

BCD Adder/Subtract Circuit

1. Adder circuit, in Figure 1, allows the user to add or subtract inputs A and B. J1 is Dip switch containing eight switches. Switches 1 – 4 will be used for inputs $A_3, A_2, A_1,$ and A_0 . Switches 5-8 will be used for input $B_3, B_2, B_1,$ and B_0 . Input A ($A_3A_2A_1A_0$) will always be a positive number. Input B ($B_3B_2B_1B_0$) is used as a positive or negative number depending on J2. J2 a single-pole-double-throw (SPDT) switches. When the switch position is set on high (+5V), B is a negative number. This allows for subtraction ($A - B$) to take place. When J2 is set low (0V), B is positive and addition ($A + B$) takes place.

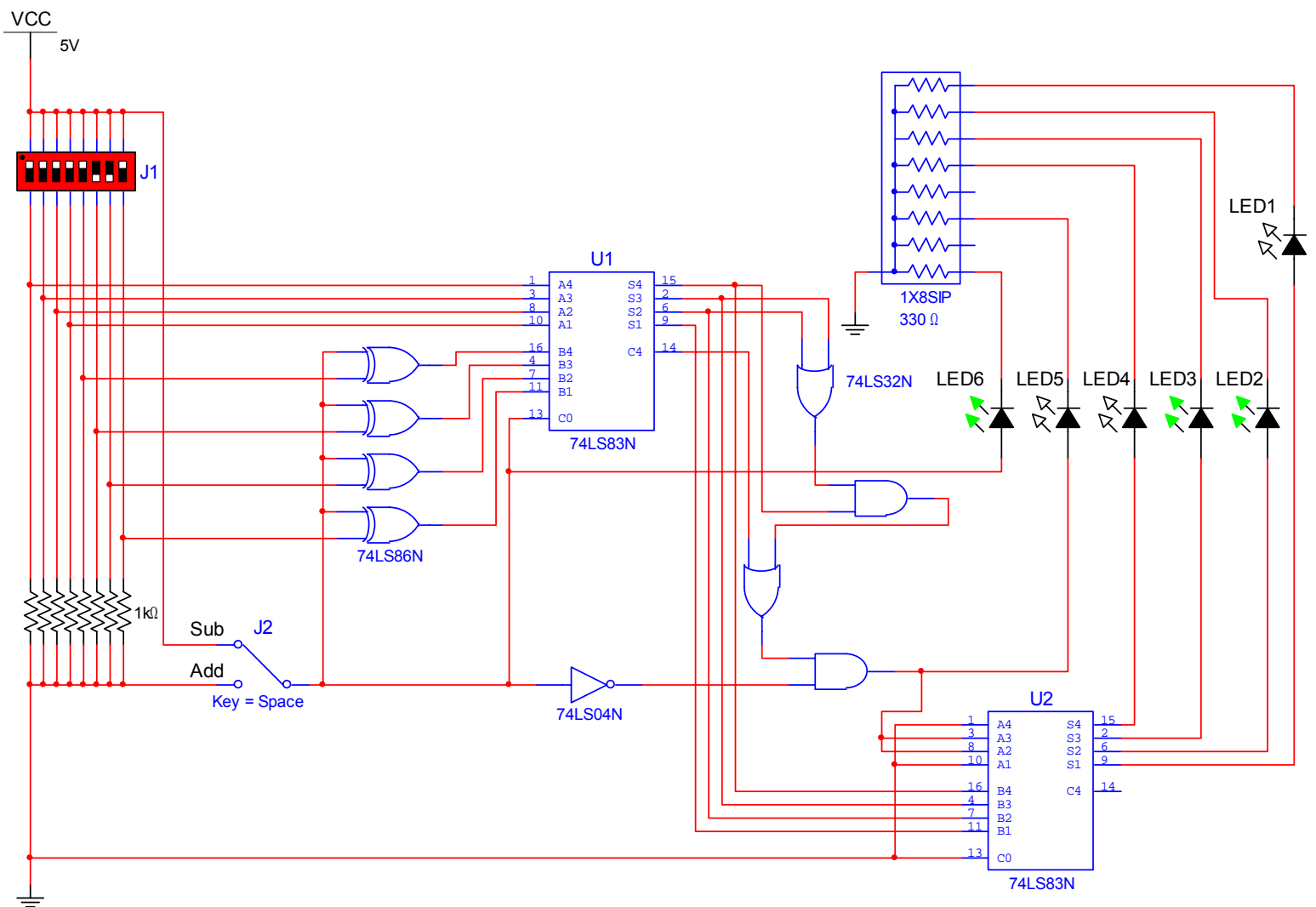


Figure 1: Adder Circuit

Note: Notice that multiple wires are crossing, but recognize that only wires with junction points are connected.

Parts List:

- 1 Dip Switch
- 1 74LS86 IC Quad 2-Input XOR gate
- 2 74LS83 IC 4-bit Adder
- 1 74LS32 IC Quad 2-Input OR gate
- 1 74LS08 IC Quad 2-Input AND gate
- 1 74LS04 IC Hex Inverter
- 6 LEDs
- 1 1x8 SIP 1k Ω
- 1 1x10 Sip 330 Ω

2. Wire circuit on breadboard. Demonstrate to Instructor or TA for credit.
3. Fill in the following table. For LEDs, logic 1 is when a LED is lit. Logic 0 is when LED is not lit.

Control	Switch (Input A)				Switch (Input B)				LEDs					
	1	2	3	4	5	6	7	8	6	5	4	3	2	1
0	0	0	0	0	0	0	0	0						
0	0	0	0	1	0	0	0	1						
0	0	0	1	0	0	0	1	0						
0	0	0	1	1	0	0	1	1						
0	0	1	0	0	0	1	0	0						
0	0	1	0	1	0	1	0	1						
0	0	1	1	0	0	1	1	0						
0	0	1	1	1	0	1	1	1						
0	1	0	0	0	1	0	0	0						
0	1	0	0	1	1	0	0	1						
1	1	0	0	1	0	0	0	0						
1	1	0	0	1	0	0	0	1						
1	1	0	0	1	0	0	1	0						
1	1	0	0	1	0	0	1	1						
1	1	0	0	1	0	1	0	0						
1	1	0	0	1	0	1	0	1						
1	1	0	0	1	0	1	1	0						
1	1	0	0	1	0	1	1	1						
1	1	0	0	1	1	0	0	0						
1	1	0	0	1	1	0	0	1						