Chapter Three: Understanding the components of your CalBOT kit

1. The CalBOT Kit

Figure 1 below shows the most important components of your kit.

![Figure 1. Stuff in your CalBOT kit. Clockwise from top left, you should have: a Ni-CD battery, a plastic bag with some switches and a motor driver IC (SN754410), a DC adaptor (or charger), a wire-wrap tool, a dummy plug, the KitCON-167 hardware manual, the C167 User’s manual, the Getting Started manual, the datasheet for the C167CR (optional), the serial cable and most important of all, the board and the body (Note that the LCD display is optional).](image)

Having seen the components in the kit, let us examine them one by one.

(a) The Ni-CD battery

This is the power source block in figure 1, chapter 1. Ni-CD batteries are different from ordinary batteries in many respects:

1. They can provide higher amounts of current for a given voltage than a regular dry-cell battery.
2. They also have the “memory effect”. That is, if you do not completely discharge the battery before charging it, the effective voltage on the battery will be reduced.
In order to avoid the memory effect, completely discharge the battery before charging it. The battery is fully discharged when its voltage drops below 7 V.

To charge a Ni-CD using your adaptor, follow the four step process in figure 2. The dummy plug simply makes sure the battery receives all the adaptor voltage, not the board. This process usually takes 24 hours, because your adaptor can supply only a small amount of current (around 300 mA). If you want to charge the battery quickly, use the charging stations in the EECS 40 lab. Ask a 40 TA to demonstrate the use of the charging stations. PLEASE DO NOT LEAVE YOUR BATTERY IN THE CHARGING STATION OVERNIGHT. WE ARE NOT RESPONSIBLE FOR LOST BATTERIES!

(b) Wire Wrap tool

A wire wrap is a gun provided in your kit for wiring circuits. Examine the end of the gun’s barrel, and note that there are two holes: a large one in the center (for the post), and a smaller one towards the perimeter (for the wire). Your wire wrapper also includes a slit in the middle for stripping wires. Place a wire\(^1\) into the strip and just pull. Remove 1” of insulation. Please refer to figure 3. Now, take a small piece of stripped wire and

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\(^1\) You can buy wire-wrap wire from the IEEE office in 204A Cory.
place it into the smaller hole as far in as it will go. A small portion of the insulation should fit into the hole. Now, bend the wire 90 degrees.

Push the barrel of the gun into one of the KitCON connector pins on the board. Turn clockwise a few times to wrap the wire. To unwrap a wire, fit the larger hole of the wire wrap gun into the KitCON connector pin and turn counter clockwise. Refer to figure 4. Your TA should give you a hands-on demonstration of wire-wrapping. For further information, please refer to the following webpage:
http://www.cs.utah.edu/classes/cs3700/lab3/node13.html#SECTION000380000000000000000

![Figure 3. Wire wrapping gun.](image)

![Figure 4. Wire wrapping.](image)

Wire-wrapping might be time consuming and seem mundane, but if you do it incorrectly, it WILL MAKE DEBUGGING INSANELY HARD! Please take time to wire-wrap correctly the first time around.
(c) Documentation

The manuals that come with your kit are (refer to figure 1):

1. **KitCON-167 hardware manual** describes the board in detail. It has block diagrams, and DIPs/jumper configurations among other things. The hardware manual will be referred to throughout this book.

2. **C167 User’s manual.** As the name implies, this manual describes your microcontroller in full detail. This 300-page bible will be the main source of information about your controller.

3. **The Getting Started and Microcomputer Components** are not very useful and will not be covered in this book. Feel free to skim through them.

(d) Miscellaneous hardware

Figure 5 shows the touch sensor and the motor driver.

![Image of touch sensor and motor driver](image)

**Figure 5.** The switch (touch) sensor (on the left) and the motor driver. You may have a switch of a different size.

The serial cable, the CalBOT body and the KitCON-167 round up the final components of your kit.

2. **Summary**

This chapter covered a lot of material. It gave you an overview of what is in your kit. The following checklist shows what you MUST have in the kit:

1. The KitCON-167
2. The CalBOT body
3. The Ni-CD battery
4. The DC adaptor
5. The dummy plug
6. Touch sensor(s)
7. The motor driver IC
8. The serial cable
9. The wire-wrap tool
10. The KitCON-167 hardware manual
11. The C167 user’s manual

If any of the above components are missing, contact your TA ASAP.