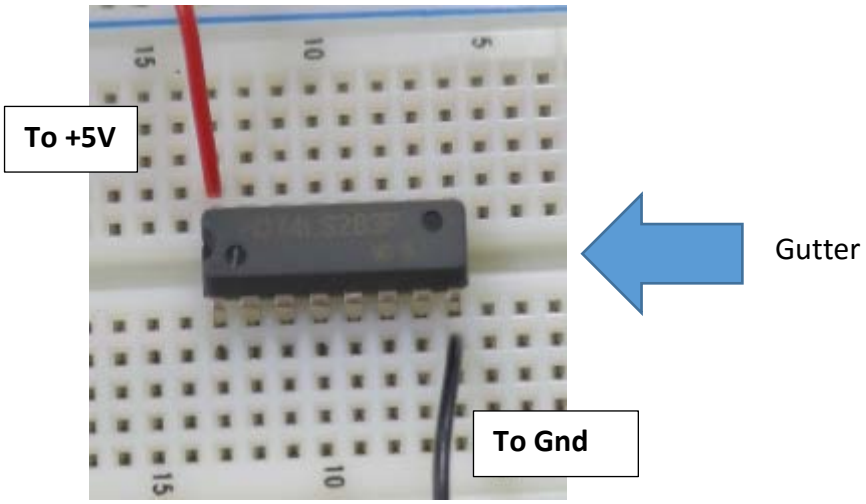
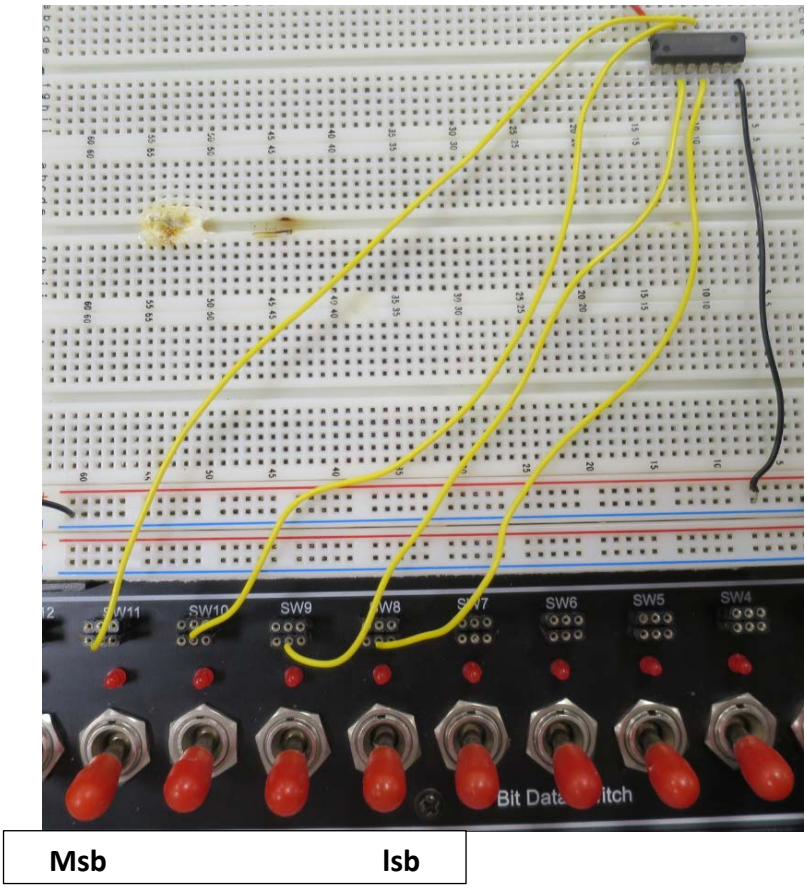
Lab experiment 2 circuit connection guide

Different colour wires (they are the same functionally) are usually used to make circuit connections easier to trace. Students are encouraged to use the same wire colours in this guide so that it is easier to follow the logic signals as well as troubleshoot in the event the connected circuit does not function as expected.

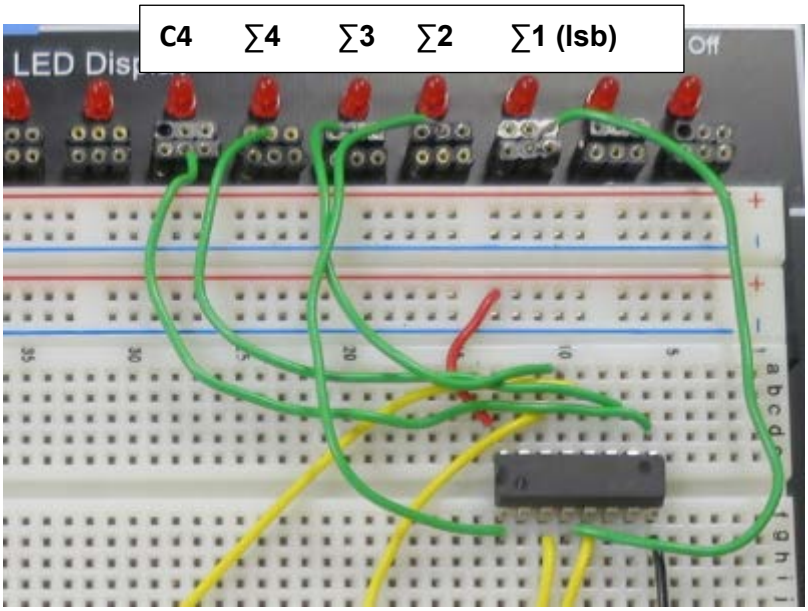
1. Mount the IC 74LS283 (4-bit adder) firmly on the breadboard across the gutter and connect its Vcc (pin 16, **red** wire) and Gnd (pin 8, **black** wire) to 5V and 0V respectively.



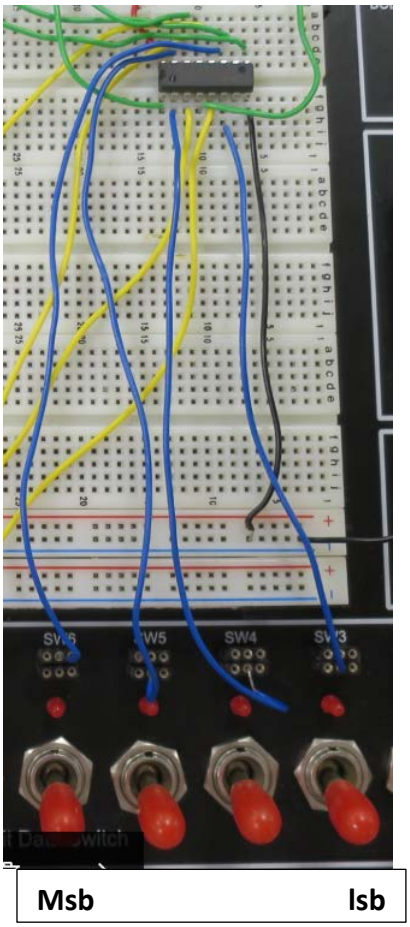
2. Connect the **input** pins A4 (msb), A3, A2, A1(lsb) to a toggle switch each (**yellow** wires).



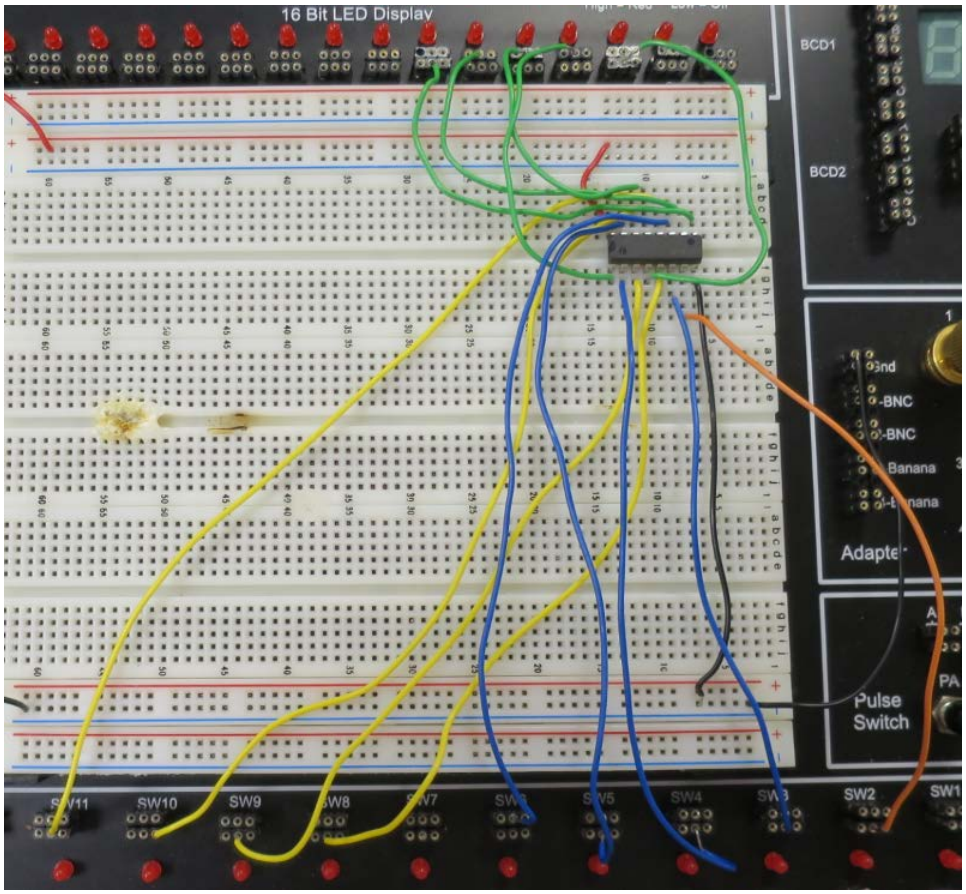
3. Connect the **output** pins C4, ∑4 (msb), ∑3, ∑2, ∑1 (lsb) to an LED each (**green** wires).



4. Connect the **input** pins B4 (msb), B3, B2, B1 (lsb) to a toggle switch each (**blue** wires).

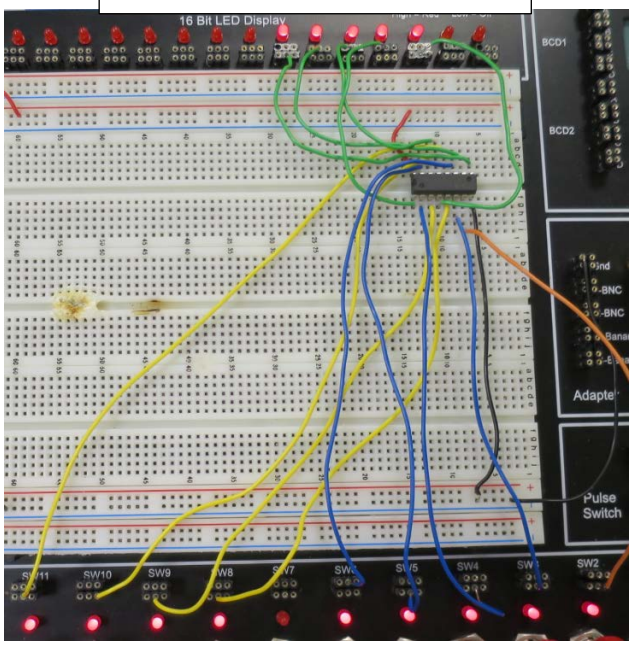


5. Connect C0 (Carry input) to a toggle switch (**orange** wire).



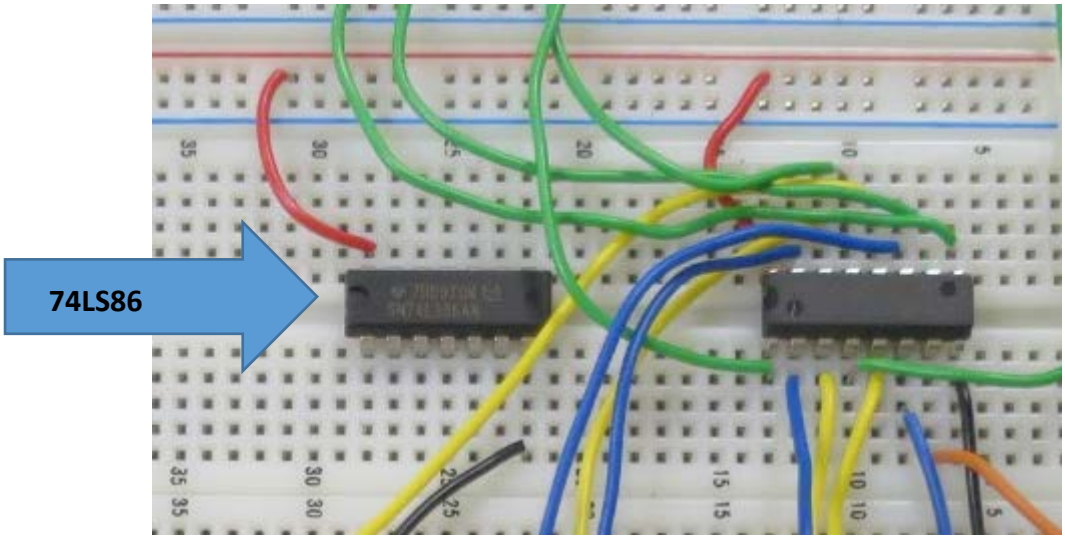
6. Power up the circuit and test it out for <u>arithmetic addition</u>. This figure shows the largest addition result that can be produced by the 4-bit adder.

Outputs: C4 ∑4 ∑3 ∑2 ∑1

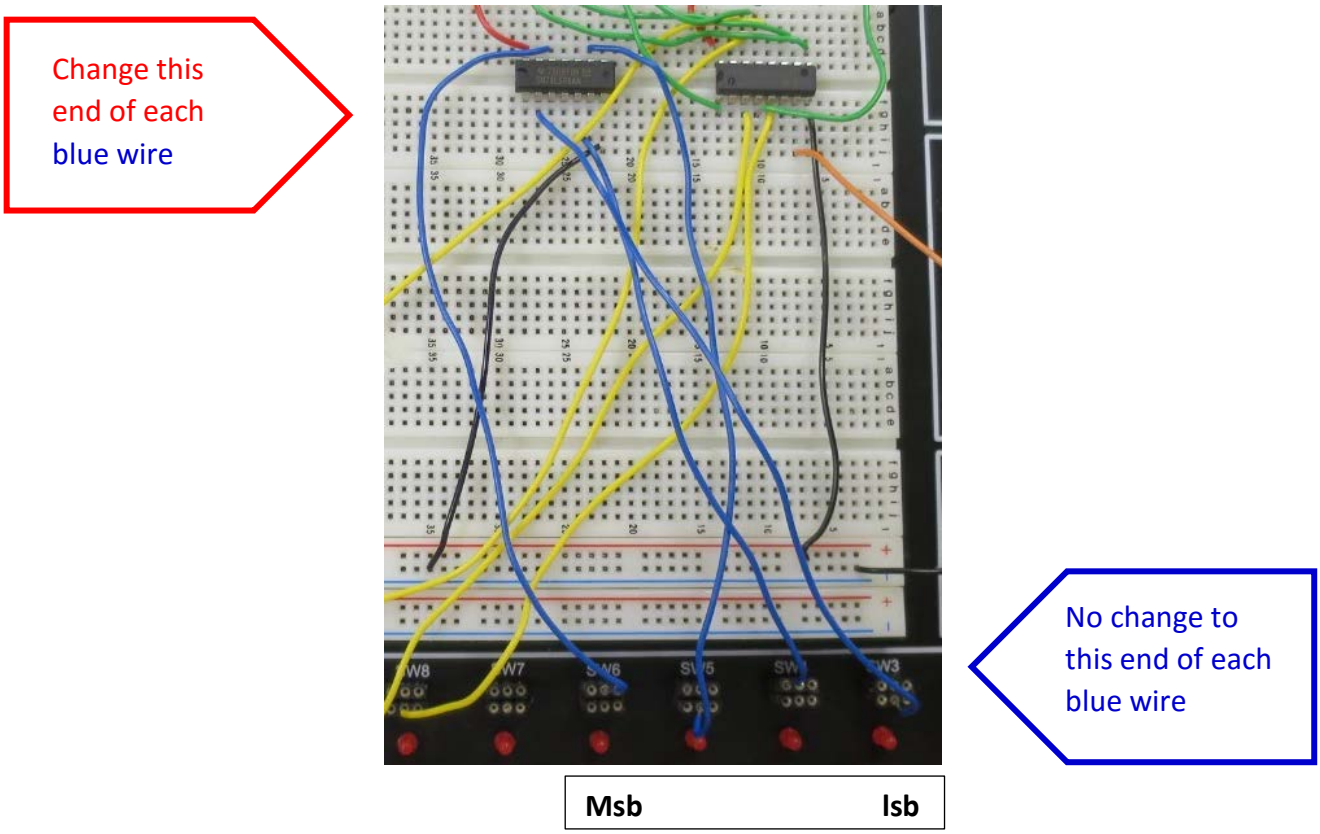


Inputs: A4 A3 A2 A1 B4 B3 B2 B1 C0

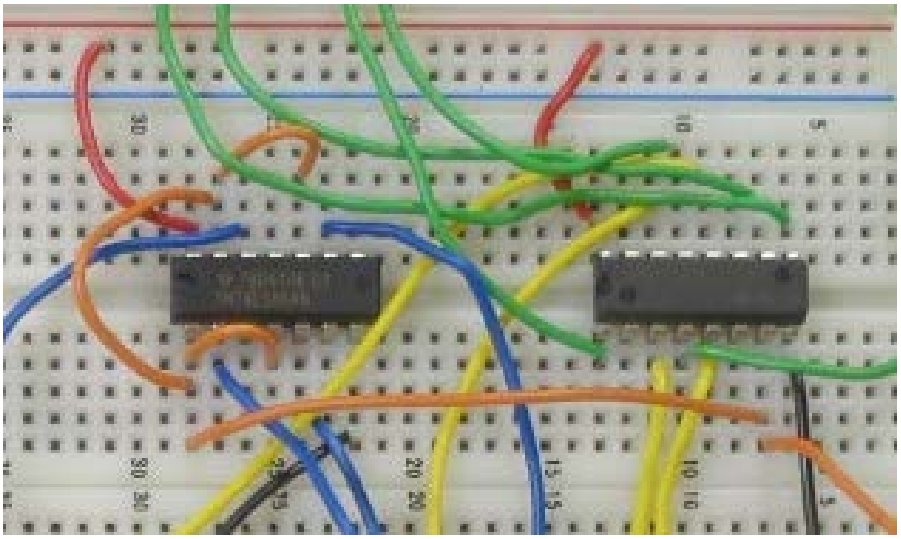
7. Power off the circuit board. Mount the 74LS86 (quad-XOR) IC and connect its Vcc and Gnd pins to 5V (**red** wire) and 0V (**black** wire) respectively.



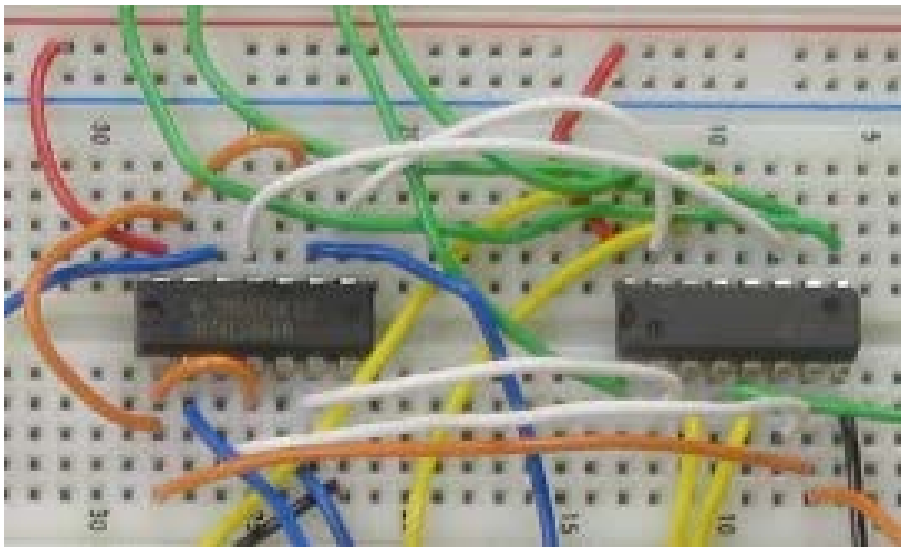
8. Disconnect the toggle switches from B4, B3, B2, B1 of the 74LS283 (4-bit adder) and connect them to the 74LS86 (quad-XOR) instead (i.e. the lower end of each **blue** wire remains connected to the toggle switch, but the upper end is connected to the 74LS86 instead of the 74LS283).



9. Connect the four remaining inputs of the 74LS86 (quad-XOR) to C0 (carry input) of the 74LS283 (4-bit adder) (**orange** wires).

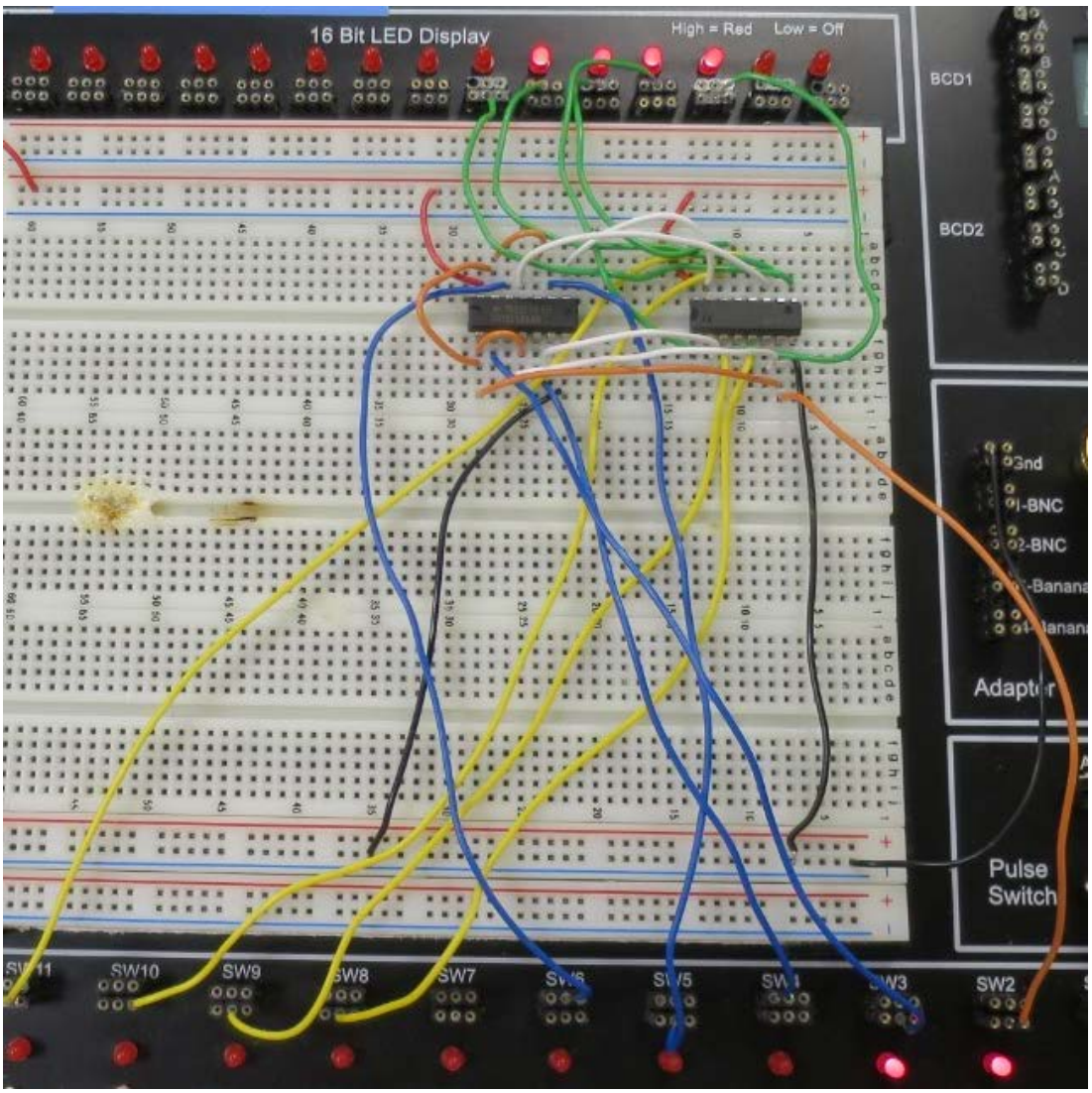


10. Connect the four outputs of the 74LS86 (quad-XOR) to the B4, B3, B2 and B1 inputs of the 74LS283 (4-bit adder). Make sure the order of the bits (msb to lsb) is correct (**white** wires).



11. Power up the circuit and test it out for <u>arithmetic addition and subtraction</u>. This figure shows the binary result of x – y (x=0000, y=0001).

Outputs:	**C4**	**∑4**	**∑3**	**∑2**	**∑1**



Inputs:	**x3**	**x2**	**x1**	**x0**		**y3**	**y2**	**y1**	**y0**	**Add/Sub**

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