

Operation:

Strain Gauge Amplifier Operating Temperature: -40°C - 125°C

DD Operating Air Pressure: 22 psi

LinPot Readings: Position of LinPot is measured in inches from the top of the damper

Arduino:

- Internal Oscillation of 16 MHz for the Mega2560; 8 MHz for Uno
- Arduino Mega's clock speed is actually about 125 KHz
- analogRead(); takes 13 clock cycles to read the voltage coming in from the port.
- When assigning analog pins, have them spaced apart to reduce noise

ADC Shield:

Reads signal voltage from the linpot and converts it to the corresponding digital value in the range from 0 to 16777215.

ADC - Analog to Digital Conversion

10bit ADC means it has the ability to detect (2^{10}) discrete analog levels

These conversions happen using this conversion:

$$\frac{\text{Resolution of the ADC}}{\text{System Voltage}} = \frac{\text{ADC Reading}}{\text{Analog Voltage Measured}}$$

The ADC shield gets a certain analog input voltage, does a conversion controlled by a master, then outputs a digital signal through the pins to the Arduino via i2c.

The ltc2499ReadRaw(); function outputs a 32bit conversion result. The range of values seen is between 2147561000 and 3221225472. Doesn't tell you anything useful

The ltc2499Read(); function outputs a 24bit conversion result. The range of values seen is between -50 and 16777216. Good, but can't interpret negative values. **If config2_speed_2x is used in the setup configuration, the minimum value seen is ~1100 to 16777216

The ltc2499ReadVoltage(); function outputs a voltage reading. The range of values seen is between 0.00 to 2.048 V, then it jumps to inf. **You can use the voltage reading to do a calculation in order to get what you want.

High end of range based on value set to VREF

(Datasheet) The useful measuring range is 0 - 2.048V in single-ended mode and +/- 2.048V in differential mode.

Omair: Put a voltage divider between potentiometer and adc bring down 0-5V measuring range to 0-2.048V

$$2.048/5 = 0.4096 = R2/R1+R2$$

5Vo actually 4.938V, Use potentiometer as R2

$$2.048/4.94 = 0.415$$

$$\text{LinPot's Resistance} = 4.746 \text{ k}\Omega \quad R1 = 6.697 \text{ k}\Omega$$

Arduino's AnalogRead function uses its' 10bit ADC to read voltages.

Damper Characteristics

Stroke length is 57mm without bumpstop. 47.244mm = 1.860 inches with bumpstop

Rebound limit = 0.929 in.

Compression limit = 3.376 in.

Air Cylinder Characteristics

Bimba SR-313-5-D: 2" Bore with 31 Bimba Power Factor & 120 ft-lb of torque

Load Cell - Strain Gauge Amplifier Calibration

Rated Output of Load Cell: 1.3 mV/V

- Maximum Mechanical Load = ~4500 lbs
- Load Cell is powered by 5V, so maximum output at full mechanical load is 6.5 mV
- *Since the Arduino has a preinstalled 10bit ADC on it, the Arduino can only recognize mV in steps of $5V/1024 = 4.9\text{mV}$. We use to the added 24bit ADC shield to increase the resolution

**Currently, strain gauge amplifier is outputting 369 at maximum compression load (80 lbs) and 781 at maximum rebound load (85 lbs)

$$V_{out} = A \cdot V_{in} + 2.5 \quad (0-5V \text{ power supply}) \quad V_{in} = 412/1024 \cdot 5V = 2.01171875V$$

$$A = 1.2427184466019417475 \quad R_f = 1000\Omega \quad R_s = 801.46875 \sim 820\Omega$$