluation Software Installation—User Account Control

4. Select the location to install the software, and then click **Next** (see Figure 4).

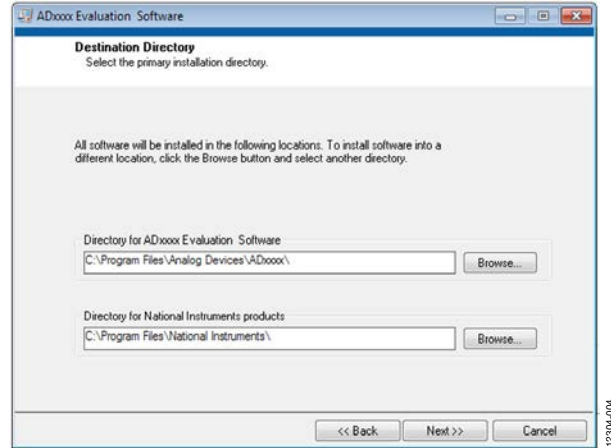


Figure 4. Evaluation Software Installation—Destination Directory

5. A license agreement appears. Read the agreement and then select **I accept the License Agreement** and click **Next**.
6. A summary of the installation is displayed. Click **Next** to continue (see Figure 5).

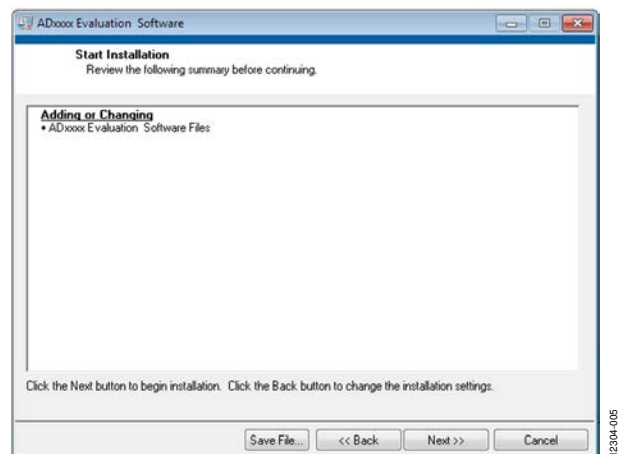


Figure 5. Evaluation Software Installation—Start Installation

7. A dialog box informs you when the evaluation software installation is complete. Click **Next** to proceed with the installation of the drivers (see Figure 6).

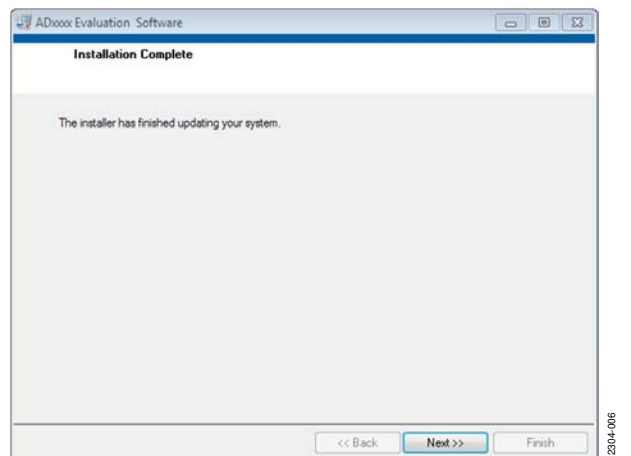


Figure 6. Evaluation Software Installation—Installation Complete

**Installing the EVAL-SDP-CH1Z System Demonstration Platform Board Drivers**

After the installation of the evaluation board software is complete, the **ADI SDP Drivers Setup Wizard** window opens for the installation of the **EVAL-SDP-CH1Z** system demonstration platform board drivers (see Figure 7).

1. Make sure that all other applications are closed, and then click **Next** to begin the driver installation process (see Figure 7).



Figure 7. EVAL-SDP-CH1Z Drivers Installation—Setup Wizard

2. Select the location to install the drivers, and then click **Install** (see Figure 8).

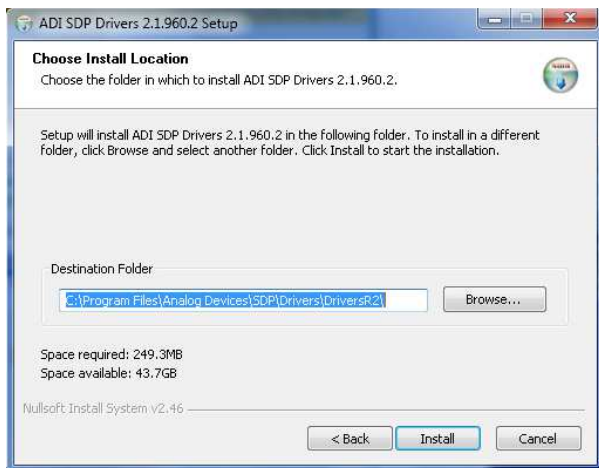


Figure 8. EVAL-SDP-CH1Z Drivers Installation—Choose Install Location

3. Click **Install** to proceed with the installation (see Figure 9).

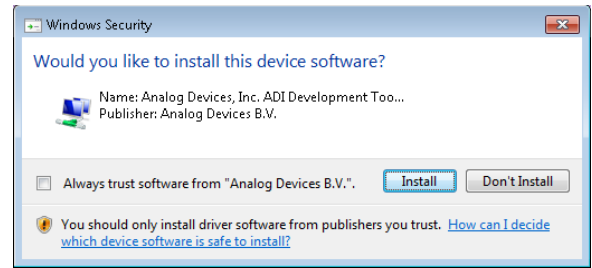


Figure 9. EVAL-SDP-CH1Z Drivers Installation—Windows Security

4. To complete the drivers installation, click **Finish**, which closes the installation wizard (see Figure 10).

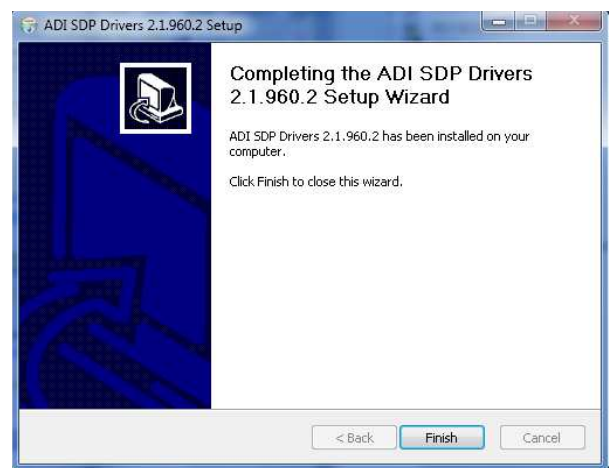


Figure 10. EVAL-SDP-CH1Z Drivers Installation—Complete

## EVALUATION BOARD SETUP PROCEDURES

The [EVAL-AD7405FMCZ](#) connects to the [EVAL-SDP-CH1Z](#) system demonstration platform. The [EVAL-SDP-CH1Z](#) 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 between the [EVAL-AD7405FMCZ](#) daughter board and the [EVAL-SDP-CH1Z](#) board.

After following the instructions in the Software Installation Procedures section, set up the evaluation and SDP-H1 boards as detailed in this section.

### Warning

The evaluation software and drivers must be installed before connecting the evaluation board and [EVAL-SDP-CH1Z](#) board to the USB port of the PC to ensure that the evaluation system is correctly recognized when it is connected to the PC.

### Connecting the Evaluation and SDP Boards to a PC

1. Ensure that all configuration links are in the appropriate positions (see Table 2).
2. Connect the [EVAL-AD7405FMCZ](#) board securely to the J4 FMC connector on the [EVAL-SDP-CH1Z](#) board.
3. The [EVAL-SDP-CH1Z](#) board requires an external power supply adapter, which is included in the [EVAL-SDP-CH1Z](#) kit. Connect this power supply to the dc barrel connector labeled +12V\_VIN on the [EVAL-SDP-CH1Z](#) board.
4. Connect the [EVAL-SDP-CH1Z](#) board to the PC via the USB cable enclosed in the [EVAL-SDP-CH1Z](#) kit.

### Verifying the Board Connection

1. Allow the **Found New Hardware Wizard** to run after the [EVAL-SDP-CH1Z](#) board is plugged into your PC. (If you are using Windows XP, you may need to search for the [EVAL-SDP-CH1Z](#) drivers. Choose to automatically search for the drivers for the [EVAL-SDP-CH1Z](#) 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. From the list of **System Tools**, click **Device Manager**.
  - b. Under **ADI Development Tools**, **Analog Devices SDP-H1** should appear (see Figure 11), indicating that the [EVAL-SDP-CH1Z](#) driver software is installed and that the board is connected to the PC correctly.

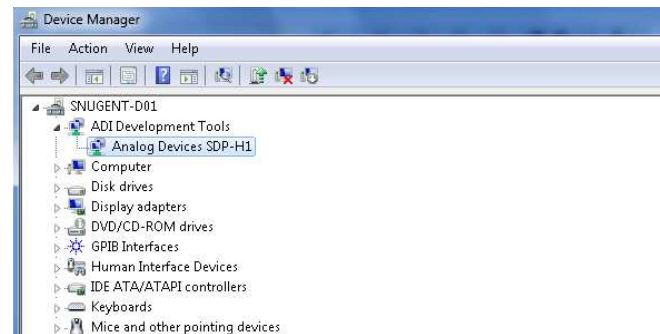


Figure 11. Device Manager:  
Checking That the Board Is Connected to the PC Correctly

### Disconnecting the [EVAL-AD7405FMCZ](#) Board

#### Caution

Always remove power from the [EVAL-SDP-CH1Z](#) or click the reset tact switch (located alongside the mini-USB port) before removing the [EVAL-AD7405FMCZ](#) daughter board.

## EVALUATION BOARD HARDWARE

### DEVICE DESCRIPTION

This user guide describes the evaluation board for the [AD7405](#) isolated ADC. The [AD7405](#) is a second-order,  $\Sigma$ - $\Delta$  modulator that converts an analog input signal into a high speed, 1-bit data stream with on-chip digital isolation based on Analog Devices, Inc., *iCoupler*<sup>®</sup> technology. The [AD7405](#) operates from a 5 V ( $V_{DD1}$ ) power supply and accepts a differential input signal of  $\pm 250$  mV ( $\pm 320$  mV full scale). The differential input is ideally suited to shunt voltage monitoring in high voltage applications where galvanic isolation is required.

The analog input is continuously sampled by a high performance analog modulator, and converted to a ones density, digital output stream with a data rate up to 20 MHz. The original information can be reconstructed with an appropriate digital filter. The serial I/O can use a 5 V or a 3.3 V supply ( $V_{DD2}$ ).

The serial interface is digitally isolated. High speed CMOS, combined with monolithic transformer technology, allows the on-chip isolation provide outstanding performance characteristics, superior to alternatives such as optocoupler devices. The [AD7405](#) device is offered in a 16-lead wide body SOIC package and has an operating temperature range of  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

Complete specifications for the [AD7405](#) device are provided in the device data sheet, available from Analog Devices, Inc., which should be consulted in conjunction with this user guide when using the evaluation board. Full details on the [EVAL-SDP-CH1Z](#) are available on the [EVAL-SDP-CH1Z](#) product page.

### HARDWARE LINK OPTIONS

The functions of the link options are described in Table 2. The default setup is configured to operate the board with the power supplied from the [EVAL-SDP-CH1Z](#) board and to supply the analog supply rail ( $V_{DD1}$ ) via the on-board *isoPower* [ADuM6000](#).

### POWER SUPPLIES

Take care before applying power and signals to the evaluation board to ensure that all link positions are set according to the required operating mode. See Table 2 for the complete list of link options.

This evaluation board is designed to be supplied via the [EVAL-SDP-CH1Z](#). The [EVAL-SDP-CH1Z](#) generates 12 V and 3.3 V supply rails. The 12 V supply is connected to the on-board 5 V linear regulator that supplies the [ADuM6000](#) with power. The [ADuM6000](#) then generates an isolated 5 V supply to power the  $V_{DD1}$  rail of the [AD7405](#). The 3.3 V supply rail from the [EVAL-SDP-CH1Z](#) is used to supply the  $V_{DD2}$  rail of the [AD7405](#).

If the user wishes to supply  $V_{DD1}$  externally, an external power supply in the range of  $24\text{ V} \pm 5\%$  may be connected to the HIGH\_V connector, J4. Alternatively an external supply in the range of  $5\text{ V} \pm 10\%$  may be connected to the J3 connector.

The  $V_{DD2}$  supply may also be supplied via an external power supply in the range of 3 V to 5.5 V via the J5 connector.

There are two main ground planes, GND1 and GND2. These are isolated planes with a creepage and clearance of 8 mm.

#### Caution

When the [EVAL-AD7405FMCZ](#) is connected to the [EVAL-SDP-CH1Z](#), take care to ensure that if an external voltage is supplied to the J5 input connector, the voltage does not exceed 3.3 V. Exceeding this voltage may cause permanent damage to the [EVAL-SDP-CH1Z](#) board.

### INPUT SIGNALS

The analog input range to the [AD7405](#) is  $\pm 250$  mV ( $\pm 320$  mV full scale), which should not be exceeded. An input signal in the range of 500 mV p-p should be connected to the evaluation board via the analog input connector, J1.

The [EVAL-AD7405FMCZ](#) has analog and digital ground planes that are physically isolated from one other. As such, power to the analog supply rail is by default, supplied through the on-board [ADuM6000](#) isolated *iCoupler* 5 kV, dc-to-dc converter.  $V_{DD1}$  can optionally be supplied from the J3 external connector or from the J4 high voltage external connector. A 24 V supply connected to J4 is stepped down to 5 V by means of the on-board [ADP2441](#) step-down dc-to-dc regulator. See Table 2 for more information about supplying  $V_{DD1}$  externally.

**Table 1. External Power Supplies (Optional)**

Power Supply	Connector	Voltage Range	Purpose
$V_{DD1}$	J3	4.5 V to 5.5 V	Analog supply rail
$V_{DD2}$	J5	3 V to 5.5 V	Digital supply rail without <a href="#">EVAL-SDP-CH1Z</a> connected
		$3.3\text{ V} \pm 5\%$	Digital supply rail with <a href="#">EVAL-SDP-CH1Z</a> connected
HIGH_V ( $V_{DD1}$ )	J4	$24\text{ V} \pm 5\%$	Analog supply rail (high voltage alternative to J5)



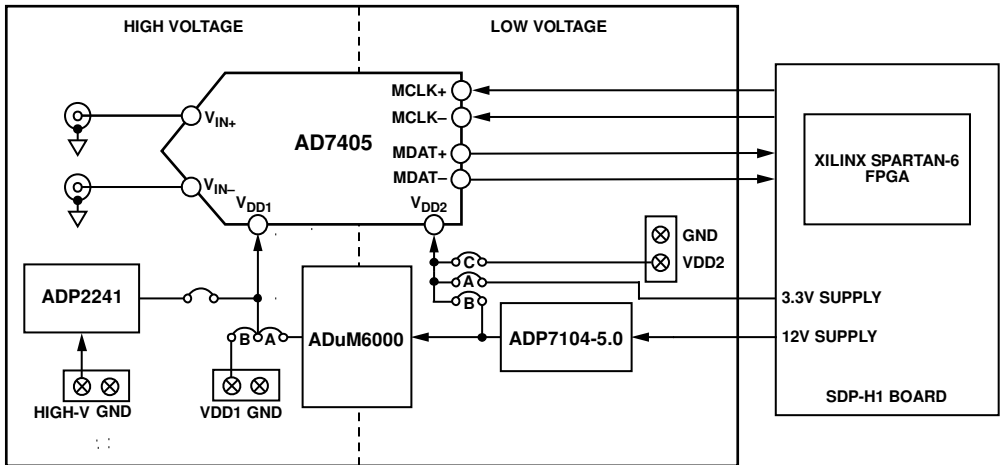


Figure 12. EVAL-AD7405FMCZ Block Diagram

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## LINK CONFIGURATION OPTIONS

There are multiple link options that must be set correctly to select the appropriate operating setup before you begin using the [EVAL-AD7405FMCZ](#) evaluation board. The functions of these options are outlined in Table 2.

### SETUP CONDITIONS

Take care before applying power and signals to the evaluation board to 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-H1 controlled mode to be used with the [EVAL-SDP-CH1Z](#) board, or the evaluation board can be used in standalone mode.

The default position column of Table 2 shows the default positions in which the links are set when the evaluation board is packaged. When the board is shipped, it is set up to operate in SDP-H1 controlled mode, with the power supplied from the [EVAL-SDP-CH1Z](#) board and the analog supply rail ( $V_{DD1}$ ) being supplied via the on-board *isoPower*® [ADuM6000](#) dc-to-dc converter.

**Table 2. Link Options**

Category	Link	Default Position	Function
Power Supplies	LK1	A	This link selects the <a href="#">AD7405</a> $V_{DD1}$ supply source. Remove LK5 if using either Position A or Position B. Position A: $V_{DD1}$ is supplied from the <a href="#">ADuM6000</a> on-board device. Position B: $V_{DD1}$ is supplied externally via Connector J3. When LK5 is inserted, $V_{DD1}$ is supplied via a step-down dc-to-dc regulator via J4. Remove LK5 if $V_{DD1}$ is supplied via LK1. Remove LK1 if $V_{DD1}$ is supplied via LK5.
	LK5	Removed	
	LK2	A	
Analog Input	LK7	Removed	This link selects the <a href="#">AD7405</a> $V_{DD2}$ supply source. Position A: $V_{DD2}$ is supplied from the <a href="#">EVAL-SDP-CH1Z</a> board. Position B: $V_{DD2}$ is supplied from the on-board 5 V regulator. Position C: $V_{DD2}$ is supplied externally via Connector J5. When LK7 is inserted, $V_{IN+}$ is shorted to ground. Remove LK7 if a signal is applied to $A_{IN+}$ . When LK8 is inserted, $V_{IN-}$ is shorted to ground. Remove LK8 if a signal is applied to $A_{IN-}$ .
	LK8	Inserted	

## EVALUATION BOARD CIRCUITRY

### SOCKETS/CONNECTORS

The connectors and sockets on the [EVAL-AD7405FMCZ](#) are described in Table 3.

**Table 3. On-Board Connectors**

Connector	Function
J1	Analog input AIN+
J2	Analog input AIN–
J3	MCLK input—standalone mode
J4	MDAT output—standalone mode
J5	V <sub>DD1</sub> external source
J6	V <sub>DD2</sub> external source
J7	V <sub>DD1</sub> external source—high voltage

The default interface to this evaluation board is via the FMC connector, which connects the [EVAL-AD7405FMCZ](#) to the [EVAL-SDP-CH1Z](#) board. If the [EVAL-AD7405FMCZ](#) board is used in standalone mode, communication is achieved via the J3 and J4 SMB jacks. See Table 2 for more information about configuring the evaluation board for standalone mode.

### TEST POINTS

There are several test points on the [EVAL-AD7405FMCZ](#) board. These test points provide easy access to the signals from the evaluation board for probing, evaluation, and debugging.

## BASIC HARDWARE SETUP

The [EVAL-AD7405FMCZ](#) connects to the [EVAL-SDP-CH1Z](#) system demonstration platform. The [EVAL-SDP-CH1Z](#) 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 between the [EVAL-AD7405FMCZ](#) daughter board and [EVAL-SDP-CH1Z](#) board.

The analog input range to the [AD7405](#) is  $\pm 250$  mV ( $\pm 320$  mV full scale) and should not be exceeded. Connect an input signal in the range of 500 mV p-p to the evaluation board via analog input connector, J1.

The [EVAL-AD7405FMCZ](#) has analog and digital ground planes physically isolated from one other. As such, power to the analog supply rail is by default, supplied through the on-board [ADuM6000](#) isolated *iCoupler*® 5 kV, dc-to-dc converter.  $V_{DD1}$  may optionally be supplied from external connector, J3, or high voltage connector, J4. A 24 V supply connected to J4 is stepped down to 5 V by means of the on-board [ADP2441](#) step down dc-to-dc regulator. Consult Table 2 if supplying  $V_{DD1}$  externally.

If using the evaluation board in default mode of operation, ensure that the link options are in their default positions as outlined in Table 2. Ensure all links are in the appropriate position before connecting the evaluation board to the [EVAL-SDP-CH1Z](#).

Before powering up the [EVAL-SDP-CH1Z](#), connect the [EVAL-AD7405FMCZ](#) to FMC Connector J4 on the [EVAL-SDP-CH1Z](#) board. After the evaluation board and the [EVAL-SDP-CH1Z](#) board have been connected securely, apply power to the [EVAL-SDP-CH1Z](#). The [EVAL-SDP-CH1Z](#) requires an external power supply adapter, which is included in the [EVAL-SDP-CH1Z](#) kit. Connect this power supply to the dc barrel connector labeled **+12V\_VIN** on the [EVAL-SDP-CH1Z](#).

Before connecting the [EVAL-SDP-CH1Z](#) board to your PC, ensure that the evaluation software (supplied on included CD) has been installed. The full software installation procedure is detailed in the Evaluation Board Software section.

Finally, connect the [EVAL-SDP-CH1Z](#) board to the PC via the USB cable enclosed in the [EVAL-SDP-CH1Z](#) kit. If using a Windows XP platform, you may need to search for the [EVAL-SDP-CH1Z](#) drivers. Choose to automatically search for the drivers for the [EVAL-SDP-CH1Z](#) board if prompted by the operating system.

### Caution

Always remove power from the [EVAL-SDP-CH1Z](#), or click the reset tact switch (located alongside the mini-USB port) before removing the [EVAL-AD7405FMCZ](#) daughter board.

## EVALUATION BOARD SOFTWARE

### STARTING THE SOFTWARE

After the [EVAL-AD7405FMCZ](#) and [EVAL-SDP-CH1Z](#) boards are correctly connected to your PC, the evaluation software can be started.

1. From the **Start** menu, select **Programs > Analog Devices > AD7405**. The main window of the software then opens (see Figure 14).
2. If the [EVAL-AD7405FMCZ](#) is not connected to the USB port via the [EVAL-SDP-CH1Z](#) when the software is launched, a connectivity error displays (see Figure 13). Connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and follow the instructions.

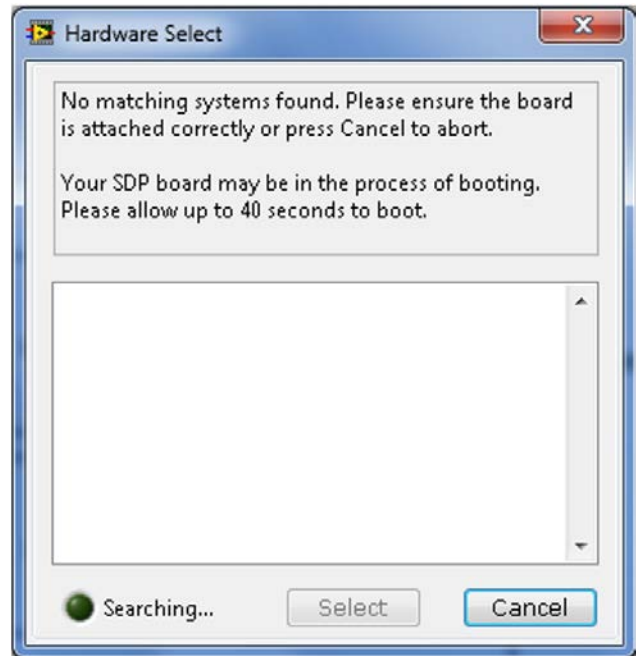


Figure 13. Connectivity Error Alert

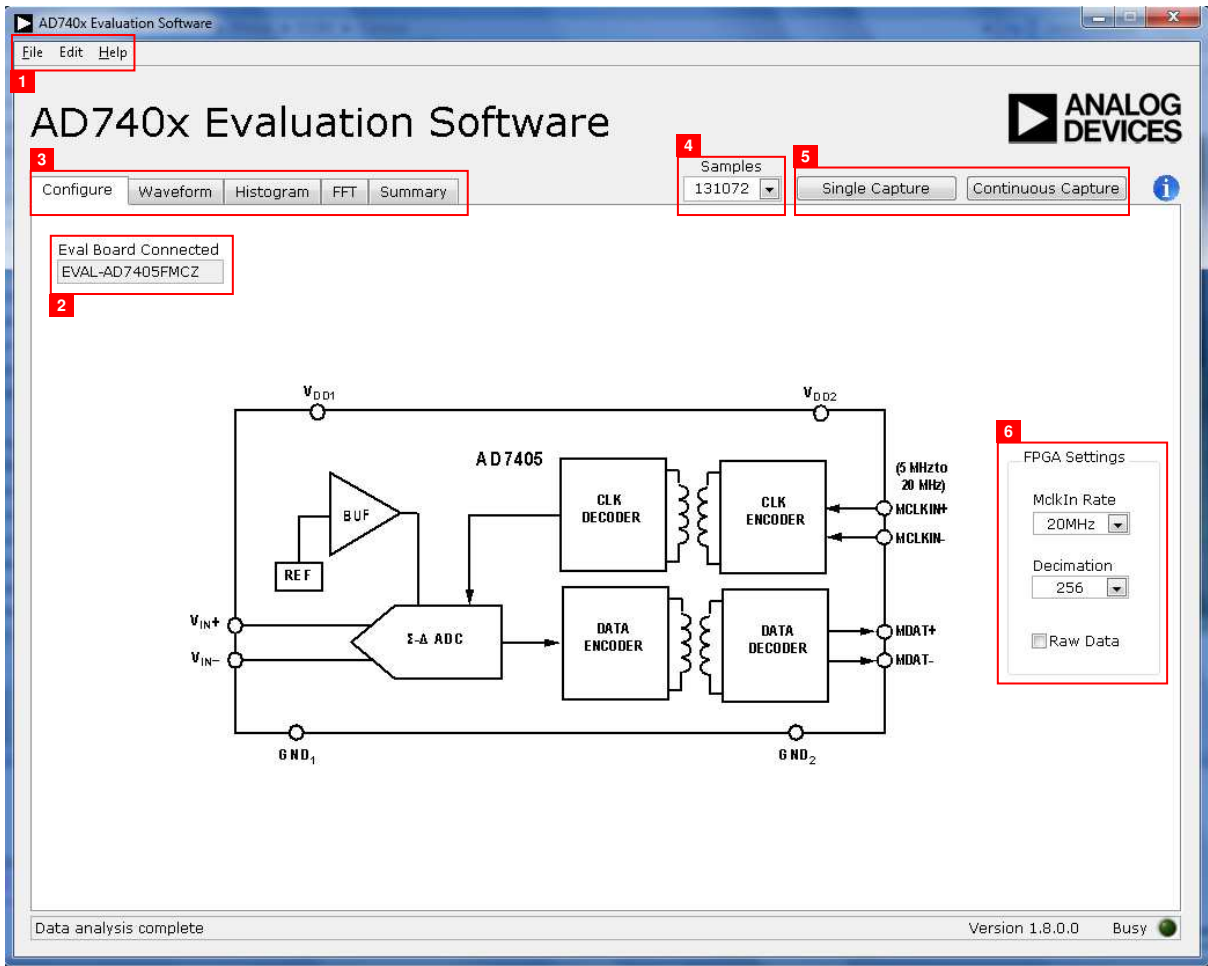


Figure 14. Evaluation Software Main Window

## DESCRIPTION OF MAIN WINDOW

When the software is launched, the main software window opens (see Figure 14).

The evaluation software panel as shown in Figure 14 has the following features:

- Menu bar
- Control buttons
- FPGA configuration options
- Data capture display
- AC/DC analysis

### Menu Bar

The menu bar, labeled 1 in Figure 14, consists of the **File**, **Edit**, and **Help** menus.

### File Menu

- **Save Captured Data.** Saves captured data in .csv format for future analysis.
- **Load Captured Data.** Loads previously captured data in comma separated values (.csv) format for analysis.
- **Take Screenshot.** Saves screenshot of window as a .jpeg file.
- **Print Screenshot.** Sends screenshot of window to the default printer.
- **Exit.** Exits the program.

### Edit Menu

- **Reinitialize to default.** Places the evaluation board in a known default state.

### Help Menu

- **Analog Devices Website.** Opens the Analog Devices website in the default browser.
- **Context Help.** Turns on context sensitive help.
- **About.** Provides evaluation kit information.

## Control Buttons, Drop-Down Boxes, and Indicators

The evaluation software includes the following control buttons, drop-down boxes, and indicators.

- The **Eval Board Connected** box (labeled 2 in Figure 14) indicates whether the **EVAL-AD7405FMCZ** board has been detected.
- The **FPGA Settings** section (labeled 6 in Figure 14) specifies the MCLK frequency used for the serial interface and the decimation ratio used by the FPGA to filter the data.
- The **Samples** drop-down box (labeled 4 in Figure 14) allows selecting the number of samples to be captured in a single acquisition.
- Clicking **Single Capture** (see label 5 in Figure 14) initiates the sampling and readback of the number of measurements defined in the **Samples** box.
- Clicking **Continuous Capture** (see label 5 in Figure 14) performs a continuous capture from the ADC. Clicking **Continuous Capture** a second time to stop sampling.

## Window Tabs

There are five tabs available in the tabs area (labeled 3 in Figure 14) of the main window: **Configure**, **Waveform**, **Histogram**, **FFT**, and **Summary**. These tabs are used to switch among device configuration, waveform analysis, histogram analysis, FFT analysis, and a summary of the last capture. 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*.

## Graph Tools

Graph tools are provided within each tab to allow you to control the cursor, zooming, and panning (see Figure 15) within the graphs displayed.



1. USED FOR CONTROLLING THE CURSOR, IF PRESENT.
2. USED FOR ZOOMING IN AND OUT.
3. USED FOR PANNING.

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Figure 15. Graph Tools

**GENERATING A WAVEFORM ANALYSIS REPORT**

Figure 16 illustrates the tab used for waveform capture.

Click **Single Capture** or **Continuous Capture** (labeled 1 in Figure 16) to capture a number of samples from the ADC and graph the resulting waveform.

Graph controls (labeled 2 in Figure 16) are located above the graph and may be used pan and zoom into particular areas of

the graph (see the Graph Tools section and Figure 15 for more information).

The **Waveform Analysis** area (labeled 3 in Figure 16) shows statistics pertaining to the captured waveform such as maximum, minimum, and mean amplitudes and signal frequency.

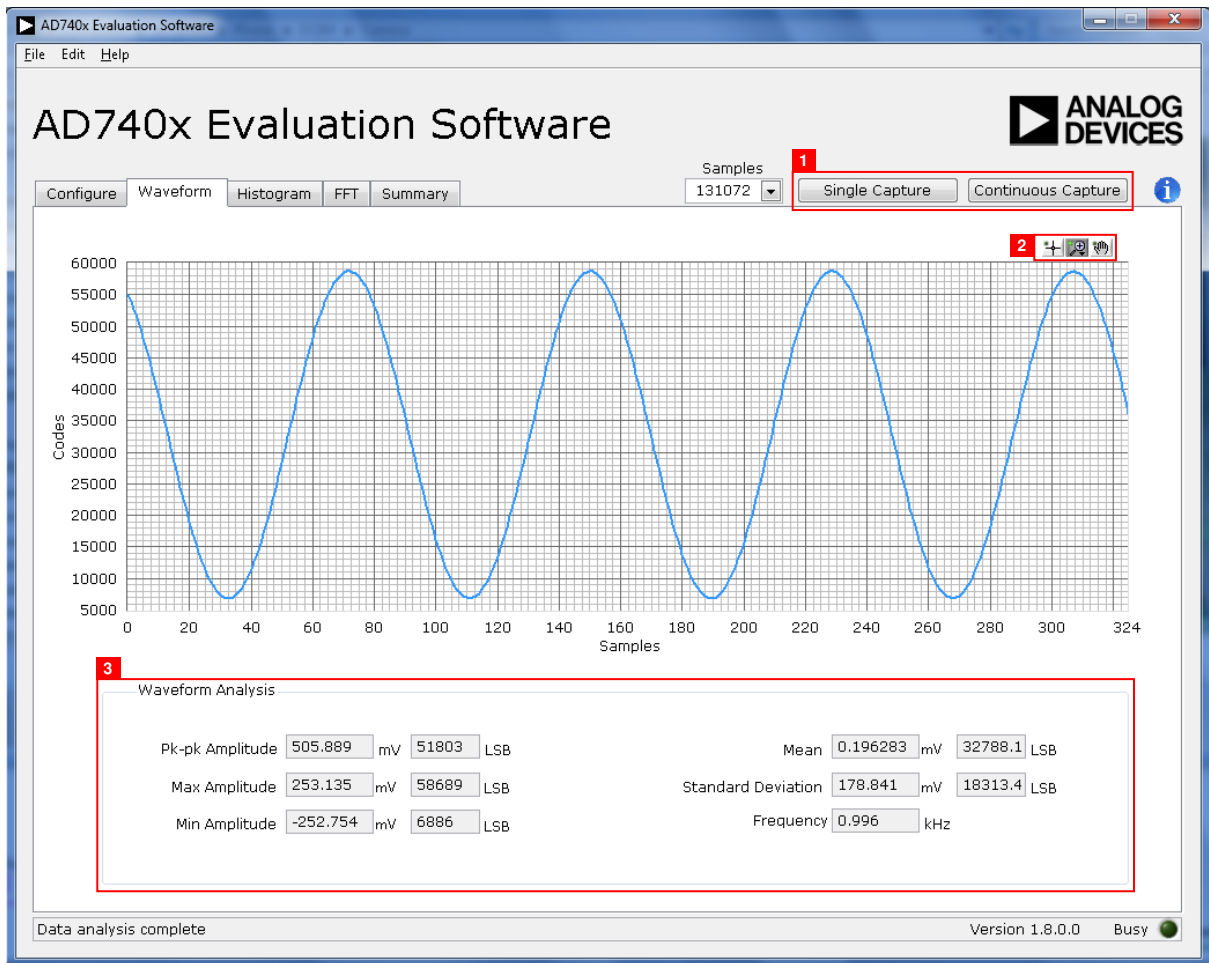


Figure 16. Waveform Capture Tab



**GENERATING A HISTOGRAM OF THE ADC CODE DISTRIBUTION**

The **Histogram** tab (see Figure 17) 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 **DC Offset/Mean** and **Transition Noise**, respectively, in the **Histogram Analysis** area (labeled 2 in Figure 17).

**AC Input**

To perform a histogram test of ac input,

1. Apply a quality signal source to the VIN+ input on the board.
2. Select the **Histogram** tab in the evaluation software main window
3. Click the **Single Capture** or **Continuous Capture** button (labeled 1 in Figure 17).

**DC Input**

The histogram is more commonly used for dc testing.

To perform a histogram test of dc input,

1. Select the **Histogram** tab in the evaluation software main window.
2. Click **Single Capture** or **Continuous Capture** (labeled 1 in Figure 17).

Raw data is captured and passed to the PC for statistical computations, and various measured values are displayed in the **Histogram Analysis** area (labeled 2 in Figure 17).

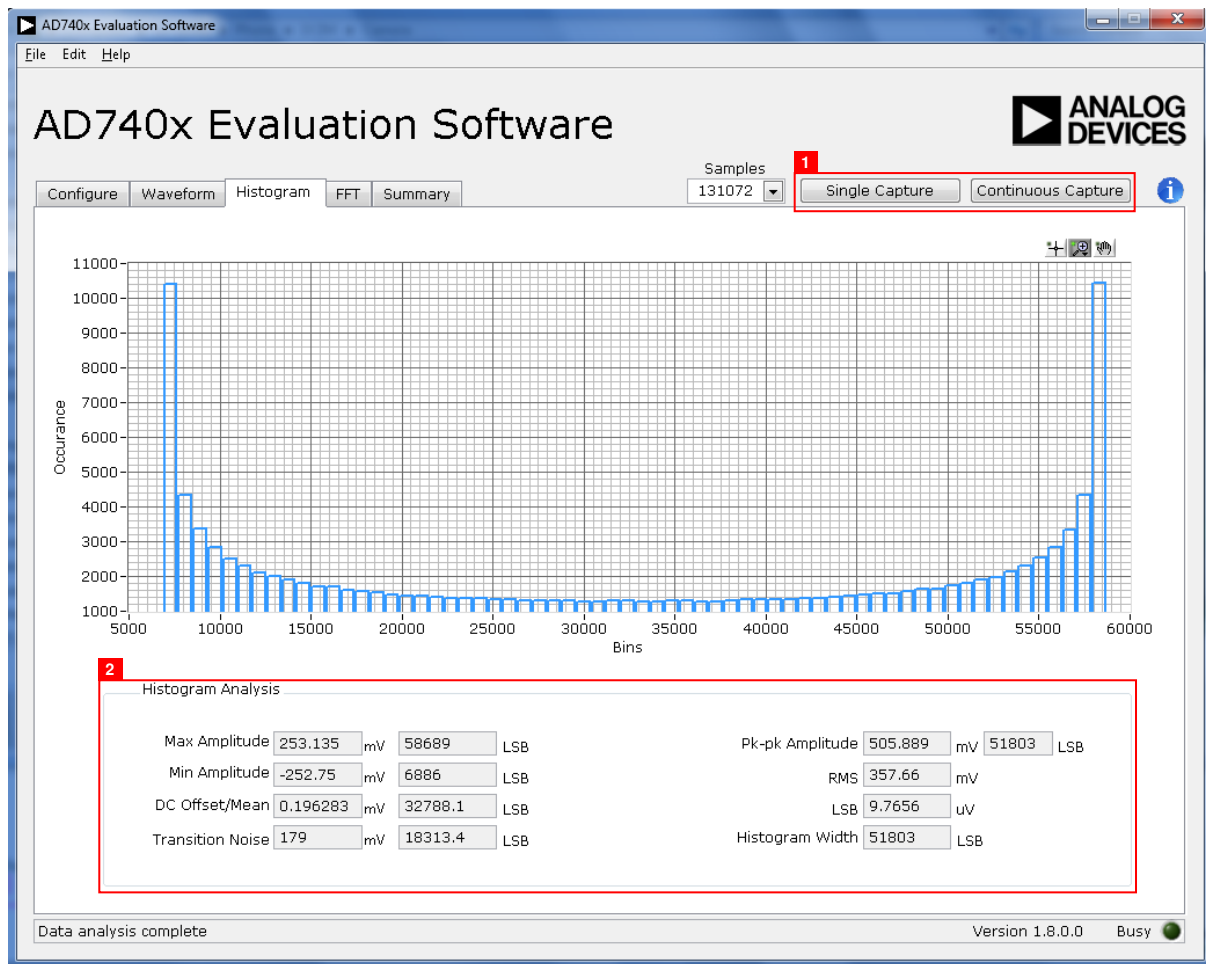


Figure 17. Histogram Capture Tab

### GENERATING A FAST FOURIER TRANSFORM OF AC CHARACTERISTICS

Figure 18 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 test,

1. Apply a bipolar sinusoidal signal with low distortion (better than 115 dB) to the evaluation board at the VIN+ input. To attain the requisite low distortion, which is necessary to allow true evaluation of the part, one option is to filter the input signal from the ac source. Choose an appropriate band-pass filter based on the sinusoidal signal applied.
2. Click the FFT tab from the main window.
3. Click **Single Capture** or **Continuous Capture**.

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.

Figure 18 displays the spectral analysis results of the captured data.

- The plot is the FFT image of the raw data.
- The **FFT Analysis** box displays the performance data: SNR, THD, SINAD, dynamic range, and noise performance along with the input signal characteristics (see label 1 in Figure 18).
- Clicking **Show Harmonic Content** (labeled 2 in Figure 18) displays the frequency and amplitude of the fundamental in addition to the second to fifth harmonics.

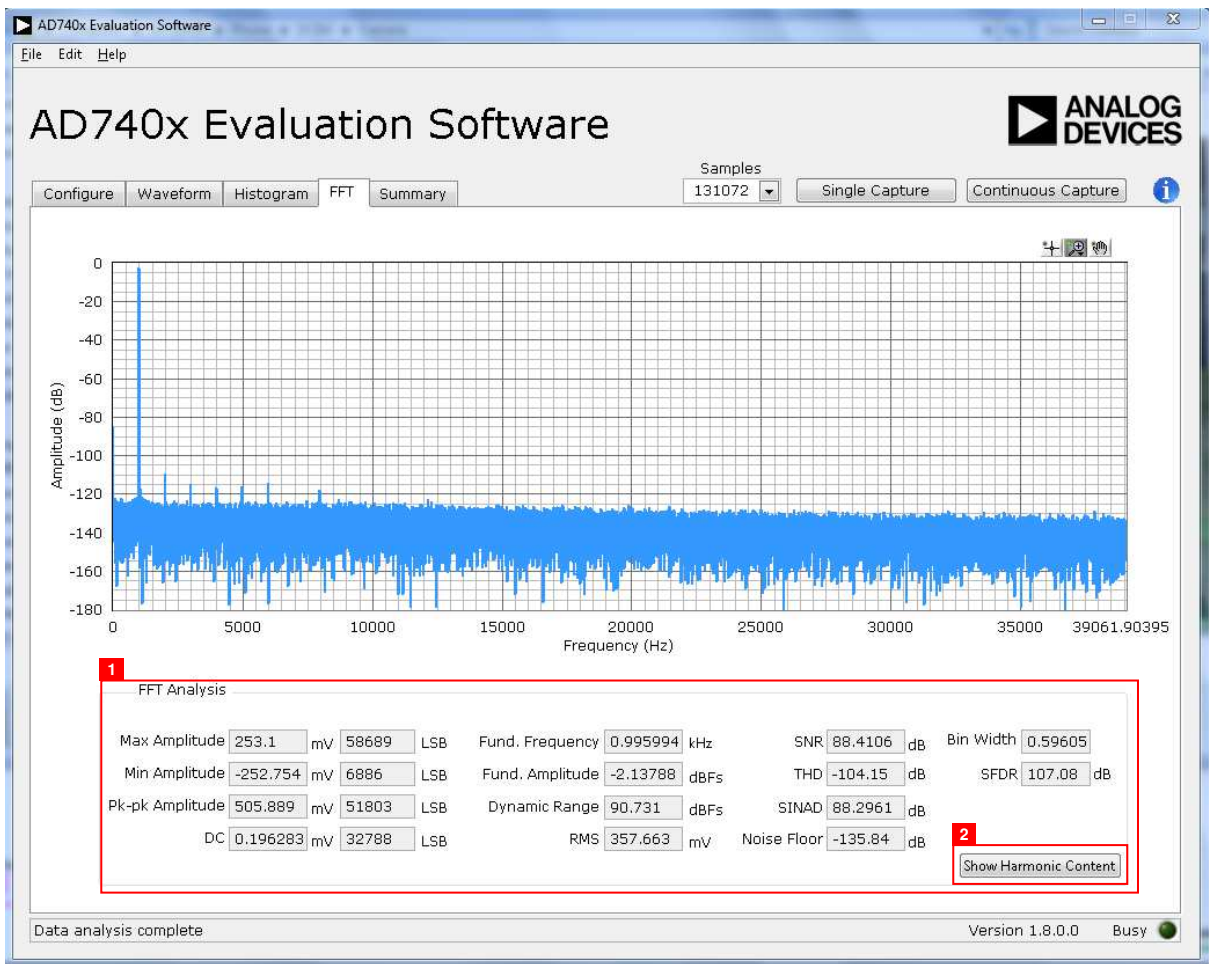


Figure 18. FFT Capture Tab

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

Figure 19 shows the **Summary** tab. This tab captures and displays all of the information in one window with a synopsis of the information, including key performance parameters, such as SNR and THD (see the **SNR** and **THD** boxes, labeled 1 and 2, respectively, in Figure 19).

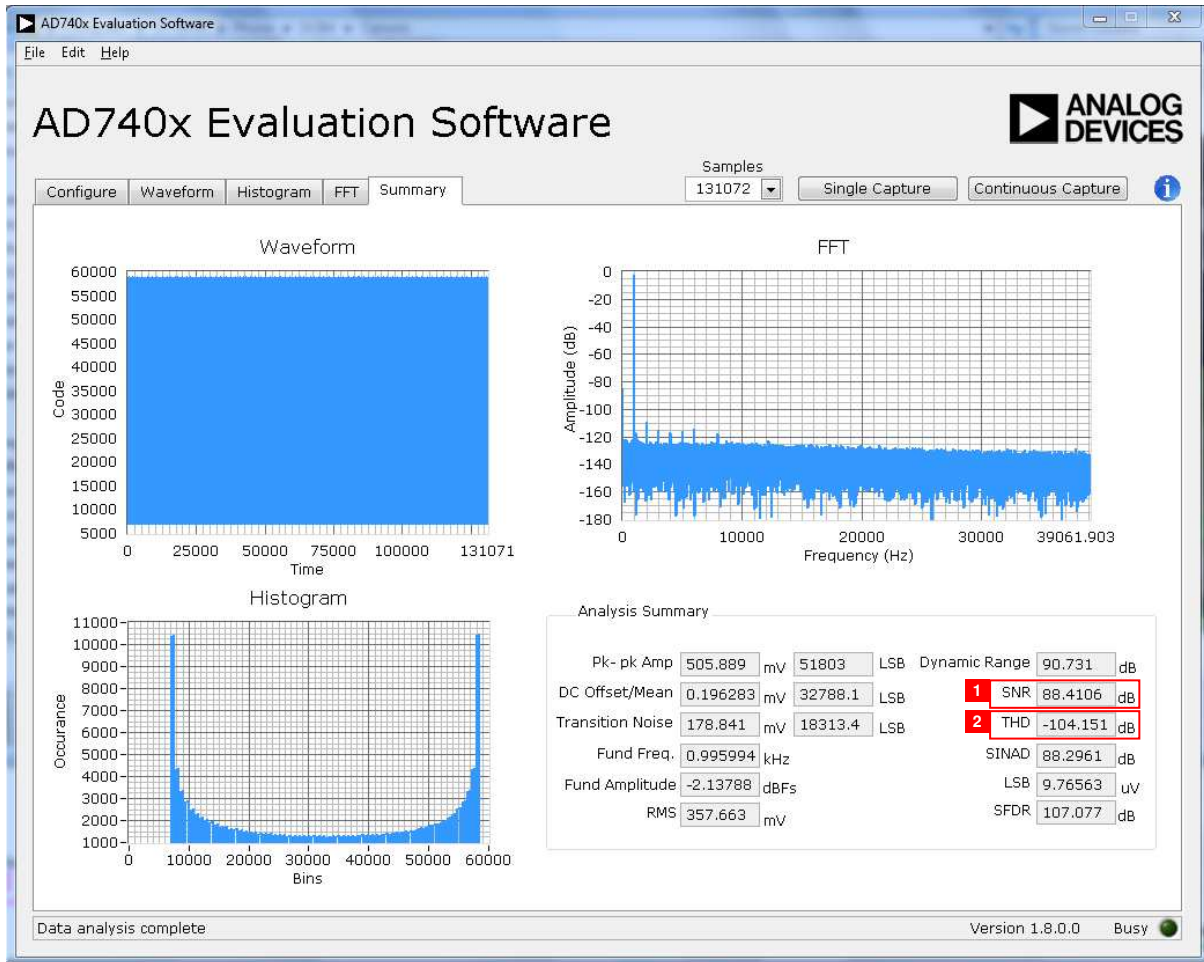


Figure 19. Summary Tab

**SAVING FILES**

The software can save the current captured data for future analysis. The software also has the ability to save or print a screenshot of the currently displayed window.

**Saving Captured Data**

To save data, from the **File** menu, select **Save Captured Data**, The **Save As** dialog box shown in Figure 20 opens. Save the file to an appropriate folder location. Waveform data is saved in .csv format and may be opened for further analysis in other software, such as Excel and MATLAB®.

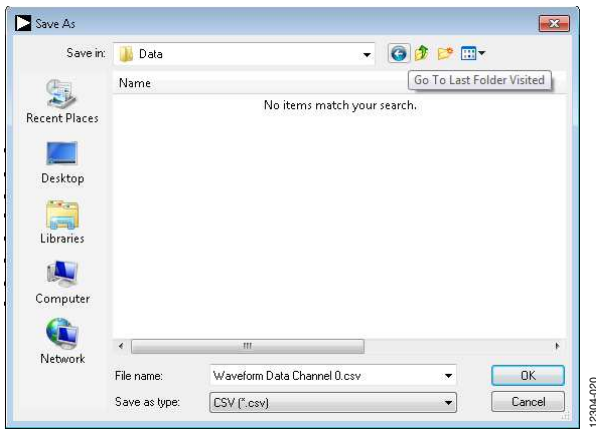


Figure 20. Dialog Box for Saving a File

**Saving Screenshot**

To save a screenshot, from the **File** menu, select **Take Screenshot**. The **Select the JPEG file to write** dialog box in Figure 21 opens. Save the file to an appropriate folder location. Screenshots are saved in .jpeg format and can be viewed with any picture viewer/editor.

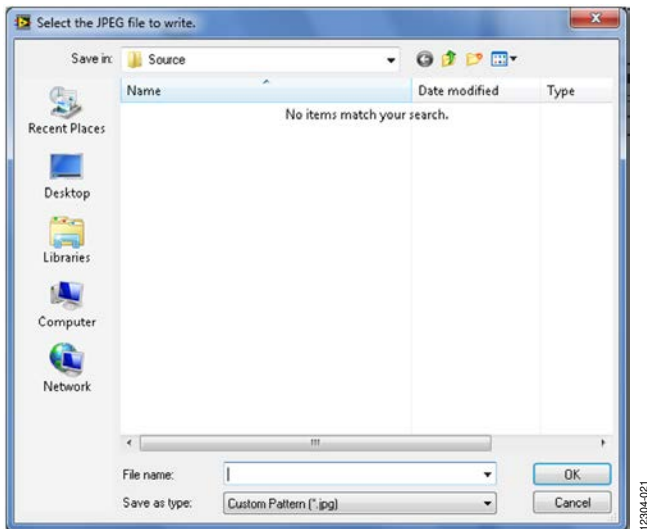


Figure 21. Dialog Box for Saving a Screenshot

**PRINT SCREENSHOT**

To print a screenshot, from the **File** menu, select **Print Screenshot**. The screenshot is sent to the default printer. No dialog will appear when printing a screenshot.

**OPENING FILES**

**Loading Captured Data**

The software can load previously captured data for analysis.

From the **File** menu, select **Load Captured Data**. Only data that was previously captured and saved can be opened. The raw data is used to rebuild the histogram and ac spectrum analyses upon being loaded into the evaluation platform.

When **Load Captured Data** is selected, the **Open** file dialog box in Figure 22 opens for loading an appropriate file. The evaluation software expects that a previously generated waveform file is in .csv format.

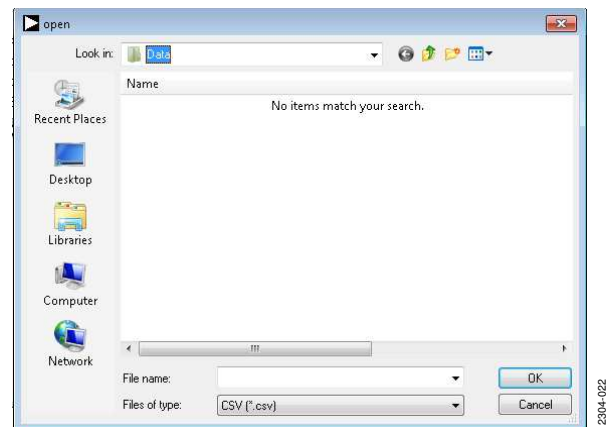


Figure 22. Dialog Box for Opening a File

## NOTES

**ESD Caution**

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

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