

CN-0288 Software User Guide

Overview

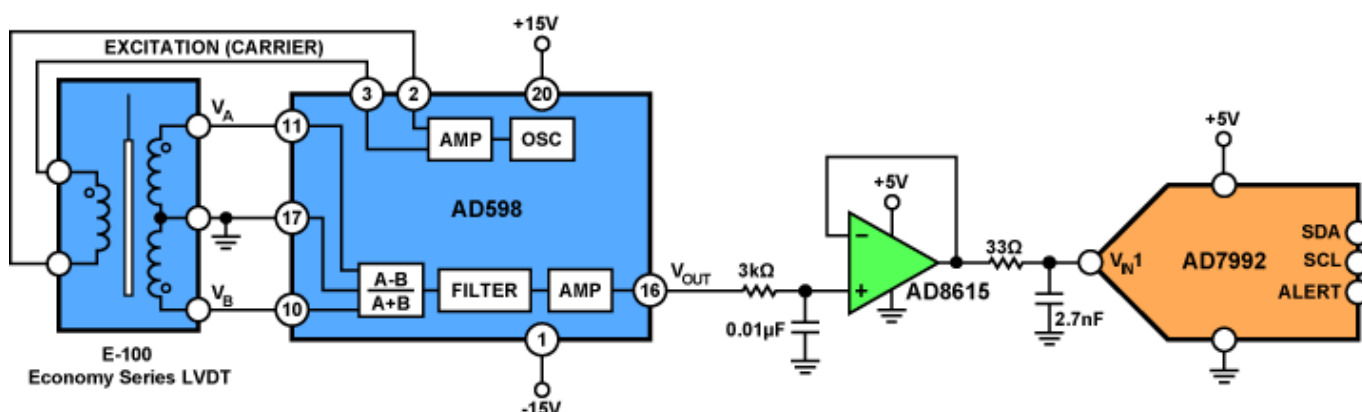
CN-0288 is a linear variable differential transformer (LVDT) signal conditioning circuit. The system converts the output of the LVDT sensor to a unipolar DC voltage and drives the inputs of a successive approximation analog-to-digital converter (ADC).

This circuit uses a single chip solution that drives the excitation signal of the primary side of the LVDT and converts the secondary side. The complete system uses a 12-bit ADC resulting in a dynamic range of 82dB at a standard LVDT bandwidth of 250Hz. (The term bandwidth used in this case is referring to a sinusoidally varying mechanical position and can be easily configured to meet wider bandwidth applications by configuring a few external passive components.)

The signal conditioning circuitry of the system consumes only 15mA of current from the $\pm 15V$ supply and 3mA from the +5V supply making this configuration suitable for industrial precision position and gauging applications such as flight control surface position feedback.

This circuit note discusses the design steps needed to optimize the circuit shown in Figure 1 for a specific bandwidth including noise analysis and component selection considerations.

This user guide will discuss how to use the evaluation software to collect data from the [EVAL-CN0288-SDPZ](#) Evaluation Board (**CN-0288 Board**)



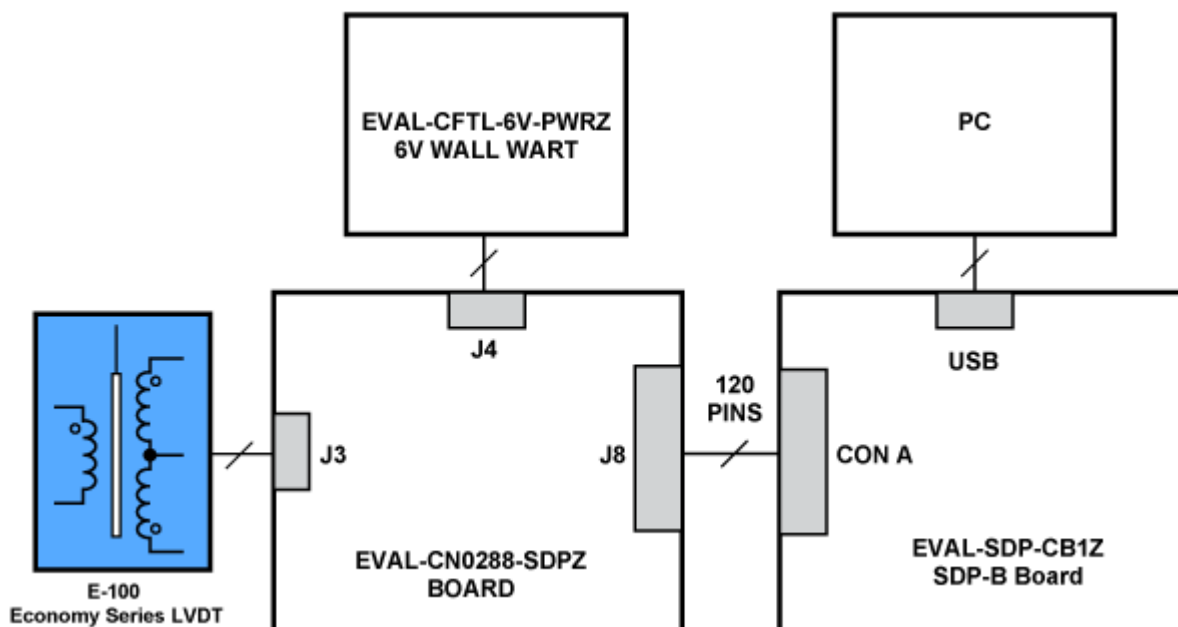
Required Equipment

- [EVAL-SDP-CB1Z](#) Controller Board (**SDP-B Board**)
- [EVAL-CN0288-SDPZ](#) Evaluation Board (**CN-0288 Board**)

- [EVAL-CFTL-6V-PWRZ \(+6V Power Supply\)](#) or equivalent
- [EVAL-CFTL-LVDT](#) Linear Variable Differential Transformer (Measurement Specialties, Inc. E-100 Economy Series LVDT)
- [CN-0288 Evaluation Software](#)
 - (supplied with provided CD in kit)
- PC with the following *Minimum Requirements*
 - Windows XP Service Pack 2 (32-bit)
 - USB type A Port
 - Processor rated at 1GHz or faster
 - 512 MB RAM and 500 MB available hard disk space
- USB type A to USB type mini-B cable

General Setup

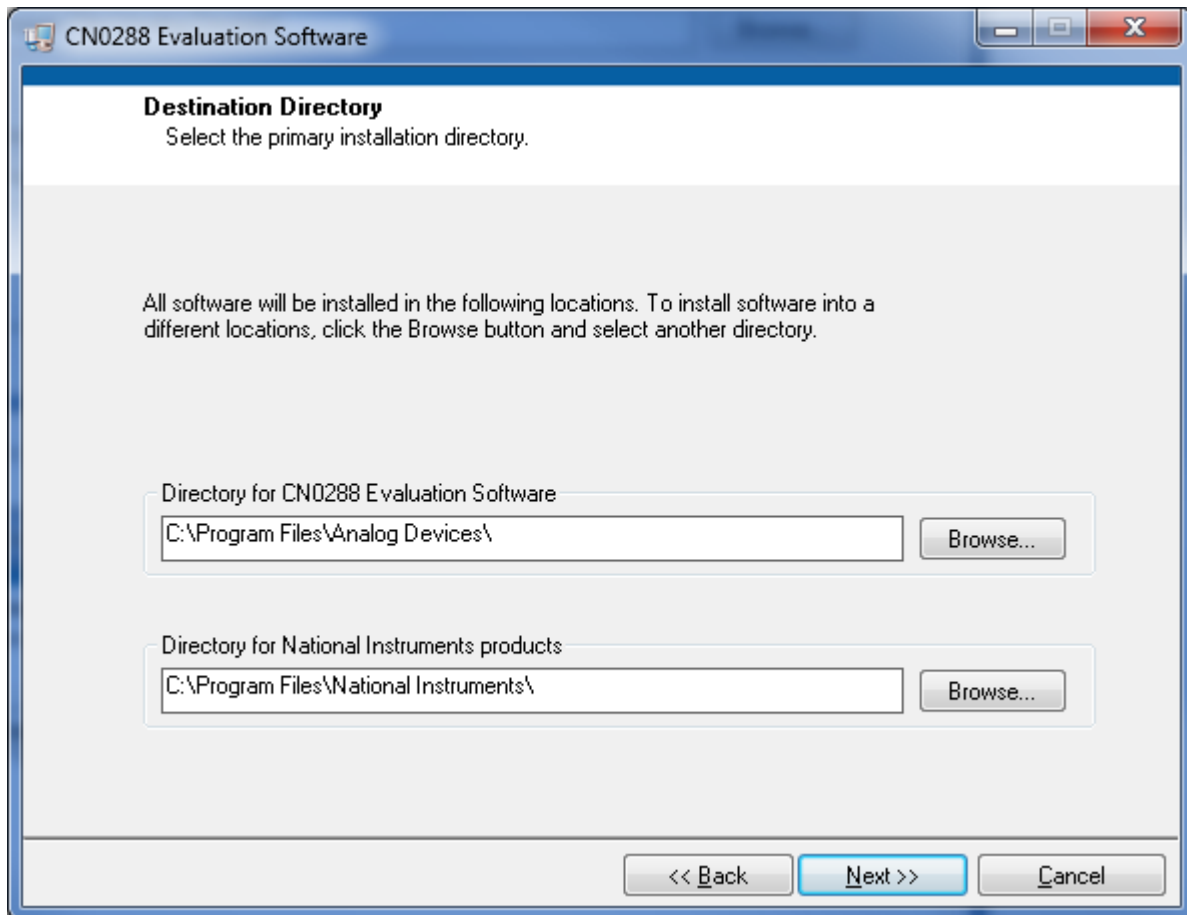
- The [EVAL-CN0288-SDPZ \(CN-0288 Board\)](#) connects to the [EVAL-SDP-CB1Z \(SDP-B Board\)](#) via the 120-Pin connector
- The [EVAL-CFTL-6V-PWRZ \(+6V DC Power Supply\)](#) powers the [EVAL-CN0288-SDPZ \(CN-0288 Board\)](#) via the DC barrel jack
- The [EVAL-SDP-CB1Z \(SDP-B Board\)](#) connects to the PC via the USB cable.
- The [EVAL-CFTL-LVDT \(LVDT\)](#) connects to the [EVAL-CN0288-SDPZ \(CN-0288 Board\)](#) via the 6-pin header at **J3**.



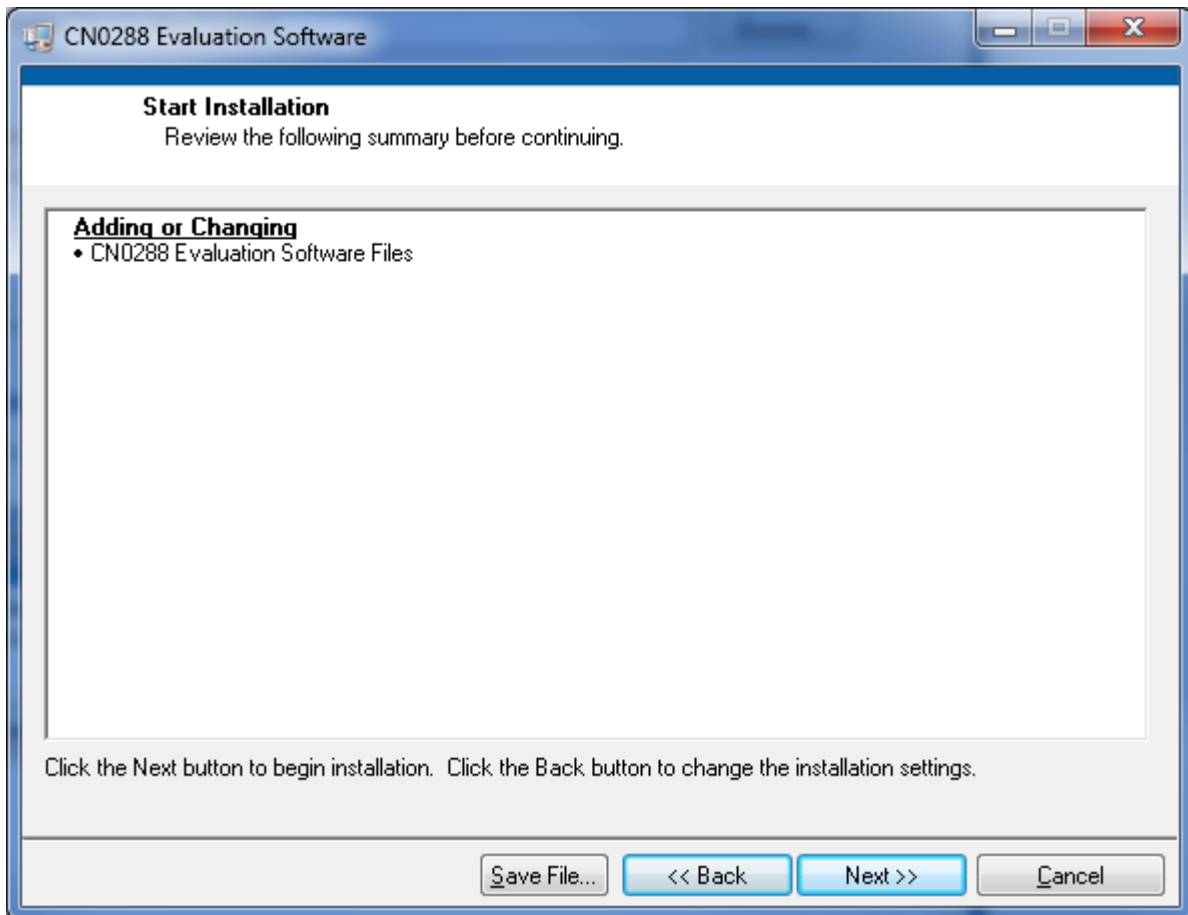
Installing the Software

1. Extract the file **CN0288 Eval Software.zip** and open the file **setup.exe**.

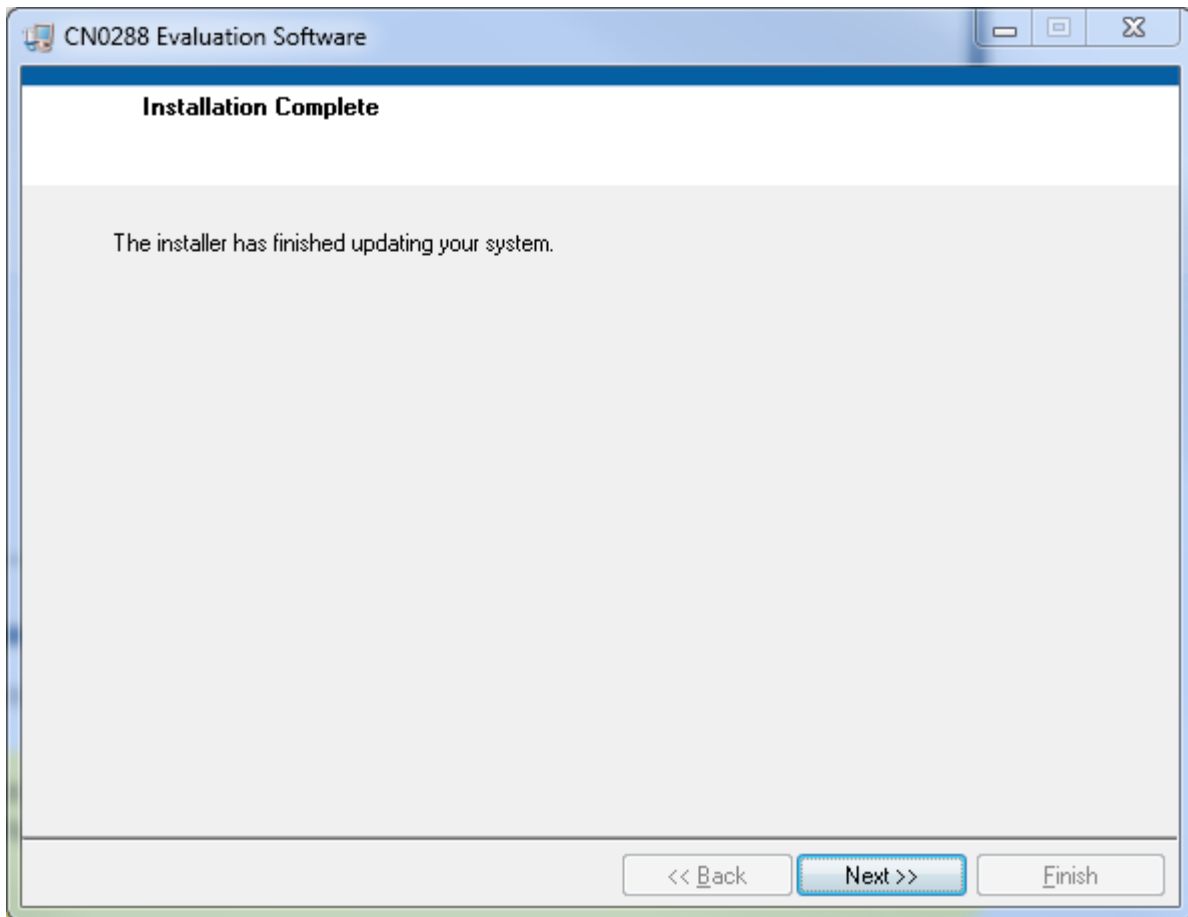
NOTE: It is recommended that you install the [CN-0288 Evaluation Software](#) to the default directory path **C:\Program Files\Analog Devices\CN0288** and all National Instruments products to **C:\Program Files\National Instruments**



2. Click **Next** to view the installation review page

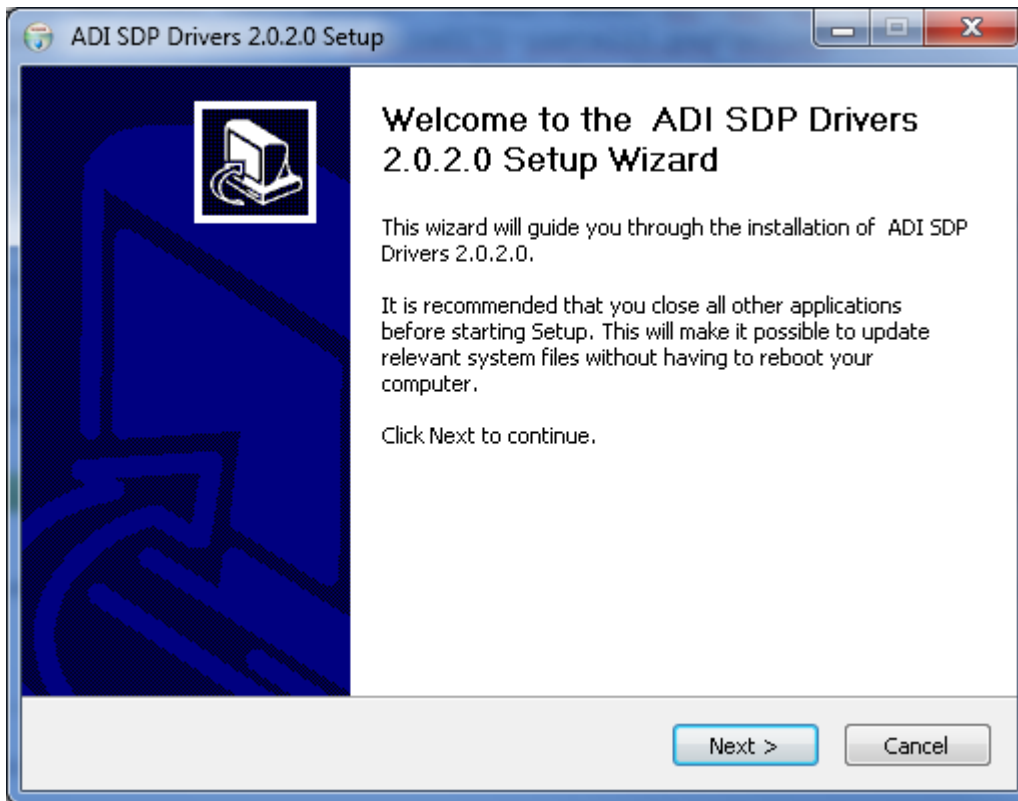


3. Click **Next** to start the installation



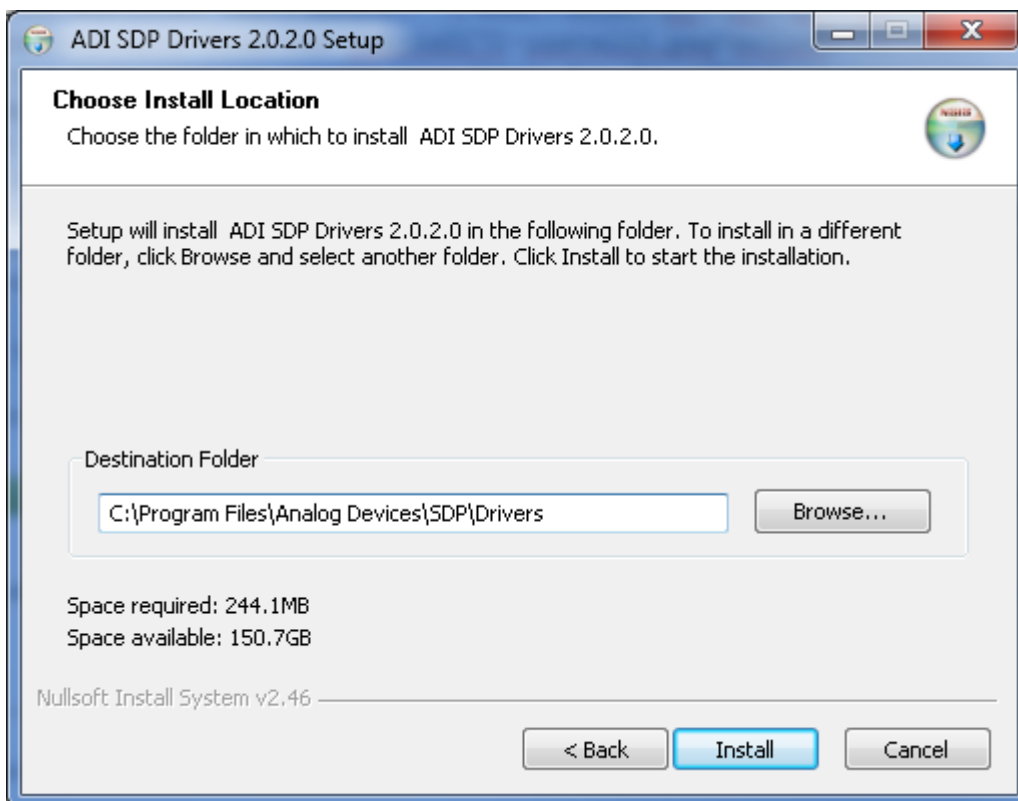
4. Upon completion of the installation of the **CN-0288 Evaluation Software**, the installer for the **ADI SDP Drivers** will execute.

NOTE: It is recommended that you close all other applications before clicking **“Next”**. This will make it possible to update relevant system files without having to reboot your computer.

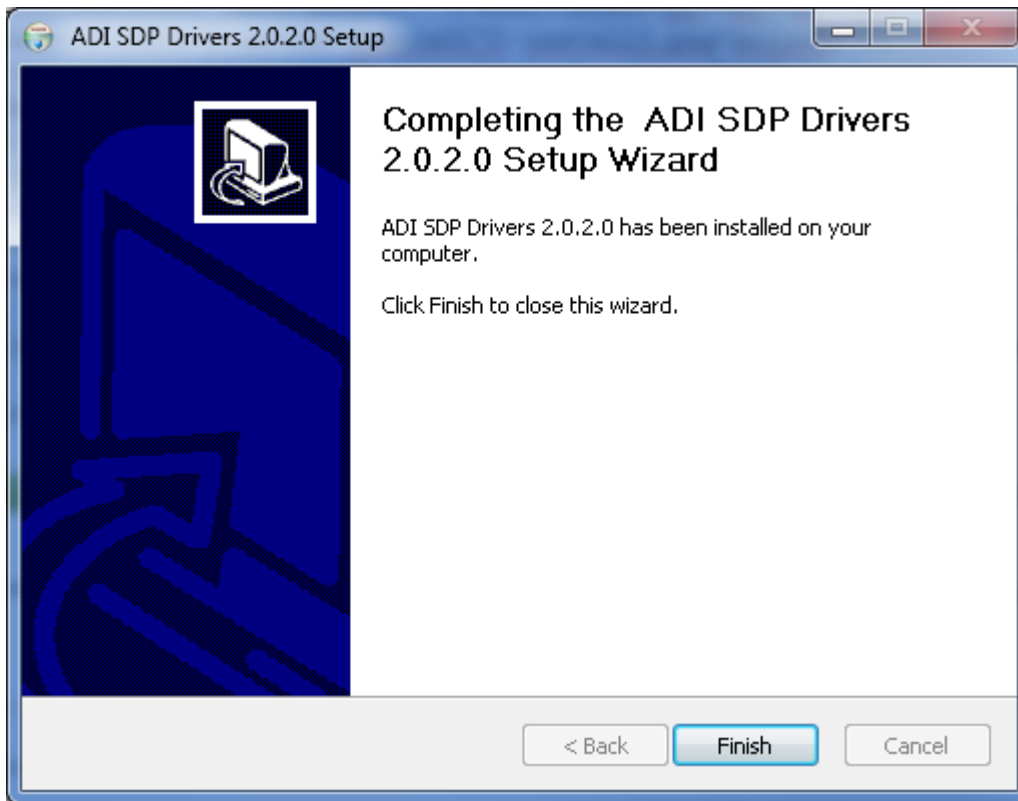


5. Press **“Next”** to set the installation location for the **SDP Drivers**.

It is recommended that you install the drivers to the default directory path
C:\Program Files\Analog Devices\SDP\Drivers



6. Press **“Next”** to install the **SDP Drivers** and complete the installation of all software. Click **“Finish”** when done.

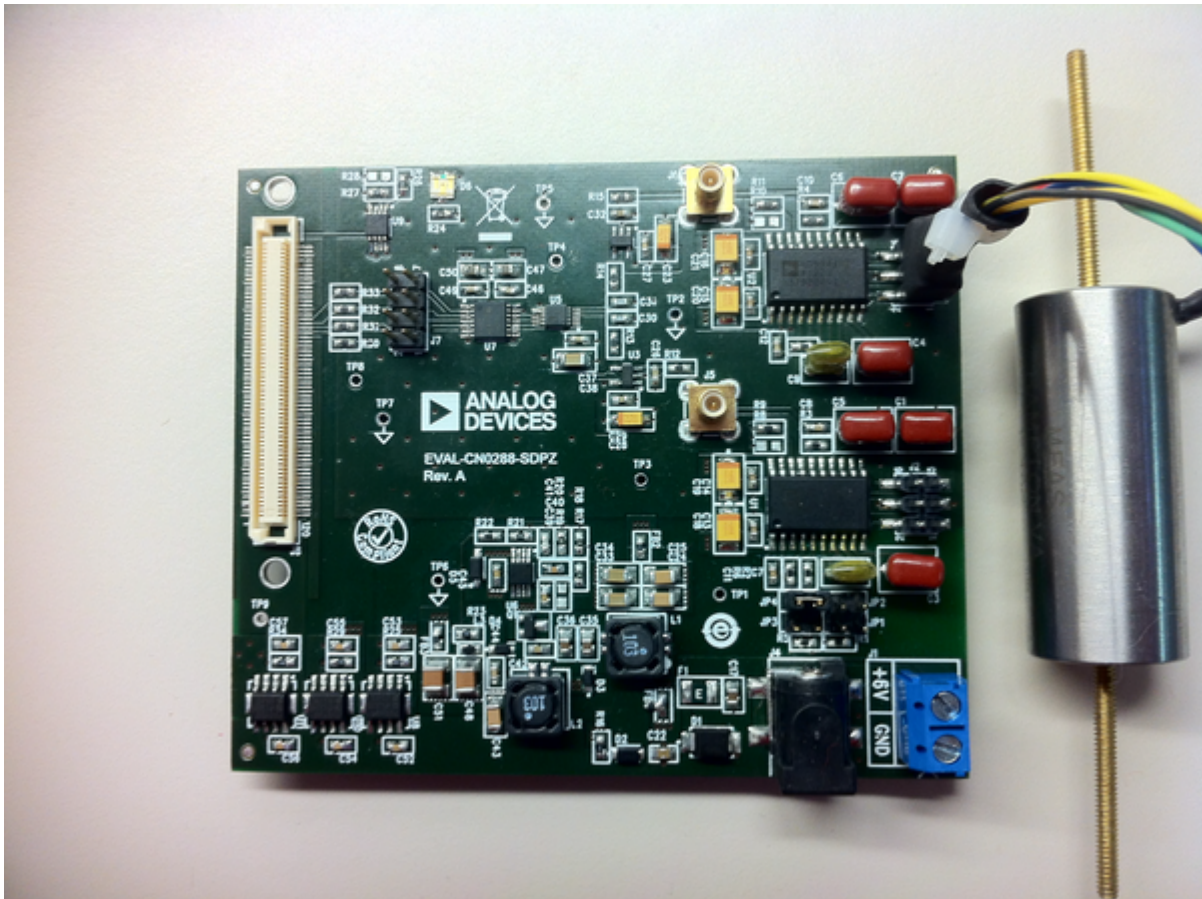
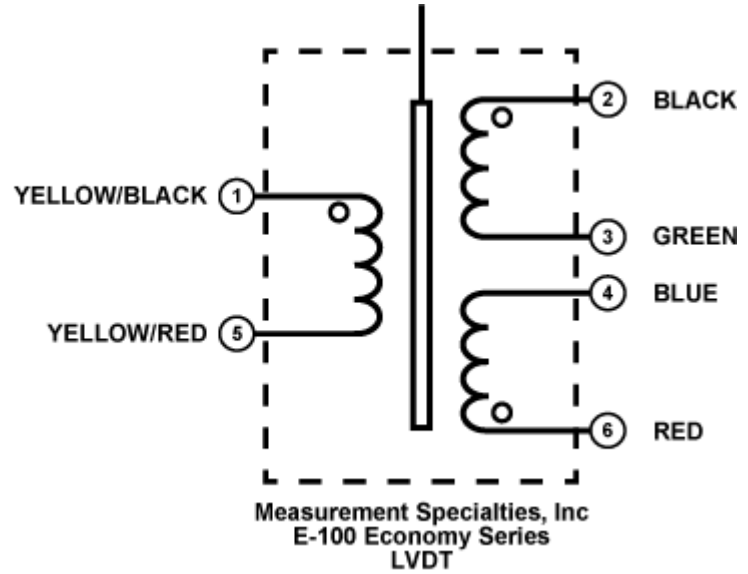
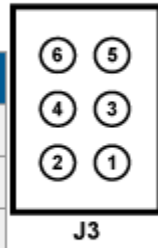


Connecting the Hardware

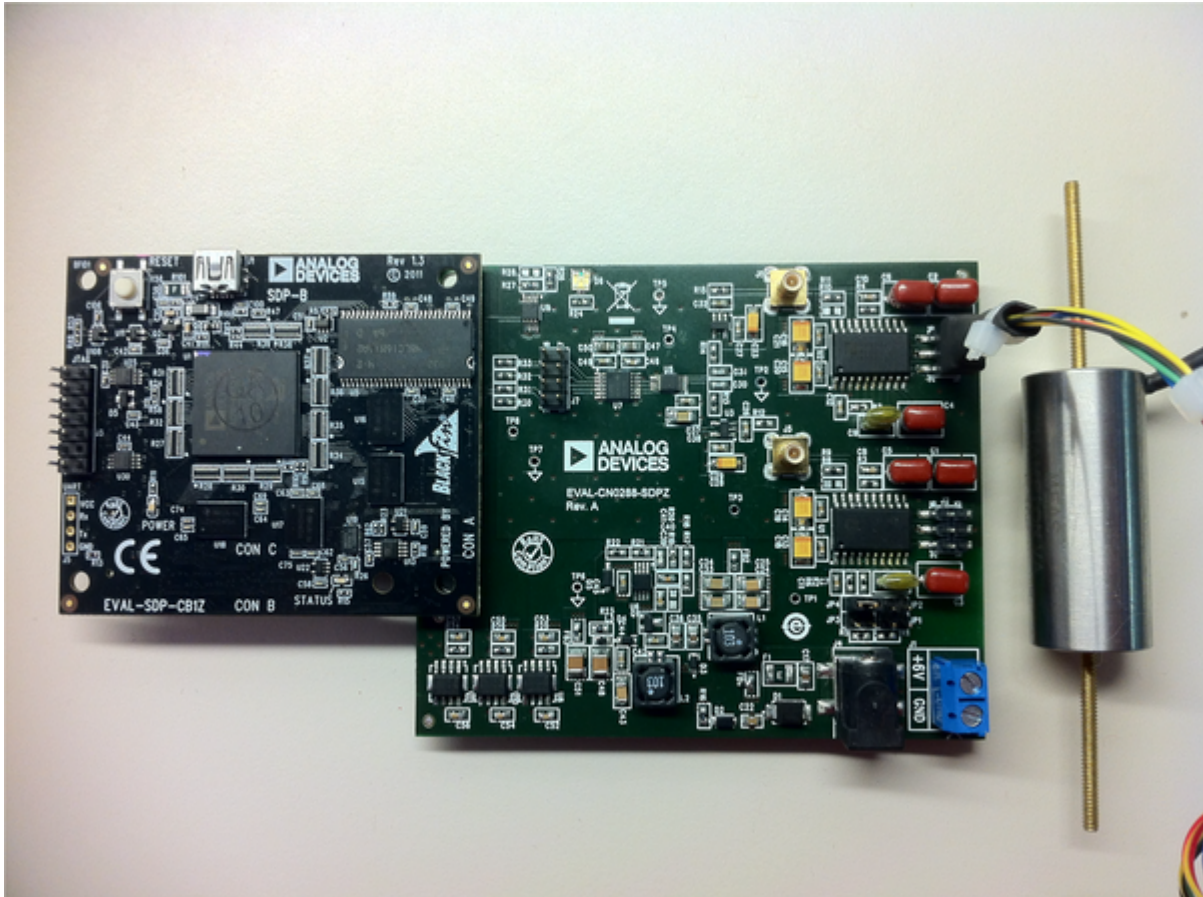
1. Connect the [EVAL-CFTL-LVDT \(LVDT\)](#) to **J3** of the [EVAL-CN0288-SDPZ \(CN-0288 Board\)](#) as depicted below.

NOTE: If a different LVDT is used other than the E-100 LVDT from Measurement Specialties, Inc the wiring schematic will be different!

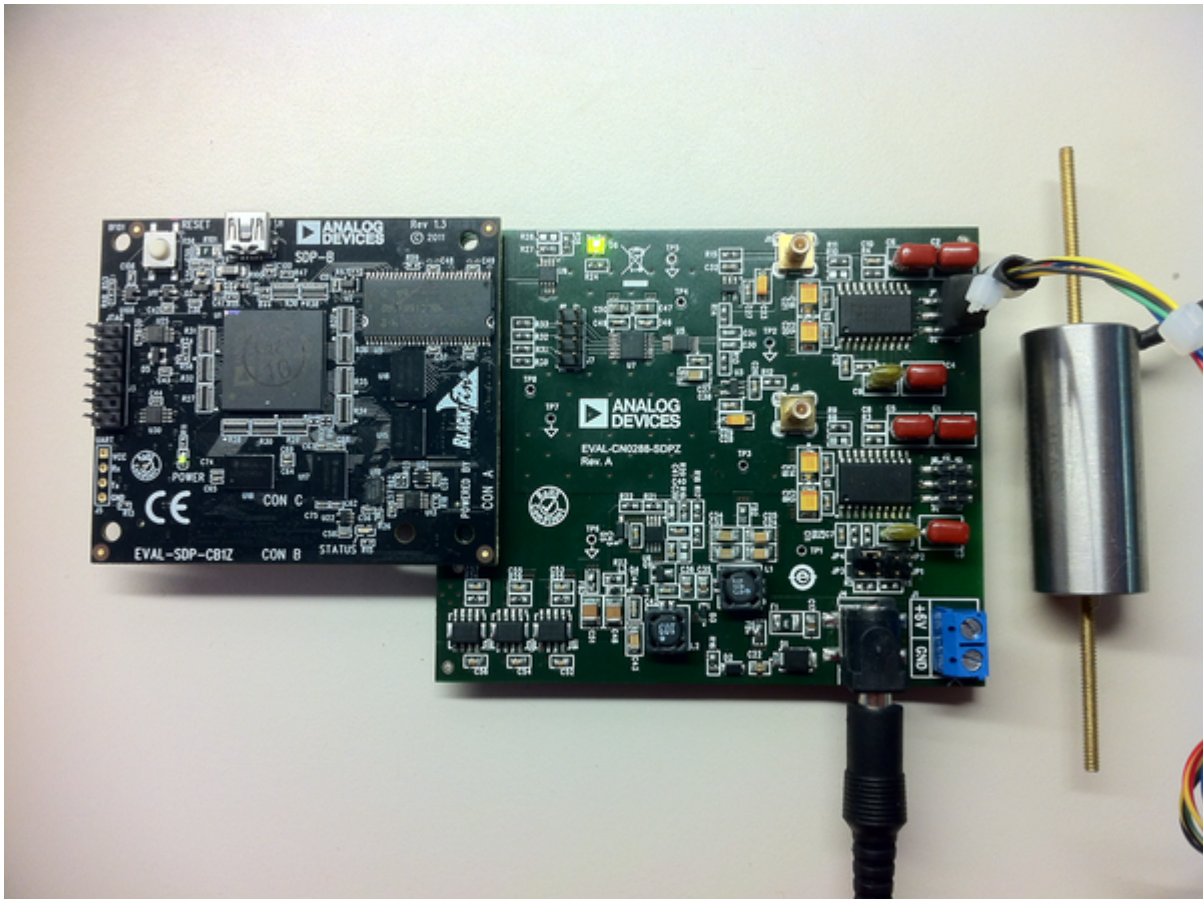
J3 Pin	LVDT Wire
1	Primary Dot
2	Secondary A Dot
3	Secondary A
4	Secondary B
5	Primary
6	Secondary B Dot



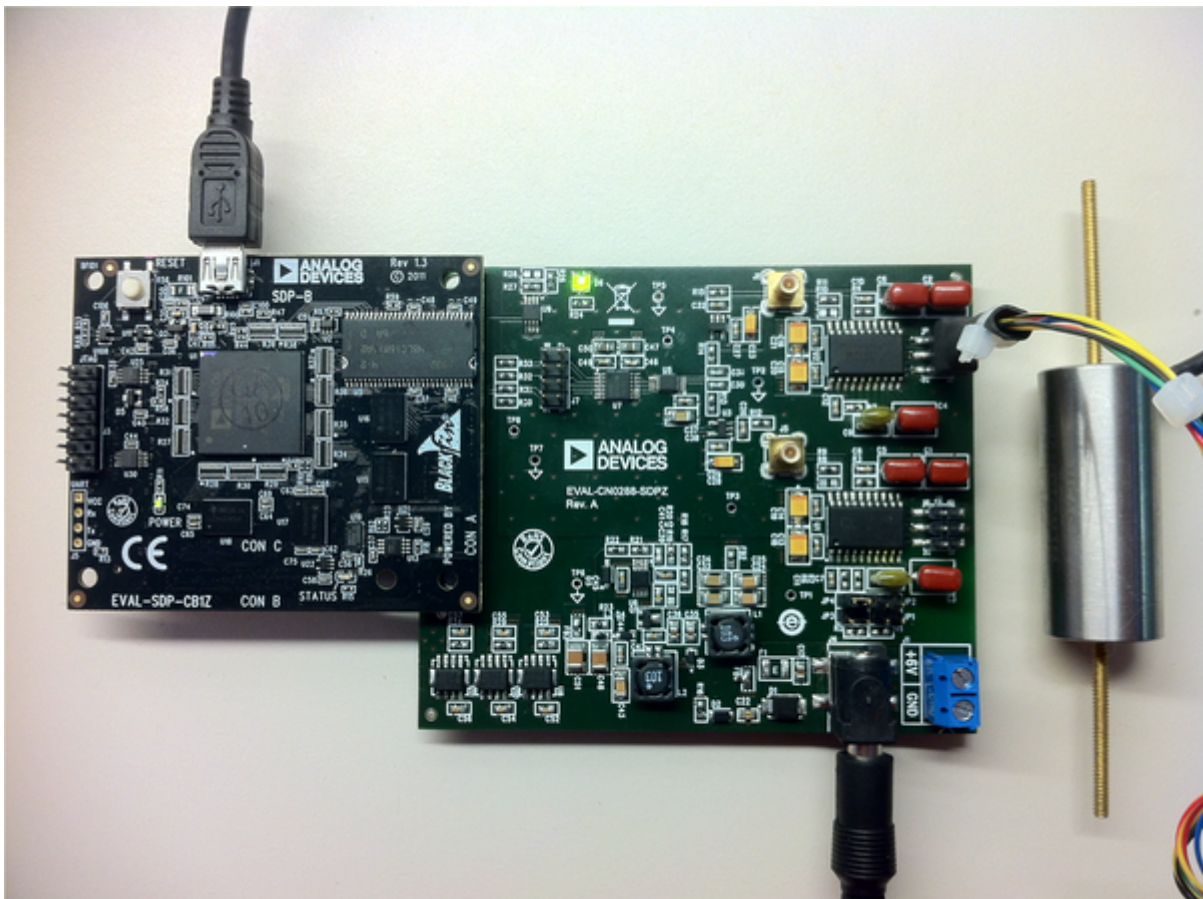
2. Connect **J8** of the [EVAL-CN0288-SDPZ \(CN-0288 Board\)](#) to **CON A** of the [EVAL-SDP-CB1Z \(SDP-B Board\)](#)



3. Connect the [EVAL-CFTL-6V-PWRZ \(+6V DC Power Supply\)](#) to the Barrel Jack at **J4** or the Screw Terminal at **J1** on the [EVAL-CN0288-SDPZ \(CN-0288 Board\)](#)

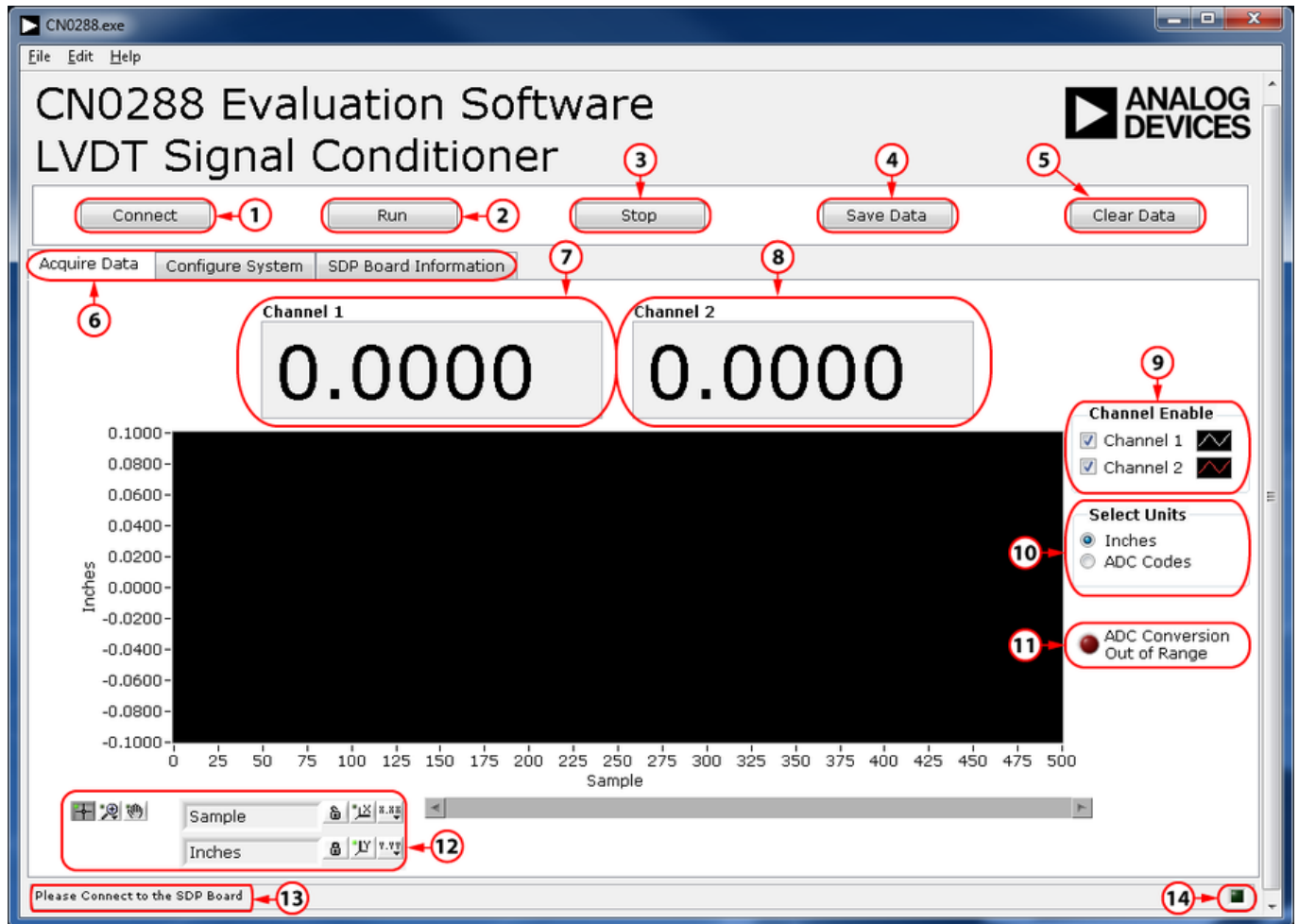


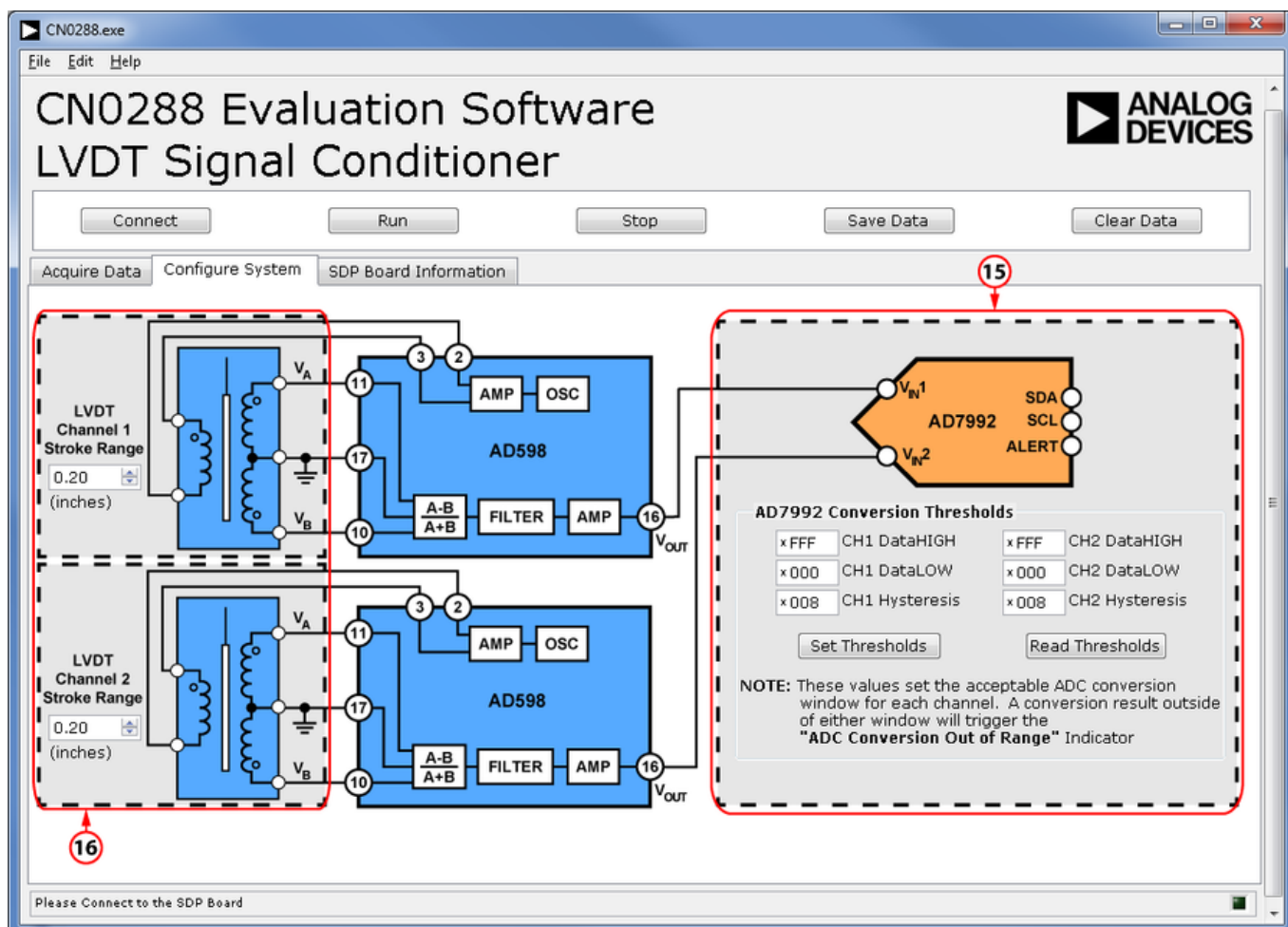
4. Connect the USB cable to **J1** of the **EVAL-SDP-CB1Z (SDP-B Board)**



Using the Evaluation Software

Software Control and Indicator Descriptions





1. **Connect/Reconnect Button**
 - When this button is pressed, the SDP-B Board makes a USB connection to the CN-0288 Board. A connection to the SDP-B Board must be made to use the software.
2. **Run Button**
 - When this button is pressed, the SDP-B Board will collect conversion data and present the acquisitions in the chart.
3. **Stop Button**
 - When this button is pressed, the software stop collecting data from the CN-0288 Board
4. **Save Data Button**
 - When this button is pressed, the software will save the data collected to a tab delimited ASCII spreadsheet file.
5. **Clear Data Button**
 - When this button is pressed, the software will clear all data collected from the chart history.
6. **Control Tabs**
 - Acquire Data - Clicking this tab brings the data collection chart to the front.
 - Configure System - Clicking this tab bring the system configuration settings to the front.
7. **Channel 1 Numerical Indicator**
 - This indicator displays the current position from null on Channel 1.
8. **Channel 2 Numerical Indicator**
 - This indicator displays the current position from null on Channel 2.
9. **Channel Enable Checkboxes**
 - This control determines which channels display in the chart.
10. **Select Units Radio Buttons**
 - This control determines the Y-Axis units of the data displayed in the chart.

11. **ADC Conversion Out of Range LED Indicator**

- This indicator determines whether a conversion result is outside the allowable range of conversion results.

12. **Chart Controls**

- These controls allow the user to zoom-in, zoom-out, and pan through the data collected.

13. **System Status String Indicator**

- This indicator displays a message to the user detailing the current state of the software.

14. **System Status LED Indicator**

- This indicator displays the current state of the software in the form of an LED. There are three status LED colors.

 Inactive

 Busy

 Error

15. **ADC Conversion Thresholds Panel**

- This panel allows the registers in the AD7992 analog-to-digital converter to be written to and read back.

16. **LVDT Full Scale Range Panel**

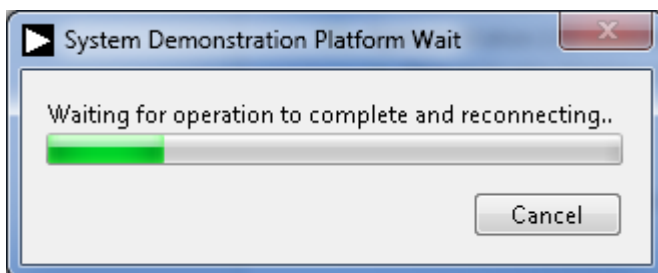
- This panel configures the maximum stroke range of the LVDT. The default configuration is 0.2 inches.

Establishing a USB Connection Link

1. Follow the instructions to properly install the software and connect the hardware as described in the previous sections.
2. Open the file named **CN0288.exe** in the installation directory.

NOTE: If the software was installed to the default location it will be found at
C:\Program Files\Analog Devices\CN0288\CN0288.exe

3. Click the **Connect/Reconnect Button**. A window with a progress bar will load.



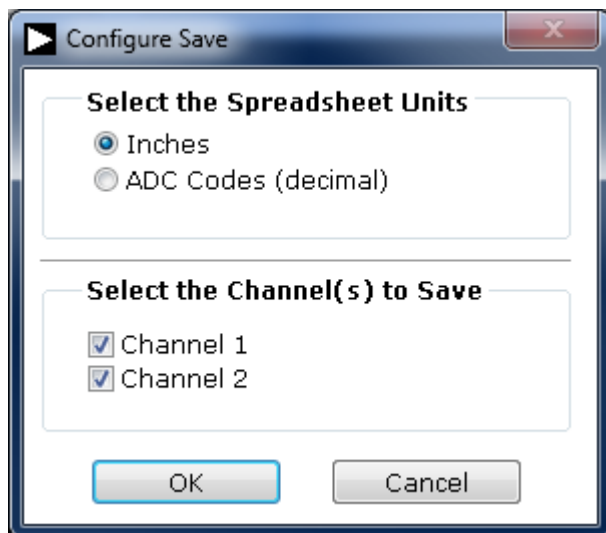
4. Upon success, the **System Status String Indicator** will display SDP Board Ready to Acquire Data

Capturing a Data

1. **Establish a USB Connection Link.**
2. Click the **Run Button**
3. Click the **Stop Button** when acquisition is complete.

Saving Data to a Spreadsheet File

1. **Establish a USB Connection Link.**
2. **Capture Data.**
3. Click the **Save Data Button**.
4. Configure the format of the spreadsheet data.
 - Select either **Inches** or **ADC Codes**.
 - Select either **Channel 1**, **Channel 2**, or select both channels.



5. Click the **OK Button**.
6. Browse to the directory location where the spreadsheet file is to be saved.
7. Name the file.
8. Click the **OK Button**.



The software saves the spreadsheet file as ASCII text with columns separated by tabs.

Setting ADC Conversion Thresholds

1. **Establish a USB Connection Link.**
2. Click the **“Configure System” Control Tab**.

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3. Change the hexadecimal value of the register to be written in the **ADC Conversion Thresholds Panel**.
 4. Press the **Set Thresholds Button**.



Information regarding the internal register structure can be found in the [AD7992 Datasheet](#).

Reading ADC Conversion Thresholds

1. **Establish a USB Connection Link.**
2. Click the **“Configure System” Control Tab**.
3. Press the **Read Thresholds Button**.



The threshold contents will be displayed in the **ADC Conversion Thresholds Panel**.

Setting the Full Scale LVDT Range

1. Click the **“Configure System” Control Tab**.
2. Change the value of the channel of interest in the **LVDT Full Scale Range Panel**.
 - The default value is 0.20 inches for both channels.