Ethan Griesman

Lab #1 CPRE 185 9/5/2022

1.1) MITS Altair 8800

input: Sense Switches, Front panels
output: LEDs
maxRAM: 512,000 bits, 64,000 bytes, 64 kB
min RAM: 0.256 kB, 256 bytes, 2048 bits
CPU: intel 8080, 2MHz

1.2) MOSKIM-1

input: on board hex keypad
RAM: 1024 bytes, 8192 bits, } min RAM 1.024 kB
CPU: MOS 6502 1MHz
output: 6 digital LED display

1.3) Apple 1

- I/O in: Keyboard port; out: mono 280×192 (40×24 text)
- max RAM: 65 kB, 65,000 bytes, 520,000 bits
- min RAM: 4 kB, 4,000 bytes, 32,000 bits
- CPU: MOS 6502, 1MHz

1.4) IBM (PC) 5150

input: Keyboard
output: Monitor, audio tape cassette player
MAX RAM: 640 kB, 640,000 Bytes, 5,120,000 bits
MIN RAM: 16 kB, 16,000 Bytes, 128,000 bits
CPU: Intel 8088, 4.77 MHz

1.5) Macintosh

I/O: Keyboard, mouse, Scanner
out: 9 inch monochrome screen 512×342 pixels
RAM: Max: 512 KB, 512,000, 4096000
min: 128 kB, 0 B, 0 bits
CPU: Motorola 68000 7.83 MHz.

LAB #1

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2.) BASE CONVERSION

a.) $1_{10} \rightarrow {}^{?}_{(2)} \rightarrow 1_8 \rightarrow 1_{16}$

$2^0 = 1$ $8^0 = 1$ $16^0 = 1$

b.) $10_{10} \rightarrow$ ($10/2 \rightarrow 2$ R 0 → $12_{(8)}$ → a (16)

$5/2 \rightarrow 2.5$ 1

$2/2 \rightarrow 1$ 0

$1/2 \rightarrow 0.5$ 1

1010_2

$10/8 \rightarrow 1$ R 2

1.25 0

1/2 1

12_8

$10/16 \rightarrow 0$ R 10

a_{16}

c.) $42_{10} \rightarrow 42_{10} \rightarrow 101010_2 \rightarrow 52_8 \rightarrow 2a_{16}$

$42/2$ 21 R 0

$21/2$ 10 R 1

$10/2$ 5 R 0

$5/2$ 2 R 1

$2/2$ 1 0

1/2 1

101010_2

$42/8 \rightarrow 5$ R 2

5/8 0 R 5

52_8

$42/16 \rightarrow 2$ R 10 (a)

$2/16 \rightarrow 0$ R 2

$255_{10} \rightarrow 11111111_2 \rightarrow 377_8$

$255/2 \rightarrow 127$ R (1)
$127/2 \rightarrow 63$ R (1)
$63/2 \rightarrow 31$ R (1)
$31/2 \rightarrow 15$ R (1)
$15/2 \rightarrow 7$ R (1)
$7/2 \rightarrow 3$ R (1)
$3/2 \rightarrow 1$ R (1)
$1/2 \rightarrow 0$ R (1)

11111111_2

$255/8 \rightarrow 31$ R (7)
$31/8 \rightarrow 3$ R (7)
$3/8 \rightarrow 0$ R (3)

377_8

ff_{16}

$255/16$ 15 R 15 (f)
$15/16$ 0 R 15 (f)

ff_{16}

$F_{16} \rightarrow 15_{10} \rightarrow 1111_2 \rightarrow 17_8$

$F_{16} \rightarrow$

$15/2$
7 R (1)
$7/2$ 3 R (1)
$3/2$ 1 R (1)
$1/2$ 0 R (1)

1111_2

2

$15/8$ 1 R 7
$1/8$ 0 R 1

17_8

DF_{16} → $13 \times 16^1 + 15 \times 1$

$= 208 + 15$

$= \boxed{223_{10}} \longrightarrow \boxed{11011111_2} \rightarrow \boxed{337_8}$

$223/2 \rightarrow 111$ R (1)

$111/2 \rightarrow 55$ R (1)

$55/2 \rightarrow 27$ R (1)

$27/2 \rightarrow 13$ R (1)

$13/2 \rightarrow 6$ R (1)

$6/2 \rightarrow 3$ R (0)

$3/2 \rightarrow 1$ R (1)

$1/2 \rightarrow 0$ R (1)

$\boxed{11011111_2}$

$223/8 \rightarrow 27$ R 7

$27/8 \rightarrow 3$ R 3

$3/8 \rightarrow 0$ R 3

$\boxed{337_8}$

81_{16} → $8 \times 16^1 + 1 \times 16^0$

$128 + 1$

$= \boxed{129_{10}} \longrightarrow \boxed{10000001_2} \rightarrow \boxed{201_8}$

$129/2 \rightarrow 64$ R [1]

$64/2 \rightarrow 32$ R [0]

$32/2 \rightarrow 16$ R [0]

$16/2 \rightarrow 8$ R [0]

$8/2 \rightarrow 4$ R [0]

$4/2 \rightarrow 2$ R [0]

$2/2 \rightarrow 1$ R [0]

$1/2 \rightarrow 0$ R [1]

$\boxed{10000001_2}$

$129/8 \rightarrow 16$ R 1

$16/8 \rightarrow 2$ R 0

$2/8 \rightarrow 0$ R 2

$\boxed{201_8}$

$04_{16} = \boxed{4_{10}} \rightarrow \boxed{100_2} \rightarrow \boxed{4_8}$

$4/2 \rightarrow 2\ R\ 0$
$2/2 \rightarrow 1\ R\ 0$
$1/2 \rightarrow 0\ R\ 1$

$\boxed{100_2}$

$4/8 \rightarrow 0\ R\ 4$

$\boxed{4_8}$

$1001001_2 \rightarrow \boxed{147_{10}} \rightarrow \boxed{223_8} \rightarrow \boxed{93_{16}}$

$= (1\times2^0) + (1\times2^1) + (0\times2^2) + (0\times2^3) + (1\times2^4) + (0\times2^5) + (1\times2^7) = (1) + (2) + (16) + 128$

$= 3 + 16 + 128$

$= 19 + 128$

$\boxed{147_{10}}$

$147/8 \rightarrow 18\ R\ 3$
$18/8 \rightarrow 2\ R\ 2$
$2/8 \rightarrow 0\ R\ 2$

$\boxed{223_8}$

$147/16 \rightarrow 9\ R\ 3$
$9/16 \rightarrow 0\ R\ 9$

$\boxed{93_{16}}$

$111111_2 \rightarrow \boxed{63_{10}} \rightarrow \boxed{77_8} \rightarrow \boxed{3F_{16}}$

$[1\times2^0] + (1\times2^1) + (1\times2^2) + (1\times2^3) + (1\times2^4) + (1\times2^5)$

$= 1 + 2 + 4 + 8 + 16 + 32$

$= 3 + 4 + 8 + 16 + 32$

$= 15 + 16 + 32$

$= 31 + 32$

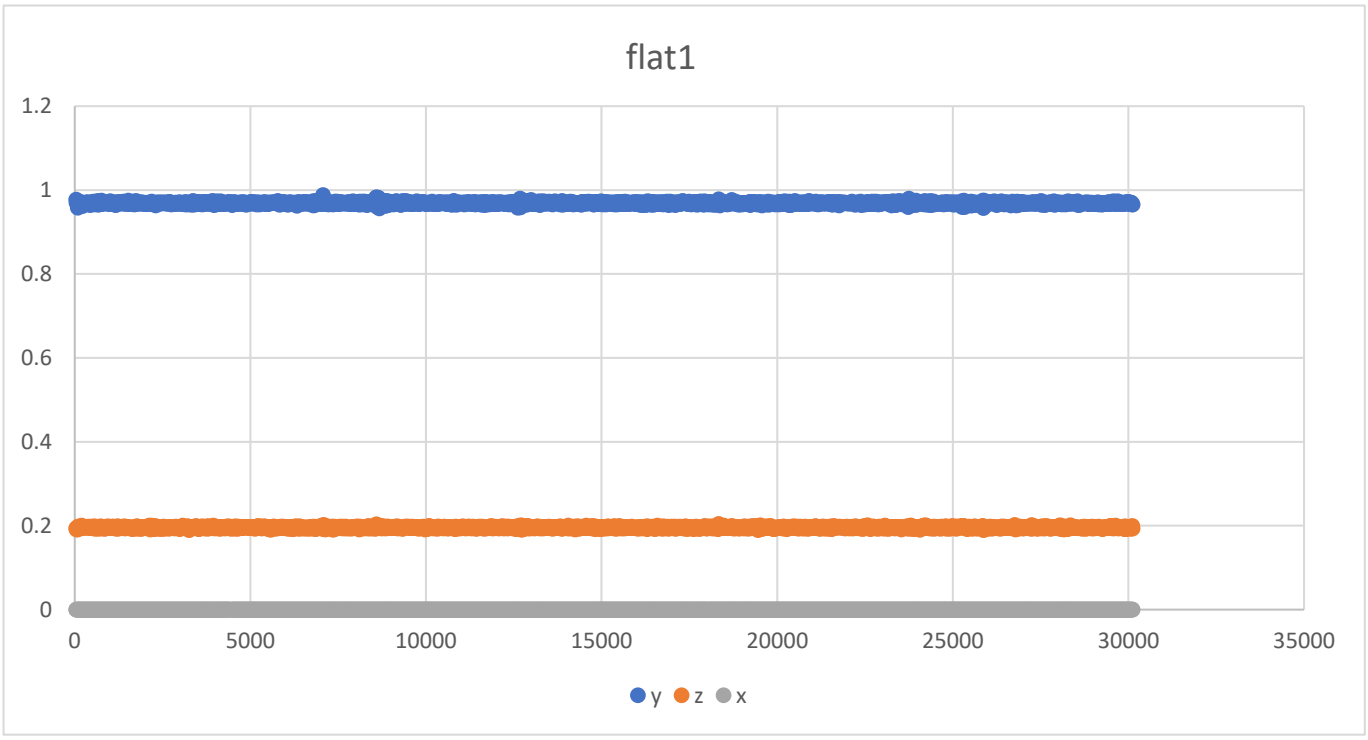
$= 63_{10}$

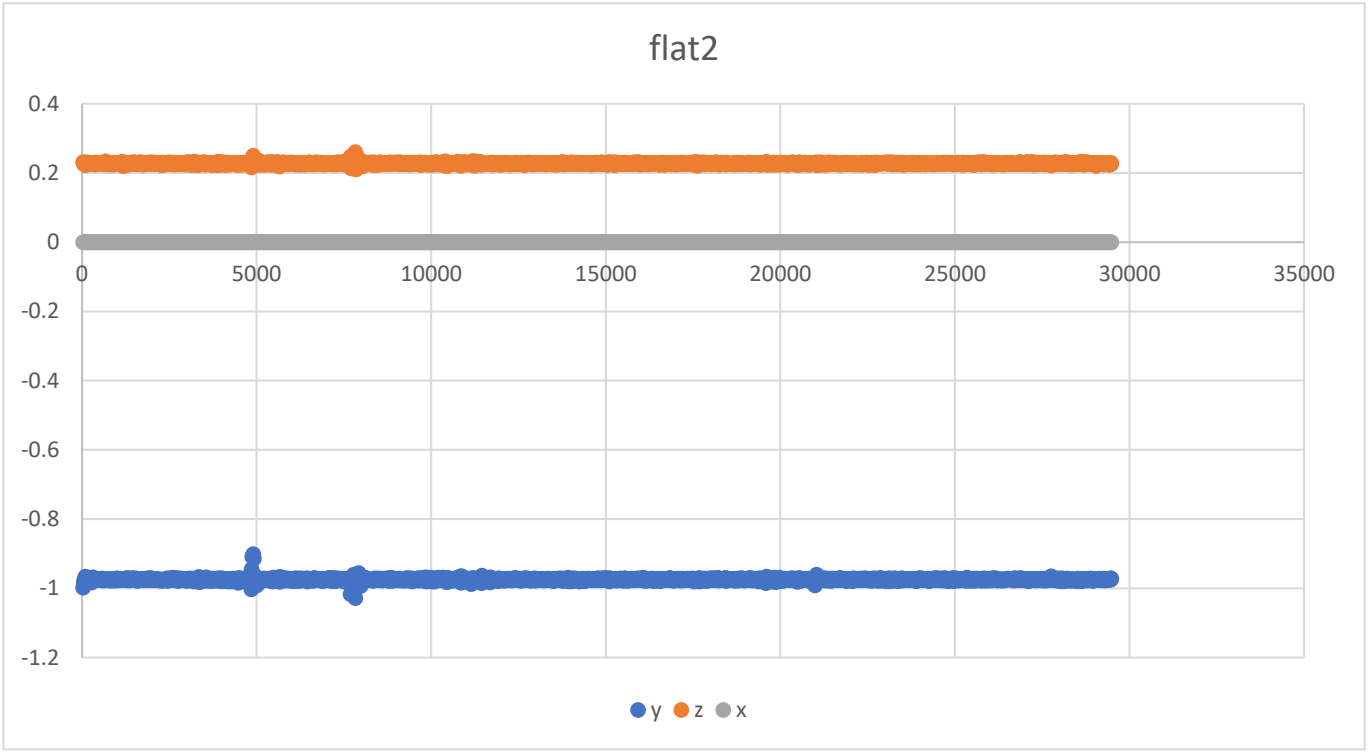
$63/8 \rightarrow 7\ R\ 7$
$7/8 \rightarrow 0\ R\ 7$

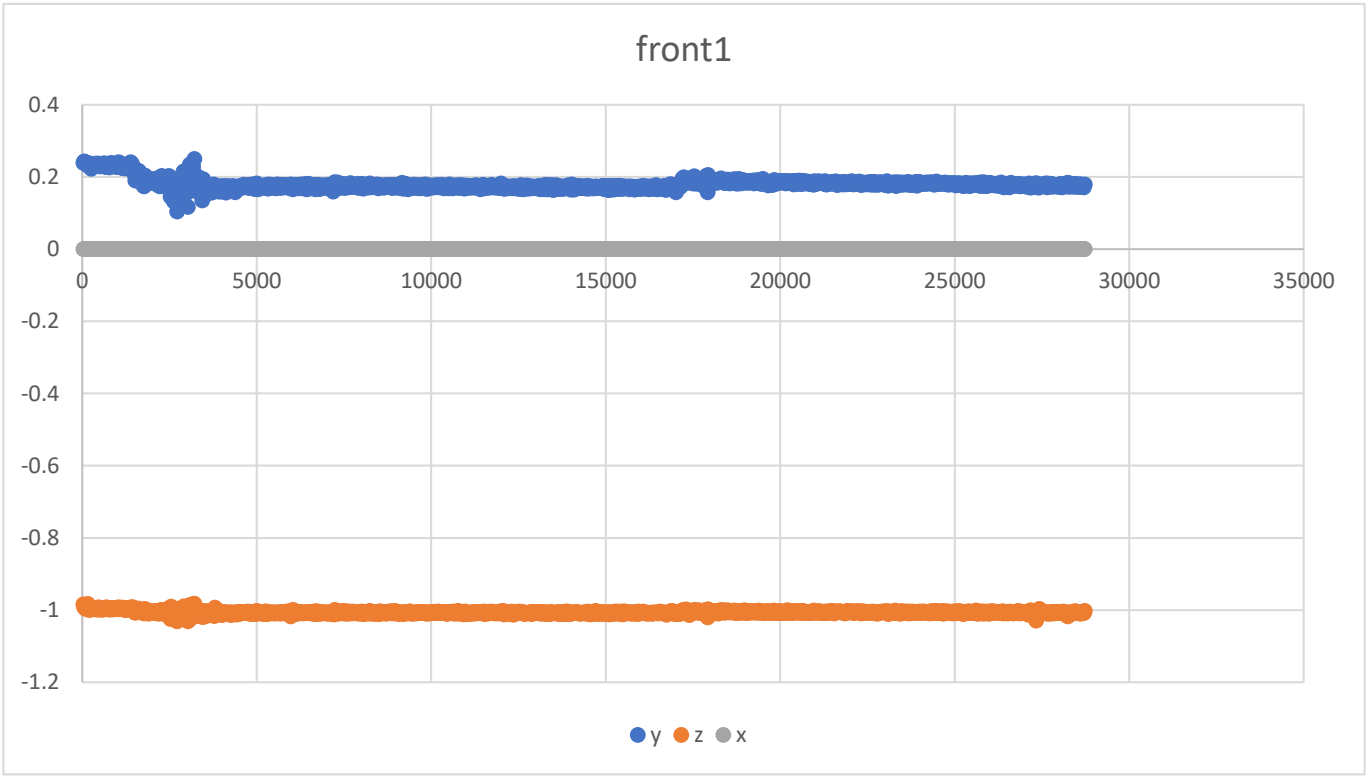
$= \boxed{77_8}$

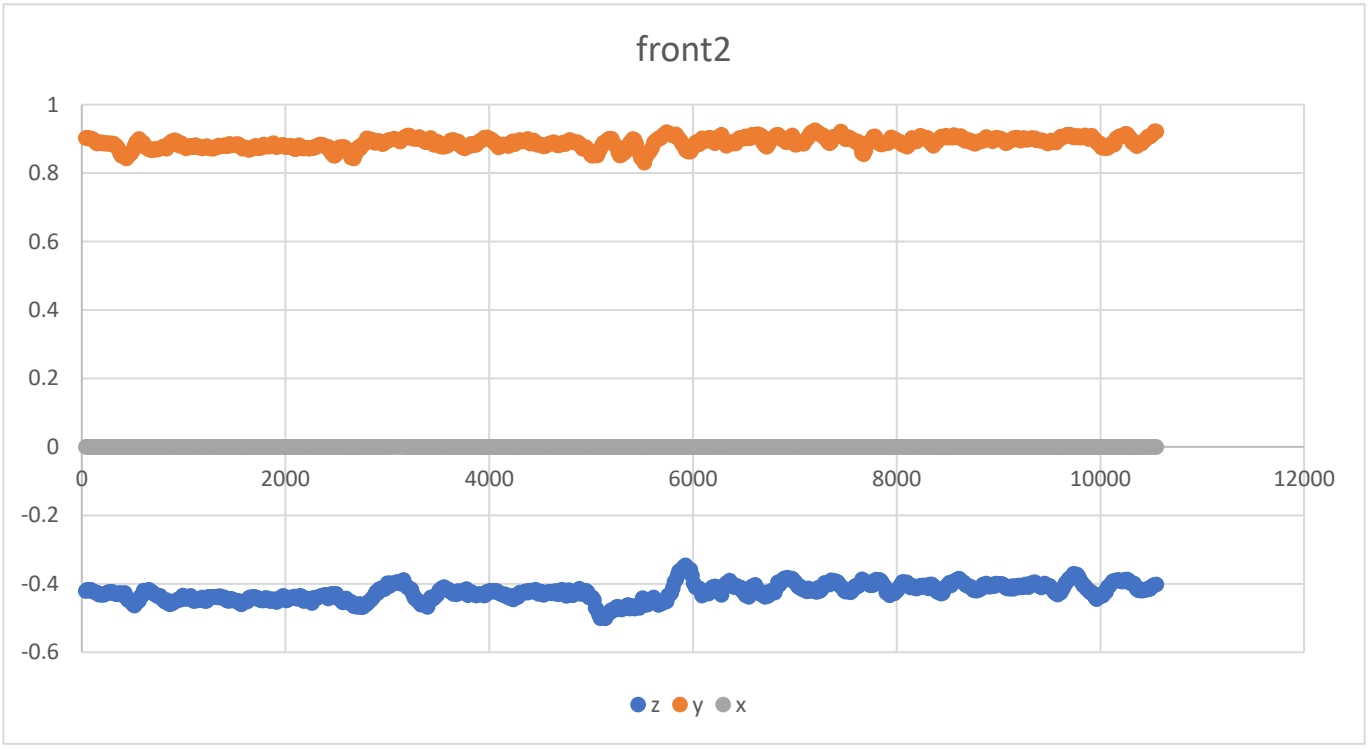
$63/16 \rightarrow 3\ R\ 15\ (F)$
$3/16 \rightarrow 0\ R\ 3$

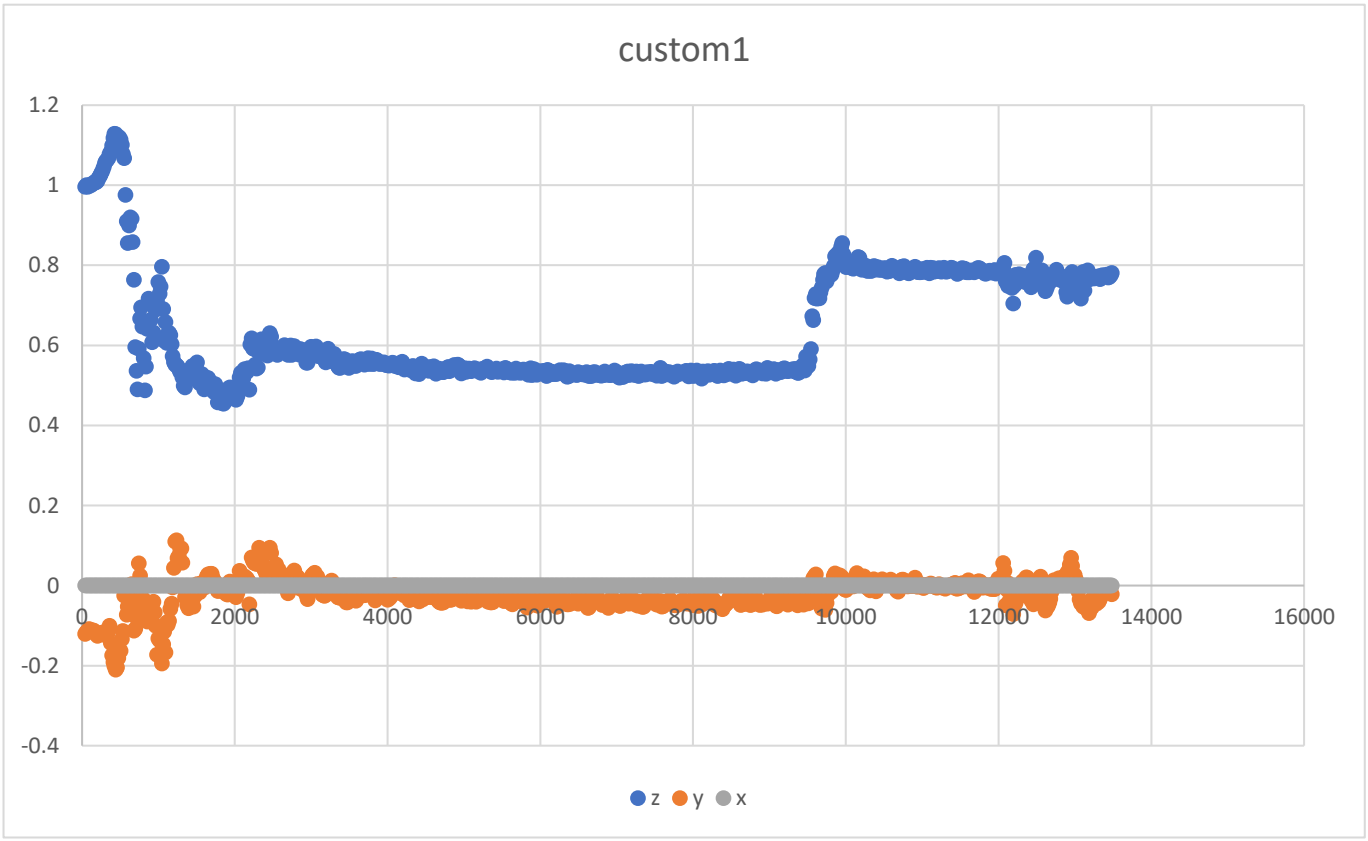
$\boxed{3F_{16}}$

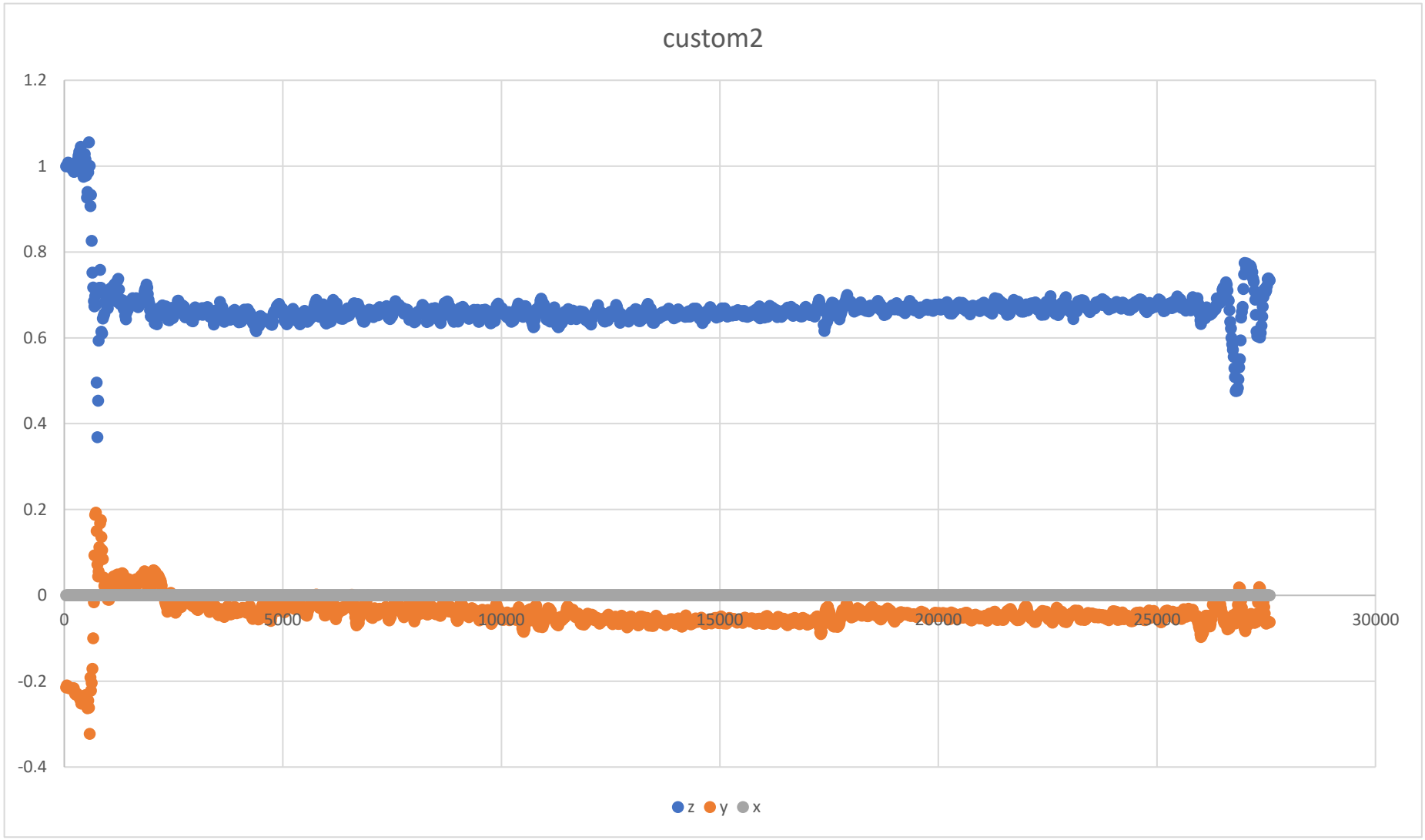

flat1
1.2
1
0.8
0.6
0.4
0.2
0
0
5000
10000
15000
20000
25000
30000
35000
y
z
x


flat2
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
0
5000
10000
15000
20000
25000
30000
35000
y
z
x


front1
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
0
5000
10000
15000
20000
25000
30000
35000
y
z
x


front2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2000
4000
6000
8000
10000
12000
z
y
x


custom1
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
0
2000
4000
6000
8000
10000
12000
14000
16000
z
y
x


custom2
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
0
5000
10000
15000
20000
25000
30000
z
y
x

3. Exploration

1. What do you think each column of data represent?
    - **Each column represents x, y, or z axis movement. The furthest left column represents a kind of time measurement (ms).**

2. How does this relate the the flags (-t and -g) that you used?
    - **Time and gyroscope orientation of joystick in x,y, and z**

3. What unit of measure are the data in?
    - **Degrees.**
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, on your computer or by hand (scan and include in your PDF), parts of the graphs and then describe what is going on.

    - **Flat1: controller was lying flat on a surface,**
    - **Flat2: controller was horizontally flipped over, maintaining the same same x and y orientation.**
    - **Front1: controller was oriented to have lightbar facing up, keeping the same x but different y and z orientations**
    - **Front2: controller vertically flipped, keeping the same x but different y and z orientations**
    - **Custom1:**
    - **Custom2:**

4. Joystick Calibration

1. What are you vertical and horizontal joystick equations? Are they similar or not? Why or why not? **x/128, y/128**
2. What did you find as the center point? Explain why it is or is not 0? **Around 0.00061? And because the program would not be able to run properly if it were exactly 0, so it comes as close as possible for approximation purposes?**
3. What could cause the center to not be 0? **Being miscalibrated or being on a slightly slanted surface while recording data. That or the controller being in "drift" mode. Could also have something to do with USB connection to PC?**
4. What could you change to make the center be 0? **Make sure the surface is perfectly flat, doing multiple tests for each calibration, and then calculating data from each. Another option would be to have some way of holding the controller fixed in placed to minimize any sudden movements by hand.**