

# Lab #4

## Using SPI to Read and Accelerometer Sensor

Ver 0.6

Background:

This lab we will be using an ADXL345 breakout board in SPI mode:

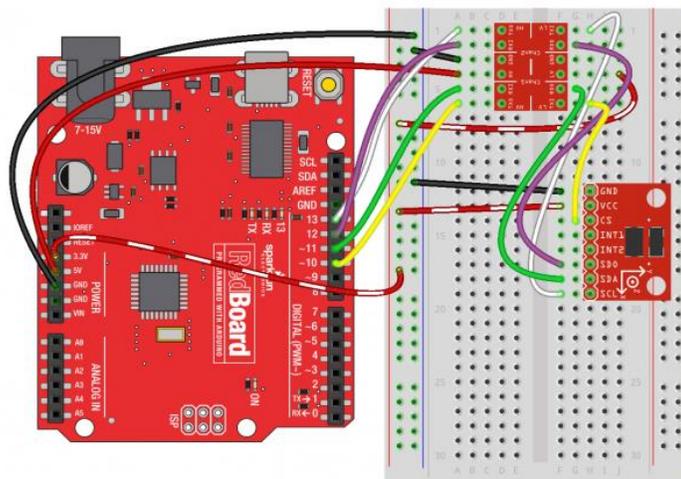


Note: This is a 3.3v device, so like the LCD, you will have to use the Bi-Directional Logic Level Converter to connect the device to the Arduino<sup>1</sup>:

The following is a table describing which pins on the Arduino should be connected to the pins on the accelerometer for SPI 4-wire communication.

Arduino Pin	ADXL345 Pin
GND	GND
3V3	VCC
10	CS
12	SDO
11	SDA
13	SCL

Here is a wiring connection diagram to aid you in hooking it up for SPI 4-wire communication.



<sup>1</sup> [Sparkfun adxl345 hookup guide](#)

It has the following registers that are of interest for this experiment:

Register (Hex)	Name	Description
0x00	DEVID	Device ID (should return 0xE5)
0x2D	POWER_CTL	Power-saving features control.
0x31	DATA_FORMAT	Data format control
0x32	DATA_X0	X-Axis Least Significant Byte
0x33	DATA_X1	X-Axis Most Significant Byte
0x34	DATA_Y0	Y-Axis Least Significant Byte
0x35	DATA_Y1	Y-Axis Most Significant Byte
0x36	DATA_Z0	Z-Axis Least Significant Byte
0x37	DATA_Z1	Z-Axis Most Significant Byte

**Refer to the ADXL345 data sheet<sup>2</sup>** for further details, make sure to read the SPI Communications section and understand the timing diagrams for the 4 wire interface that we will be using for the experiment. Also take note of the  $R/\bar{W}$  bit (first bit sent in address byte) and the MB (Multiple-byte bit – 2<sup>nd</sup> bit sent in address byte).

Other notes:

- 1) You must set the Measure Bit to 1 in the POWER\_CTL Register of the device.
- 2) Make the Data\_Format register a 0x0b (SPI, Full Res and  $\pm 16g$  range).
- 3) We will read DEVID to verify SPI communication is functional.
- 4) The X, Y and Z data comes in on 10 bits, so you will have to convert the two 8 bit values back into a 10 bit value for proper output. Also note that the 10 bit values will be SIGNED.

Objective:

Write a program that will set up the ADXL345 in 4-wire spi mode (see above) and then read DEVID, X, Y and Z acceleration and display it in a Comma Delimited format (so it can be easily imported into excel for analysis). The flow chart for the program is on the following page.

Submit the project (zip) file and a sample excel file of the device being moving in the following pattern, X (out back), y (out back) and Z (up down). Include a graph of the x y z data.

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<sup>2</sup> [ADXL345 Data Sheet](#)

