

LAB 1
SECTION A

SUBMITTED BY:
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1. Old Computers

1.1 MITS Altair 8800

Input devices: Front-panel switches

Output devices: Front-panel LEDs

Expansion cards were released, including a keyboard interface, TTY, monitor, printer and data storage

Minimum amount of RAM: 0.256 kilobytes, 256 bytes, 2,048 bits

Maximum amount of RAM: 64 kilobytes, 64,000 bytes, 512,000 bits

CPU: Intel 8080, 2.0 MHz

1.2 MOS KIM-1

Input devices: On-board hexadecimal keypad

An ASCII terminal or video monitor could also be used through the serial port.

Output devices: 6 digital LED display

Data could be stored on a cassette recorder, or paper-tape reader.

Amount of RAM: 1.024 kilobytes, 1,024 bytes, 8,192 bits

CPU: MOS 6502, 1MHz

1.3 Apple 1

Input devices: Keyboard (not included)

Output devices: Composite video output, cassette interface

Minimum amount of RAM: 4 kilobytes, 4,000 bytes, 32,000 bits

Maximum amount of RAM: 65 kilobytes, 65,000 bytes, 520,000 bits

CPU: MOS 6502, 1.0 MHz

1.4 IBM Personal Computer (PC) 5150

Input devices: Cassette (load and save data), keyboard, and floppy drive which is optional

Output devices: Television set

Minimum amount of RAM: 16K kilobytes, 16,000 bytes, 128,000 bits

Maximum amount of RAM: 640K kilobytes, 640,000 bytes, 5,120,000 bits

CPU: Intel 8088, 4.77MHz

1.5 Apple Macintosh

Input devices: Mouse, keyboard, external floppy port

Output devices: 9-inch monochrome screen, printer port

Minimum amount of RAM: 128K kilobytes, 128,000 bytes, 1,024,000 bits

Maximum amount of RAM: 512K kilobytes, 512,000 bytes, 4,096,000 bits

CPU: Motorola 68000, 7.83 Mhz

2. Base Conversion

Base Conversion

Decimal \rightarrow Binary

$$1 \rightarrow 1$$

$$\begin{array}{r} 0 \text{ R1} \\ 2 \overline{)1} \end{array}$$

$$10 \rightarrow 0101$$

$$\begin{array}{r} 0 \text{ R1} \\ 2 \overline{)1} \text{ R0} \\ 2 \overline{)2} \text{ R1} \\ 2 \overline{)5} \text{ R0} \\ 2 \overline{)10} \end{array}$$

$$255 \rightarrow 11111111$$

$$\begin{array}{r} 0 \text{ R1} \\ 2 \overline{)1} \text{ R1} \\ 2 \overline{)3} \text{ R1} \\ 2 \overline{)7} \text{ R1} \\ 2 \overline{)15} \text{ R1} \\ 2 \overline{)31} \text{ R1} \\ 2 \overline{)63} \text{ R1} \\ 2 \overline{)127} \text{ R1} \\ 2 \overline{)255} \end{array}$$

$$42 \rightarrow 010101$$

$$\begin{array}{r} 0 \text{ R1} \\ 2 \overline{)1} \text{ R0} \\ 2 \overline{)2} \text{ R1} \\ 2 \overline{)5} \text{ R0} \\ 2 \overline{)10} \text{ R1} \\ 2 \overline{)21} \text{ R0} \\ 2 \overline{)42} \end{array}$$

Decimal \rightarrow Octal

$$1 \rightarrow 1$$

$$\begin{array}{r} 0 \text{ R1} \\ 8 \overline{)1} \end{array}$$

$$10 \rightarrow 12$$

$$\begin{array}{r} 0 \text{ R1} \\ 8 \overline{)1} \text{ R2} \\ 8 \overline{)10} \end{array}$$

$$42 \rightarrow 52$$

$$\begin{array}{r} 0 \text{ R5} \\ 8 \overline{)5} \text{ R2} \\ 8 \overline{)42} \end{array}$$

$$255 \rightarrow 377$$

$$\begin{array}{r} 0 \text{ R3} \\ 8 \overline{)3} \text{ R7} \\ 8 \overline{)31} \text{ R7} \\ 8 \overline{)255} \end{array}$$

Decimal \rightarrow Hexadecimal A=10 B=11 C=12 D=13
 E=14 F=15

$$\begin{array}{r} 0 \text{ R1} \\ 16 \overline{) 1} \end{array}$$

10 \rightarrow A

$$\begin{array}{r} 0 \text{ R10} \rightarrow A \\ 16 \overline{) 10} \end{array}$$

42 \rightarrow 2A

$$\begin{array}{r} 0 \text{ R2} \\ 16 \overline{) 2} \text{ R10} \rightarrow A \\ 16 \overline{) 42} \end{array}$$

255 \rightarrow FF

$$\begin{array}{r} 0 \text{ R15} \rightarrow F \\ 16 \overline{) 15} \text{ R15} \rightarrow F \\ 16 \overline{) 255} \end{array}$$

Hexadecimal \rightarrow Decimal A=10 B=11 C=12 D=13
 E=14 F=15

F \rightarrow 15

$$(F \cdot 16^0) = (15 \cdot 1) = 15$$

DF \rightarrow 223

$$(D \cdot 16^1) + (F \cdot 16^0) = (13 \cdot 16) + (15 \cdot 1) = 223$$

81 \rightarrow 129

$$(8 \cdot 16^1) + (1 \cdot 16^0) = (8 \cdot 16) + (1 \cdot 1) = 129$$

04 \rightarrow 4

$$(0 \cdot 16^1) + (4 \cdot 16^0) = (0) + (4) = 4$$

Hexadecimal \rightarrow Binary

F \rightarrow 1111

DF \rightarrow 10111111

F=15

D=13 F=15

$$\begin{array}{r} 0 \text{ R1} \\ 2 \overline{) 1} \text{ R1} \\ 2 \overline{) 3} \text{ R1} \\ 2 \overline{) 7} \text{ R1} \\ 2 \overline{) 15} \end{array}$$

$$\begin{array}{r} 0 \text{ R1} \\ 2 \overline{) 1} \text{ R1} \\ 2 \overline{) 3} \text{ R0} \\ 2 \overline{) 6} \text{ R1} \\ 2 \overline{) 13} \end{array} \quad \begin{array}{r} 0 \text{ R1} \\ 2 \overline{) 1} \text{ R1} \\ 2 \overline{) 3} \text{ R1} \\ 2 \overline{) 7} \text{ R1} \\ 2 \overline{) 15} \end{array}$$

$$81 \rightarrow 1000\ 0001$$

$$\begin{array}{r} 0\ R1 \\ 2 \overline{)1}\ R0 \\ 2 \overline{)2}\ R0 \\ 2 \overline{)4}\ R0 \\ 2 \overline{)8} \end{array} \quad \begin{array}{r} 0\ R1 \\ 2 \overline{)1} \end{array}$$

$$04 \rightarrow 0100$$

$$\begin{array}{r} 0\ R1 \\ 2 \overline{)1}\ R0 \\ 2 \overline{)2}\ R0 \\ 2 \overline{)4} \end{array}$$

Hexadecimal \rightarrow Octal

$$F \rightarrow 17$$

$$F = \underline{1111} \text{ (convert to binary)}$$

$$001 = 2^0 = 1$$

$$111 = 2^2 + 2^1 + 2^0 = 7$$

$$04 \rightarrow 4$$

$$4 = \underline{0100} \text{ (convert to binary)}$$

$$100 = 2^2 + 0 + 0 = 4 \text{ binary}$$

$$DF \rightarrow 337$$

$$D = 1101 \quad F = 1111$$

$$DF = \underline{11011111} \text{ (convert to binary)}$$

$$011 = 0 + 2^1 + 2^0 = 3$$

$$011 = 0 + 2^1 + 2^0 = 3$$

$$111 = 2^2 + 2^1 + 2^0 = 7$$

$$81 \rightarrow 201$$

$$8 = 1000 \quad 1 = 0001$$

$$81 = \underline{10000001} \text{ (convert to binary)}$$

$$010 = 0 + 2^1 + 0 = 2$$

$$000 = 0 + 0 + 0 = 0$$

$$001 = 0 + 0 + 2^0 = 1$$

Binary \rightarrow Decimal

10010011 \rightarrow 147

$$2^7 + 0 + 0 + 2^4 + 0 + 0 + 2^1 + 2^0 = 147$$

111111 \rightarrow 63

$$2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0 = 63$$

Binary \rightarrow Octal

10010011 \rightarrow 223

$$010 = 0 + 2^1 + 0 = 2$$

$$010 = 0 + 2^1 + 0 = 2$$

$$011 = 0 + 2^1 + 2^0 = 3$$

111111 \rightarrow 77

$$111 = 2^2 + 2^1 + 2^0 = 7$$

$$111 = 2^2 + 2^1 + 2^0 = 7$$

Binary \rightarrow Hexadecimal

10010011 \rightarrow 93

$$1001 = 2^3 + 0 + 0 + 2^0 = 9$$

$$0011 = 0 + 0 + 2^1 + 2^0 = 3$$

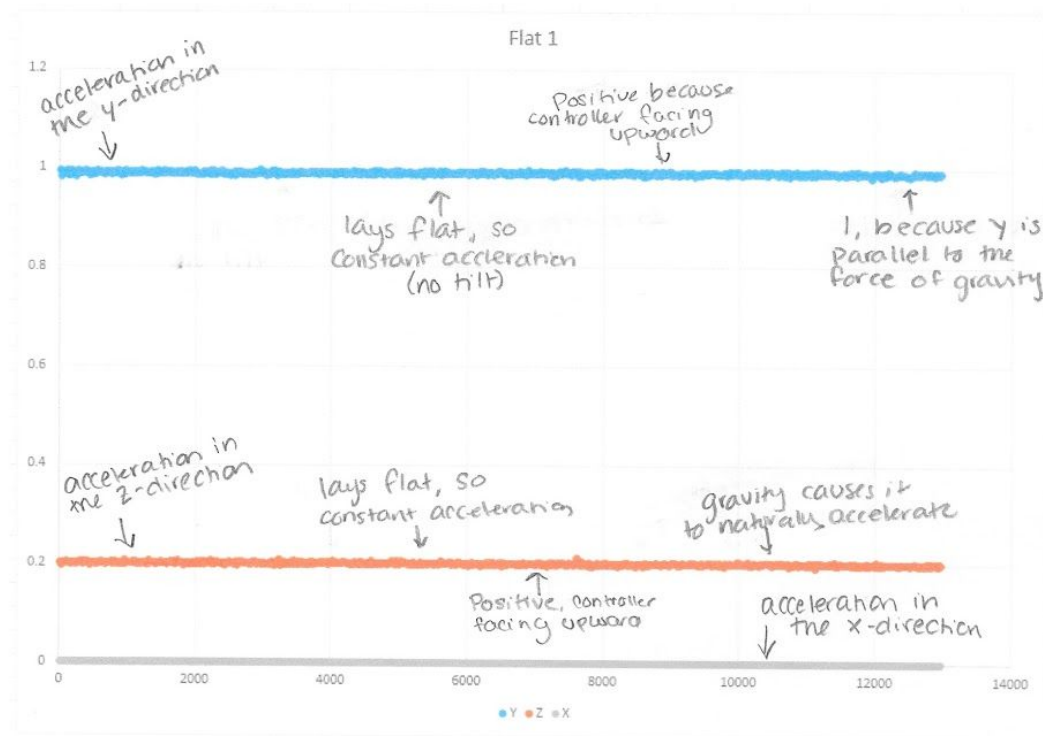
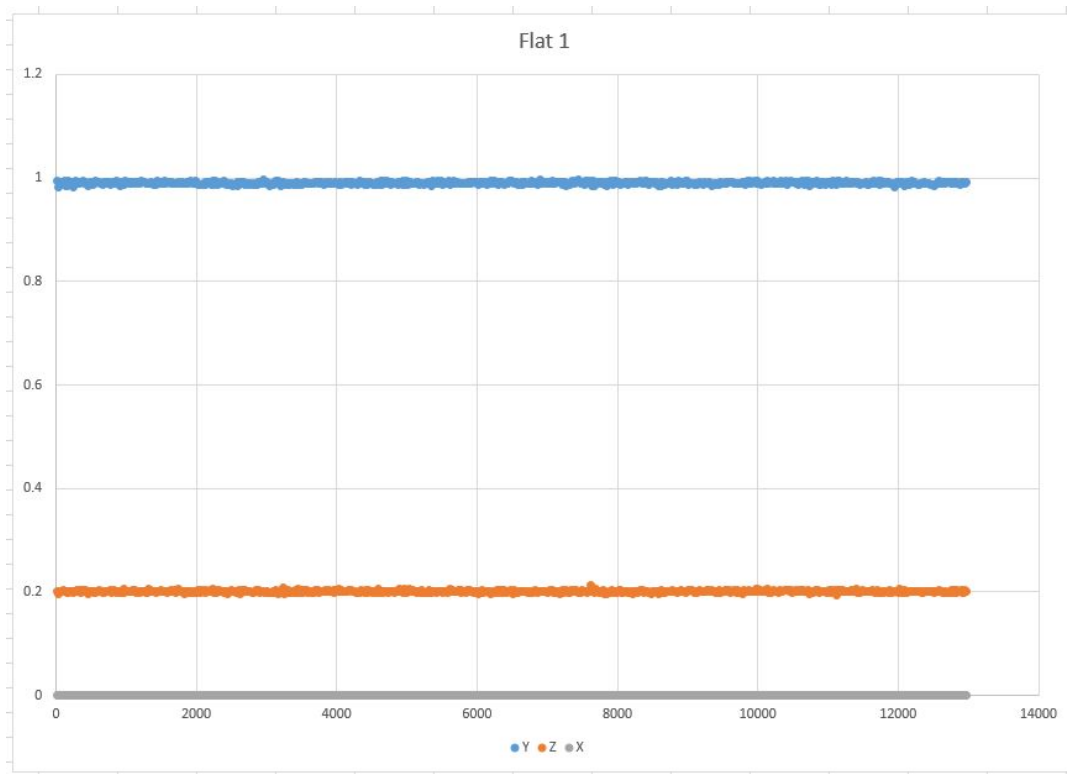
111111 \rightarrow 3F

$$0011 = 0 + 0 + 2^1 + 2^0 = 3$$

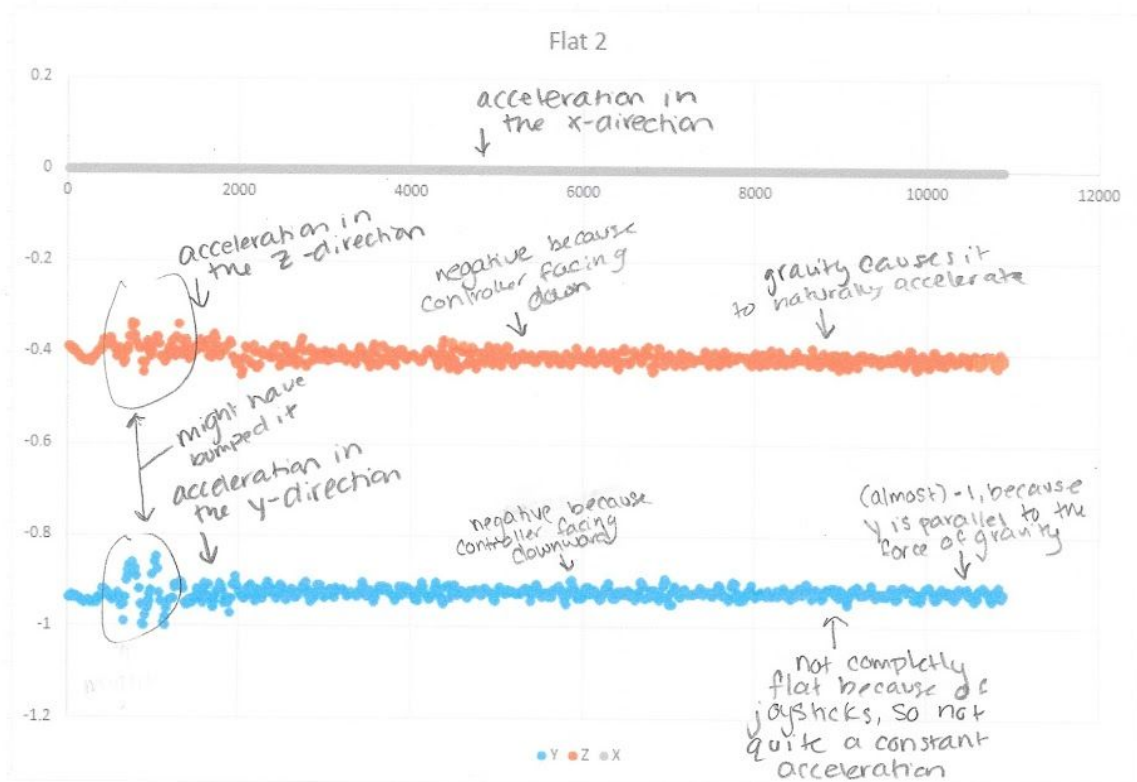
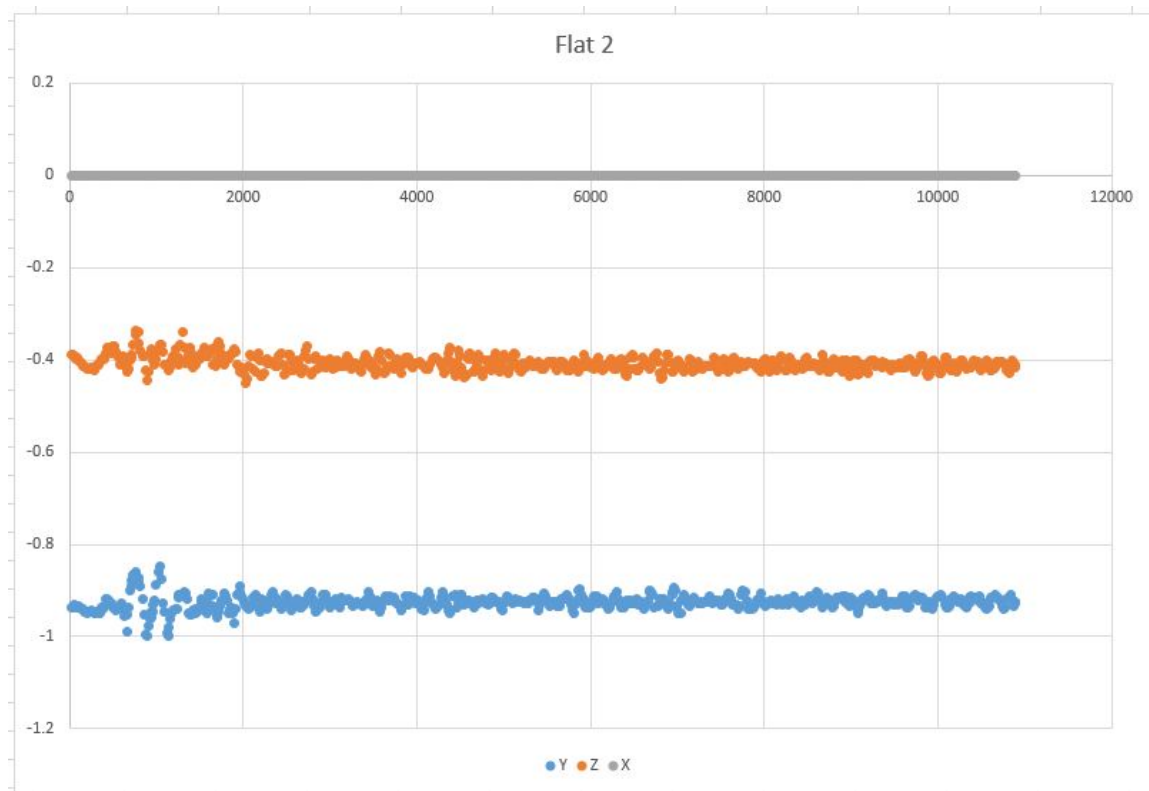
$$1111 = 2^3 + 2^2 + 2^1 + 2^0 = 15 = F$$

3. Exploration

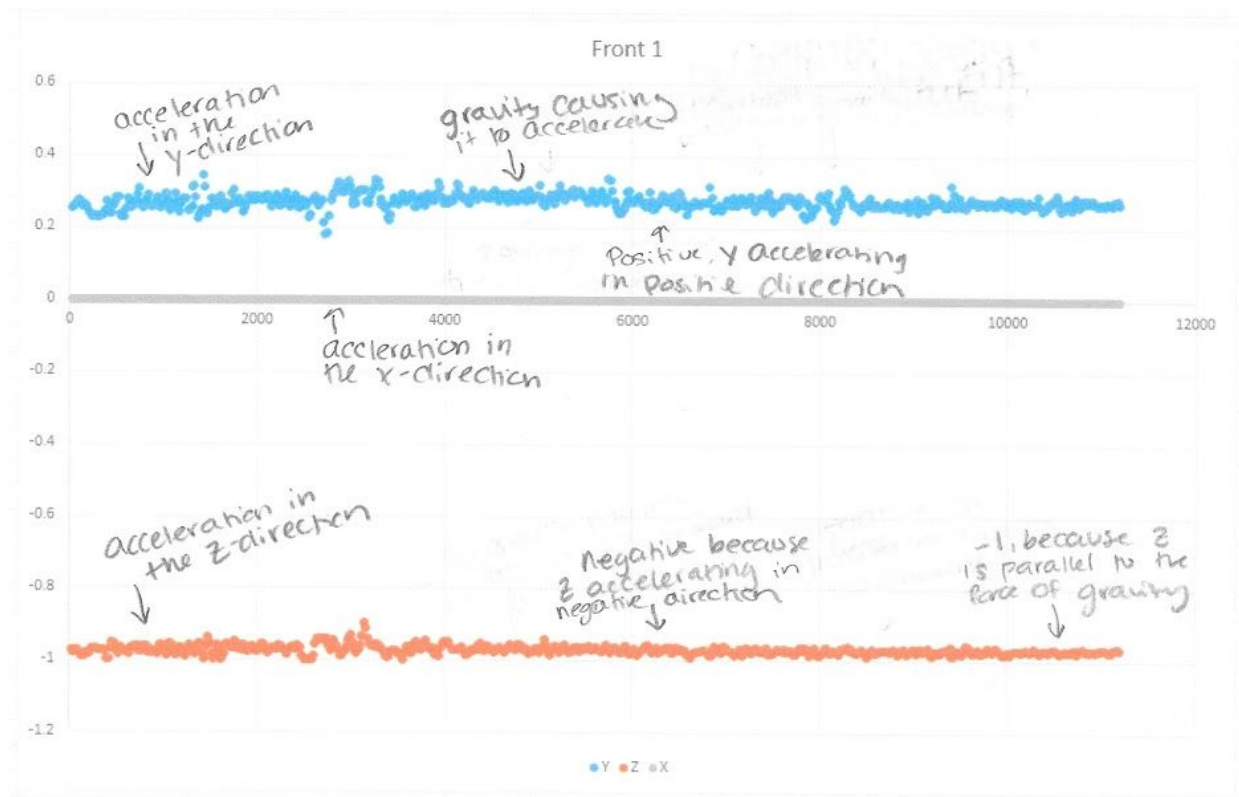
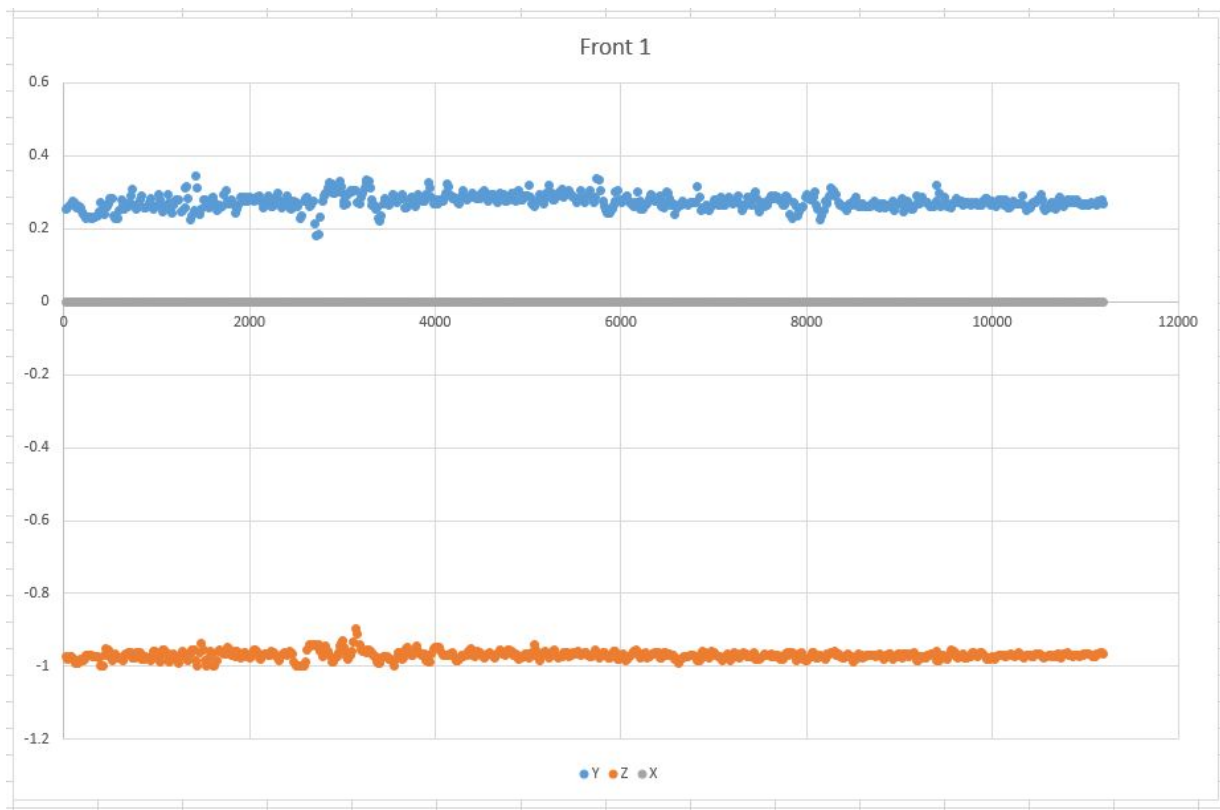
Flat 1



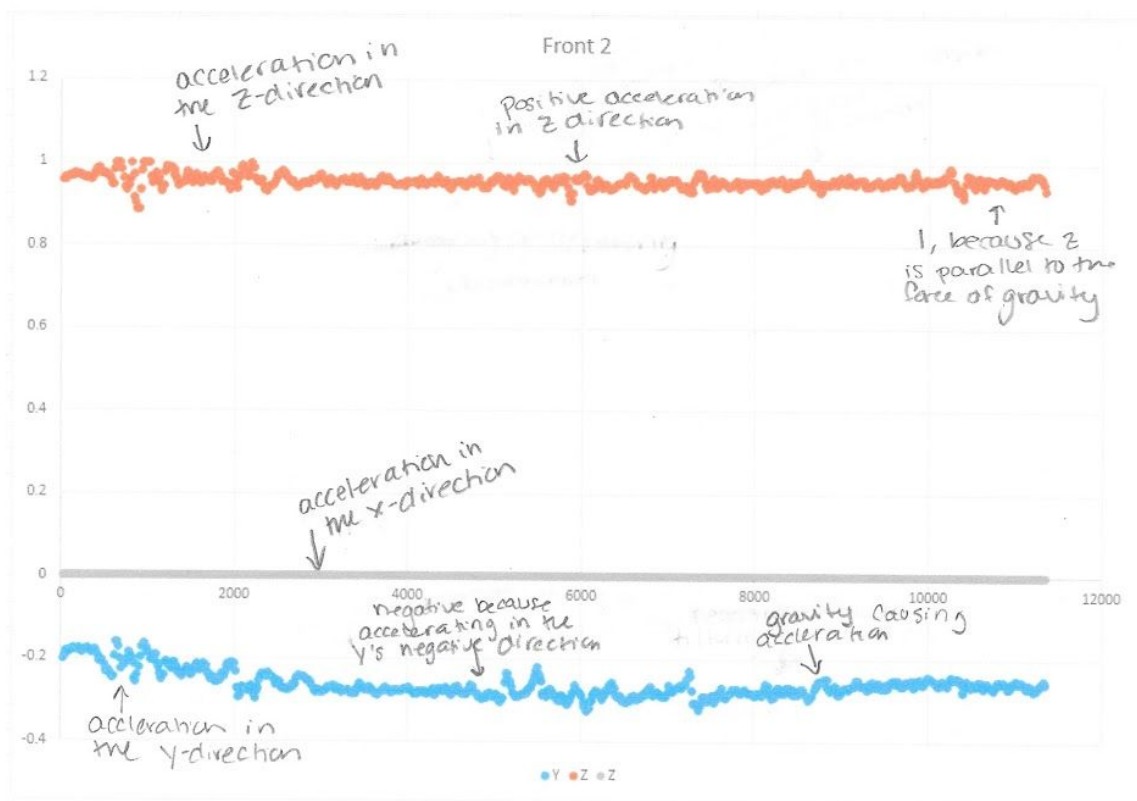
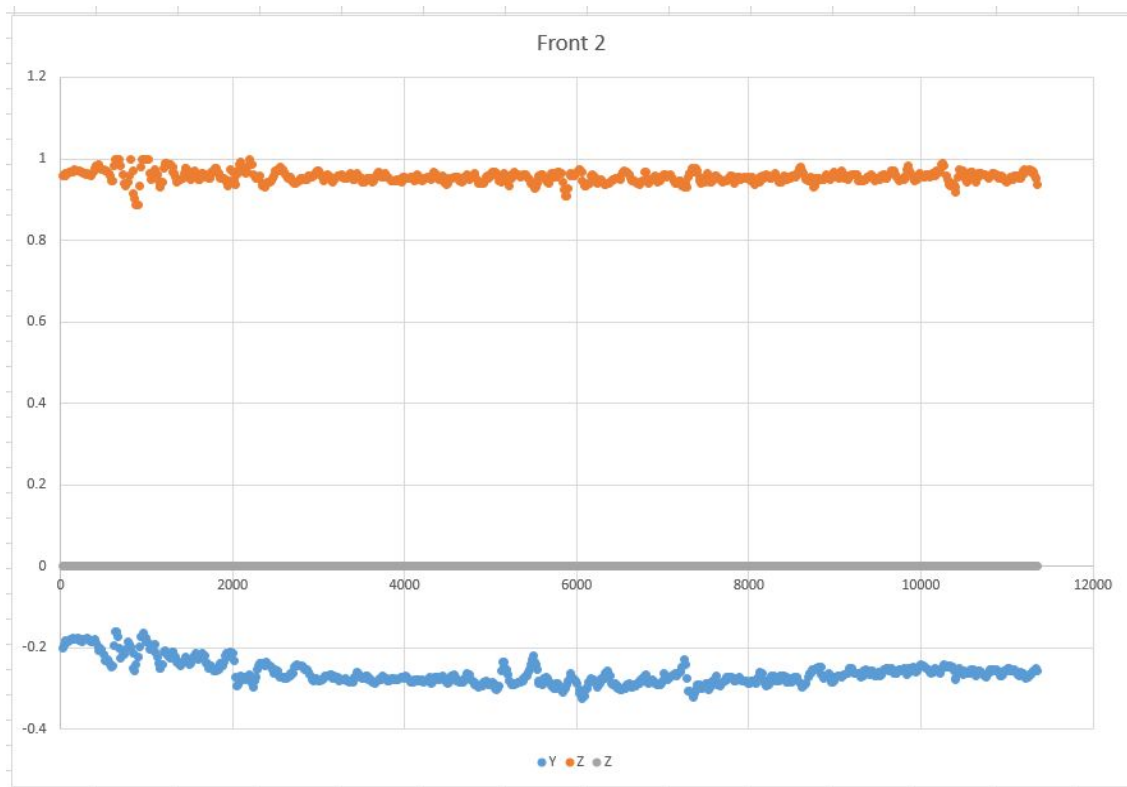
Flat 2



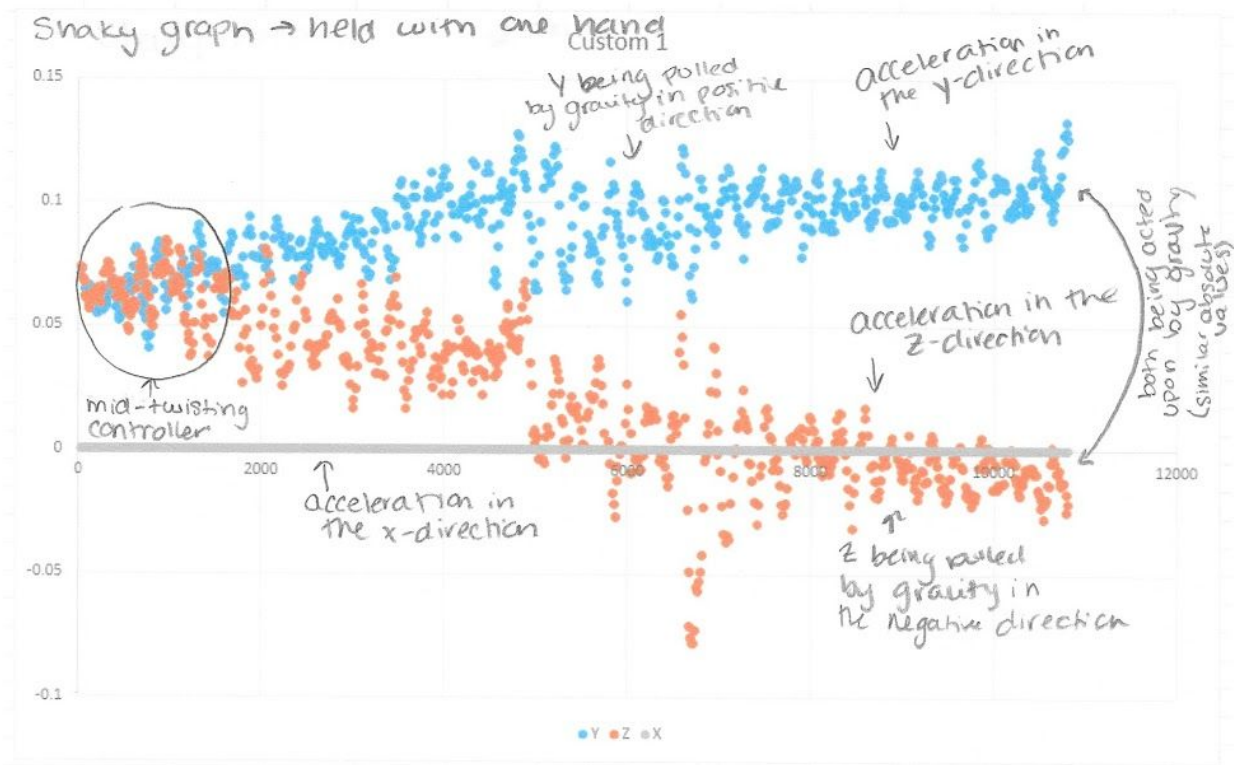
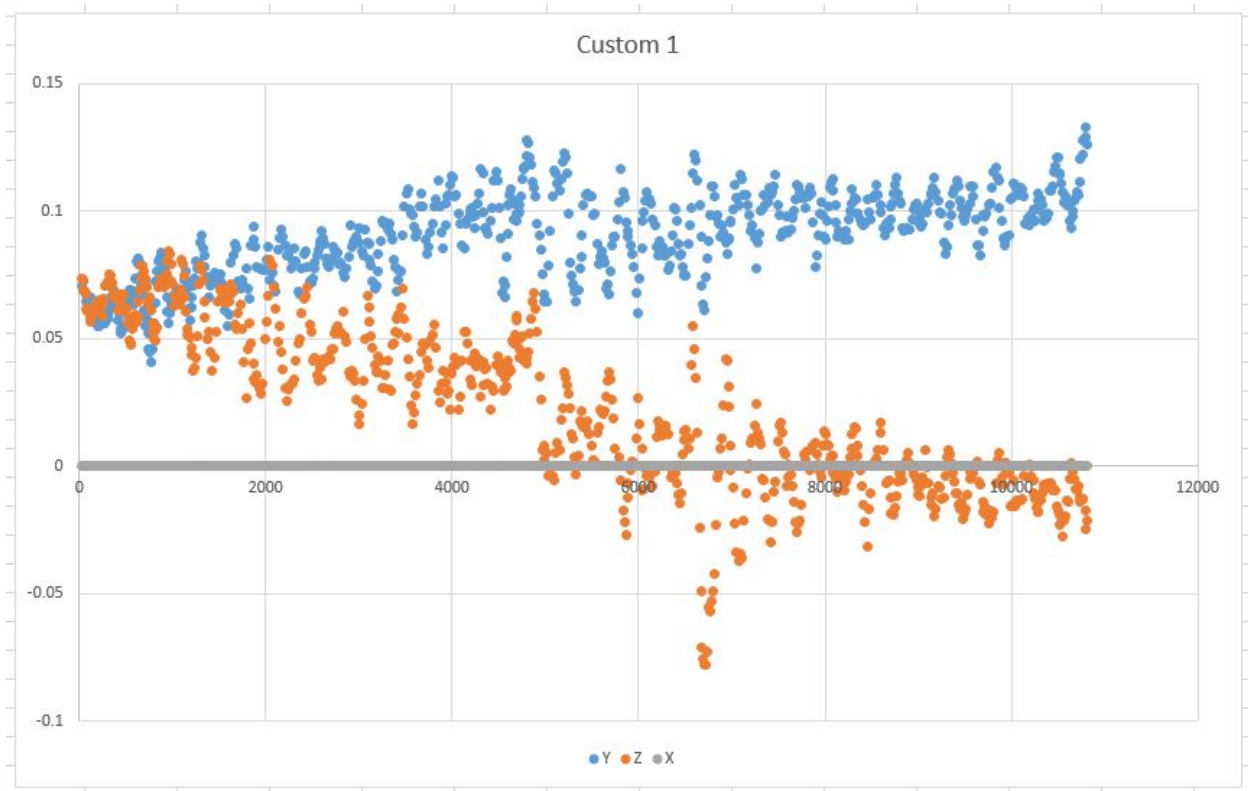
Front 1



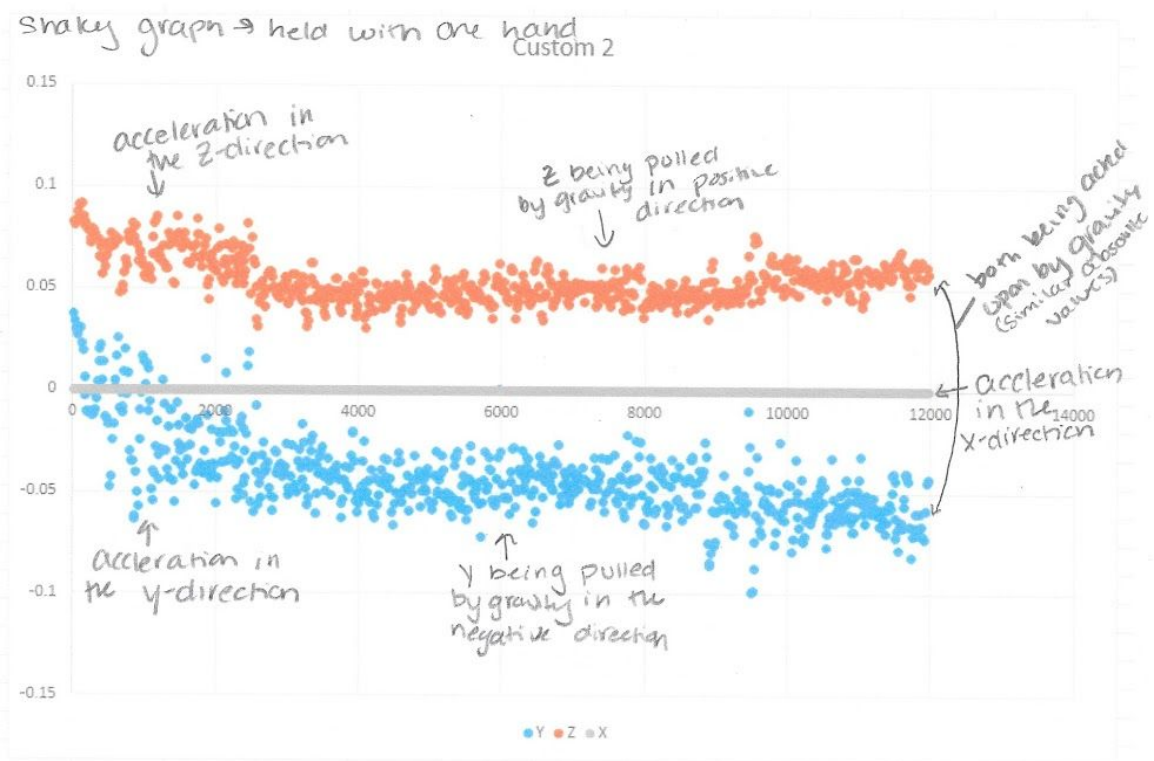
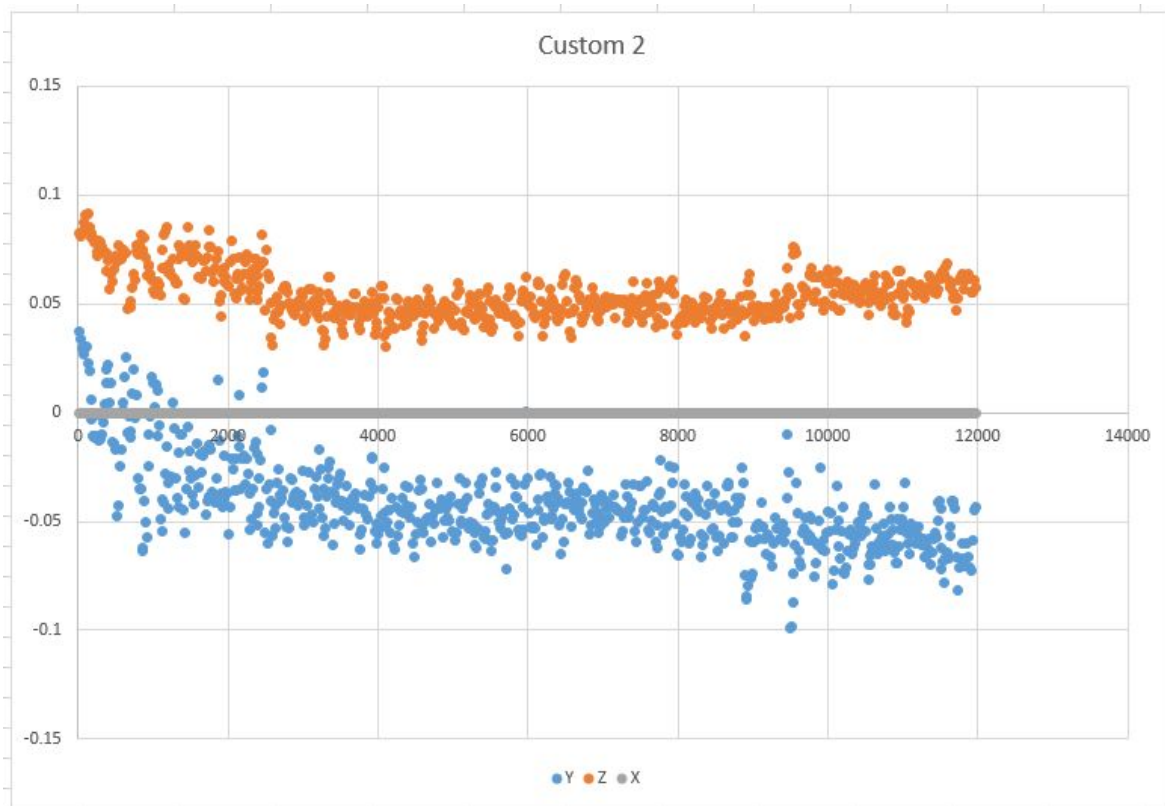
Front 2



Custom 1



Custom 2



Questions

1. What do you think each column of data represent?

Column A: Time, increments constantly

Column B: Y-axis, acceleration in the y-direction (Y = tilt)

Column C: Z-axis, acceleration in the z-direction (Z = lift)

Column D: X-axis, gravity doesn't act in the x direction (X = twist doorknob)

2. How does this relate the the flags (-t and -g) that you used?

I'm guessing that -t prints out the time in the console, and -g is the gyroscope which prints out the x, y, and z coordinates in the console.

3. What unit of measure are the data in?

m/s^2 -> acceleration

4. On each of your plots, explain what is going on. Try to understand why the graphs look like they do and then relate the graphs to what you did when you took the data. Label, by hand (scan and include in your PDF), parts of the graphs and then describe what is going on.

(On same page as each graph)