CSE 331 HW3

CEM BOZKURT

1801042090

TRUTH TABLE

P2	P1	P0	Lsbm0	Lsbm1	Rep<32	Rep=31	N2	N1	N0
0	0	0	X	X	X	X	0	0	1
0	0	1	0	1	X	X	0	1	0
0	0	1	1	0	X	X	0	1	1
0	1	0	X	X	X	X	0	1	1
0	1	1	X	X	0	1	1	0	0
0	1	1	X	X	1	0	0	0	1
1	0	0	X	X	X	X	1	0	1
1	0	1	X	X	X	X	1	0	1

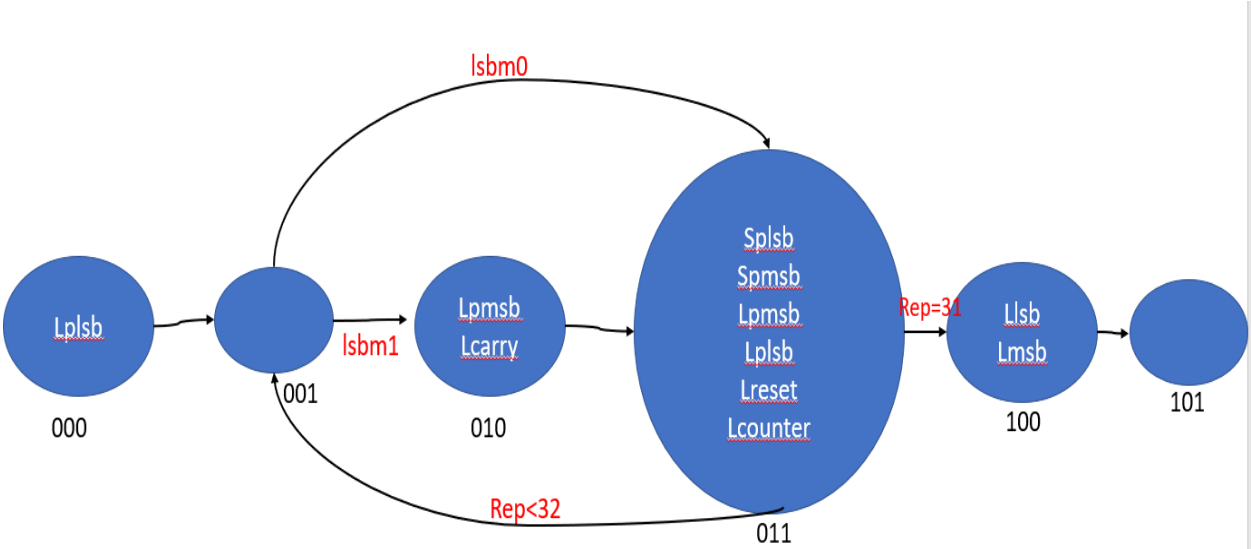
N0 = P2’P1’P0 + P2’P1’P0.Lsbm0 + P2’P1P0’ + P2’P1P0.REP<32 + P2P1’P0’ + P2P1’P0

N1 = P2’P1’P0(Lsbm1 + Lsbm0) + P2’P1P0’

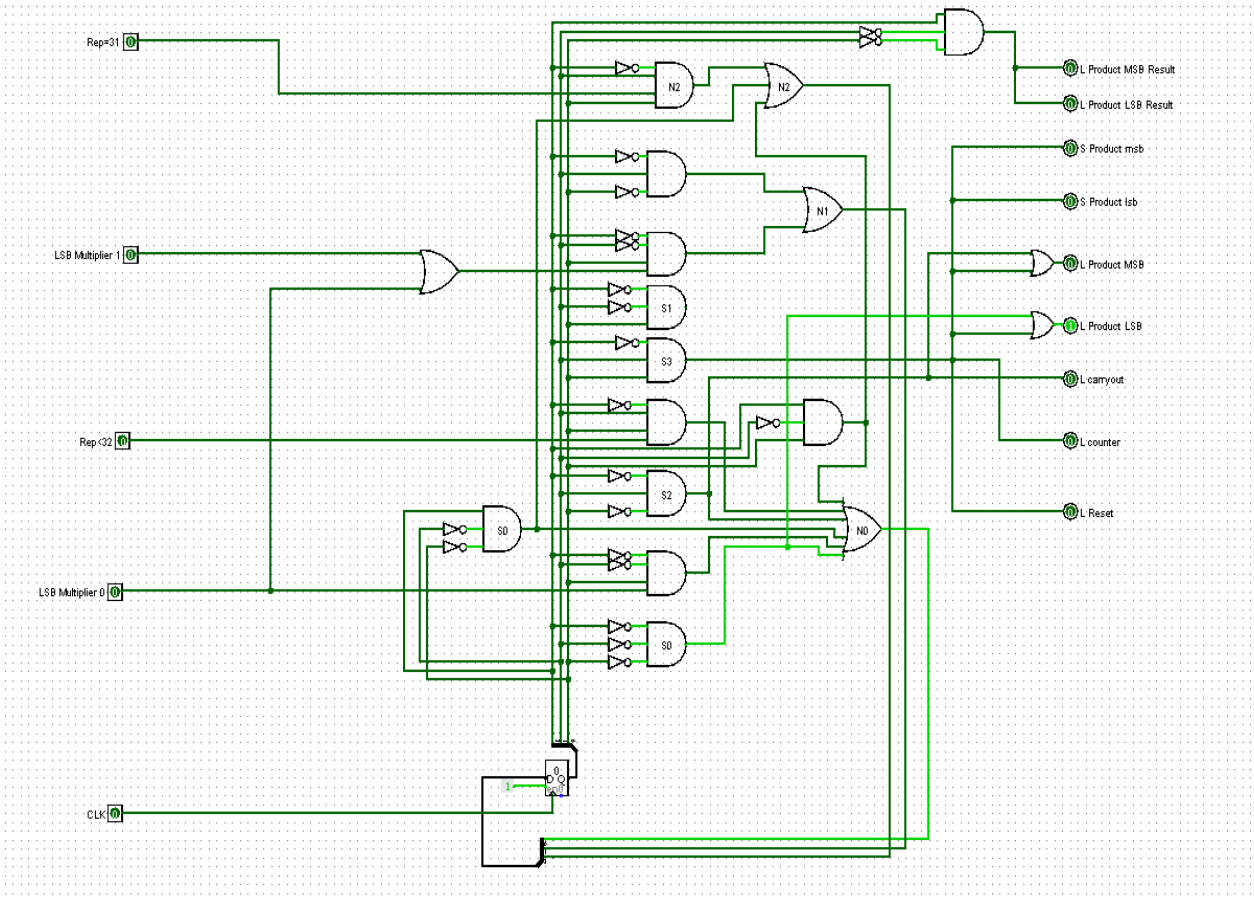
N2 = P2’P1P0.Rep=31 + P2P1’P0’ + P2P1’P0

STATE	Lplsb	Lpmsb	Splsp	Spmsp	Lcounter	L carry	L reset	L msb	L lsb	
000	1									
001										
010		1				1				
011	1	1	1	1	1		1			
100								1	1	
101										

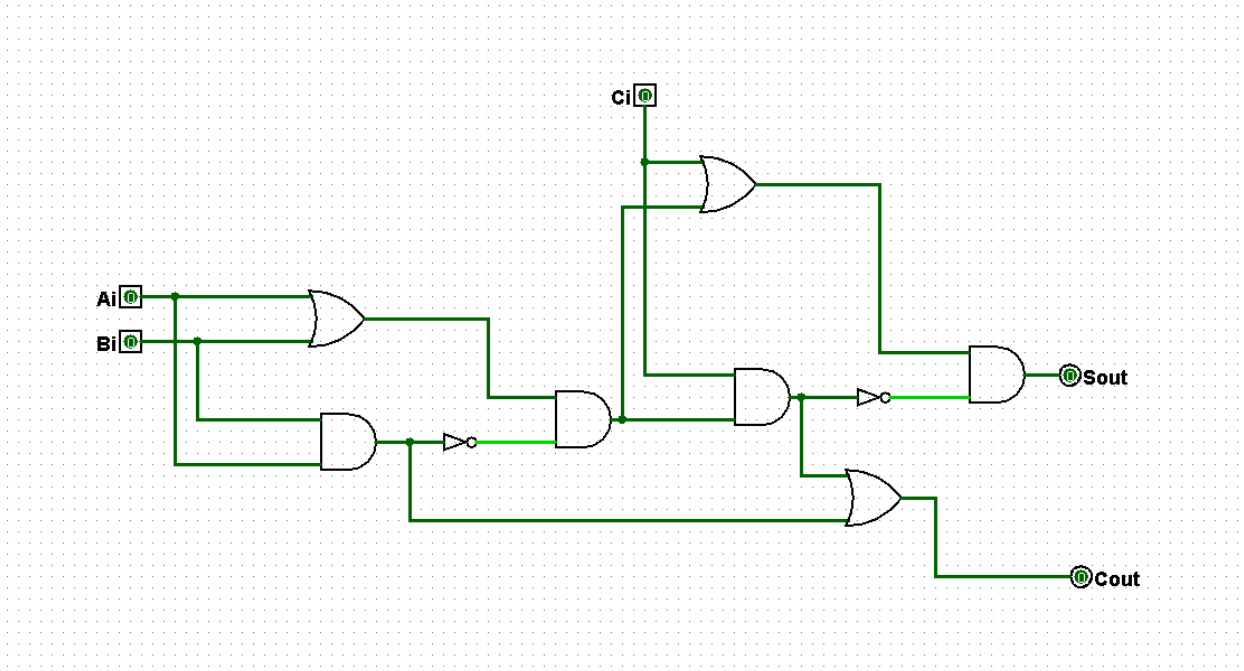
STATE DIAGRAM



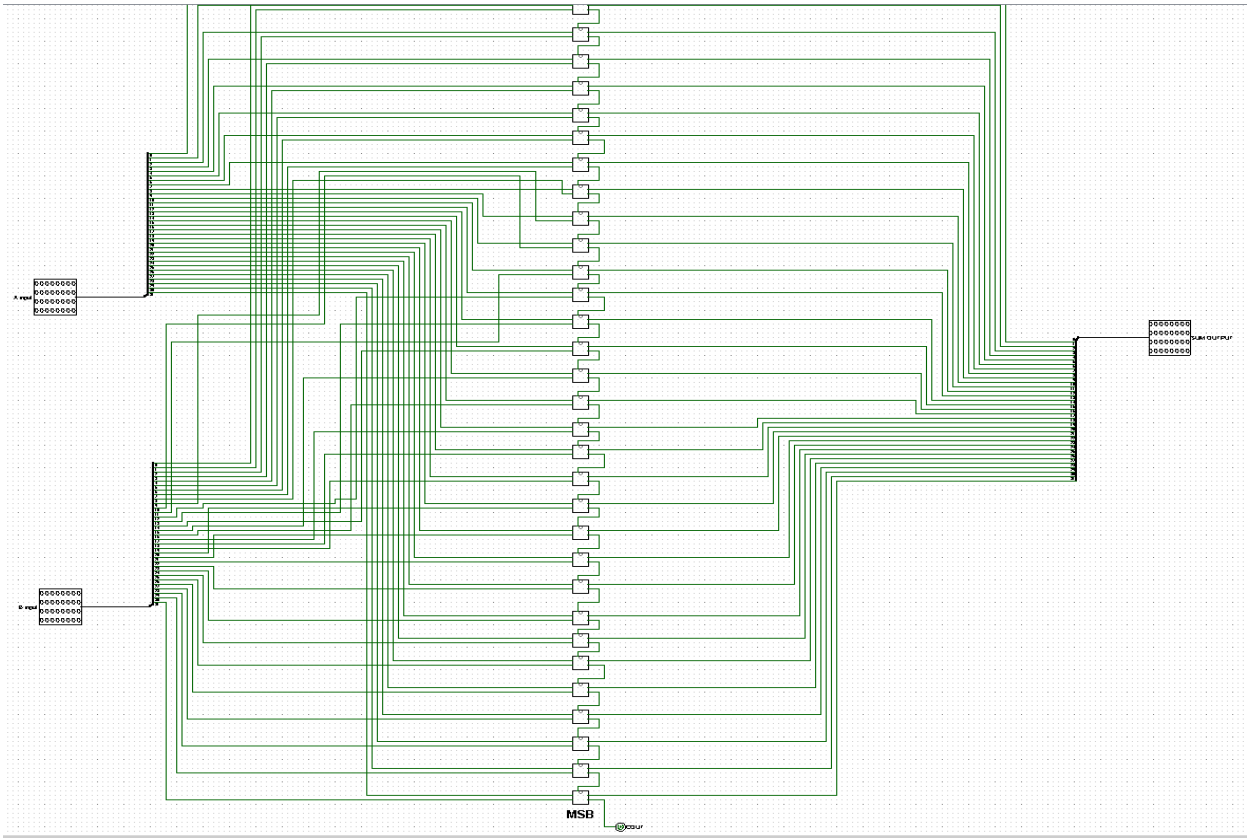
Control Unit



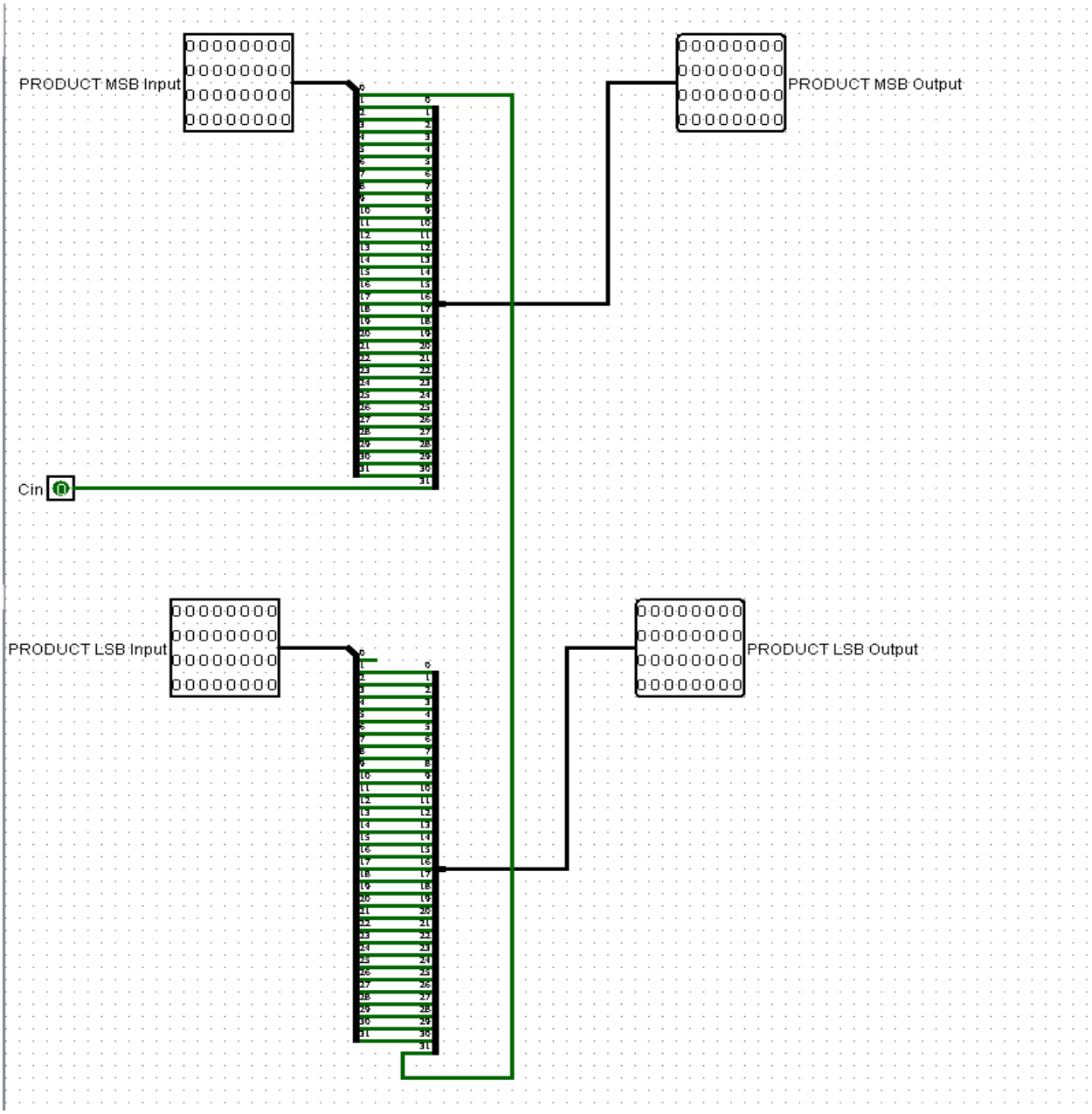
1-BIT FULL ADDER



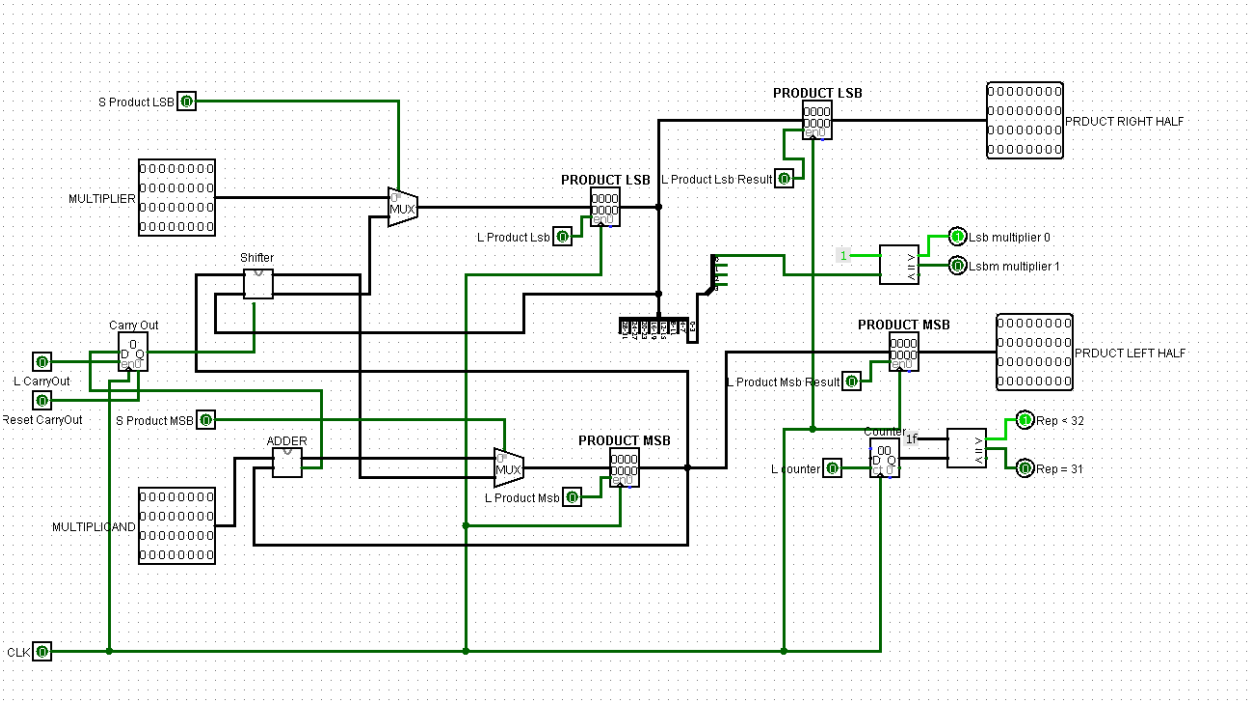
32-BIT ADDER



64-BIT SHIFTER



DATA PATH



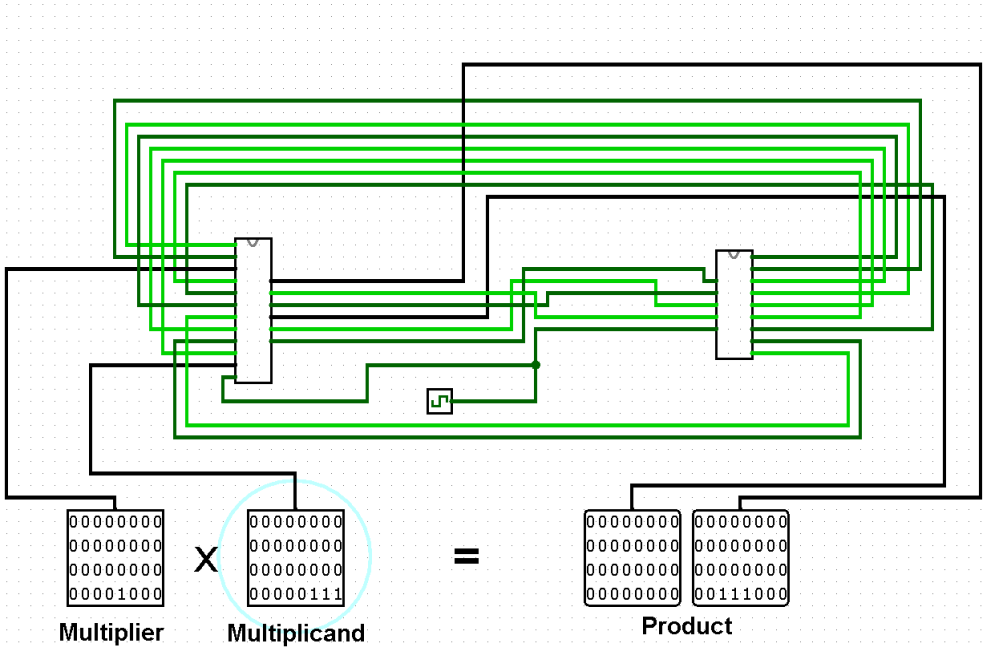
Basically, I use 2 32-bit register for 64 bit product. Multiplier is connected to Product Lsb and multiplicand connected to product Msb. There is carry out, loading with adder's carry output and reseting with every end of cycyle. Sending this carry out to the shifter.

There is 2 counter for 2 signals. Lsb multiplier 0/1 signal takes Least significant bit and decide if it is going to be add and shift or just shift. Counter register is Counting reps with L counter input. Seconds Product LSB and MSB are for the output. They load the outputs end of state.

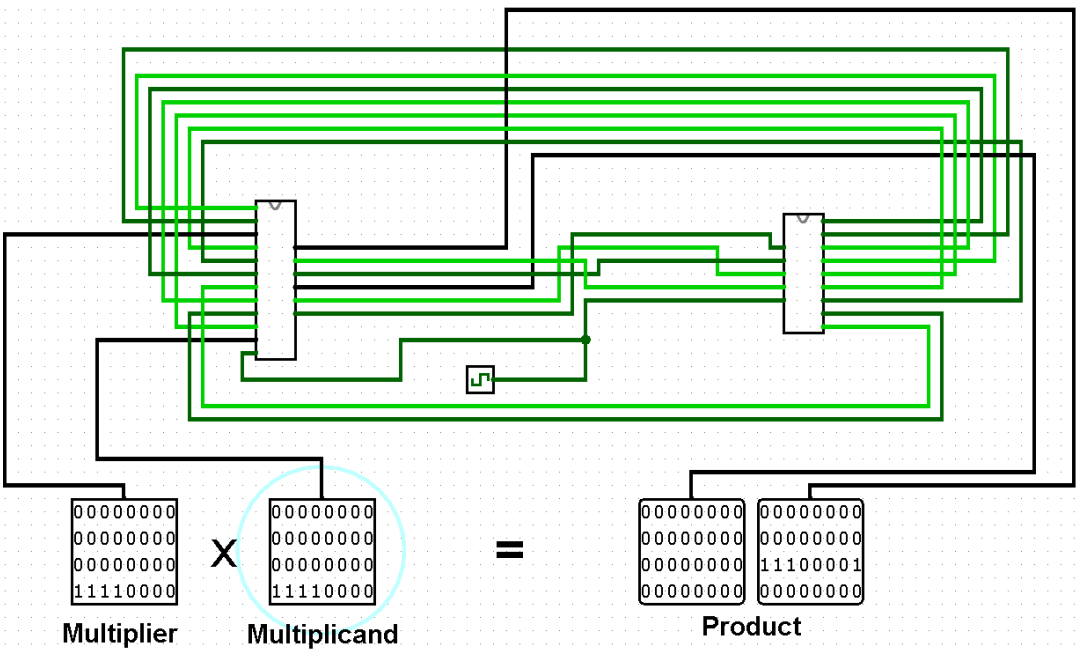
I did not make start and reset button because it wasn't told. So that after calculation it should be resetted.

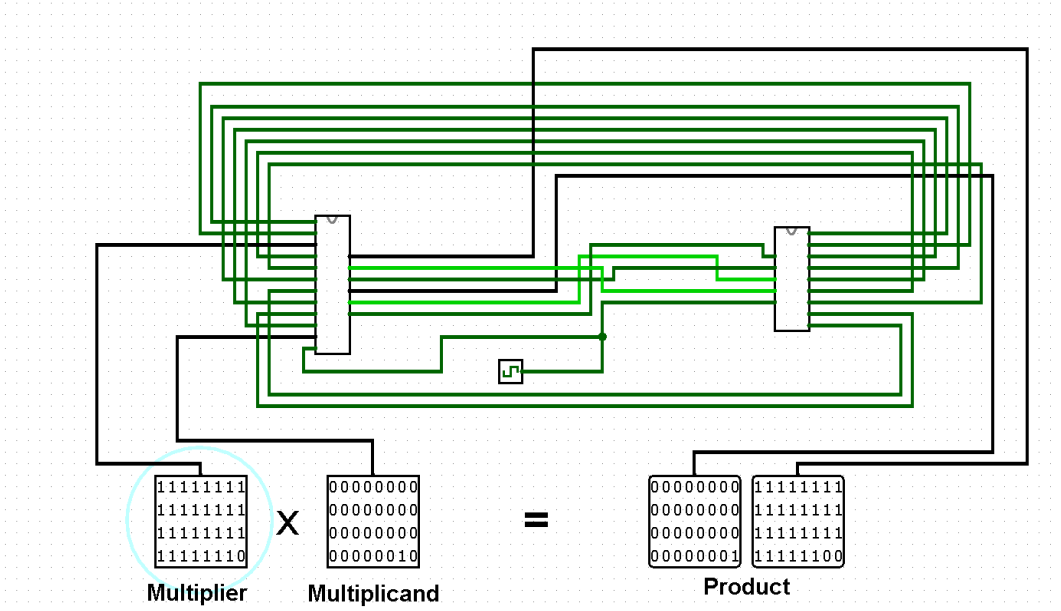
TEST CASES

8X7 = 56

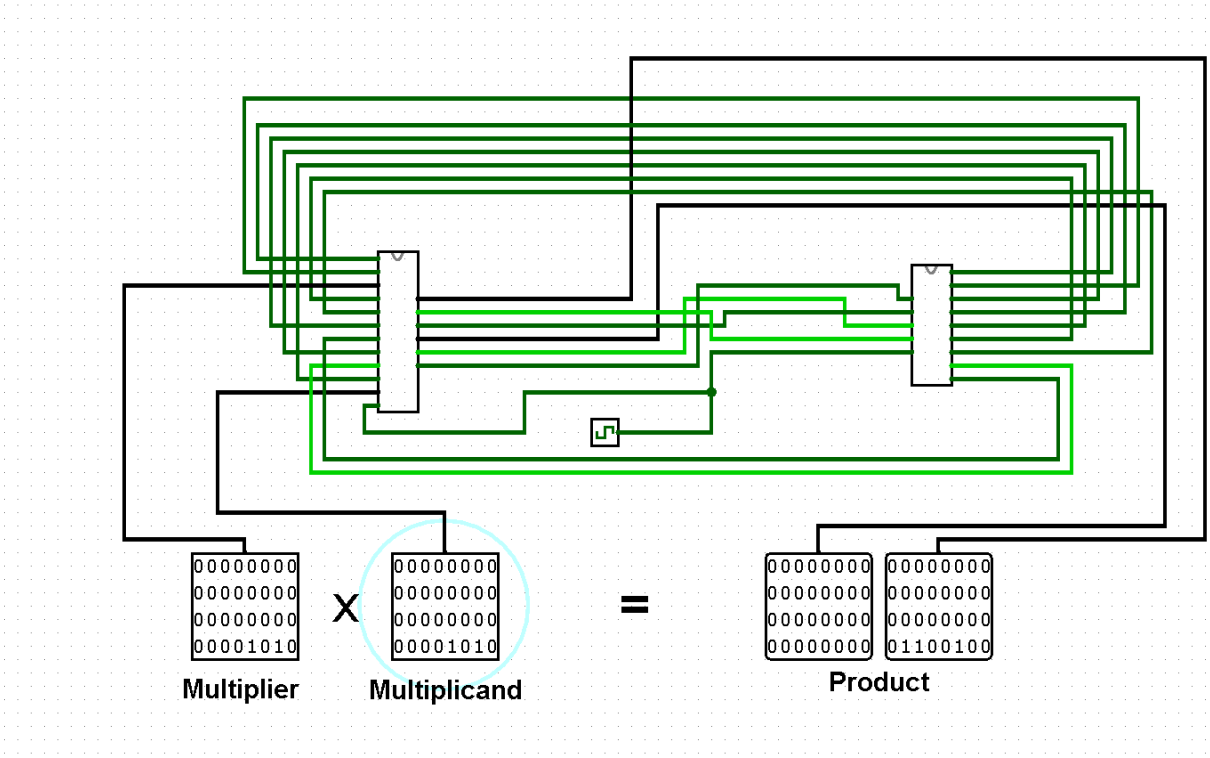


240X240 = 57600

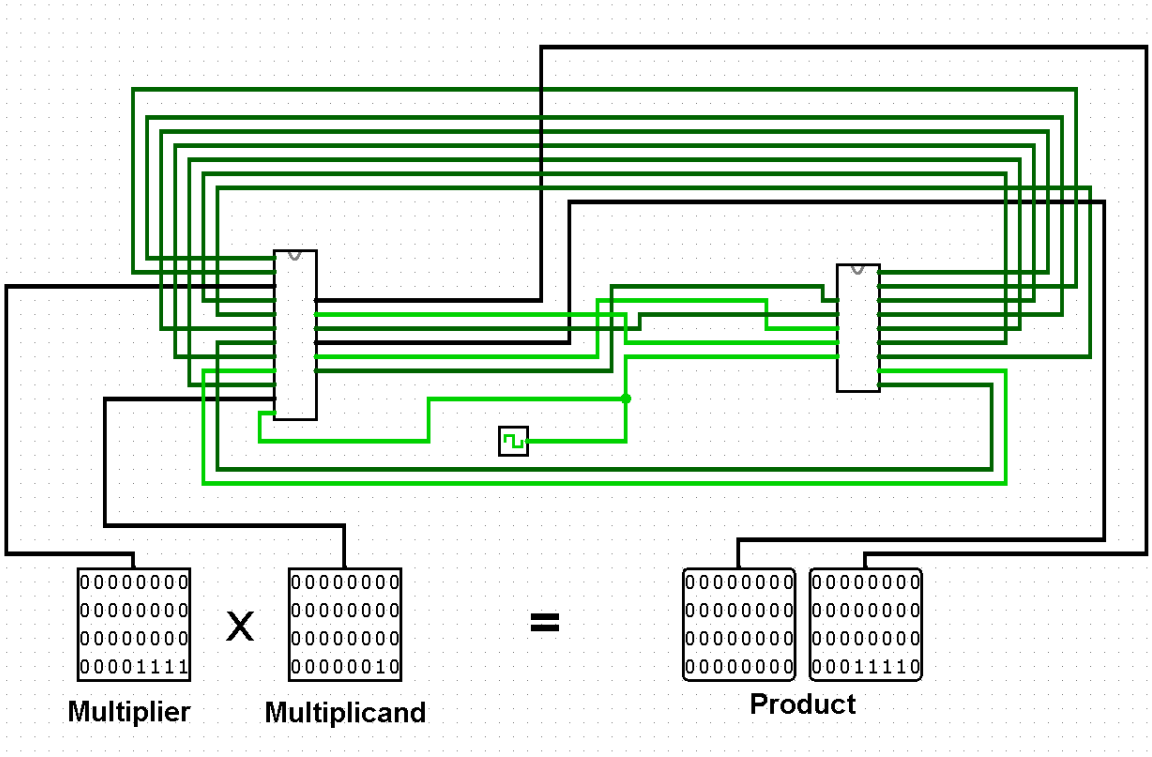



11111111
11111111
11111111
11111110
X
00000000
00000000
00000000
00000010
=
00000000
00000000
00000000
00000001
11111111
11111111
11111111
11111100
Multiplier
Multiplicand
Product

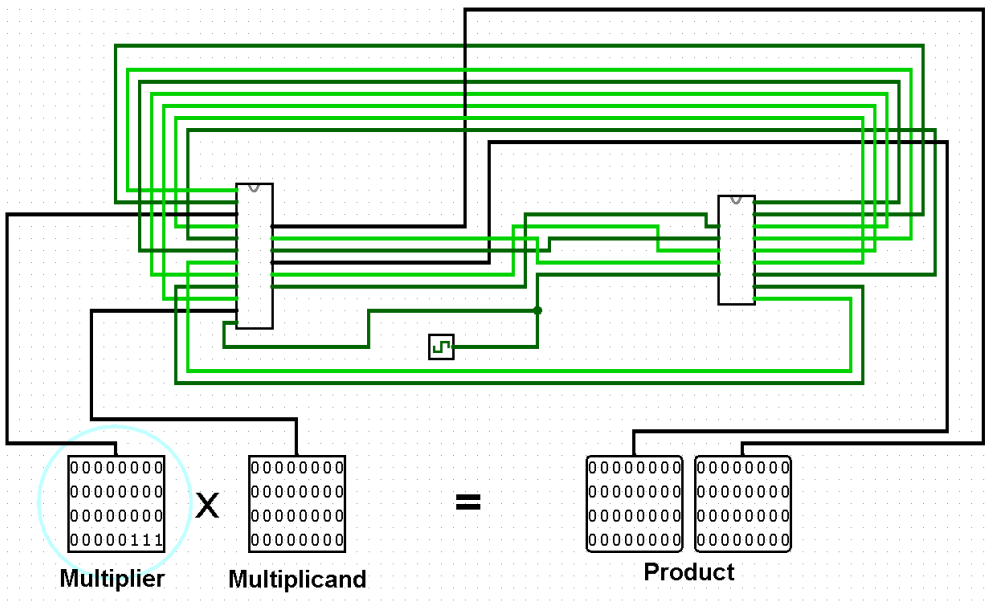
10X10 = 100


00000000
00000000
00000000
00001010
X
00000000
00000000
00000000
00001010
=
00000000
00000000
00000000
00000000
00000000
00000000
00000000
01100100
Multiplier
Multiplicand
Product

15X2 = 30


00000000
00000000
00000000
00001111
X
00000000
00000000
00000000
00000010
=
00000000
00000000
00000000
00000000
00000000
00000000
00000000
00011110
Multiplier
Multiplicand
Product

7x0 = 0


00000000
00000000
00000000
00000111
X
00000000
00000000
00000000
00000000
=
00000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Multiplier
Multiplicand
Product