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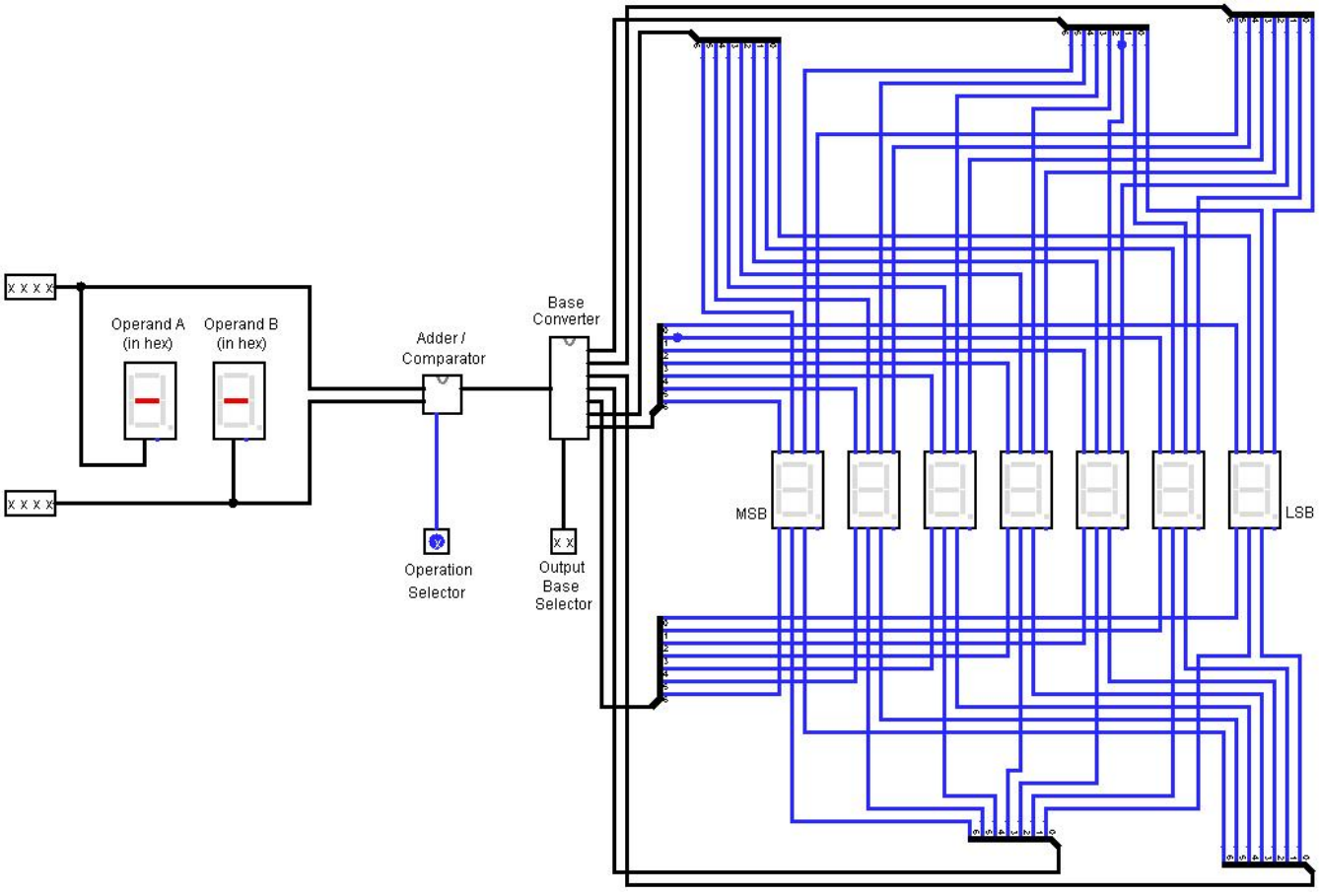
CS 20 PROJECT 1: Adder and Comparator with Base Conversion

This documentation contains the schematics, truth tables, k-maps as well as some explanation regarding the schematic design and decisions of the pair. Full explanation of the circuitry will be given on the documentation video.

The general schematic of the whole circuit is shown below and is composed of the components: two (2) operands that have 4 bits each, an operation selector that has 1 bit, a base selector that has 2 width bits, 2 hex digit display to show the value of the input, as well as the IC's Adder/Comparator and Base Converter.



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To show and explain every detail of the schematic we will be exploring its parts and explain its use in the system. To start with, we have the Adder/Comparator subcircuit that we made. Thel schematic for the Adder/Comparator subcircuit is shown below.

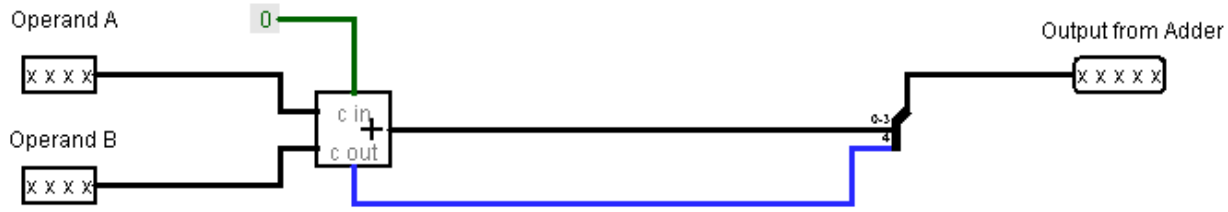

Figure 1.1 Adder

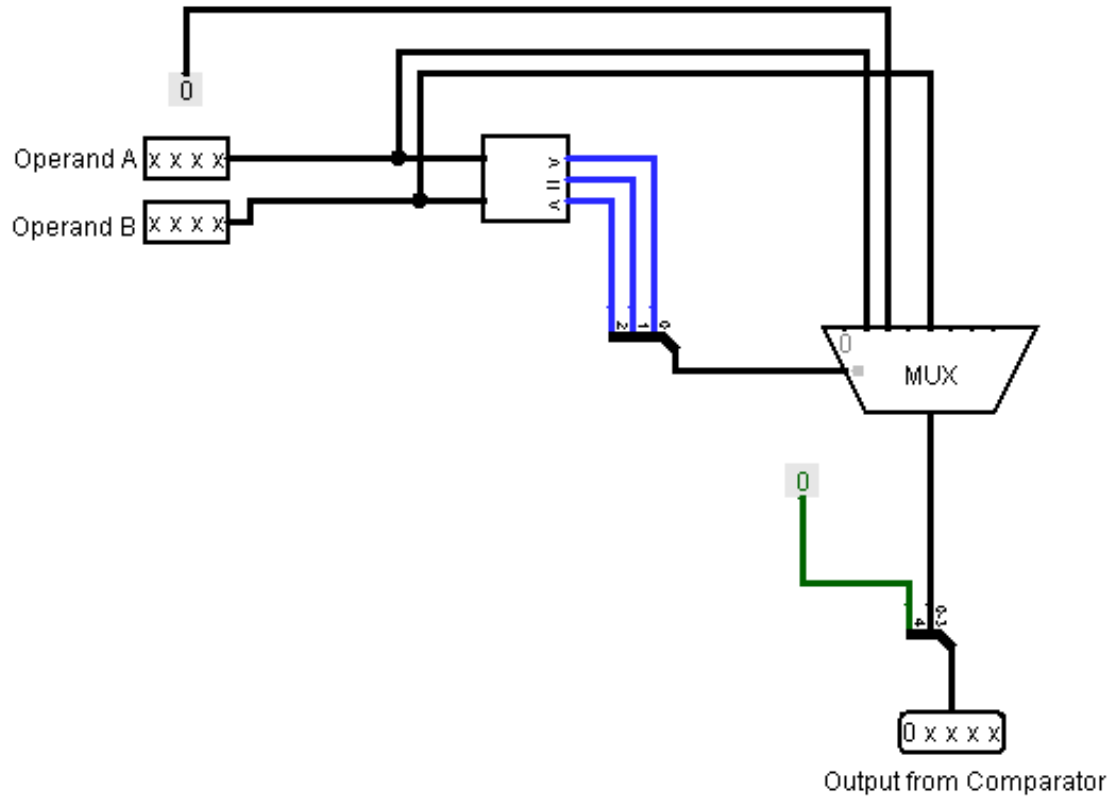

Figure 1.2 Comparator

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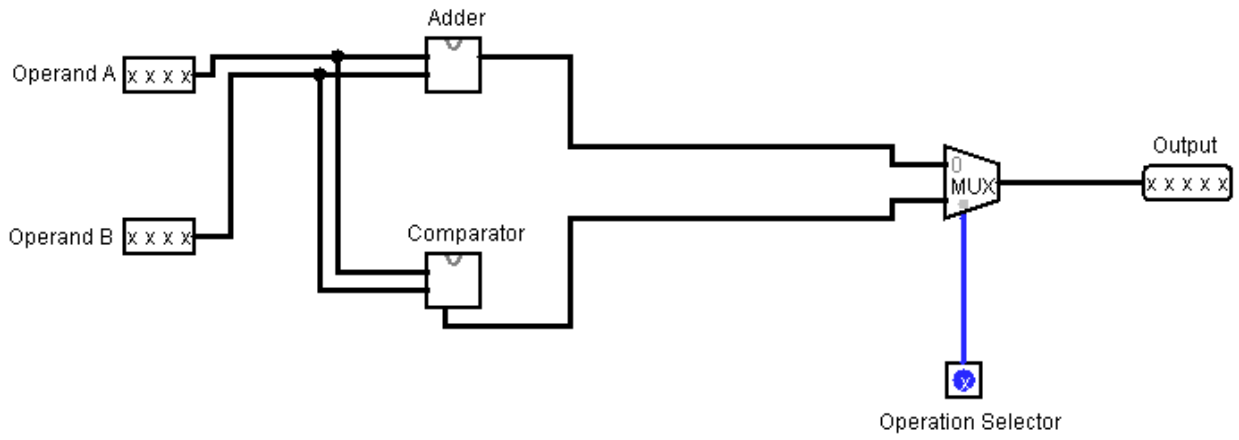

Figure 1.3 Combination of the Adder and Comparator

Figure 1.1 shows the schematic diagram for the unsigned addition of the two operands (A and B) which is done when the selection operator is set to be 0. The subcircuit works by taking in the two 4 bit input operands and connecting them to the adder (component available in the logisim). This adds the two 4 bit binary value however since there can be a case where 1111 is added to 1111 then the actual value may hold 5 bits at most so we used a constant to be added to the final value so that when a carry in is expected it can take the place of the constant. Thus, when 1111 and 1111 is added, the final carry-out value will be the 5th bit in the output. We combined the bits using a splitter and connected it to an output pin with a width of 5 bits.

Figure 1.2 shows the schematic diagram for the comparator of the two operands (A and B) which is done when the selection operator is set to be 1. The pair used the built-in comparator component in logisim. The output lines from the comparator (greater than, equal, less than) are then connected to a splitter. The connection in the splitter is: Bit 0- A > B, Bit 1 - A equals B, Bit 2- A < B. The pair used this knowledge to then connect the single output line to a multiplexer. Following the guidelines of the project, the pair connected the value of A to Bit 1 of the multiplexer because if A > B then the value of the output line from the splitter is 001 which is 1 in decimal. When A = B, the value from the splitter is 010 which is 2 (constant 0 is connected to Bit 2 in the multiplexer). And when A < B, the value from the splitter is 100 which is 4, thus we connect the value of B to Bit 4 of the multiplexer. Finally, we add a constant (0) to our output to make it 5 bits.

Figure 1.3 shows the complete implementation of the operations and the output to be passed onto the base converter. The pair decided to make both the operands A and B go into the Adder and Comparator and output their values. They then decided to put it into a Multiplexer such that the output from the adder is in the bit value 0 and the output from the comparator is in the bit value 1. We connected the 1 bit input Operation Selector to the 1 source address such that when it is selected to be then the value to be passed through will be the output from the adder and vice versa.

The 5 bit output from all of this will then be the input for the base converter where this will be converted into the following bases: Base 2 (Binary), Base 8, (Octal), and Base 7 (Mystery Base). The schematic diagram for the base converter is shown below.

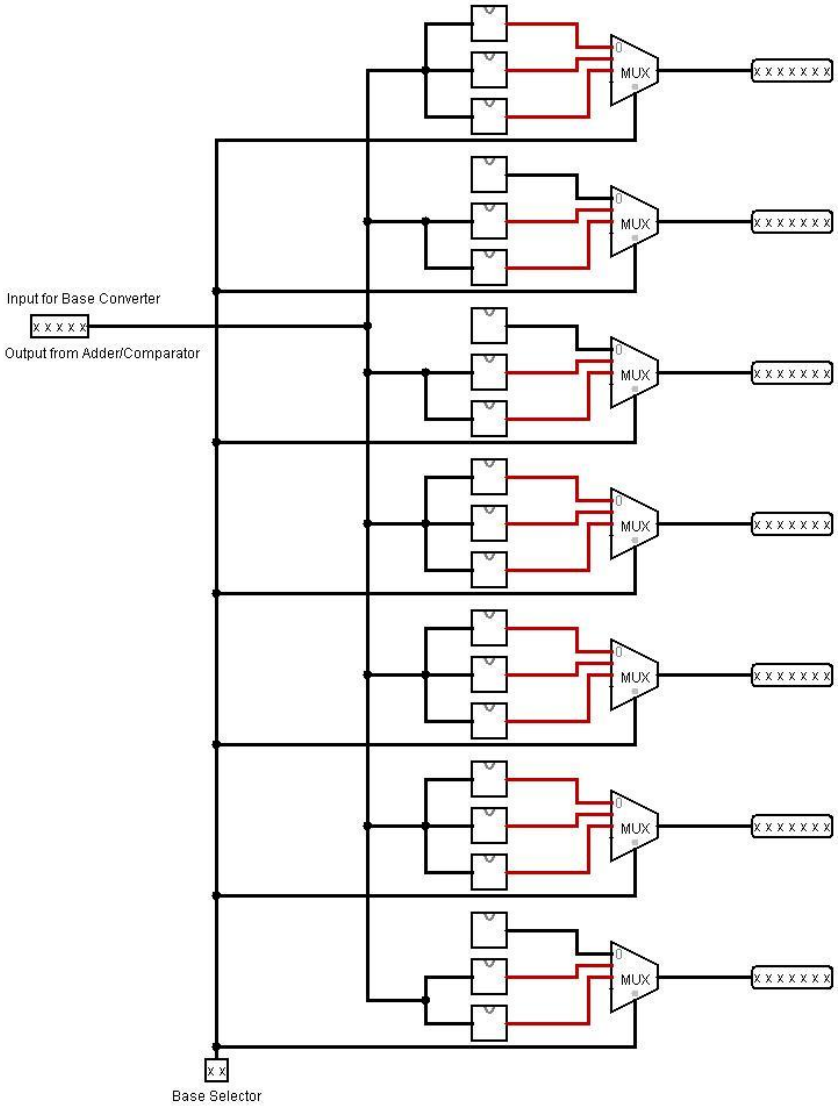

Figure 2.0 Base Selector and Converter

Figure 2.0 works by taking in the output from figure 1.3 as the input. It also takes in a 2 width bit input as the base selector. The pair decided to implement the same process they did in the operation selector wherein they added and compared the two inputs. For the base converter they took in a 5-bit input and created 7 subcircuits each for each base. Each subcircuit represents one (1) letter from the 7-segment display which is to be lit up when they are valued at 1. They created a truth table representing the values of each letter at the different possible values of the 5-bit input. These values are automatically outputted depending on the input and are stored into 7 Multiplexers. These multiplexers hold the values of a to g of the 3 different bases. The 2-width bit input determines the source address such as 00 (Binary), 01 (Octal) and 10 (Mystery Base - 7). They are then stored in a 7-bit output pin.

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The truth table, K-maps and schematic diagram for the value of the letters A (the letter that corresponds to a in the 7-segment led) of Base 2 (Binary) are shown below.

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*A0*	*A1*	*A2*	*A3*	*A4*	*A5*	*A6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	0	1
3	0	0	0	1	1	1	1	1	1	1	0	0
4	0	0	1	0	0	1	1	1	1	0	1	1
5	0	0	1	0	1	1	1	1	1	0	1	0
6	0	0	1	1	0	1	1	1	1	0	0	1
7	0	0	1	1	1	1	1	1	1	0	0	0
8	0	1	0	0	0	1	1	1	0	1	1	1
9	0	1	0	0	1	1	1	1	0	1	1	0
10	0	1	0	1	0	1	1	1	0	1	0	1
11	0	1	0	1	1	1	1	1	0	1	0	0
12	0	1	1	0	0	1	1	1	0	0	1	1
13	0	1	1	0	1	1	1	1	0	0	1	0
14	0	1	1	1	0	1	1	1	0	0	0	1
15	0	1	1	1	1	1	1	1	0	0	0	0
16	1	0	0	0	0	1	1	0	1	1	1	1
17	1	0	0	0	1	1	1	0	1	1	1	0
18	1	0	0	1	0	1	1	0	1	1	0	1
19	1	0	0	1	1	1	1	0	1	1	0	0
20	1	0	1	0	0	1	1	0	1	0	1	1
21	1	0	1	0	1	1	1	0	1	0	1	0
22	1	0	1	1	0	1	1	0	1	0	0	1
23	1	0	1	1	1	1	1	0	1	0	0	0
24	1	1	0	0	0	1	1	0	0	1	1	1
25	1	1	0	0	1	1	1	0	0	1	1	0
26	1	1	0	1	0	1	1	0	0	1	0	1
27	1	1	0	1	1	1	1	0	0	1	0	0
28	1	1	1	0	0	1	1	0	0	0	1	1
29	1	1	1	0	1	1	1	0	0	0	1	0
30	1	1	1	1	0	1	1	0	0	0	0	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 1.A

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for A0, A1

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0

Minimum SOP: I0’

K-map for A2

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1

Minimum SOP: I1’

K-map for A3

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	0	0	0	0
01	1	1	1	1	0	0	0	0
11	1	1	1	1	0	0	0	0
10	1	1	1	1	0	0	0	0

Minimum SOP: I2’

K-map for A4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	0	0	0	0	1	1
01	1	1	0	0	0	0	1	1
11	1	1	0	0	0	0	1	1
10	1	1	0	0	0	0	1	1

Minimum SOP: I3’

K-map for A5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	0	1	1	0	0	1
01	1	0	0	1	1	0	0	1
11	1	0	0	1	1	0	0	1
10	1	0	0	1	1	0	0	1

Minimum SOP: I4’

K-map for A6

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Input Value (Decimal)	Input0	Input1	Input2	Input3	Input4	B0	B1	B2	B3	B4	B5	B6
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	1
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	1
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	1	1
8	0	1	0	0	0	1	1	1	1	1	1	1
9	0	1	0	0	1	1	1	1	1	1	1	1
10	0	1	0	1	0	1	1	1	1	1	1	1
11	0	1	0	1	1	1	1	1	1	1	1	1
12	0	1	1	0	0	1	1	1	1	1	1	1
13	0	1	1	0	1	1	1	1	1	1	1	1
14	0	1	1	1	0	1	1	1	1	1	1	1
15	0	1	1	1	1	1	1	1	1	1	1	1
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	1
18	1	0	0	1	0	1	1	1	1	1	1	1
19	1	0	0	1	1	1	1	1	1	1	1	1
20	1	0	1	0	0	1	1	1	1	1	1	1
21	1	0	1	0	1	1	1	1	1	1	1	1
22	1	0	1	1	0	1	1	1	1	1	1	1
23	1	0	1	1	1	1	1	1	1	1	1	1
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	1
26	1	1	0	1	0	1	1	1	1	1	1	1
27	1	1	0	1	1	1	1	1	1	1	1	1
28	1	1	1	0	0	1	1	1	1	1	1	1
29	1	1	1	0	1	1	1	1	1	1	1	1
30	1	1	1	1	0	1	1	1	1	1	1	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 1.B

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	1	1	1	1	1	1	1	1
	01	1	1	1	1	1	1	1	1
	11	1	1	1	1	1	1	1	1
	10	1	1	1	1	1	1	1	1
Minimum SOP: 1									

K-map for B0, B1, B2, B3, B4, B5, B6

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Input Value (Decimal)	Input0	Input1	Input2	Input3	Input4	C0	C1	C2	C3	C4	C5	C6
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	1
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	1
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	1	1
8	0	1	0	0	0	1	1	1	1	1	1	1
9	0	1	0	0	1	1	1	1	1	1	1	1
10	0	1	0	1	0	1	1	1	1	1	1	1
11	0	1	0	1	1	1	1	1	1	1	1	1
12	0	1	1	0	0	1	1	1	1	1	1	1
13	0	1	1	0	1	1	1	1	1	1	1	1
14	0	1	1	1	0	1	1	1	1	1	1	1
15	0	1	1	1	1	1	1	1	1	1	1	1
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	1
18	1	0	0	1	0	1	1	1	1	1	1	1
19	1	0	0	1	1	1	1	1	1	1	1	1
20	1	0	1	0	0	1	1	1	1	1	1	1
21	1	0	1	0	1	1	1	1	1	1	1	1
22	1	0	1	1	0	1	1	1	1	1	1	1
23	1	0	1	1	1	1	1	1	1	1	1	1
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	1
26	1	1	0	1	0	1	1	1	1	1	1	1
27	1	1	0	1	1	1	1	1	1	1	1	1
28	1	1	1	0	0	1	1	1	1	1	1	1
29	1	1	1	0	1	1	1	1	1	1	1	1
30	1	1	1	1	0	1	1	1	1	1	1	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 1.C

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	1	1	1	1	1	1	1	1
	01	1	1	1	1	1	1	1	1
	11	1	1	1	1	1	1	1	1
	10	1	1	1	1	1	1	1	1
Minimum SOP: 1									

K-map for C0, C1, C2, C3, C4, C5, C6

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Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*D0*	*D1*	*D2*	*D3*	*D4*	*D5*	*D6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	0	1
3	0	0	0	1	1	1	1	1	1	1	0	0
4	0	0	1	0	0	1	1	1	1	0	1	1
5	0	0	1	0	1	1	1	1	1	0	1	0
6	0	0	1	1	0	1	1	1	1	0	0	1
7	0	0	1	1	1	1	1	1	1	0	0	0
8	0	1	0	0	0	1	1	1	0	1	1	1
9	0	1	0	0	1	1	1	1	0	1	1	0
10	0	1	0	1	0	1	1	1	0	1	0	1
11	0	1	0	1	1	1	1	1	0	1	0	0
12	0	1	1	0	0	1	1	1	0	0	1	1
13	0	1	1	0	1	1	1	1	0	0	1	0
14	0	1	1	1	0	1	1	1	0	0	0	1
15	0	1	1	1	1	1	1	1	0	0	0	0
16	1	0	0	0	0	1	1	0	1	1	1	1
17	1	0	0	0	1	1	1	0	1	1	1	0
18	1	0	0	1	0	1	1	0	1	1	0	1
19	1	0	0	1	1	1	1	0	1	1	0	0
20	1	0	1	0	0	1	1	0	1	0	1	1
21	1	0	1	0	1	1	1	0	1	0	1	0
22	1	0	1	1	0	1	1	0	1	0	0	1
23	1	0	1	1	1	1	1	0	1	0	0	0
24	1	1	0	0	0	1	1	0	0	1	1	1
25	1	1	0	0	1	1	1	0	0	1	1	0
26	1	1	0	1	0	1	1	0	0	1	0	1
27	1	1	0	1	1	1	1	0	0	1	0	0
28	1	1	1	0	0	1	1	0	0	0	1	1
29	1	1	1	0	1	1	1	0	0	0	1	0
30	1	1	1	1	0	1	1	0	0	0	0	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 1.D

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for D0, D1

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0

Minimum SOP: I0’

K-map for D2

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1

Minimum SOP: I1’

K-map for D3

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	0	0	0	0
01	1	1	1	1	0	0	0	0
11	1	1	1	1	0	0	0	0
10	1	1	1	1	0	0	0	0

Minimum SOP: I2’

K-map for D4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	0	0	0	0	1	1
01	1	1	0	0	0	0	1	1
11	1	1	0	0	0	0	1	1
10	1	1	0	0	0	0	1	1

Minimum SOP: I3’

K-map for D5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	0	1	1	0	0	1
01	1	0	0	1	1	0	0	1
11	1	0	0	1	1	0	0	1
10	1	0	0	1	1	0	0	1

Minimum SOP: I4’

K-map for D6

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Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*E0*	*E1*	*E2*	*E3*	*E4*	*E5*	*E6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	0	1
3	0	0	0	1	1	1	1	1	1	1	0	0
4	0	0	1	0	0	1	1	1	1	0	1	1
5	0	0	1	0	1	1	1	1	1	0	1	0
6	0	0	1	1	0	1	1	1	1	0	0	1
7	0	0	1	1	1	1	1	1	1	0	0	0
8	0	1	0	0	0	1	1	1	0	1	1	1
9	0	1	0	0	1	1	1	1	0	1	1	0
10	0	1	0	1	0	1	1	1	0	1	0	1
11	0	1	0	1	1	1	1	1	0	1	0	0
12	0	1	1	0	0	1	1	1	0	0	1	1
13	0	1	1	0	1	1	1	1	0	0	1	0
14	0	1	1	1	0	1	1	1	0	0	0	1
15	0	1	1	1	1	1	1	1	0	0	0	0
16	1	0	0	0	0	1	1	0	1	1	1	1
17	1	0	0	0	1	1	1	0	1	1	1	0
18	1	0	0	1	0	1	1	0	1	1	0	1
19	1	0	0	1	1	1	1	0	1	1	0	0
20	1	0	1	0	0	1	1	0	1	0	1	1
21	1	0	1	0	1	1	1	0	1	0	1	0
22	1	0	1	1	0	1	1	0	1	0	0	1
23	1	0	1	1	1	1	1	0	1	0	0	0
24	1	1	0	0	0	1	1	0	0	1	1	1
25	1	1	0	0	1	1	1	0	0	1	1	0
26	1	1	0	1	0	1	1	0	0	1	0	1
27	1	1	0	1	1	1	1	0	0	1	0	0
28	1	1	1	0	0	1	1	0	0	0	1	1
29	1	1	1	0	1	1	1	0	0	0	1	0
30	1	1	1	1	0	1	1	0	0	0	0	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 1.E

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for E0, E1

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0

Minimum SOP: I0’

K-map for E2

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1

Minimum SOP: I1’

K-map for E3

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	0	0	0	0
01	1	1	1	1	0	0	0	0
11	1	1	1	1	0	0	0	0
10	1	1	1	1	0	0	0	0

Minimum SOP: I2’

K-map for E4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	0	0	0	0	1	1
01	1	1	0	0	0	0	1	1
11	1	1	0	0	0	0	1	1
10	1	1	0	0	0	0	1	1

Minimum SOP: I3’

K-map for E5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	0	1	1	0	0	1
01	1	0	0	1	1	0	0	1
11	1	0	0	1	1	0	0	1
10	1	0	0	1	1	0	0	1

Minimum SOP: I4’

K-map for E6

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Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*F0*	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	0	1
3	0	0	0	1	1	1	1	1	1	1	0	0
4	0	0	1	0	0	1	1	1	1	0	1	1
5	0	0	1	0	1	1	1	1	1	0	1	0
6	0	0	1	1	0	1	1	1	1	0	0	1
7	0	0	1	1	1	1	1	1	1	0	0	0
8	0	1	0	0	0	1	1	1	0	1	1	1
9	0	1	0	0	1	1	1	1	0	1	1	0
10	0	1	0	1	0	1	1	1	0	1	0	1
11	0	1	0	1	1	1	1	1	0	1	0	0
12	0	1	1	0	0	1	1	1	0	0	1	1
13	0	1	1	0	1	1	1	1	0	0	1	0
14	0	1	1	1	0	1	1	1	0	0	0	1
15	0	1	1	1	1	1	1	1	0	0	0	0
16	1	0	0	0	0	1	1	0	1	1	1	1
17	1	0	0	0	1	1	1	0	1	1	1	0
18	1	0	0	1	0	1	1	0	1	1	0	1
19	1	0	0	1	1	1	1	0	1	1	0	0
20	1	0	1	0	0	1	1	0	1	0	1	1
21	1	0	1	0	1	1	1	0	1	0	1	0
22	1	0	1	1	0	1	1	0	1	0	0	1
23	1	0	1	1	1	1	1	0	1	0	0	0
24	1	1	0	0	0	1	1	0	0	1	1	1
25	1	1	0	0	1	1	1	0	0	1	1	0
26	1	1	0	1	0	1	1	0	0	1	0	1
27	1	1	0	1	1	1	1	0	0	1	0	0
28	1	1	1	0	0	1	1	0	0	0	1	1
29	1	1	1	0	1	1	1	0	0	0	1	0
30	1	1	1	1	0	1	1	0	0	0	0	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 1.F

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for F0, F1

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0

Minimum SOP: I0’

K-map for F2

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1

Minimum SOP: I1’

K-map for F3

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	0	0	0	0
01	1	1	1	1	0	0	0	0
11	1	1	1	1	0	0	0	0
10	1	1	1	1	0	0	0	0

Minimum SOP: I2’

K-map for F4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	0	0	0	0	1	1
01	1	1	0	0	0	0	1	1
11	1	1	0	0	0	0	1	1
10	1	1	0	0	0	0	1	1

Minimum SOP: I3’

K-map for F5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	0	1	1	0	0	1
01	1	0	0	1	1	0	0	1
11	1	0	0	1	1	0	0	1
10	1	0	0	1	1	0	0	1

Minimum SOP: I4’

K-map for F6

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Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*G0*	*G1*	*G2*	*G3*	*G4*	*G5*	*G6*
0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	0	0
2	0	0	0	1	0	0	0	0	0	0	0	0
3	0	0	0	1	1	0	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0	0	0	0	0
5	0	0	1	0	1	0	0	0	0	0	0	0
6	0	0	1	1	0	0	0	0	0	0	0	0
7	0	0	1	1	1	0	0	0	0	0	0	0
8	0	1	0	0	0	0	0	0	0	0	0	0
9	0	1	0	0	1	0	0	0	0	0	0	0
10	0	1	0	1	0	0	0	0	0	0	0	0
11	0	1	0	1	1	0	0	0	0	0	0	0
12	0	1	1	0	0	0	0	0	0	0	0	0
13	0	1	1	0	1	0	0	0	0	0	0	0
14	0	1	1	1	0	0	0	0	0	0	0	0
15	0	1	1	1	1	0	0	0	0	0	0	0
16	1	0	0	0	0	0	0	0	0	0	0	0
17	1	0	0	0	1	0	0	0	0	0	0	0
18	1	0	0	1	0	0	0	0	0	0	0	0
19	1	0	0	1	1	0	0	0	0	0	0	0
20	1	0	1	0	0	0	0	0	0	0	0	0
21	1	0	1	0	1	0	0	0	0	0	0	0
22	1	0	1	1	0	0	0	0	0	0	0	0
23	1	0	1	1	1	0	0	0	0	0	0	0
24	1	1	0	0	0	0	0	0	0	0	0	0
25	1	1	0	0	1	0	0	0	0	0	0	0
26	1	1	0	1	0	0	0	0	0	0	0	0
27	1	1	0	1	1	0	0	0	0	0	0	0
28	1	1	1	0	0	0	0	0	0	0	0	0
29	1	1	1	0	1	0	0	0	0	0	0	0
30	1	1	1	1	0	0	0	0	0	0	0	0
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 1.G

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	0	0	0	0	0	0	0	0
	01	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0
Minimum SOP: 0									

K-map for G0, G1, G2, G3, G4, G5, G6

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The schematic diagram for each letter from the MSB (0) to the LSB (6) is shown below.

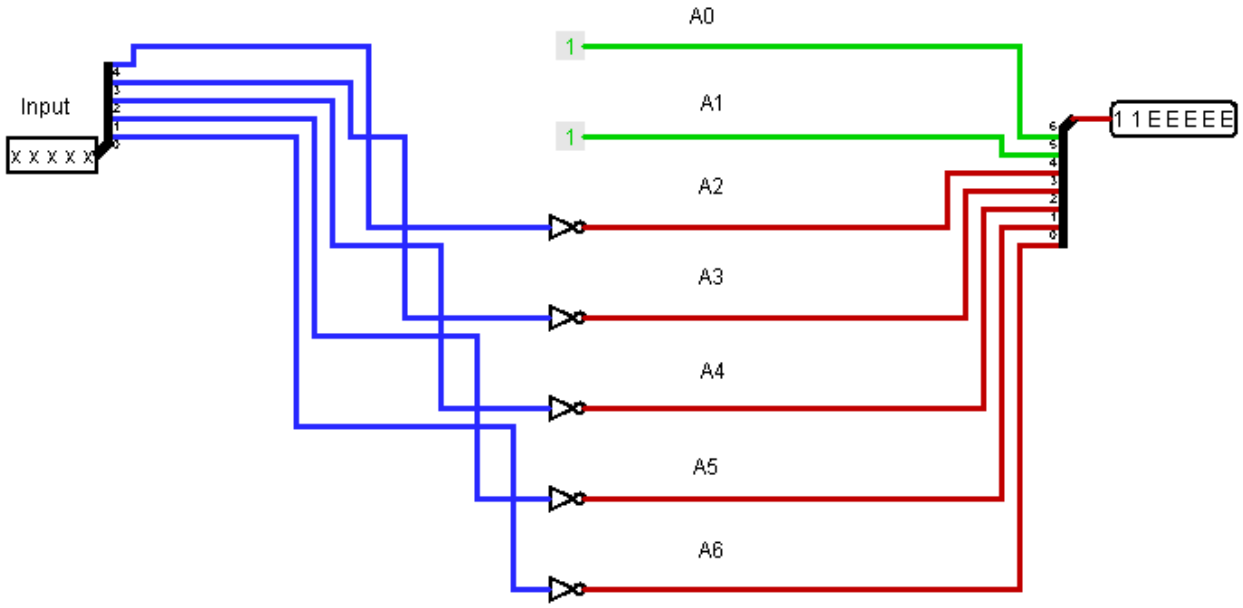

Diagram for Binary A

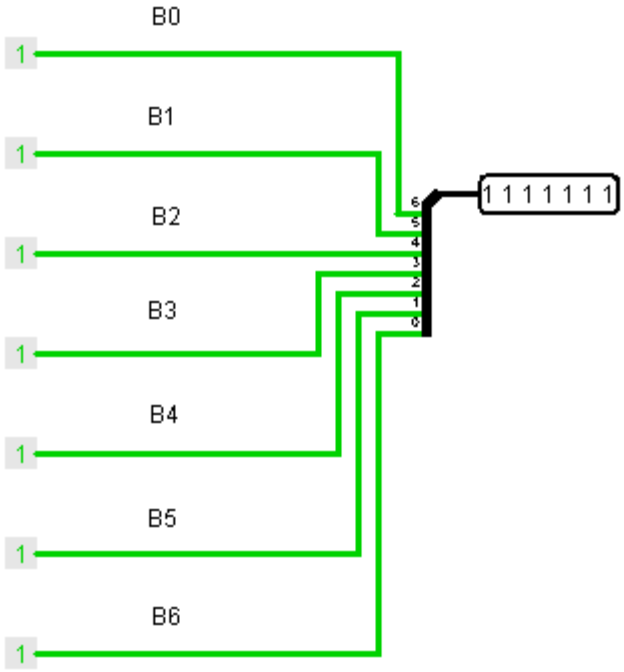

Diagram for Binary B

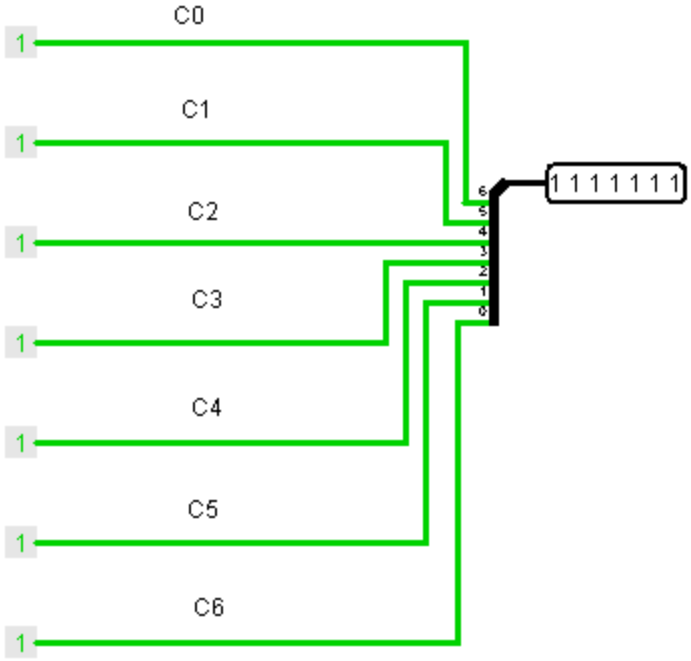

Diagram for Binary C

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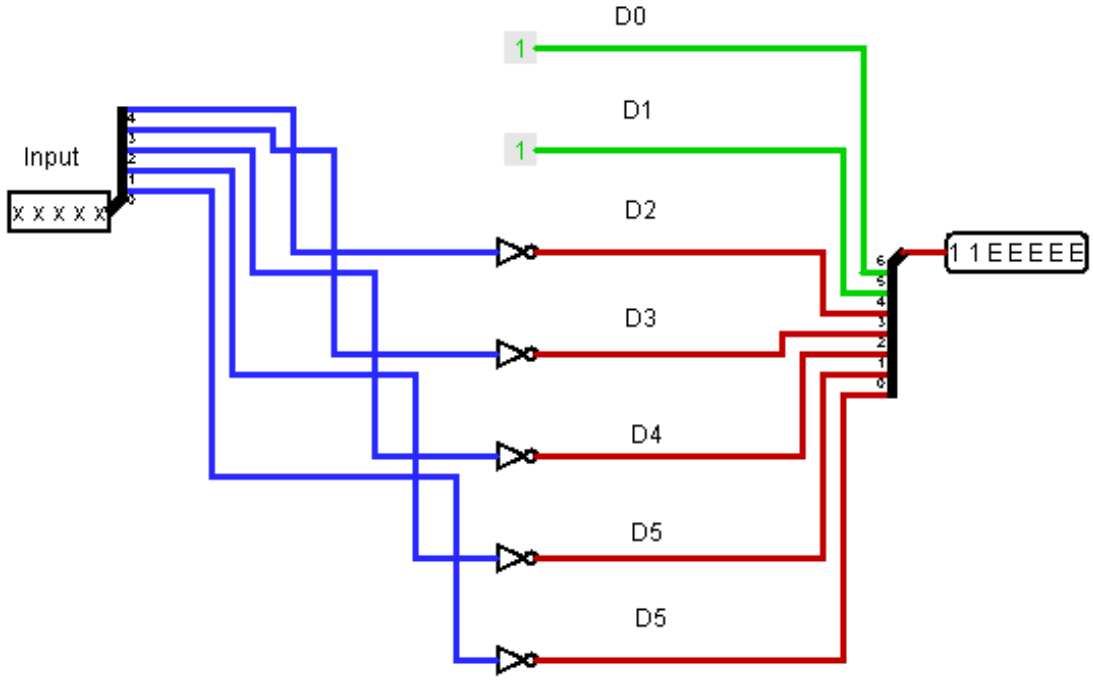

Diagram for D

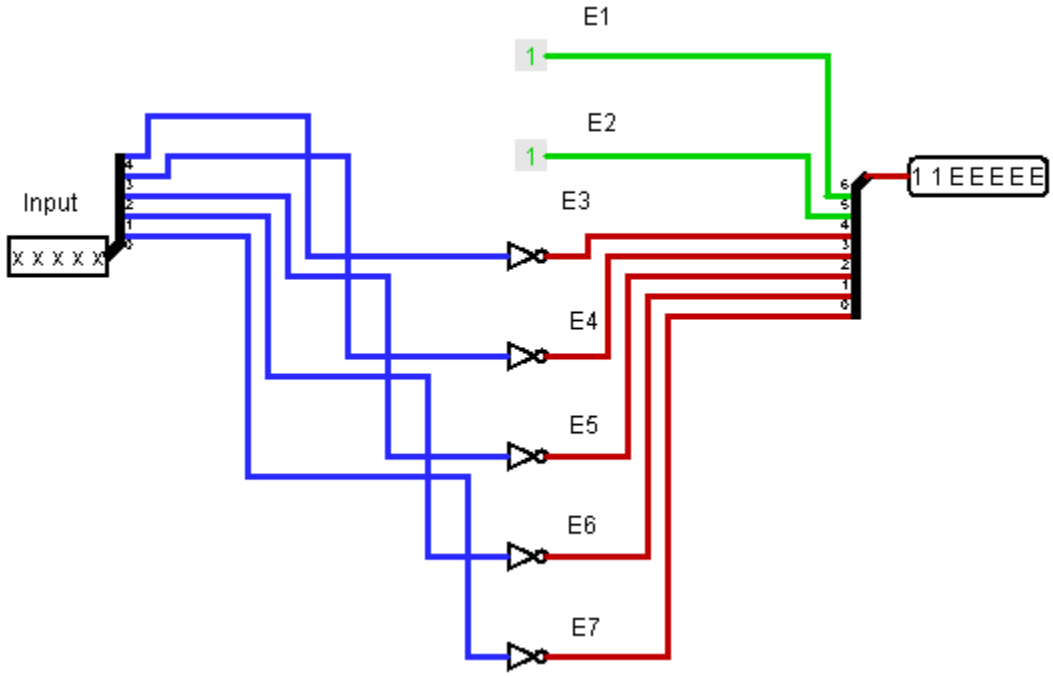

Diagram for Binary E

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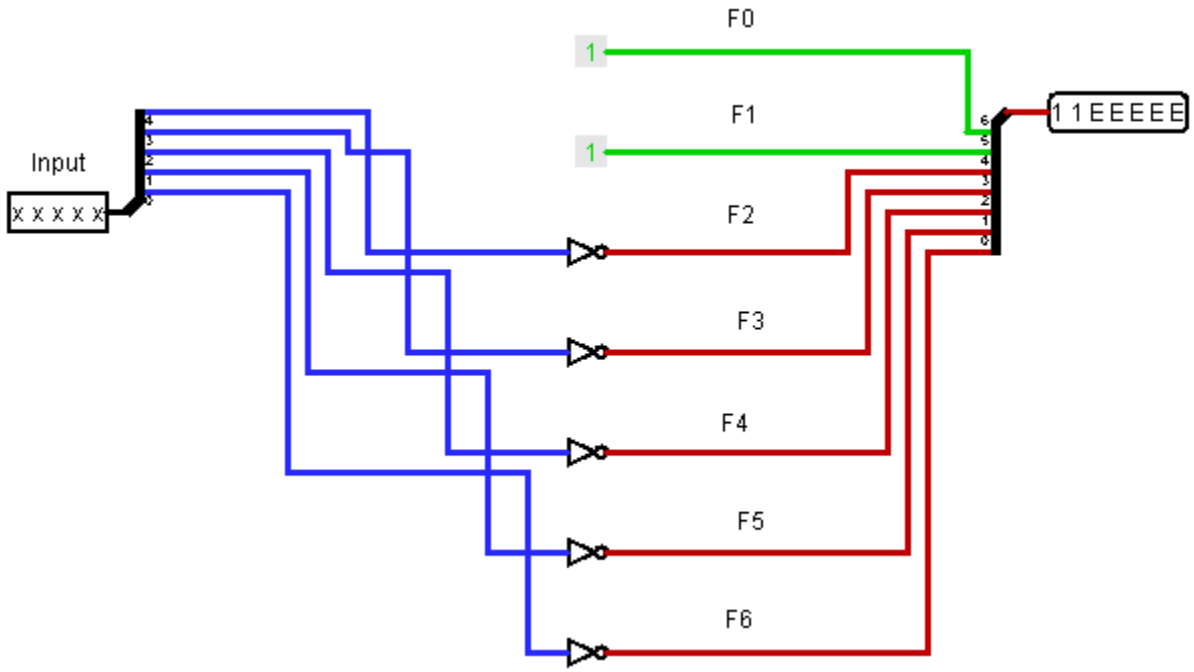

Diagram for Binary F

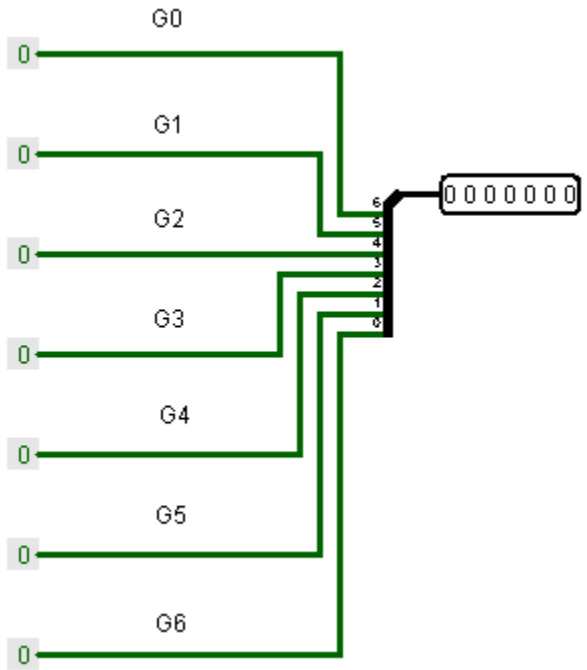

Diagram for Binary G

The diagrams were made from the different K-maps of the letter (for example the k-maps A0 to A6 were put together to form the whole subcircuit. In case of minterms 0 and 1, constants were used and the input was removed since it wasn't needed for the output.

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The truth table, K-maps and schematic diagram for the value of the letters A (the letter that corresponds to a in the 7-segment led) of Base 8 (Octal) are shown below.

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*A0*	*A1*	*A2*	*A3*	*A4*	*A5*	*A6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	0
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	1	1
8	0	1	0	0	0	1	1	1	1	1	0	1
9	0	1	0	0	1	1	1	1	1	1	0	0
10	0	1	0	1	0	1	1	1	1	1	0	1
11	0	1	0	1	1	1	1	1	1	1	0	1
12	0	1	1	0	0	1	1	1	1	1	0	0
13	0	1	1	0	1	1	1	1	1	1	0	1
14	0	1	1	1	0	1	1	1	1	1	0	1
15	0	1	1	1	1	1	1	1	1	1	0	1
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	0
18	1	0	0	1	0	1	1	1	1	1	1	1
19	1	0	0	1	1	1	1	1	1	1	1	1
20	1	0	1	0	0	1	1	1	1	1	1	0
21	1	0	1	0	1	1	1	1	1	1	1	1
22	1	0	1	1	0	1	1	1	1	1	1	1
23	1	0	1	1	1	1	1	1	1	1	1	1
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	0
26	1	1	0	1	0	1	1	1	1	1	1	1
27	1	1	0	1	1	1	1	1	1	1	1	1
28	1	1	1	0	0	1	1	1	1	1	1	0
29	1	1	1	0	1	1	1	1	1	1	1	1
30	1	1	1	1	0	1	1	1	1	1	1	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 2.A

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		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	1	1	1	1	1	1	1	1
	01	1	1	1	1	1	1	1	1
	11	1	1	1	1	1	1	1	1
	10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for A0, A1, A2, A3, A4

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	1	1	1	1	1	1	1	1
	01	0	0	0	0	0	0	0	0
	11	1	1	1	1	1	1	1	1
	10	1	1	1	1	1	1	1	1

Minimum SOP: I1’ + I0

K-map for A5

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	1	0	1	1	1	1	1	0
	01	1	0	1	1	1	1	1	0
	11	1	0	1	1	1	1	1	0
	10	1	0	1	1	1	1	1	0

Minimum SOP: I2’I4’ + I3 + I2I4

K-map for A6

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Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*B0*	*B1*	*B2*	*B3*	*B4*	*B5*	*B6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	1
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	1
5	0	0	1	0	1	1	1	1	1	1	1	0
6	0	0	1	1	0	1	1	1	1	1	1	0
7	0	0	1	1	1	1	1	1	1	1	1	1
8	0	1	0	0	0	1	1	1	1	1	1	1
9	0	1	0	0	1	1	1	1	1	1	1	1
10	0	1	0	1	0	1	1	1	1	1	1	1
11	0	1	0	1	1	1	1	1	1	1	1	1
12	0	1	1	0	0	1	1	1	1	1	1	1
13	0	1	1	0	1	1	1	1	1	1	1	0
14	0	1	1	1	0	1	1	1	1	1	1	0
15	0	1	1	1	1	1	1	1	1	1	1	1
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	1
18	1	0	0	1	0	1	1	1	1	1	1	1
19	1	0	0	1	1	1	1	1	1	1	1	1
20	1	0	1	0	0	1	1	1	1	1	1	1
21	1	0	1	0	1	1	1	1	1	1	1	0
22	1	0	1	1	0	1	1	1	1	1	1	0
23	1	0	1	1	1	1	1	1	1	1	1	1
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	1
26	1	1	0	1	0	1	1	1	1	1	1	1
27	1	1	0	1	1	1	1	1	1	1	1	1
28	1	1	1	0	0	1	1	1	1	1	1	1
29	1	1	1	0	1	1	1	1	1	1	1	0
30	1	1	1	1	0	1	1	1	1	1	1	0
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 2.B

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for B0, B1, B2, B3, B4, B5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	0	1	0	1
01	1	1	1	1	0	1	0	1
11	1	1	1	1	0	1	0	1
10	1	1	1	1	0	1	0	1

Minimum SOP: I2’ + I3’I4’ + I3I4

K-map for B6

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James Adrian Perez 2020-05633

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*C0*	*C1*	*C2*	*C3*	*C4*	*C5*	*C6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	1
2	0	0	0	1	0	1	1	1	1	1	1	0
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	1
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	1	1
8	0	1	0	0	0	1	1	1	1	1	1	1
9	0	1	0	0	1	1	1	1	1	1	1	1
10	0	1	0	1	0	1	1	1	1	1	1	0
11	0	1	0	1	1	1	1	1	1	1	1	1
12	0	1	1	0	0	1	1	1	1	1	1	1
13	0	1	1	0	1	1	1	1	1	1	1	1
14	0	1	1	1	0	1	1	1	1	1	1	1
15	0	1	1	1	1	1	1	1	1	1	1	1
16	1	0	0	0	0	1	1	1	1	1	0	1
17	1	0	0	0	1	1	1	1	1	1	0	1
18	1	0	0	1	0	1	1	1	1	1	0	0
19	1	0	0	1	1	1	1	1	1	1	0	1
20	1	0	1	0	0	1	1	1	1	1	0	1
21	1	0	1	0	1	1	1	1	1	1	0	1
22	1	0	1	1	0	1	1	1	1	1	0	1
23	1	0	1	1	1	1	1	1	1	1	0	1
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	1
26	1	1	0	1	0	1	1	1	1	1	1	0
27	1	1	0	1	1	1	1	1	1	1	1	1
28	1	1	1	0	0	1	1	1	1	1	1	1
29	1	1	1	0	1	1	1	1	1	1	1	1
30	1	1	1	1	0	1	1	1	1	1	1	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 2.C

Felix Bueno IV 2020-05609
James Adrian Perez 2020-05633

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for C0, C1, C2, C3, C4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	0	1	1	0	0	1
01	1	0	0	1	1	0	0	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: I4’ + I0

K-map for C5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	0	1	1	1	1
01	1	1	1	0	1	1	1	1
11	1	1	1	0	1	1	1	1
10	1	1	1	0	1	1	1	1

Minimum SOP: I3’ + I4 + I2

K-map for C6

Felix Bueno IV 2020-05609
James Adrian Perez 2020-05633

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*D0*	*D1*	*D2*	*D3*	*D4*	*D5*	*D6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	0
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	1	0
8	0	1	0	0	0	1	1	1	1	1	0	1
9	0	1	0	0	1	1	1	1	1	1	0	0
10	0	1	0	1	0	1	1	1	1	1	0	1
11	0	1	0	1	1	1	1	1	1	1	0	1
12	0	1	1	0	0	1	1	1	1	1	0	0
13	0	1	1	0	1	1	1	1	1	1	0	1
14	0	1	1	1	0	1	1	1	1	1	0	1
15	0	1	1	1	1	1	1	1	1	1	0	0
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	0
18	1	0	0	1	0	1	1	1	1	1	1	1
19	1	0	0	1	1	1	1	1	1	1	1	1
20	1	0	1	0	0	1	1	1	1	1	1	0
21	1	0	1	0	1	1	1	1	1	1	1	1
22	1	0	1	1	0	1	1	1	1	1	1	1
23	1	0	1	1	1	1	1	1	1	1	1	0
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	0
26	1	1	0	1	0	1	1	1	1	1	1	1
27	1	1	0	1	1	1	1	1	1	1	1	1
28	1	1	1	0	0	1	1	1	1	1	1	0
29	1	1	1	0	1	1	1	1	1	1	1	1
30	1	1	1	1	0	1	1	1	1	1	1	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 2.D

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for D0, D1, D2, D3, D4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	0	0	0	0	0	0	0	0
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: I1’ + I0

K-map for D5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	1	1	1	0	1	0
01	1	0	1	1	1	0	1	0
11	1	0	1	1	1	0	1	0
10	1	0	1	1	1	0	1	0

Minimum SOP: I2'I4' + I2'I3 + I2I3'I4 + I3I4'

K-map for D6

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Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*E0*	*E1*	*E2*	*E3*	*E4*	*E5*	*E6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	0
4	0	0	1	0	0	1	1	1	1	1	1	0
5	0	0	1	0	1	1	1	1	1	1	1	0
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	1	0
8	0	1	0	0	0	1	1	1	1	1	0	1
9	0	1	0	0	1	1	1	1	1	1	0	0
10	0	1	0	1	0	1	1	1	1	1	0	1
11	0	1	0	1	1	1	1	1	1	1	0	0
12	0	1	1	0	0	1	1	1	1	1	0	0
13	0	1	1	0	1	1	1	1	1	1	0	0
14	0	1	1	1	0	1	1	1	1	1	0	1
15	0	1	1	1	1	1	1	1	1	1	0	0
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	0
18	1	0	0	1	0	1	1	1	1	1	1	1
19	1	0	0	1	1	1	1	1	1	1	1	0
20	1	0	1	0	0	1	1	1	1	1	1	0
21	1	0	1	0	1	1	1	1	1	1	1	0
22	1	0	1	1	0	1	1	1	1	1	1	1
23	1	0	1	1	1	1	1	1	1	1	1	0
24	1	1	0	0	0	1	1	1	1	1	0	1
25	1	1	0	0	1	1	1	1	1	1	0	0
26	1	1	0	1	0	1	1	1	1	1	0	1
27	1	1	0	1	1	1	1	1	1	1	0	0
28	1	1	1	0	0	1	1	1	1	1	0	0
29	1	1	1	0	1	1	1	1	1	1	0	0
30	1	1	1	1	0	1	1	1	1	1	0	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 2.E

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for E0, E1, E2, E3, E4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1

Minimum SOP: I1’

K-map for E5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	0	1	1	0	0	0
01	1	0	0	1	1	0	0	0
11	1	0	0	1	1	0	0	0
10	1	0	0	1	1	0	0	0

Minimum SOP: I2'I4' + I3I4'

K-map for E6

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James Adrian Perez 2020-05633

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*F0*	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	1	0
3	0	0	0	1	1	1	1	1	1	1	1	0
4	0	0	1	0	0	1	1	1	1	1	1	1
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	1	0
8	0	1	0	0	0	1	1	1	1	1	0	1
9	0	1	0	0	1	1	1	1	1	1	0	0
10	0	1	0	1	0	1	1	1	1	1	0	0
11	0	1	0	1	1	1	1	1	1	1	0	0
12	0	1	1	0	0	1	1	1	1	1	0	1
13	0	1	1	0	1	1	1	1	1	1	0	1
14	0	1	1	1	0	1	1	1	1	1	0	1
15	0	1	1	1	1	1	1	1	1	1	0	0
16	1	0	0	0	0	1	1	1	1	1	0	1
17	1	0	0	0	1	1	1	1	1	1	0	0
18	1	0	0	1	0	1	1	1	1	1	0	0
19	1	0	0	1	1	1	1	1	1	1	0	0
20	1	0	1	0	0	1	1	1	1	1	0	1
21	1	0	1	0	1	1	1	1	1	1	0	1
22	1	0	1	1	0	1	1	1	1	1	0	1
23	1	0	1	1	1	1	1	1	1	1	0	0
24	1	1	0	0	0	1	1	1	1	1	0	1
25	1	1	0	0	1	1	1	1	1	1	0	0
26	1	1	0	1	0	1	1	1	1	1	0	0
27	1	1	0	1	1	1	1	1	1	1	0	0
28	1	1	1	0	0	1	1	1	1	1	0	1
29	1	1	1	0	1	1	1	1	1	1	0	1
30	1	1	1	1	0	1	1	1	1	1	0	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 2.F

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for F0, F1, F2, F3, F4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0

Minimum SOP: I0'I1'

K-map for F5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	0	0	1	0	1	1
01	1	0	0	0	1	0	1	1
11	1	0	0	0	1	0	1	1
10	1	0	0	0	1	0	1	1

Minimum SOP: I3'I4' + I2I3' + I2I4'

K-map for F6

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James Adrian Perez 2020-05633

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*G0*	*G1*	*G2*	*G3*	*G4*	*G5*	*G6*
0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	0	0
2	0	0	0	1	0	0	0	0	0	0	0	1
3	0	0	0	1	1	0	0	0	0	0	0	1
4	0	0	1	0	0	0	0	0	0	0	0	1
5	0	0	1	0	1	0	0	0	0	0	0	1
6	0	0	1	1	0	0	0	0	0	0	0	1
7	0	0	1	1	1	0	0	0	0	0	0	0
8	0	1	0	0	0	0	0	0	0	0	0	0
9	0	1	0	0	1	0	0	0	0	0	0	0
10	0	1	0	1	0	0	0	0	0	0	0	1
11	0	1	0	1	1	0	0	0	0	0	0	1
12	0	1	1	0	0	0	0	0	0	0	0	1
13	0	1	1	0	1	0	0	0	0	0	0	1
14	0	1	1	1	0	0	0	0	0	0	0	1
15	0	1	1	1	1	0	0	0	0	0	0	0
16	1	0	0	0	0	0	0	0	0	0	1	0
17	1	0	0	0	1	0	0	0	0	0	1	0
18	1	0	0	1	0	0	0	0	0	0	1	1
19	1	0	0	1	1	0	0	0	0	0	1	1
20	1	0	1	0	0	0	0	0	0	0	1	1
21	1	0	1	0	1	0	0	0	0	0	1	1
22	1	0	1	1	0	0	0	0	0	0	1	1
23	1	0	1	1	1	0	0	0	0	0	1	0
24	1	1	0	0	0	0	0	0	0	0	1	0
25	1	1	0	0	1	0	0	0	0	0	1	0
26	1	1	0	1	0	0	0	0	0	0	1	1
27	1	1	0	1	1	0	0	0	0	0	1	1
28	1	1	1	0	0	0	0	0	0	0	1	1
29	1	1	1	0	1	0	0	0	0	0	1	1
30	1	1	1	1	0	0	0	0	0	0	1	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 2.G

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I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	0	0	0	0	0	0	0	0
01	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0

Minimum SOP: 0

K-map for G0, G1, G2, G3, G4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	0	0	0	0	0	0	0	0
01	0	0	0	0	0	0	0	0
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: I0

K-map for G5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	0	0	1	1	1	0	1	1
01	0	0	1	1	1	0	1	1
11	0	0	1	1	1	0	1	1
10	0	0	1	1	1	0	1	1

Minimum SOP: I2'I3 + I2I3' + I3I4'

K-map for G6

Note: One K-map were used for columns (A0 – A6 for example) that have the same K-map annotation. These were used for the same letter only. Same K-maps for different letters (A0, B0 for example) were separated

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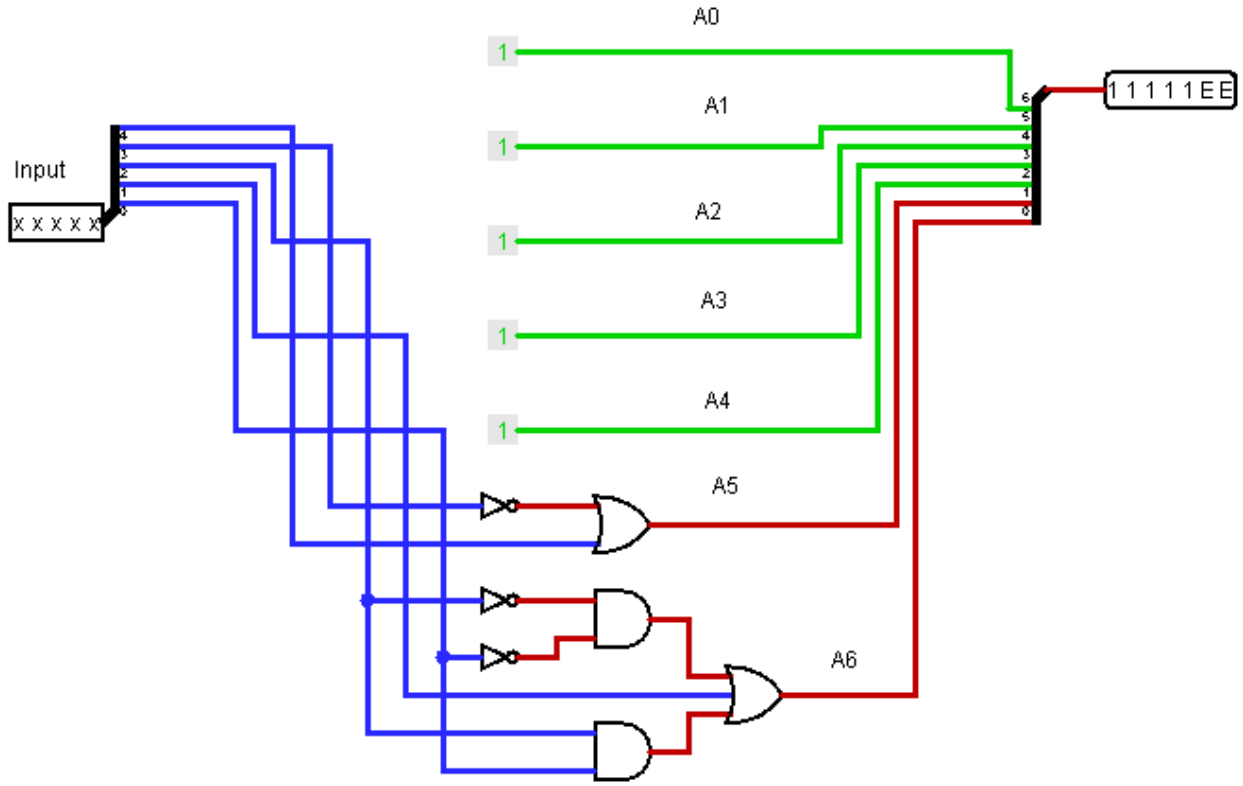

Diagram for Octal A

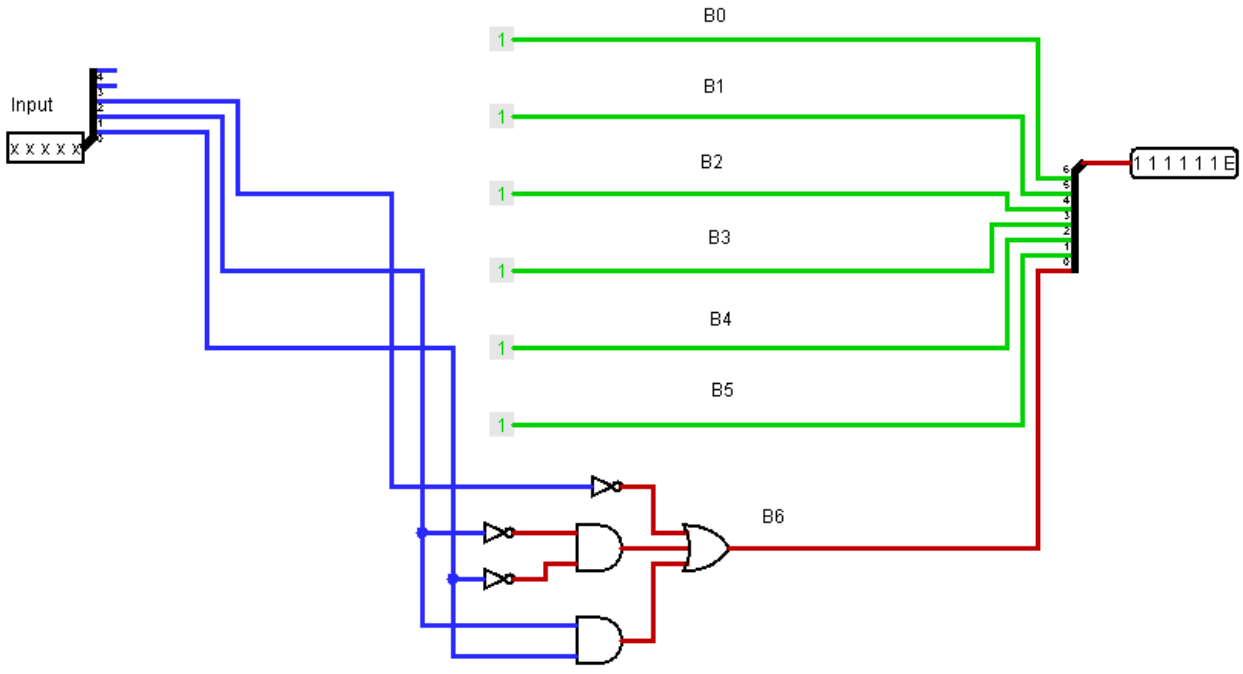

Diagram for Octal B

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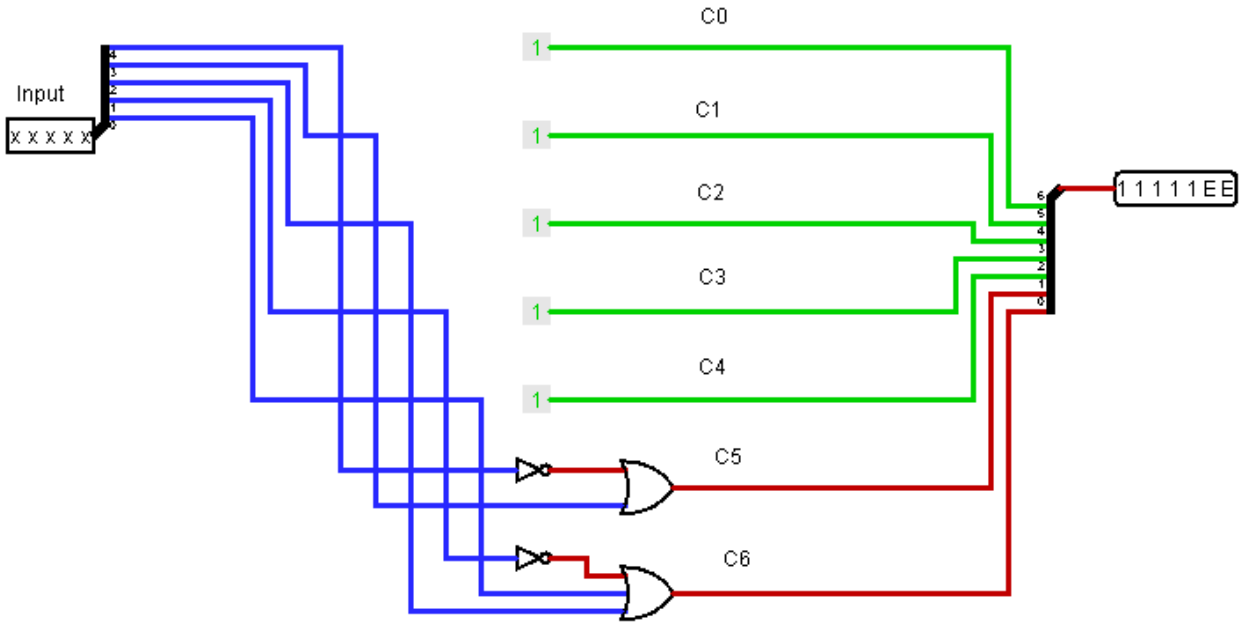

Diagram for Octal C

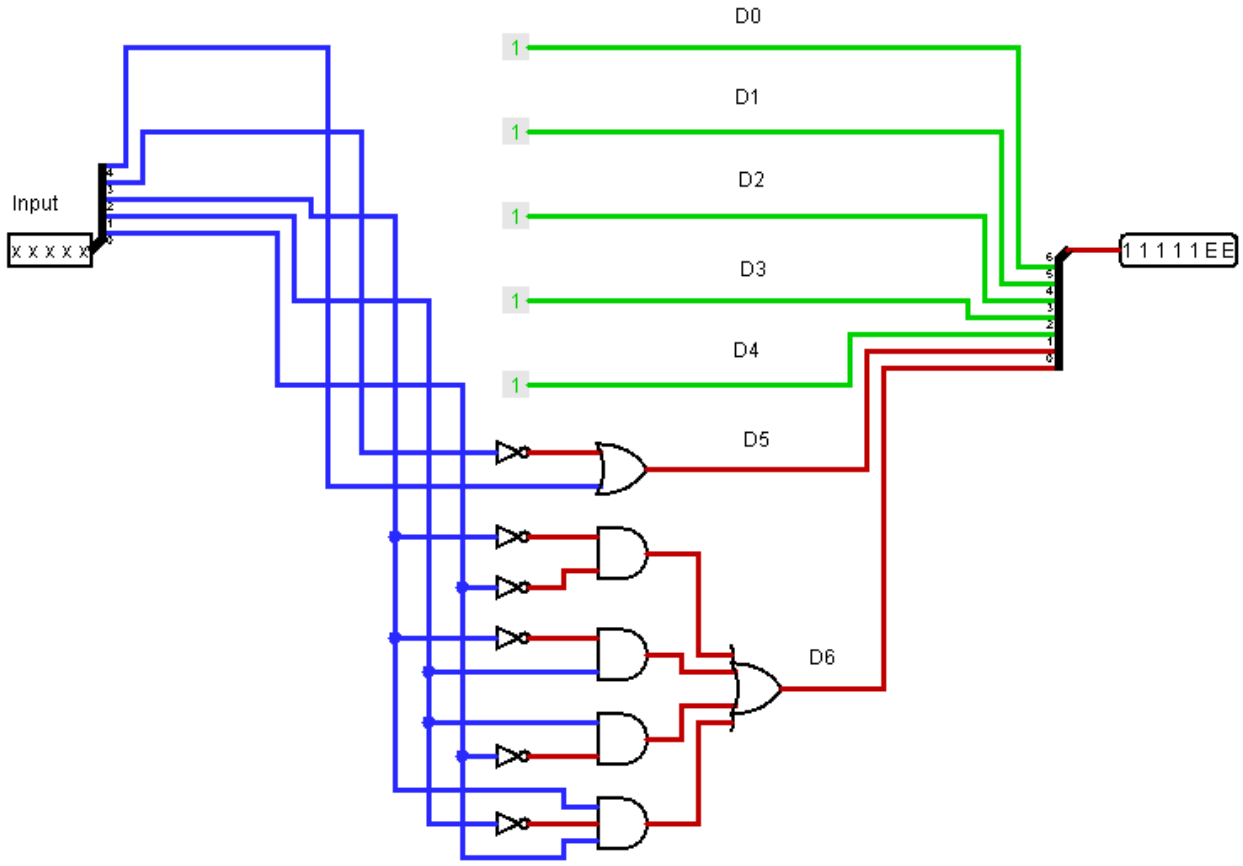

Diagram for Octal D

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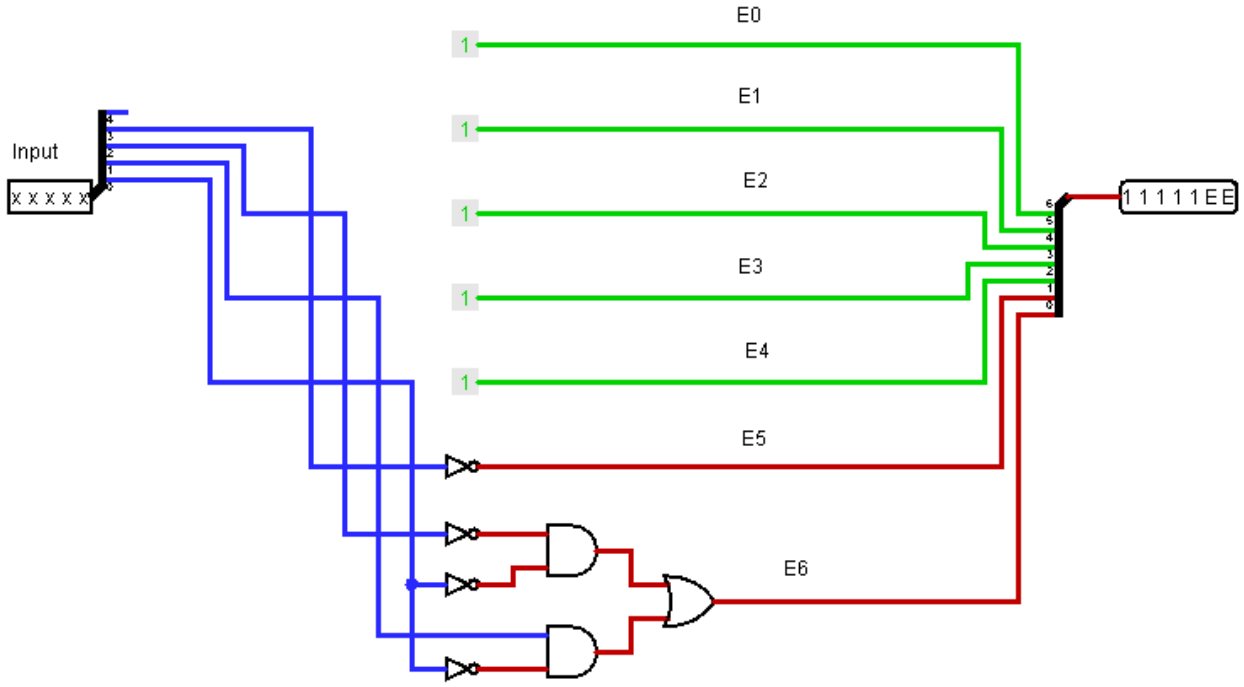

Diagram for Octal E

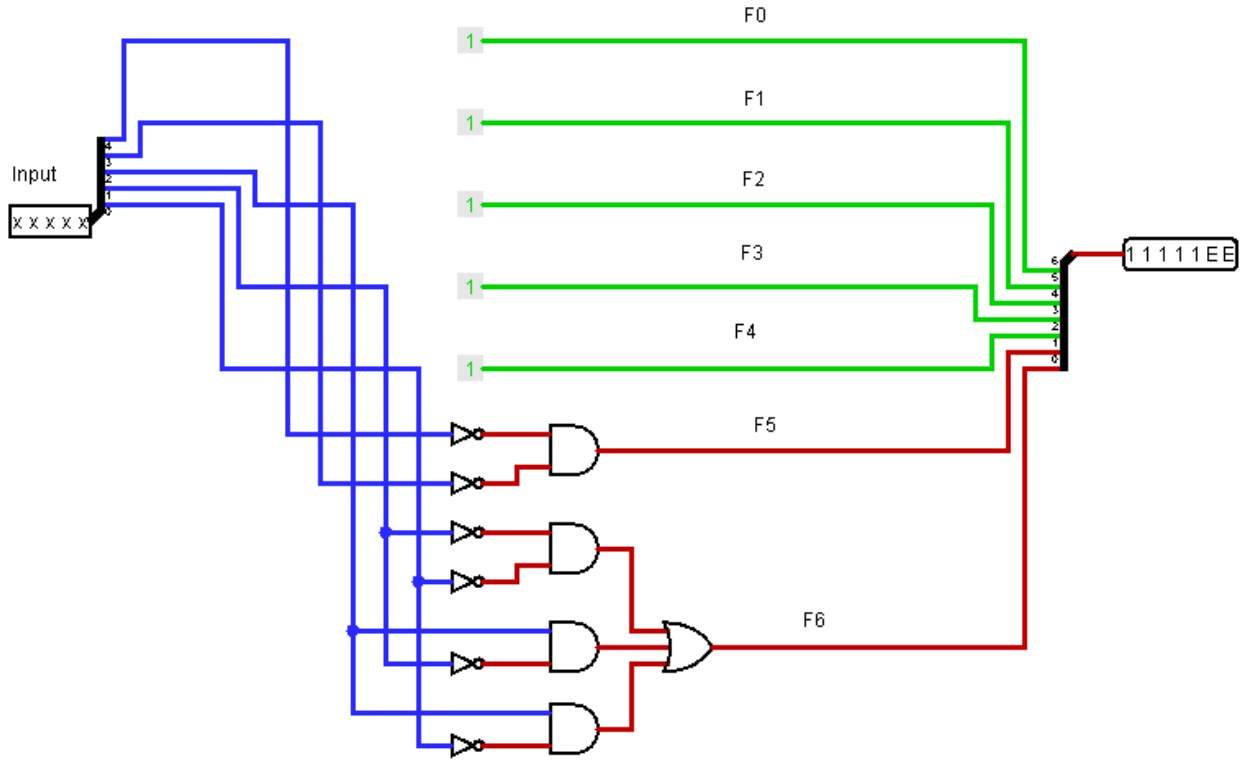

Diagram for Octal F

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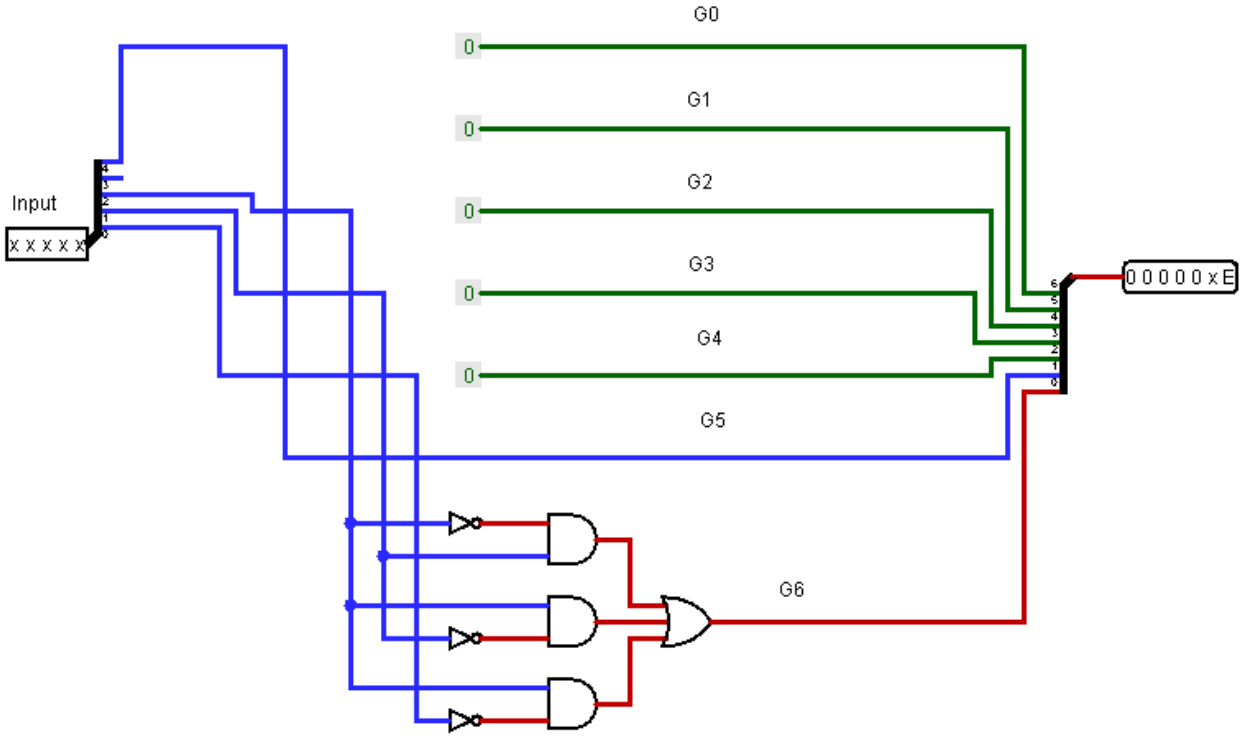

Diagram for Octal G

The diagrams were made from the different K-maps of the letter (for example the k-maps A0 to A6 were put together to form the whole subcircuit. In case of minterms 0 and 1, constants were used, and the input was removed since it wasn't needed for the output.

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The truth table, K-maps and schematic diagram for the value of the letters A (the letter that corresponds to a in the 7-segment led) of Base 7 (Mystery Base) are shown below. Our mystery base was gotten from the addition of the last 4 digits of our student numbers and applying module 3 on it [(5609 + 5633) % 3] = 1 so our base is 7.

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*A0*	*A1*	*A2*	*A3*	*A4*	*A5*	*A6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	0
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	0	1
8	0	1	0	0	0	1	1	1	1	1	0	0
9	0	1	0	0	1	1	1	1	1	1	0	1
10	0	1	0	1	0	1	1	1	1	1	0	1
11	0	1	0	1	1	1	1	1	1	1	0	0
12	0	1	1	0	0	1	1	1	1	1	0	1
13	0	1	1	0	1	1	1	1	1	1	0	1
14	0	1	1	1	0	1	1	1	1	1	1	1
15	0	1	1	1	1	1	1	1	1	1	1	0
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	1
18	1	0	0	1	0	1	1	1	1	1	1	0
19	1	0	0	1	1	1	1	1	1	1	1	1
20	1	0	1	0	0	1	1	1	1	1	1	1
21	1	0	1	0	1	1	1	1	1	1	1	1
22	1	0	1	1	0	1	1	1	1	1	1	0
23	1	0	1	1	1	1	1	1	1	1	1	1
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	0
26	1	1	0	1	0	1	1	1	1	1	1	1
27	1	1	0	1	1	1	1	1	1	1	1	1
28	1	1	1	0	0	1	1	1	1	1	0	1
29	1	1	1	0	1	1	1	1	1	1	0	0
30	1	1	1	1	0	1	1	1	1	1	0	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 3.A

Felix Bueno IV 2020-05609
James Adrian Perez 2020-05633

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for A0, A1, A2, A3, A4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	0	1	1
01	0	0	0	0	1	1	0	0
11	1	1	1	1	0	0	0	0
10	1	1	1	1	1	1	1	1

Minimum SOP: I1'I2' + I1'I3' + I0'I1I2I3 + I0I1' + I0I2' + I0'I2I3I4'

K-map for A5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	1	1	1	1	1	0
01	0	1	0	1	1	0	1	1
11	1	0	1	1	1	1	0	1
10	1	1	1	0	0	1	1	1

Minimum POS: (I0 + I1 + I2 + I3 + I4') (I0 + I1 + I2' + I3 + I4) (I0 + I1' + I2 + I3 + I4) (I0 + I1' + I3' + I4') (I0' + I1 + I3' + I4) (I0' + I1' + I3 + I4')

K-map for A6

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James Adrian Perez 2020-05633

The pair decided to perform POS on column A6 since the K-map would be extremely complex if SOP was done on it. Note that the minimized expression indicates whether POS or SOP was done.

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*B0*	*B1*	*B2*	*B3*	*B4*	*B5*	*B6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	1
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	1
5	0	0	1	0	1	1	1	1	1	1	1	0
6	0	0	1	1	0	1	1	1	1	1	1	0
7	0	0	1	1	1	1	1	1	1	1	1	1
8	0	1	0	0	0	1	1	1	1	1	1	1
9	0	1	0	0	1	1	1	1	1	1	1	1
10	0	1	0	1	0	1	1	1	1	1	1	1
11	0	1	0	1	1	1	1	1	1	1	1	1
12	0	1	1	0	0	1	1	1	1	1	1	0
13	0	1	1	0	1	1	1	1	1	1	1	0
14	0	1	1	1	0	1	1	1	1	1	1	1
15	0	1	1	1	1	1	1	1	1	1	1	1
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	1
18	1	0	0	1	0	1	1	1	1	1	1	1
19	1	0	0	1	1	1	1	1	1	1	1	0
20	1	0	1	0	0	1	1	1	1	1	1	0
21	1	0	1	0	1	1	1	1	1	1	1	1
22	1	0	1	1	0	1	1	1	1	1	1	1
23	1	0	1	1	1	1	1	1	1	1	1	1
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	1
26	1	1	0	1	0	1	1	1	1	1	1	0
27	1	1	0	1	1	1	1	1	1	1	1	0
28	1	1	1	0	0	1	1	1	1	1	1	1
29	1	1	1	0	1	1	1	1	1	1	1	1
30	1	1	1	1	0	1	1	1	1	1	1	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 3.B

Felix Bueno IV 2020-05609
James Adrian Perez 2020-05633

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for B0, B1, B2, B3, B4, B5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	0	1	0	1
01	1	1	1	1	1	1	0	0
11	1	1	0	0	1	1	1	1
10	1	1	0	1	1	1	1	0

Minimum POS: (I0 + I2' + I3 + I4') (I0 + I1 + I2' + I3' + I4) (I0 + I1' + I2' + I3) (I0' + I2 + I3' + I4') (I0' + I1 + I2' + I3 + I4) (I0' + I1' + I2 + I3')

K-map for B6

Note that the pair used POS for K-map B6 since it would be extremely complicated to use SOP in this K-map. The minimized terms used in the K-maps are always in the form of SOP unless stated.

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Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*C0*	*C1*	*C2*	*C3*	*C4*	*C5*	*C6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	1
2	0	0	0	1	0	1	1	1	1	1	1	0
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	1
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	1	1
8	0	1	0	0	0	1	1	1	1	1	1	1
9	0	1	0	0	1	1	1	1	1	1	1	0
10	0	1	0	1	0	1	1	1	1	1	1	1
11	0	1	0	1	1	1	1	1	1	1	1	1
12	0	1	1	0	0	1	1	1	1	1	1	1
13	0	1	1	0	1	1	1	1	1	1	1	1
14	0	1	1	1	0	1	1	1	1	1	0	1
15	0	1	1	1	1	1	1	1	1	1	0	1
16	1	0	0	0	0	1	1	1	1	1	0	0
17	1	0	0	0	1	1	1	1	1	1	0	1
18	1	0	0	1	0	1	1	1	1	1	0	1
19	1	0	0	1	1	1	1	1	1	1	0	1
20	1	0	1	0	0	1	1	1	1	1	0	1
21	1	0	1	0	1	1	1	1	1	1	1	1
22	1	0	1	1	0	1	1	1	1	1	1	1
23	1	0	1	1	1	1	1	1	1	1	1	0
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	1
26	1	1	0	1	0	1	1	1	1	1	1	1
27	1	1	0	1	1	1	1	1	1	1	1	1
28	1	1	1	0	0	1	1	1	1	1	1	1
29	1	1	1	0	1	1	1	1	1	1	1	1
30	1	1	1	1	0	1	1	1	1	1	1	0
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 3.C

Felix Bueno IV 2020-05609
James Adrian Perez 2020-05633

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for C0, C1, C2, C3, C4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	0	0	1	1
11	1	1	1	1	1	1	1	1
10	0	0	0	0	1	1	1	0

Minimum SOP: I0'I1' + I1I2' + I1I3' + I2I3'I4 + I0I2I3

K-map for C5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	0	1	1	1	1
01	1	0	1	1	1	1	1	1
11	1	1	1	1	0	0	1	1
10	0	1	1	1	1	0	1	1

Minimum POS: (I0 + I1 + I2 + I3' + I4) (I0 + I1' + I2 + I3 + I4') (I0' + I1 + I2 + I3 + I4) (I0' + I2' + I3' + I4') (I0' + I1' + I2' + I3')

K-map for C6

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James Adrian Perez 2020-05633

Note that the pair used POS for K-map C6 since it would be extremely complicated to use SOP in this K-map. The minimized terms used in the K-maps are always in the form of SOP unless stated.

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*D0*	*D1*	*D2*	*D3*	*D4*	*D5*	*D6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	1
4	0	0	1	0	0	1	1	1	1	1	1	0
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	0	1
8	0	1	0	0	0	1	1	1	1	1	0	0
9	0	1	0	0	1	1	1	1	1	1	0	1
10	0	1	0	1	0	1	1	1	1	1	0	1
11	0	1	0	1	1	1	1	1	1	1	0	0
12	0	1	1	0	0	1	1	1	1	1	0	1
13	0	1	1	0	1	1	1	1	1	1	0	1
14	0	1	1	1	0	1	1	1	1	1	1	1
15	0	1	1	1	1	1	1	1	1	1	1	0
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	1
18	1	0	0	1	0	1	1	1	1	1	1	0
19	1	0	0	1	1	1	1	1	1	1	1	1
20	1	0	1	0	0	1	1	1	1	1	1	1
21	1	0	1	0	1	1	1	1	1	1	1	1
22	1	0	1	1	0	1	1	1	1	1	1	0
23	1	0	1	1	1	1	1	1	1	1	1	1
24	1	1	0	0	0	1	1	1	1	1	1	1
25	1	1	0	0	1	1	1	1	1	1	1	0
26	1	1	0	1	0	1	1	1	1	1	1	1
27	1	1	0	1	1	1	1	1	1	1	1	1
28	1	1	1	0	0	1	1	1	1	1	0	1
29	1	1	1	0	1	1	1	1	1	1	0	0
30	1	1	1	1	0	1	1	1	1	1	0	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 3.D

Felix Bueno IV 2020-05609
James Adrian Perez 2020-05633

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for D0, D1, D2, D3, D4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	0	1	1
01	0	0	0	0	1	1	0	0
11	1	1	1	1	0	0	0	0
10	1	1	1	1	1	1	1	1

Minimum POS: (I0 + I1 + I2' + I3' + I4') (I0 + I1' + I2) (I0' + I1' + I2') (I1' + I2' + I3)

K-map for D5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	1	1	1	1	1	0
01	0	1	0	1	1	0	1	1
11	1	0	1	1	1	1	0	1
10	1	1	1	0	0	1	1	1

Minimum POS: (I0 + I1 + I2 + I3 + I4') (I0 + I1 + I2' + I3 + I4) (I0 + I1' + I2 + I3 + I4) (I0 + I1' + I3' + I4') (I0' + I1 + I3' + I4) (I0' + I1' + I3 + I4')

K-map for D6

Felix Bueno IV 2020-05609
James Adrian Perez 2020-05633

Note that the pair used POS for K-map D5, D6 since it would be extremely complicated to use SOP in this K-map. The minimized terms used in the K-maps are always in the form of SOP unless stated.

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*E0*	*E1*	*E2*	*E3*	*E4*	*E5*	*E6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1	0
4	0	0	1	0	0	1	1	1	1	1	1	0
5	0	0	1	0	1	1	1	1	1	1	1	0
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	0	1
8	0	1	0	0	0	1	1	1	1	1	0	0
9	0	1	0	0	1	1	1	1	1	1	0	1
10	0	1	0	1	0	1	1	1	1	1	0	0
11	0	1	0	1	1	1	1	1	1	1	0	0
12	0	1	1	0	0	1	1	1	1	1	0	0
13	0	1	1	0	1	1	1	1	1	1	0	1
14	0	1	1	1	0	1	1	1	1	1	1	1
15	0	1	1	1	1	1	1	1	1	1	1	0
16	1	0	0	0	0	1	1	1	1	1	1	1
17	1	0	0	0	1	1	1	1	1	1	1	0
18	1	0	0	1	0	1	1	1	1	1	1	0
19	1	0	0	1	1	1	1	1	1	1	1	0
20	1	0	1	0	0	1	1	1	1	1	1	1
21	1	0	1	0	1	1	1	1	1	1	0	1
22	1	0	1	1	0	1	1	1	1	1	0	0
23	1	0	1	1	1	1	1	1	1	1	0	1
24	1	1	0	0	0	1	1	1	1	1	0	0
25	1	1	0	0	1	1	1	1	1	1	0	0
26	1	1	0	1	0	1	1	1	1	1	0	0
27	1	1	0	1	1	1	1	1	1	1	0	1
28	1	1	1	0	0	1	1	1	1	1	0	1
29	1	1	1	0	1	1	1	1	1	1	0	0
30	1	1	1	1	0	1	1	1	1	1	0	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 3.E

Felix Bueno IV 2020-05609
James Adrian Perez 2020-05633

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for E0, E1, E2, E3, E4

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	1	1	1	1	0	1	1
01	0	0	0	0	1	1	0	0
11	0	0	0	0	0	0	0	0
10	1	1	1	1	0	0	0	1

Minimum SOP: I1' I2' + I0' I1' I3' + I0' I1 I2 I3 + I1' I3' I4' + I0' I2 I3 I4'

K-map for E5

I0 I1 \ I2 I3 I4	000	001	011	010	110	111	101	100
00	1	0	0	1	1	1	0	0
01	0	1	0	0	1	0	1	0
11	0	0	1	0	1	1	0	1
10	1	0	0	0	0	1	1	1

Minimum SOP: I0'I1I3'I4 + I0I1I3I4 + I0'I1'I2'I4' + I0'I1'I2I3 + I0'I2I3I4' + I0I1'I3'I4' + I0I1'I2I4 + I0I1I2I4'

K-map for E6

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James Adrian Perez 2020-05633

Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*F0*	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*
0	0	0	0	0	0	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	1	0
2	0	0	0	1	0	1	1	1	1	1	1	0
3	0	0	0	1	1	1	1	1	1	1	1	0
4	0	0	1	0	0	1	1	1	1	1	1	1
5	0	0	1	0	1	1	1	1	1	1	1	1
6	0	0	1	1	0	1	1	1	1	1	1	1
7	0	0	1	1	1	1	1	1	1	1	0	1
8	0	1	0	0	0	1	1	1	1	1	0	0
9	0	1	0	0	1	1	1	1	1	1	0	0
10	0	1	0	1	0	1	1	1	1	1	0	0
11	0	1	0	1	1	1	1	1	1	1	0	1
12	0	1	1	0	0	1	1	1	1	1	0	1
13	0	1	1	0	1	1	1	1	1	1	0	1
14	0	1	1	1	0	1	1	1	1	1	0	1
15	0	1	1	1	1	1	1	1	1	1	0	0
16	1	0	0	0	0	1	1	1	1	1	0	0
17	1	0	0	0	1	1	1	1	1	1	0	0
18	1	0	0	1	0	1	1	1	1	1	0	1
19	1	0	0	1	1	1	1	1	1	1	0	1
20	1	0	1	0	0	1	1	1	1	1	0	1
21	1	0	1	0	1	1	1	1	1	1	0	1
22	1	0	1	1	0	1	1	1	1	1	0	0
23	1	0	1	1	1	1	1	1	1	1	0	0
24	1	1	0	0	0	1	1	1	1	1	0	0
25	1	1	0	0	1	1	1	1	1	1	0	1
26	1	1	0	1	0	1	1	1	1	1	0	1
27	1	1	0	1	1	1	1	1	1	1	0	1
28	1	1	1	0	0	1	1	1	1	1	1	1
29	1	1	1	0	1	1	1	1	1	1	1	0
30	1	1	1	1	0	1	1	1	1	1	1	0
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 3.F

Felix Bueno IV 2020-05609
James Adrian Perez 2020-05633

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	1	1	1	1	1	1	1	1
	01	1	1	1	1	1	1	1	1
	11	1	1	1	1	1	1	1	1
	10	1	1	1	1	1	1	1	1

Minimum SOP: 1

K-map for F0, F1, F2, F3, F4

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	1	1	1	1	1	0	1	1
	01	0	0	0	0	0	0	0	0
	11	0	0	0	0	1	1	1	1
	10	0	0	0	0	0	0	0	0

Minimum SOP: I0' I1' I2' + I0' I1' I3' + I0' I1' I4' + I0 I1 I2

K-map for F5

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	1	0	0	0	1	1	1	1
	01	0	0	1	0	1	0	1	1
	11	0	1	1	1	0	0	0	1
	10	0	0	1	1	0	0	1	1

Minimum SOP: I0' I1' I3' I4' + I0' I1' I2 + I1 I2' I3 I4 + I0' I2 I3' + I0' I2 I4' + I0 I2' I3 + I1' I2 I3' + I0 I1 I2' I4 + I2 I3' I4'

K-map for F6

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Input Value (Decimal)	*Input0*	*Input1*	*Input2*	*Input3*	*Input4*	*G0*	*G1*	*G2*	*G3*	*G4*	*G5*	*G6*
0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	0	0
2	0	0	0	1	0	0	0	0	0	0	0	1
3	0	0	0	1	1	0	0	0	0	0	0	1
4	0	0	1	0	0	0	0	0	0	0	0	1
5	0	0	1	0	1	0	0	0	0	0	0	1
6	0	0	1	1	0	0	0	0	0	0	0	1
7	0	0	1	1	1	0	0	0	0	0	0	0
8	0	1	0	0	0	0	0	0	0	0	0	0
9	0	1	0	0	1	0	0	0	0	0	0	1
10	0	1	0	1	0	0	0	0	0	0	0	1
11	0	1	0	1	1	0	0	0	0	0	0	1
12	0	1	1	0	0	0	0	0	0	0	0	1
13	0	1	1	0	1	0	0	0	0	0	0	1
14	0	1	1	1	0	0	0	0	0	0	1	0
15	0	1	1	1	1	0	0	0	0	0	1	0
16	1	0	0	0	0	0	0	0	0	0	1	1
17	1	0	0	0	1	0	0	0	0	0	1	1
18	1	0	0	1	0	0	0	0	0	0	1	1
19	1	0	0	1	1	0	0	0	0	0	1	1
20	1	0	1	0	0	0	0	0	0	0	1	1
21	1	0	1	0	1	0	0	0	0	0	1	0
22	1	0	1	1	0	0	0	0	0	0	1	0
23	1	0	1	1	1	0	0	0	0	0	1	1
24	1	1	0	0	0	0	0	0	0	0	1	1
25	1	1	0	0	1	0	0	0	0	0	1	1
26	1	1	0	1	0	0	0	0	0	0	1	1
27	1	1	0	1	1	0	0	0	0	0	1	1
28	1	1	1	0	0	0	0	0	0	0	1	0
29	1	1	1	0	1	0	0	0	0	0	1	0
30	1	1	1	1	0	0	0	0	0	0	1	1
31	1	1	1	1	1	x	x	x	x	x	x	x

Table 3.G

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		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	0	0	0	0	0	0	0	0
	01	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0
Minimum SOP: 0									

K-map for G0, G1, G2, G3, G4

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	0	0	0	0	0	0	0	0
	01	0	0	0	0	1	1	0	0
	11	1	1	1	1	1	1	1	1
	10	1	1	1	1	1	1	1	1
Minimum SOP: I1 I2 I3 + I0									

K-map for G5

		I2 I3 I4							
		000	001	011	010	110	111	101	100
I0 I1	00	0	0	1	1	1	0	1	1
	01	0	1	1	1	0	0	1	1
	11	1	1	1	1	1	1	0	0
	10	1	1	1	1	0	1	0	1
Minimum POS: (I0 + I1 + I2 + I3) (I0 + I2' + I3' + I4') (I0 + I2 + I3 + I4) (I0 + I1' + I2' + I3') (I0' + I2' + I3 + I4') (I0' + I1 + I2' + I3' + I4) (I0' + I1' + I2' + I3)									

K-map for G6

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Note that the pair used POS for K-map G6 since it would be extremely complicated to use SOP in this K-map. The minimized terms used in the K-maps are always in the form of SOP unless stated.

The schematic diagram for each letter of Base 7 (Mystery Base) from the MSB (0) to the LSB (6) is shown below.

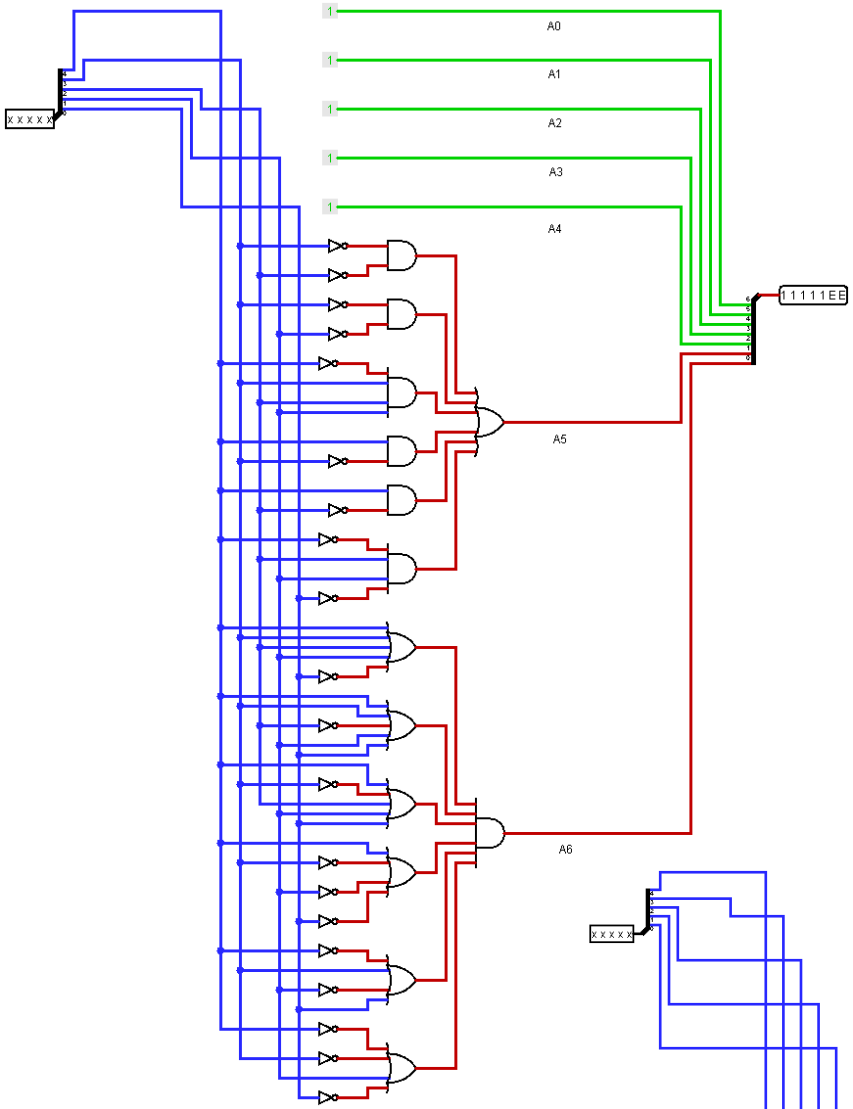

Diagram for Mystery Base (7) A

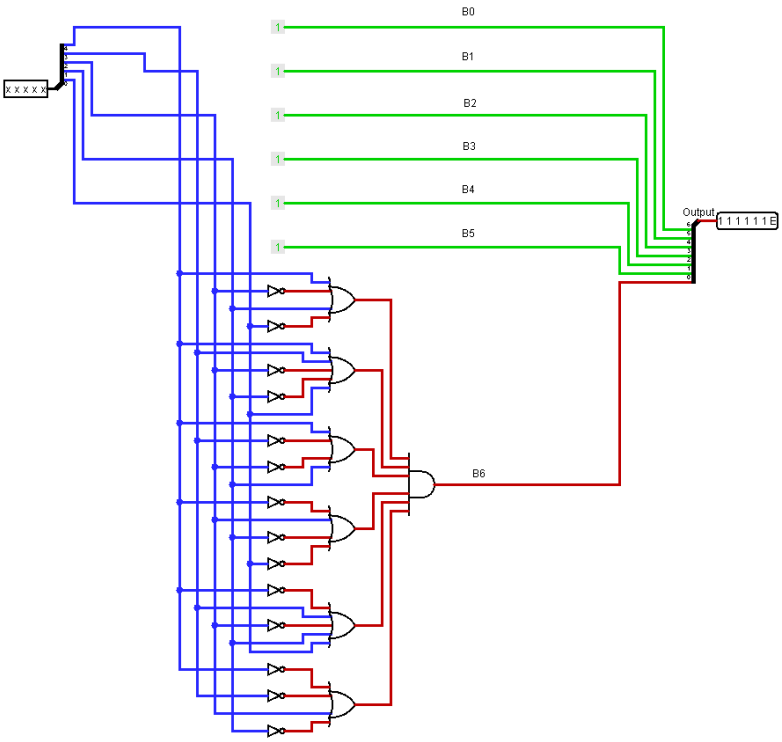

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Diagram for Mystery Base (7) B

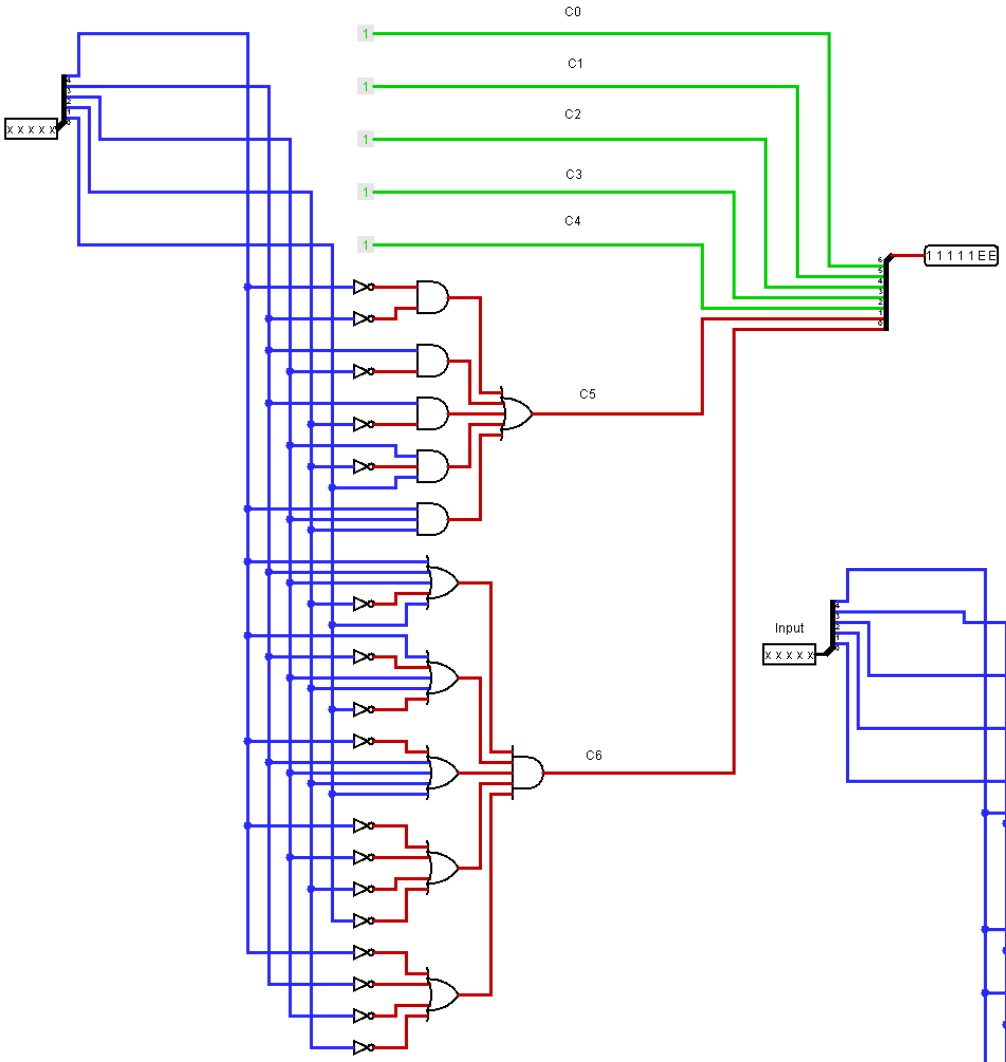
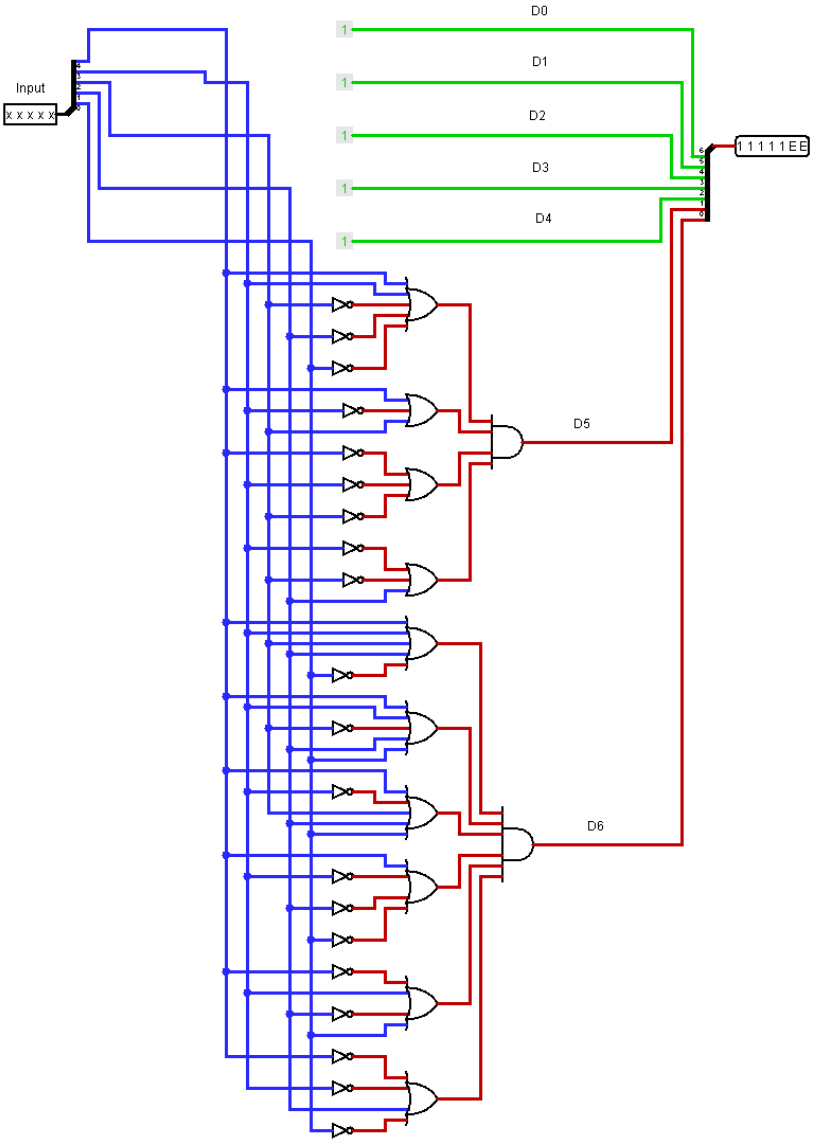


Diagram for Mystery Base (7) C



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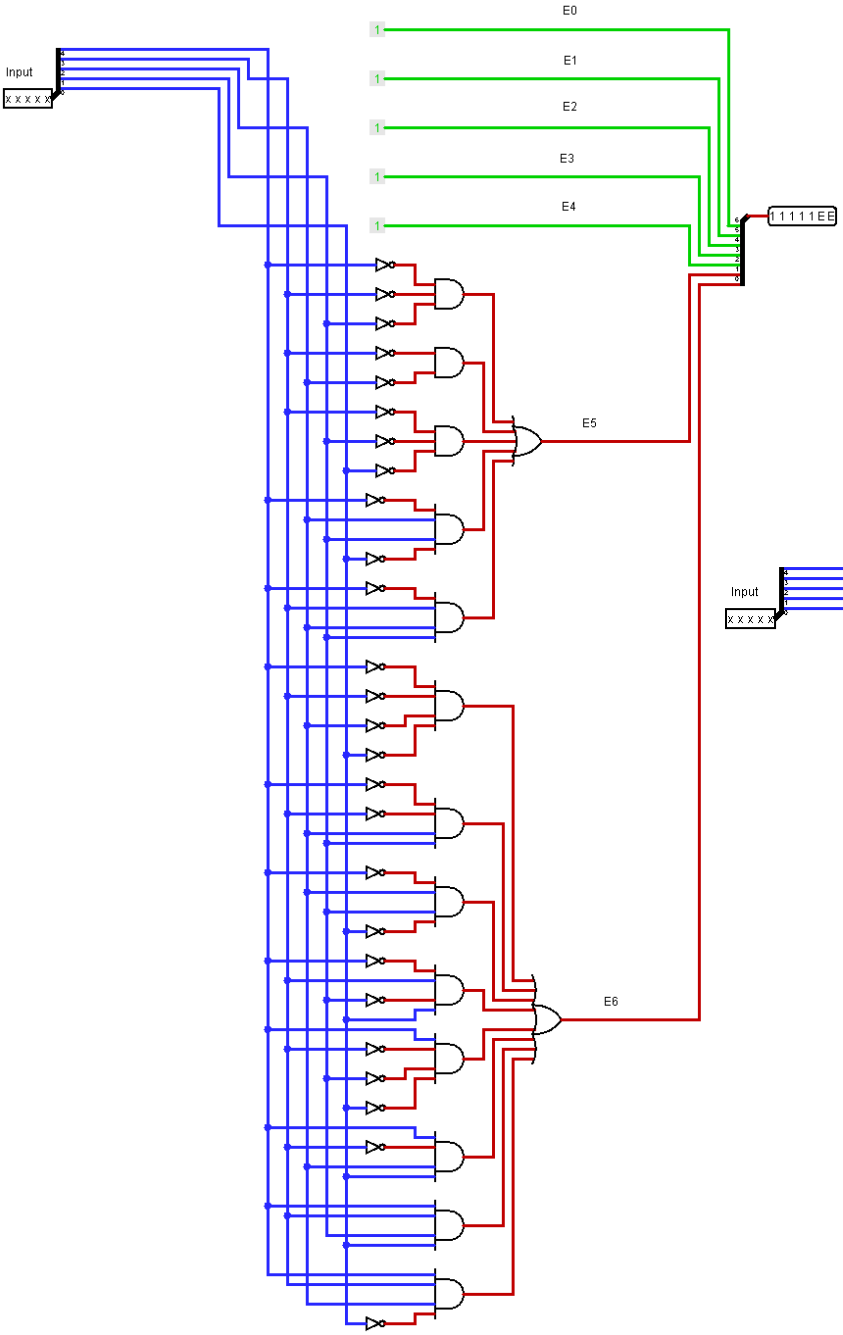

Diagram for Mystery Base (7) E

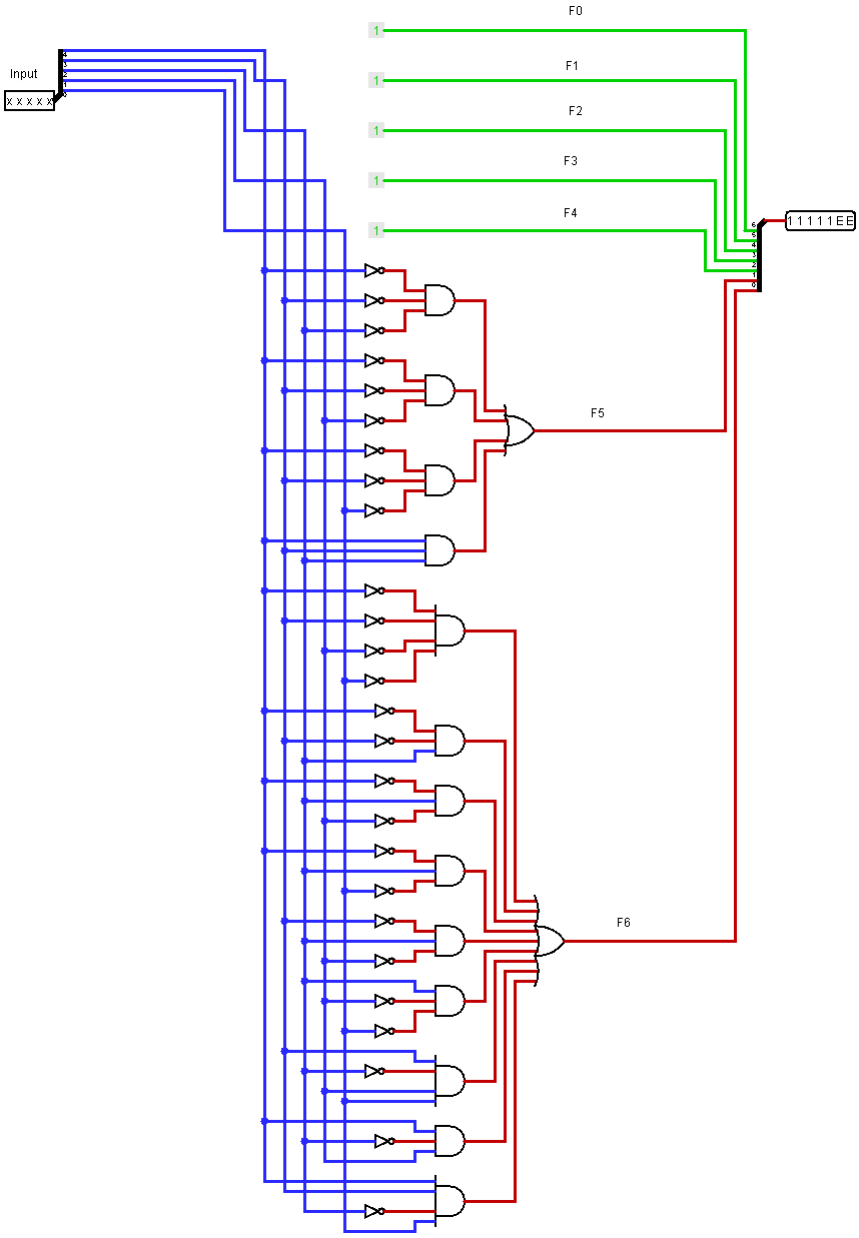

Diagram for Mystery Base (7) F

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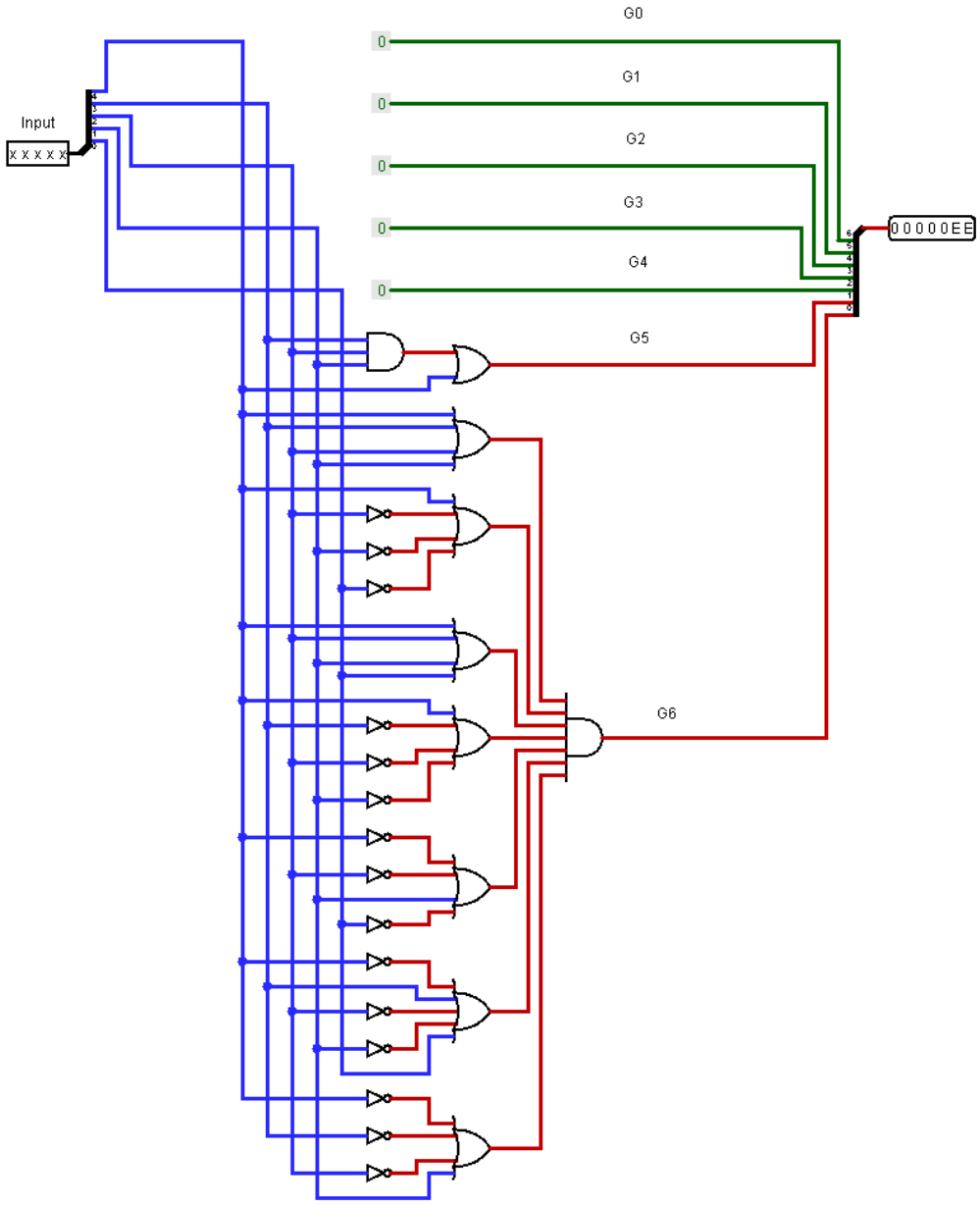

Diagram for Mystery Base (7) G

The pair created these circuits from creating a truth table for each letter. They used this table in the Combinational Analysis function of Logisim to automatically create schematic diagrams. Whilst doing the K-maps for each column of each letter, the pair noticed that there are some inconsistencies with the diagram since the diagram made sure that each input must be used even though it wasn't used in the minimized expression. They then decided to alter the expression for those columns using the combinational analysis so that the diagram and K-map matched each other.

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Contributions:

General Decisions for the Project Flow: Felix Bueno IV & James Adrian Perez

Adder: Felix Bueno IV

Comparator: Felix Bueno IV

Combination of Adder/Comparator: James Adrian Perez

Base Converter: Felix Bueno IV & James Adrian Perez

Truth Tables: Felix Bueno IV & James Adrian Perez

K-maps (unannotated): Felix Bueno IV

K-maps (annotated): James Adrian Perez

Documentation: James Adrian Perez

Documentation Video: Felix Bueno & James Adrian Perez

Link for Google Drive containing Documentation video:

https://drive.google.com/drive/folders/1oqPRP8Es9WM9UbBdg1AZlpSeuRNmKkhW