ASSEMBLING
the
ECEbot

Printed Circuit Board: Part Three

Due Date

The Part Three assembly steps must be completed prior to: _____

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20081013RCM

3.1. Soldering Step 8: Light Emitting Diodes

3.1.1. Display

Figure 3-1 shows the location of the 4-digit LED Display (**U1**) to be mounted at the top center of the PCB.

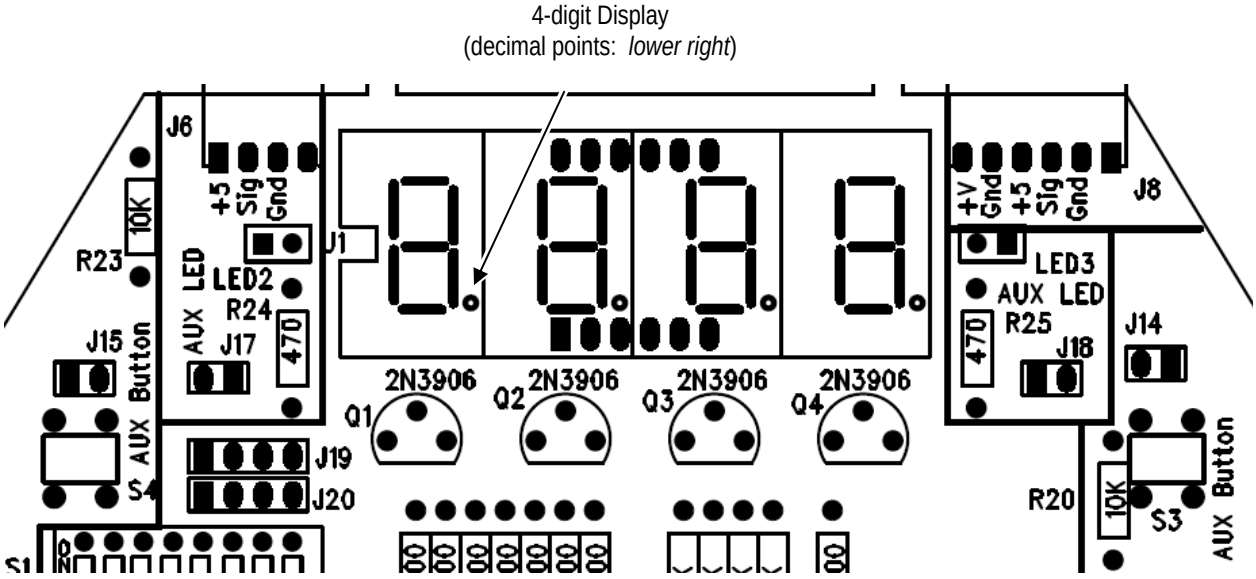


Figure 3-1: Position of 4-digit LED Display

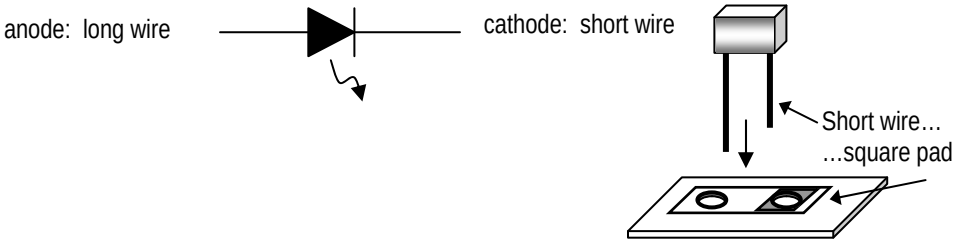
First, take the 4-digit display and insert its 12 pins with the same orientation as the silk screen: *decimal points located to the bottom right of each digit*.

→ As before, use a piece of tape or some other technique to keep the display flush with the PCB while soldering the display's pins on the back side.

3.1.2. Discrete LEDs

Four individual light emitting diodes need to be installed (**LED2**, **LED3**, **LED4** and **LED5**).

Remember: The LEDs (light emitting diodes) are directional. The long wire is the anode and the short wire is the cathode. Make sure the LED is inserted so the short wire goes through the square pad



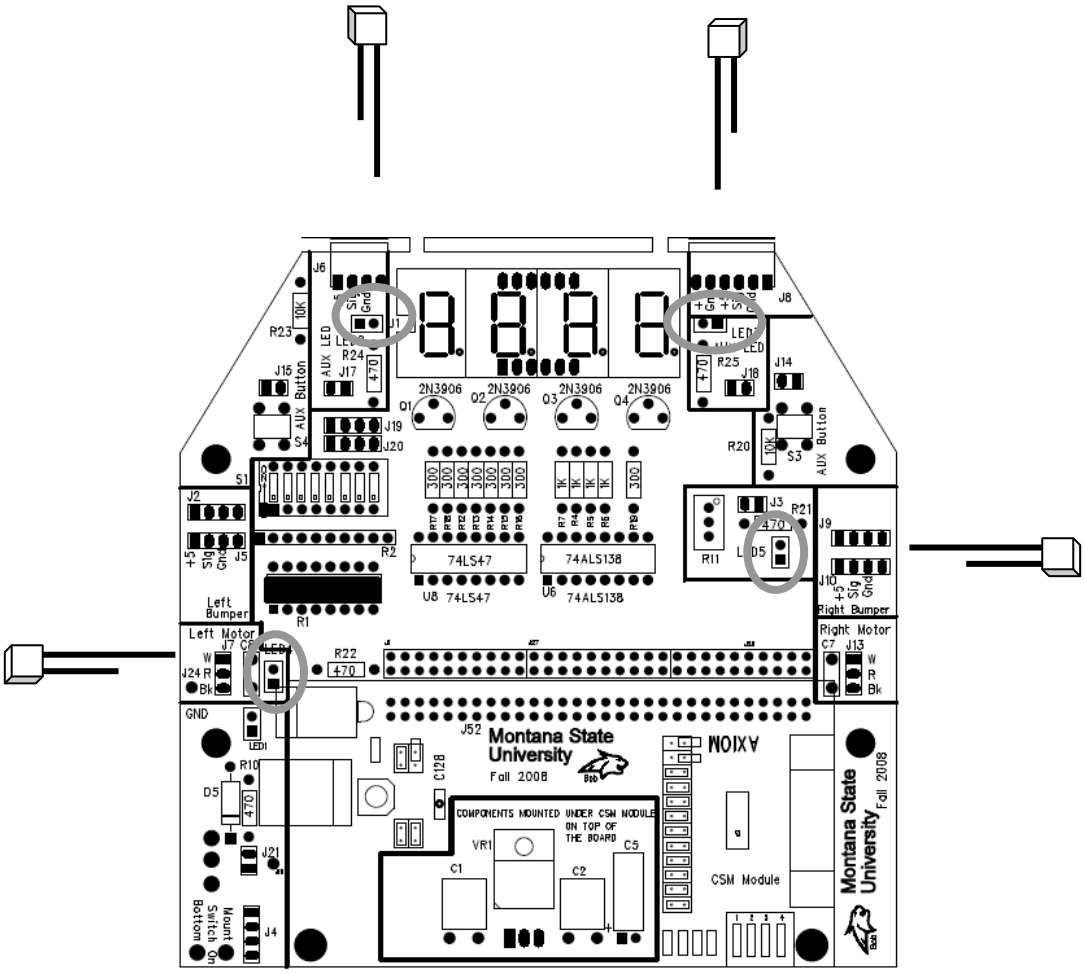
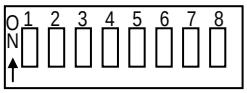


Figure 3-2: Discrete LED Position and Orientation

→ Solder each LED in place and carefully snip the excess wire.

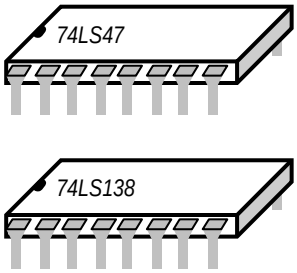
3.2. Soldering Step 9: DIP Switches and Decoder Chips

3.2.1. DIP Switches



→ Next, solder in place the 16 pins of the DIP switch (**S1**), making sure that the switch numbers and 'ON' label read right-side up before you start soldering. By now you are probably getting pretty comfortable soldering, but be sure to only use just enough heat and time to make good joints: overheating can cause damage to the components.

3.2.2. Decoder Integrated Circuits



The final electronic components are two integrated circuit (IC) packages. These are black, 16-pin, dual in-line packages. **Although the two packages are exactly the same shape and size, notice that they are labeled with different part numbers and they perform two different functions**. They must be installed in the proper place. IT MATTERS WHICH CIRCUIT GOES WHERE, SO DOUBLE-CHECK YOUR IDENTIFICATION AND PACKAGE ORIENTATION!!

Hint: The integrated circuits can be damaged easily by static electricity and overheating during soldering. It is possible for a static discharge to occur even if you don't feel or see a spark! Be sure to discharge yourself frequently when working at the lab bench by touching a grounded panel or chassis. If possible, use an approved grounding wrist strap and antistatic mat.

→ The device placed in location **U8** (left spot) is the 74LS**47** ("BCD to 7-segment decoder"). Turn the device so that the notch on the package is to the left, and gently insert through the holes. Keep the package flush with the board while you solder the pins on the back side. *Don't overheat the pins!*

→ The device placed in location **U6** (right spot) is the 74LS**138** ("1-of-8 decoder"). Orient the package so the notch is on the left, and hold the package flush with the board while you solder the pins on the back side.

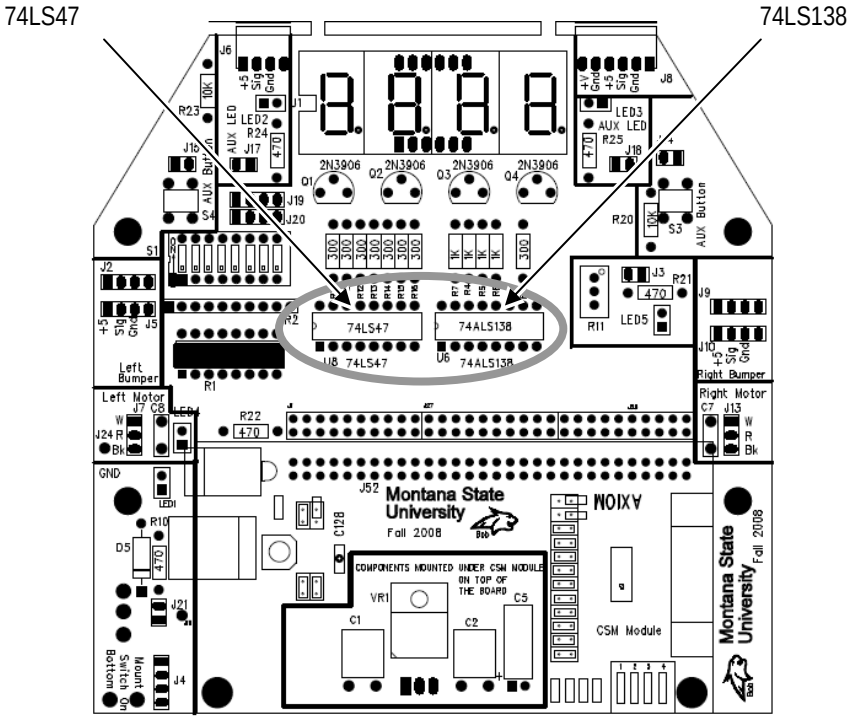


Figure 3-3: Placement of the Decoder ICs. Double check the IC label and mounting position!

3.3. Soldering Step 10: Bumper Switch Connectors

The last soldering step is to attach the two edge connectors for the bumper switches.

→ Locate the 4-pin edge connector and solder it in place on the top left front of the board (**J6**), and locate the 6-pin edge connector and solder it in place on the top right front (**J8**).

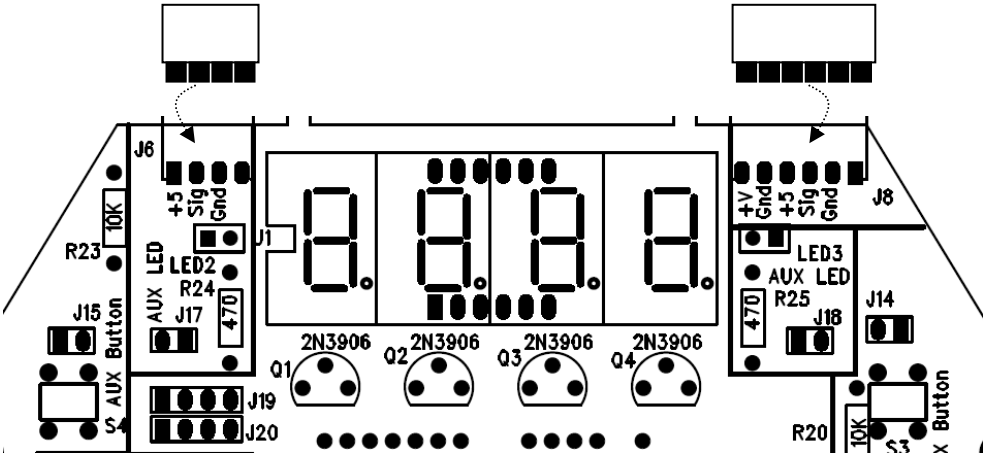


Figure 3-4: 4-pin and 6-pin edge connectors (for bumper switch attachment).

3.4. Final PCB Visual Inspection

Take a moment to examine the board carefully and critically.

- Are there any missing components—other than the unused areas of the board?
- Are all the pins soldered completely?
- Are there any "whiskers" or "solder bridges" between the pads?
- Is there any loose debris (like solder crumbs or metal flakes) caught anywhere on the board? Look closely.
- Do you see any damage to the board or its components, like bent pins, cracked housings, or crushed LEDs?

Be sure to ask your instructor or lab TA to examine any questionable areas of your PCB. You will perform electrical tests during the next lab session.

You must complete the entire PCB assembly to this point by the due date.