

# EECS 203 Lab-Tips

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1. Keep the wiring easy to debug but do not invest too much time in making the wiring too pretty. Your purpose is not to build an incorrect “good-looking” circuit. Pay more attention to making the wiring as clear as possible so that you can locate the most important signals in the breadboard. This will help you debug when your circuit does not work.
2. Debugging a circuit?
  - (a) Check your schematic. Is your design correct? You can do some simple simulation. For example, when you design a 1-bit Full Adder(FA), just set input to “000–111” to see whether sum and carry out are correct based on your logic circuit.
  - (b) If you are sure that your schematic is correct, check your breadboard.
    - i. *Did you use the right chip?* Please check the chip number with corresponding data sheet.
    - ii. *Did you connect  $V_{DD}$  and GND correctly?* If you short the circuit, then you will smell a hot IC within 30 seconds after you plug in the power supply. Just turn off the power supply to see whether any chip is very hot. If so, you made a wiring error. Correct the wiring and plug in the power supply again. Check whether your chip still functions.
    - iii. *Did you connect to the wrong pin?* Check with your data sheet in the orange box to see which pin is input and which is output.
    - iv. *Do you use LEDs correctly?* LEDs have positive and negative pins.
  - (c) If you still do not find the problem, please use the logic probe to check the circuit. Check with the location of the error first. For example, your LED is connected correctly, however it still does not work. Then you can do a reverse check. That means check from output to input. Look at your circuit diagram and use logic probe to test each point, by comparing the test result with your original design, you can find the bug. The most frequent problem I encounter is a floating input. The possible cases are the cases what I said in 2.
3. Recommend way for lab floorplan design and debug.
  - (a) First, count out how many chips you will need to build up the circuit.
  - (b) Second, separate the circuit into several function blocks. For example, you can separate the lab 4 into 5 parts: Input, 3 FAs, sign extension bit.
  - (c) Try to place the ICs inside each block together. Mark the signals of the interface of each block, thereby making debugging easier. You can write down the correspondent pin number.
  - (d) Because some labs are complicated, please check each block first, then check the whole system. If your blocks work correctly, but your system doesn't work, then the problem is from the interconnection between different blocks.