Bryce Hawes
Lab 2 Report
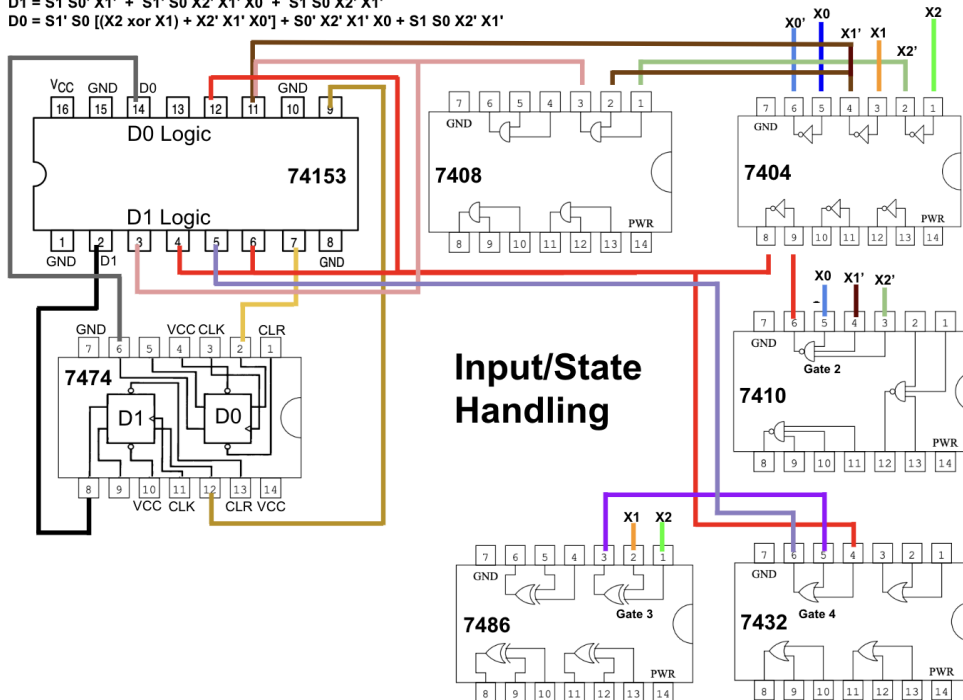**ECE 212 Fall 2024**

Diagrams:

Input/Output Diagrams

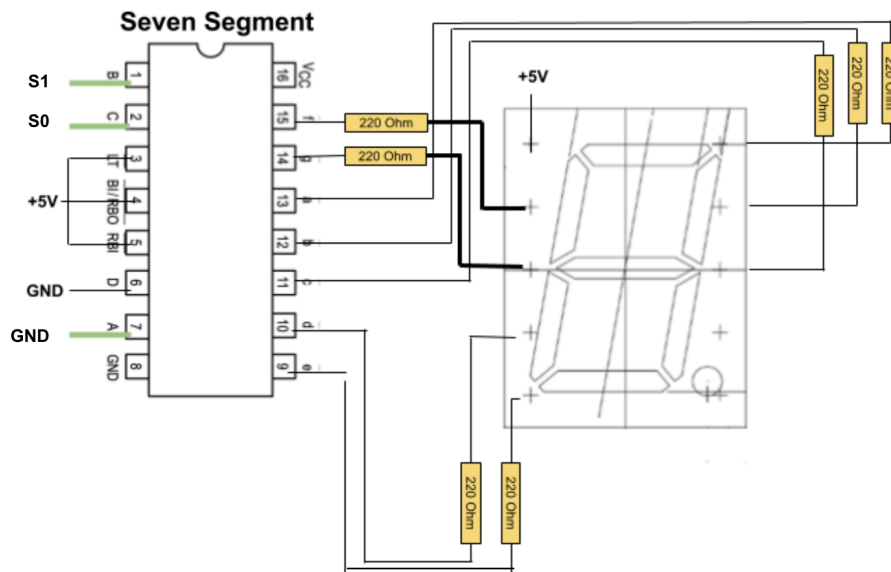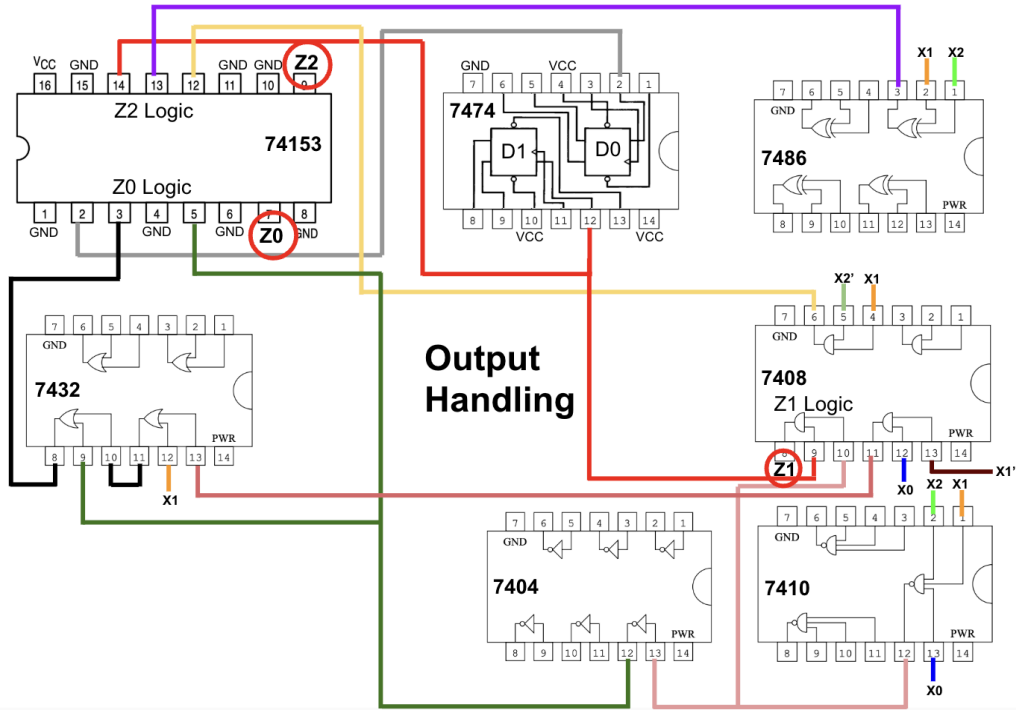$D1 = S1\ S0'\ X1'\ +\ S1'\ S0\ X2'\ X1'\ X0\ +\ S1\ S0\ X2'\ X1'$

$D0 = S1'\ S0\ [(X2\ xor\ X1) + X2'\ X1'\ X0'] + S0'\ X2'\ X1'\ X0 + S1\ S0\ X2'\ X1'$

$$Z2 = S1\ S0\ (X2\ xor\ X1) + S1\ S0'\ X2'\ X1$$
$$Z1 = S1\ X2\ X1\ X0$$
$$Z0 = S0\ X2\ X1\ X0 + S1\ S0\ X2\ (X1'\ X0 + X1)$$

Outputs

+5V

220 Ohm

D'

+5V

220 Ohm

C1'

+5V

220 Ohm

C0'
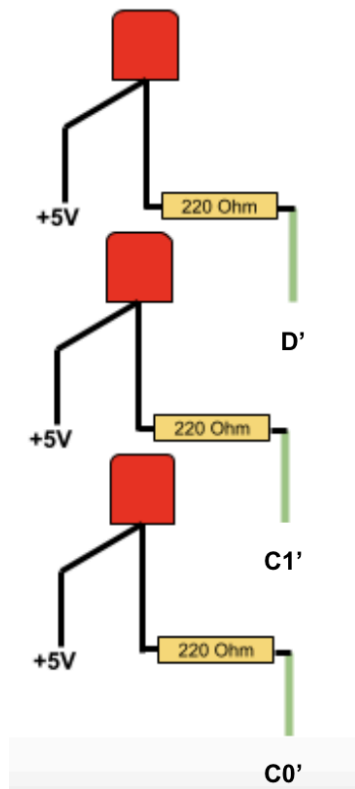
Netlists

GND -> [AD2], [74153 Pin 15, 11, 10, 8, 6, 4, 1], [7432 Pin 7], [7474 Pin 7], [7486 Pin 7], [7408 Pin 7], [7410 Pin 7], [7404 Pin 7], LEDS

+V -> VRM -> 5V -> [Capacitor], [Seven Segment Display Pin 1], [74153 (both) Pin 16], [7474 Pin 4, 10, 14], [7486 Pin 14], [7408 Pin 14], [7410 Pin 14], [7404 Pin 14], [7432 Pin 14], [74LS74 Pin 3, 4, 5, 16]

DIO 10 (X2) -> [7404 Pin 1], [7486 Pin 1], [7410 Pin 2]

7404 Pin 2 -> (X2') -> [7408 Pin 5], [7404 Pin 1], [7410 Pin 3]

DIO 8 (X1) -> [7404 Pin 3], [7486 Pin 2], [7408 Pin 4], [7410 Pin 1], [7432 Pin 12]

7404 Pin 4 -> (X1') -> [7408 Pin 2], [7410 Pin 4], [74153 Pin 11], [7408 Pin 13]

DIO 6 (X0) -> [7410 Pin 5], [7408 Pin 12], [7410 Pin 13]

7408 Pin 3 -> 75143 Pin 11, 3
7408 Pin 6 -> 75143 (2) Pin 12, 13
7408 Pin 11 -> 7432 Pin 13
7408 Pin 8 -> LED

7410 Pin 12 -> 7404 Pin 13

7404 Pin 12 -> 74153 (2) Pin 5
7404 Pin 8 -> 74153 (1) Pin 12, 6, 4

7486 Pin 3 -> 74153 (2) Pin 13 and 7432 Pin 5

7432 Pin 6 -> 74153 Pin 5
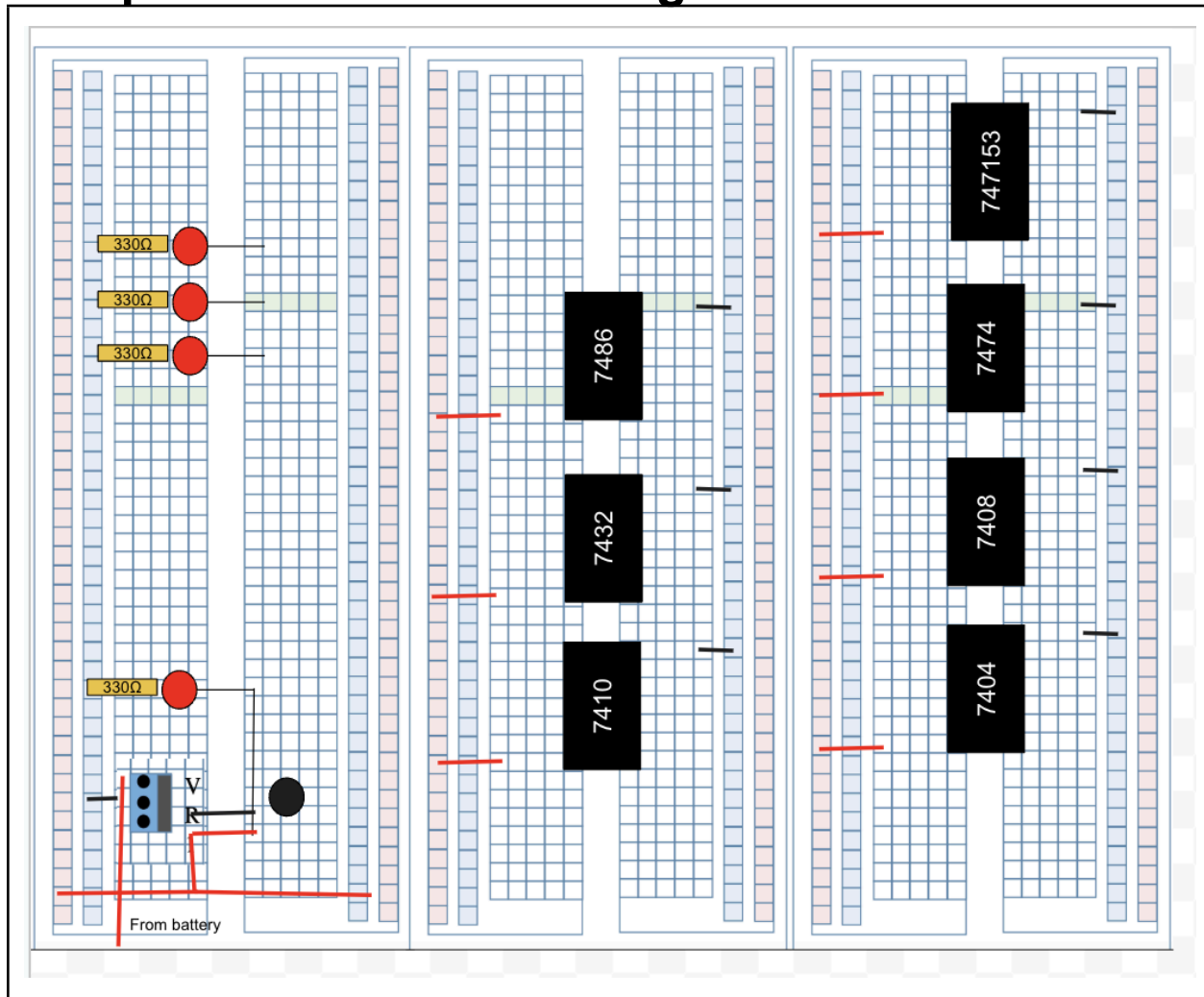**7432 Pin 11 -> 7432 Pin 10**
7432 Pin 8 -> 74153(2) Pin 3

7474 Pin 2 -> 74153(2) Pin 2, 74153(1) Pin 7
7474 Pin 12 -> 74153(1) Pin 9

74LS74 -> 270 Ohm -> Seven Seg Display:
 | 9 -> 4 | 10 -> 5 | 11 -> 8 | 12 -> 9 | 13 -> 10 | 14 -> 3 | 14 -> 2 |

Component Placement Diagram

Truth Table

	S1	S0	X2	X1	X0	D1	D0	z2	z1	z0
Stay	0	0	0	0	0	0	0	0	0	0
Deposit	0	0	0	0	1	0	1	0	0	0
m&ms	0	0	0	1	0	0	0	0	0	0
doritos	0	0	0	1	1	0	0	0	0	0
baby ruth	0	0	1	0	0	0	0	0	0	0
pop tart	0	0	1	0	1	0	0	0	0	0
N/A	0	0	1	1	0	--	--	-	-	-
coin return	0	0	1	1	1	0	0	0	0	0
Stay	0	1	0	0	0	0	1	0	0	0
Deposit	0	1	0	0	1	1	0	0	0	0
m&ms	0	1	0	1	0	0	1	0	0	0
doritos	0	1	0	1	1	0	1	0	0	0
baby ruth	0	1	1	0	0	0	1	0	0	0
pop tart	0	1	1	0	1	0	1	0	0	0
N/A	0	1	1	1	0	--	--	-	-	-
coin return	0	1	1	1	1	0	0	0	0	1
Stay	1	0	0	0	0	1	0	0	0	0
Deposit	1	0	0	0	1	1	1	0	0	0
m&ms	1	0	0	1	0	0	0	1	0	0
doritos	1	0	0	1	1	0	0	1	0	0
baby ruth	1	0	1	0	0	1	0	0	0	0
pop tart	1	0	1	0	1	1	0	0	0	0
N/A	1	0	1	1	0	--	--	-	-	-
coin return	1	0	1	1	1	0	0	0	1	0
Stay	1	1	0	0	0	1	1	0	0	0
Deposit	1	1	0	0	1	1	1	0	0	1
m&ms	1	1	0	1	0	0	0	1	0	1
doritos	1	1	0	1	1	0	0	1	0	1
baby ruth	1	1	1	0	0	0	0	1	0	0
pop tart	1	1	1	0	1	0	0	1	0	0
N/A	1	1	1	1	0	--	--	-	-	-
coin return	1	1	1	1	1	0	0	0	1	1

Expressions

$$D1 = S1\ S0'\ X1'\ +\ S1'\ S0\ X2'\ X1'\ X0\ +\ S1\ S0\ X2'\ X1'$$

$$D0 = S1'\ S0\ [(X2 \text{ xor } X1) + X2'\ X1'\ X0'] + S0'\ X2'\ X1'\ X0 + S1\ S0\ X2'\ X1'$$

$$Z2 = S1\ S0\ (X2 \text{ xor } X1) + S1\ S0'\ X2'\ X1$$

$$Z1 = S1\ X2\ X1\ X0$$

$$Z0 = S0\ X2\ X1\ X0 + S1\ S0\ X2\ (X1'\ X0 + X1)$$

Physical Circuit

Circuit

(Extended breadboard due to my 7404s and 7408 repeatedly breaking, and having to test with other chips lol)