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Line Following Servo Robot Kit (SRK+Line) Reference Manual

Revision: August 1, 2012

Overview

The Digilent Line-Following Servo Robot Kit (SRK+Line) provides the perfect starting point for those new to robotics, but has the power to be used for advanced designs and applications as well. The SRK+Line pairs our powerful Cerebot™ MX3cK microcontroller development board with a rugged steel platform and all the motors, wheels, sensors, and other parts needed to build a complete robot.

This document demonstrates a simple design that will get your SRK+Line up and running, using its four IROS sensors to follow a dark line on a lightly colored surface. Using your SRK+Line's powerful Cerebot MX3cK microcontroller, you'll be able to add all sorts of functionality to your robot. Add some of our extensive line of peripheral modules (Pmods™) and you can design almost anything!

Your Cerebot MX3cK can be programmed with either Microchip MPLAB® IDE or chipKIT™ MPIDE. Microchip MPLAB IDE can be downloaded for free from microchip.com. chipKIT MPIDE can be downloaded for free from github.com/chipKIT32/chipKIT32-MAX/downloads.

The demo project used in this design can be downloaded from the Line Following Servo Robot Kit product page at digilentinc.com. For more information on programming the Cerebot MX3cK with MPLAB or MPIDE, see the *Cerebot MX3cK Reference Manual*, available from the Cerebot MX3cK product page at digilentinc.com.

Included parts:

- Cerebot MX3cK
- PmodLS1 with Pmod clip
- four IRROSC
- bent bracket
- one 6" 6-pin cable
- 4" Velcro Mounting Strip
- standoffs for mounting MX3cK
- battery holder (4xAA)
- 2" Velcro Strip
- one two pin MTE battery cable
- rugged Metal Platform with Holes on ½-inch Center
- two continuous rotation GWS servos
- two servo brackets
- rugged plastic wheels and tail skid
- two Pmod brackets
- PmodCON3
- PmodBTN
- one 6" 6-pin cable
- 8/32 Machine Screws
- 8/32 Hex Machine Nuts
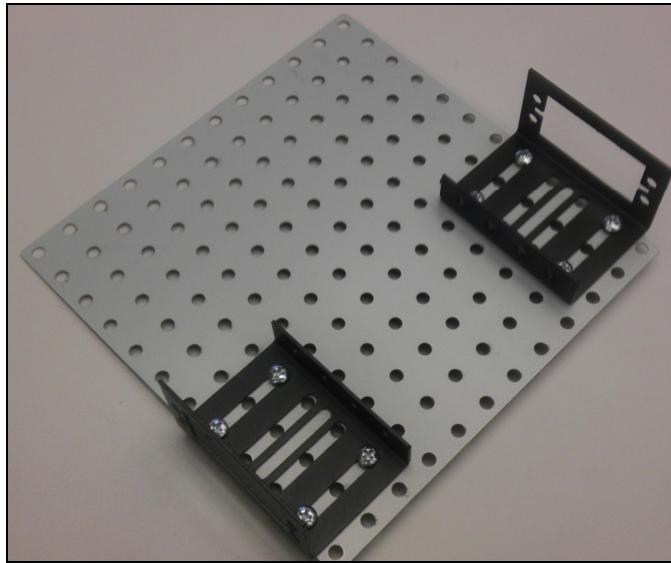
Functional Description

The rugged steel components have holes on ½-inch centers allowing Digilent circuit boards and other vendors' products to be easily attached.

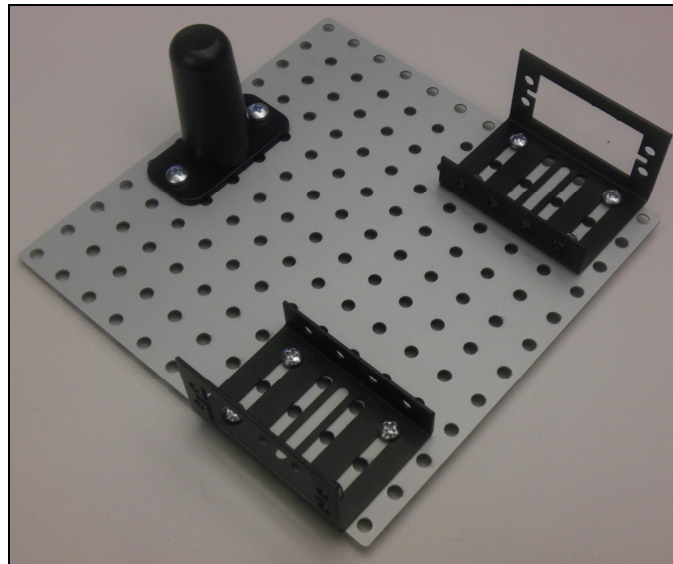The following tools are recommended for robot assembly:

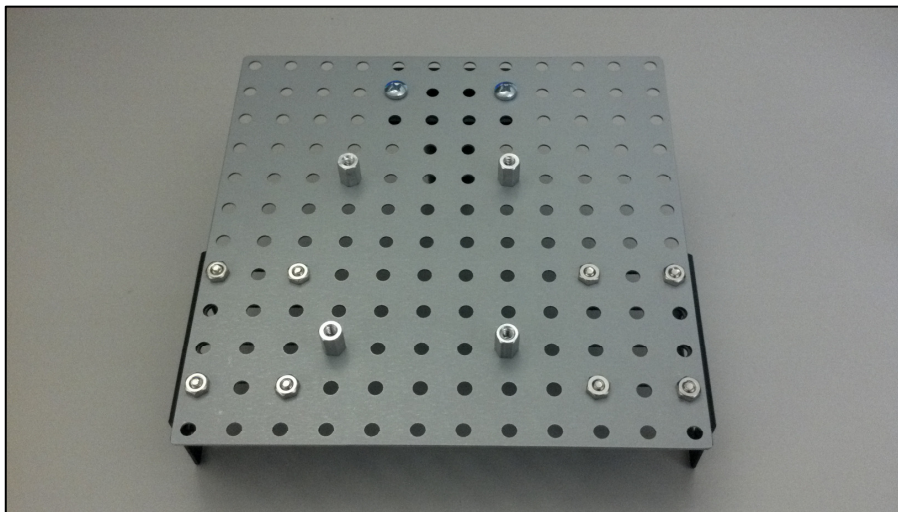- regular and small Phillips head screwdrivers
- pliers

Example Assembly

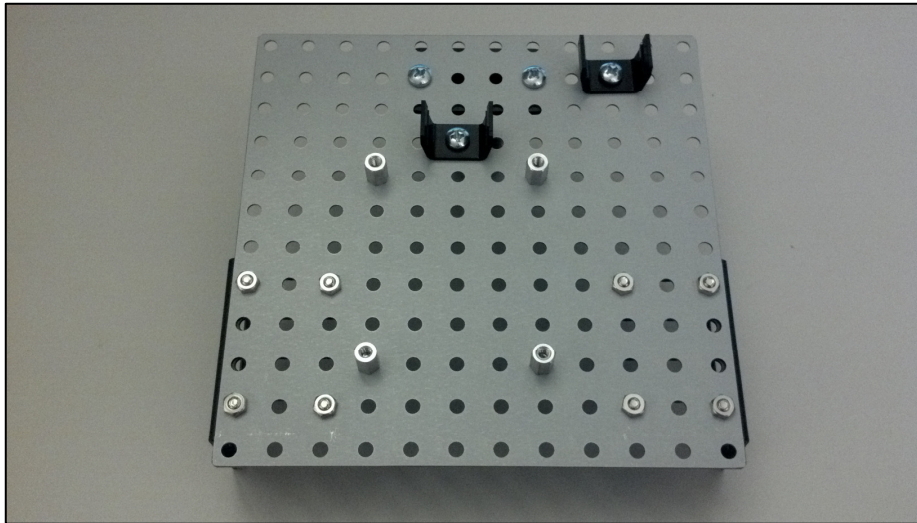1. Attach the servo brackets to the main plate as shown.
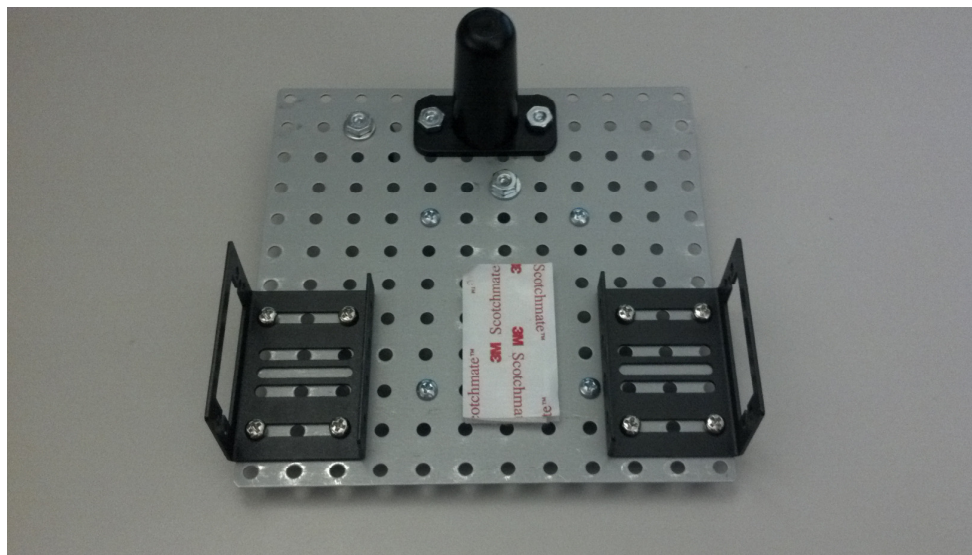
2. Attach the rear tail skid.

3. Add the standoffs to the robotic kit as shown below. Set four extra screws aside to mount the MX3cK in a later step.
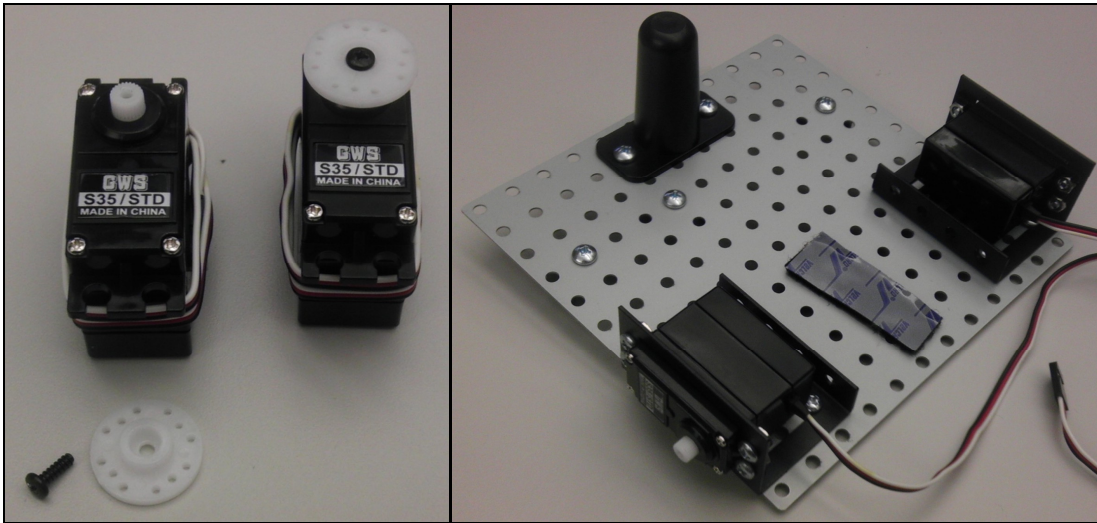
4. Attach the two Pmod clips with the hardware included in the Pmod clip bags.


5. Peel off one side of the Velcro and stick it to the main plate.

6. First, remove the white servo wheel by unscrewing the black screw, and set them aside. Mount the servos using the remaining hardware that came with the servo mounts.


7. Take out the two wheels and the rubber traction bands. Stretch the rubber band around the outside of the wheel. Then, attach the wheels to the servos, and secure them using the small black screws that were removed in the previous step.
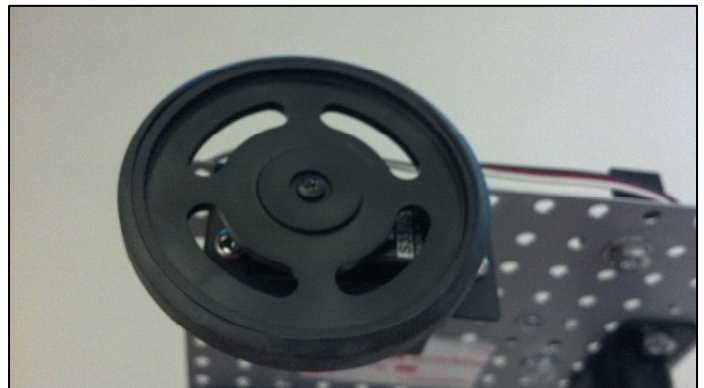
8. Attach the MX3cK to the standoffs using the four screws that were set aside in step 3. If the through-holes on the MX3cK and the standoffs do not line up, loosen the standoffs, and re-tighten them after the MX3cK is attached.
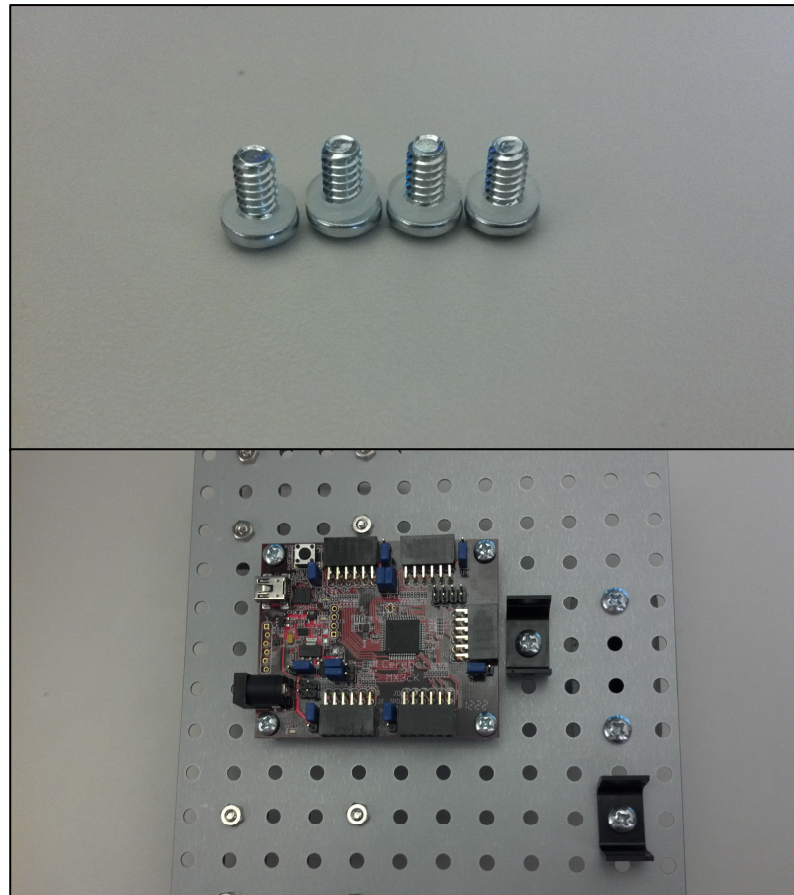
9. Connect the Pmods as shown below. The PmodCON3 connects to JC 6-10 (the bottome row) and the PmodBTN connects to JD 1-4 (the top row). Take care that the pins are all connected in the correct orientation. See below. The symbol that looks like a flower should only be visible on one end of the 6 pin cable, as you look down on the RDK.
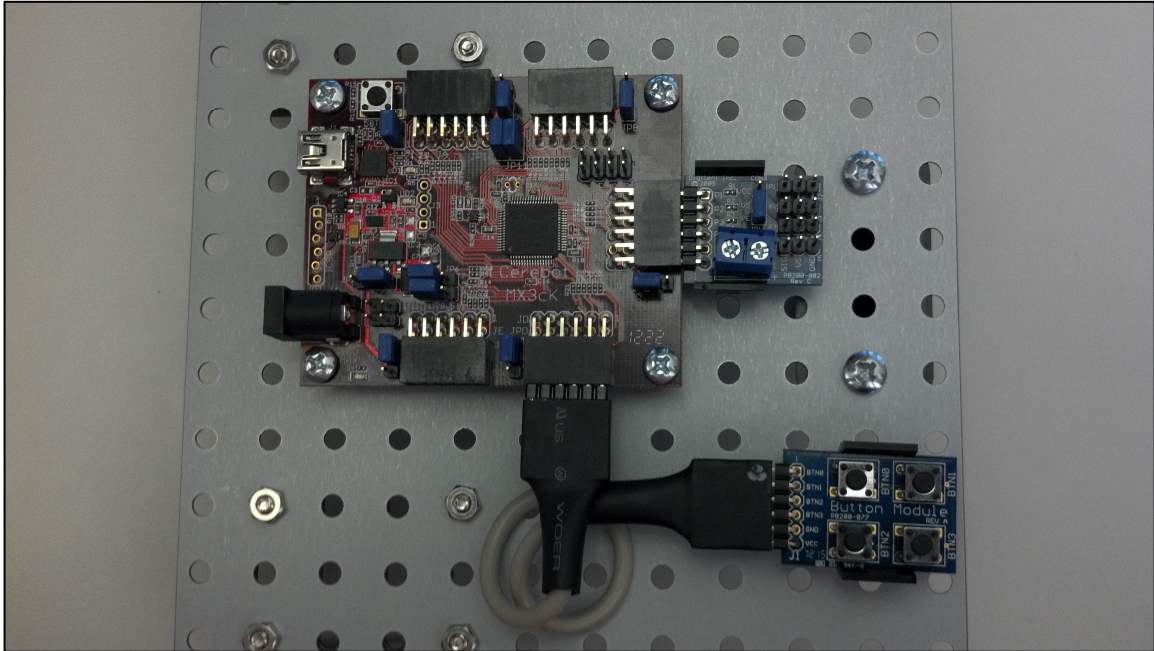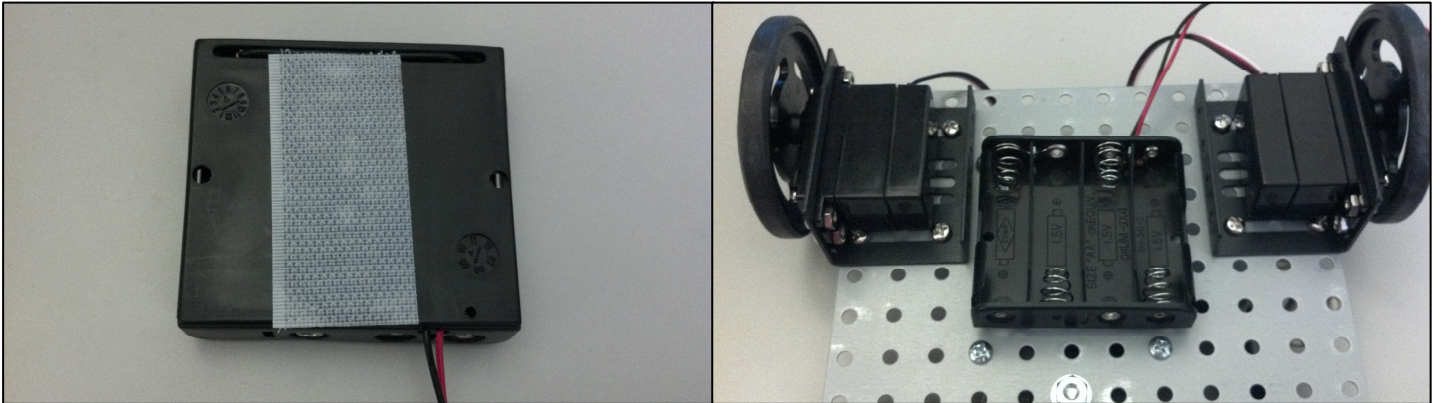

10. Connect the right servo to J4 and the left servo to J5 on the PmodCON3. The white cable must be connected to the pin labeled "SIG".
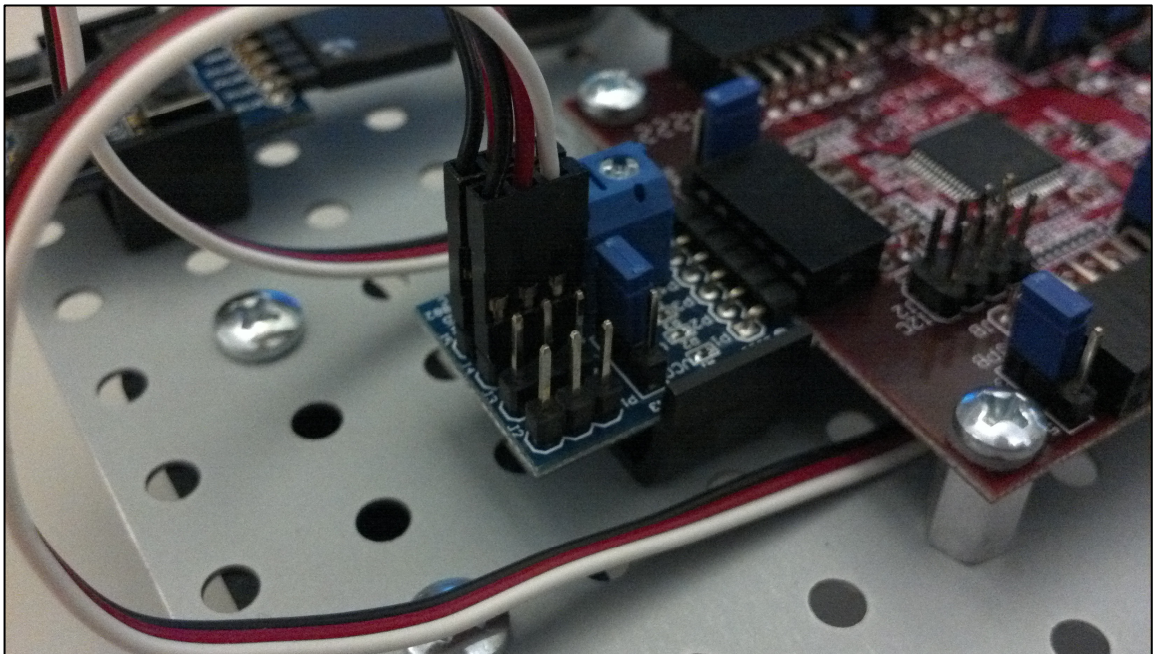
11. Remove the other piece of backing from the Velcro and attach the battery case.


12. Connect the open ends of the two pin MTE battery cable to the blue screw terminal on the PmodCON3 (J6). Take care that the red wire goes in the '+' side of the screw terminal, and that the black wire goes in the '-' side of the screw terminal. Then, attach the connector side of the two pin MTE battery cable to the two pin header J6 on the MX3cK as shown below. Take care that the red cable connects to the '+' pin (V) and that the black cable connects to the '-' pin (G).
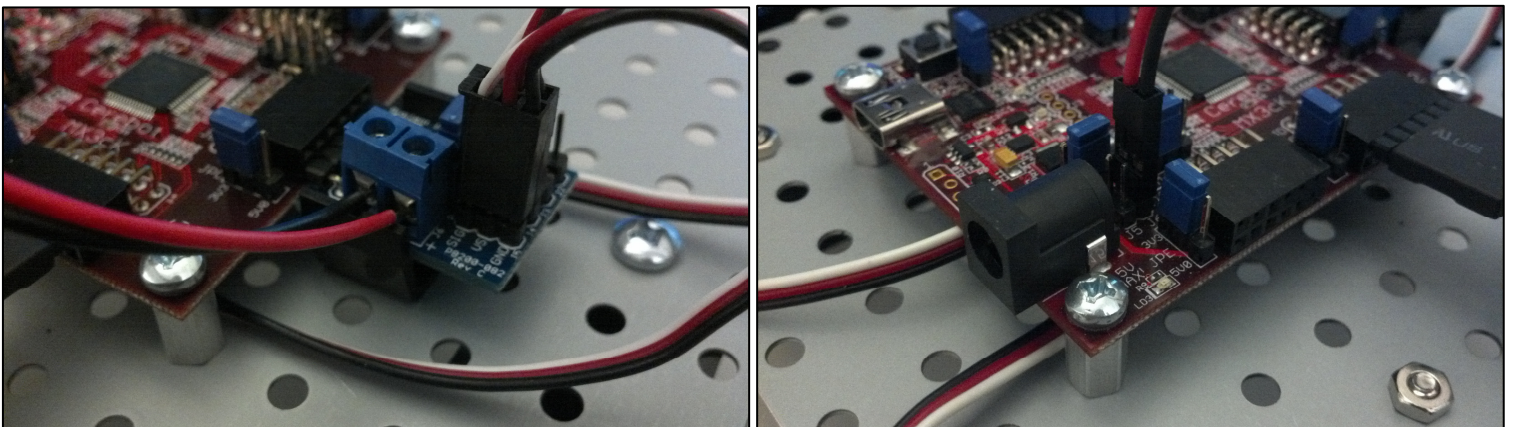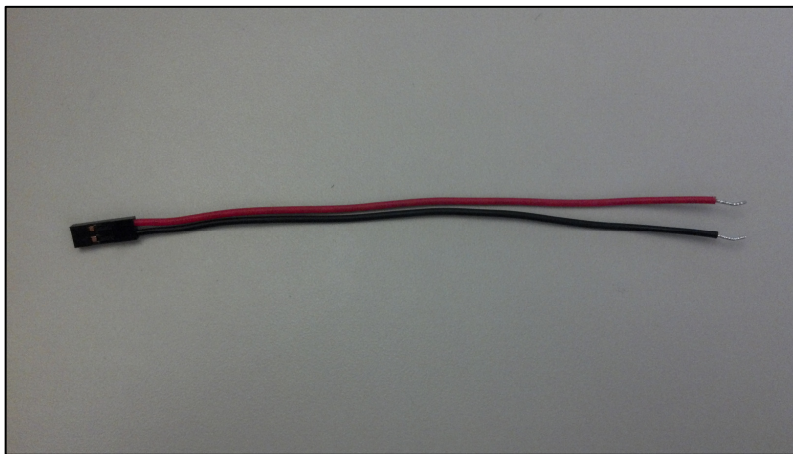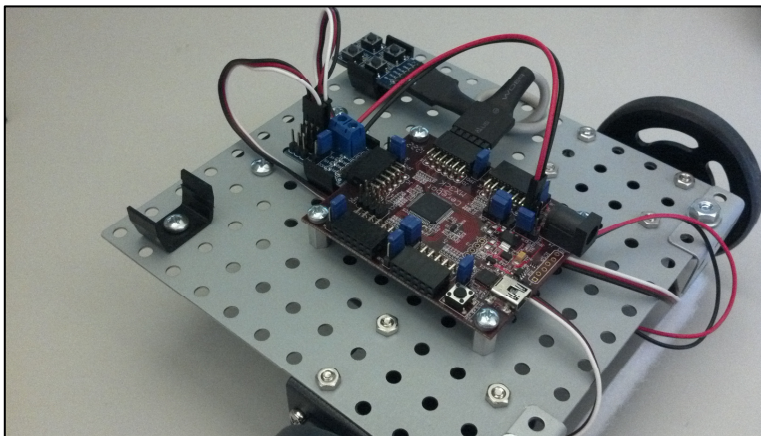
13. Attach the bent bracket to the front of the platform as shown below, along with the longer Velcro mounting strip.
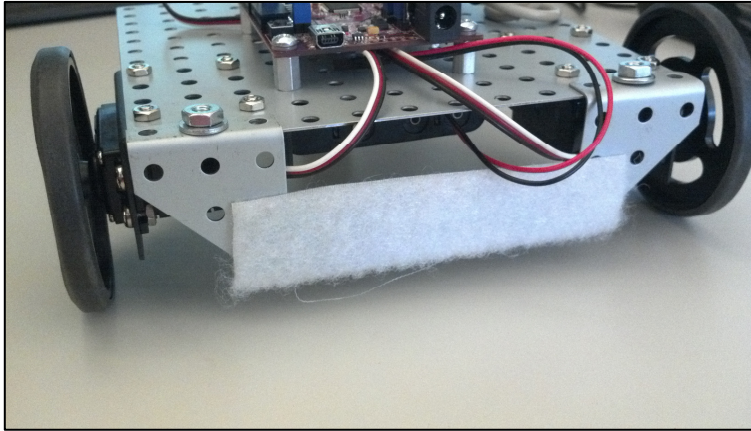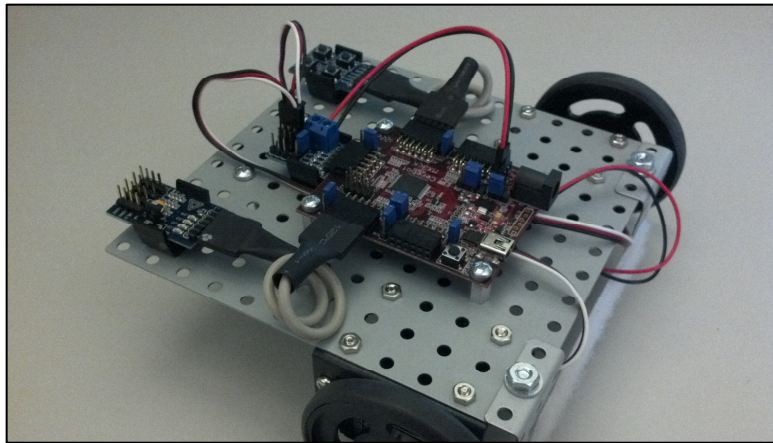

14. Cut four ½-inch sections of Velcro from the other 4-inch strip. Attach these 1/2 –inch strips to each of the four IROS sensors.
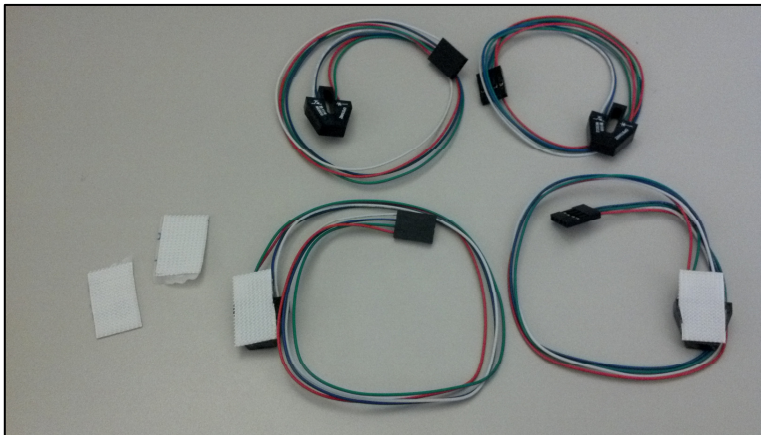

15. Attach a third Pmod Clip for the PmodLS1.

16. Connect the PmodLS1 to the bottom row of Pmod header JB (pins 6-10). Again, be sure that the pins are properly connected, and that the flower-like symbol on the 6-pin cable is only visible at one end.

17. Attach the four IROS to the bent bracket from left to right using the attached Velcro, and connect the sensors in the same order to each of the headers (S1-S4) on the PmodLS1. In other words, if the robot is facing forward, and you are looking down on it from above, the sensor on your far left should be connected to S4, the sensor at mid left should be connected to S3, the sensor at mid right should be connected to S2, and the sensor at the far right should be connected to S1.
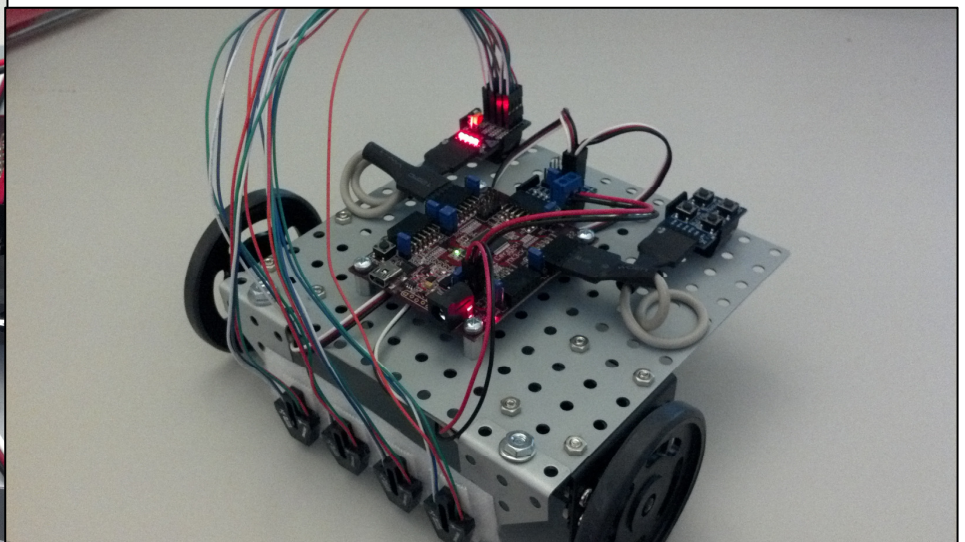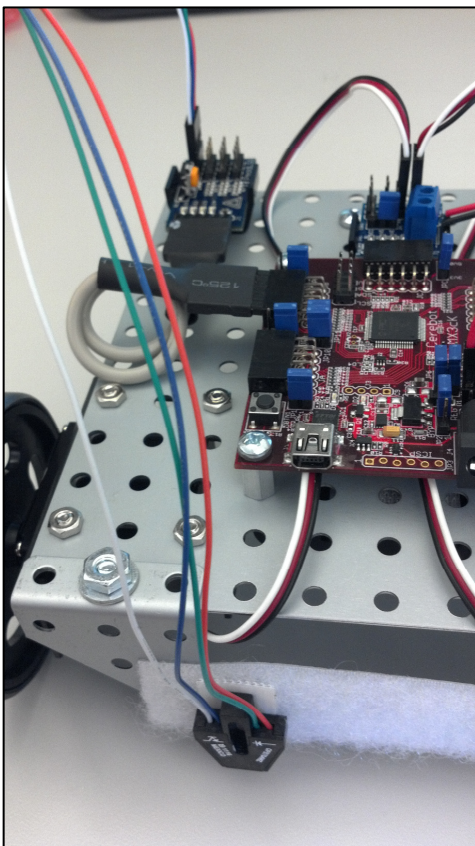
18. When you are ready to power the MX3cK, add 4 AA batteries to the battery pack, and attach the connector end of the MTE cable to the two pin header J5 on the MX3ck. Take care that the red cable connects to the '+' pin (V) and that the black cable connects to the '-' pin (G).
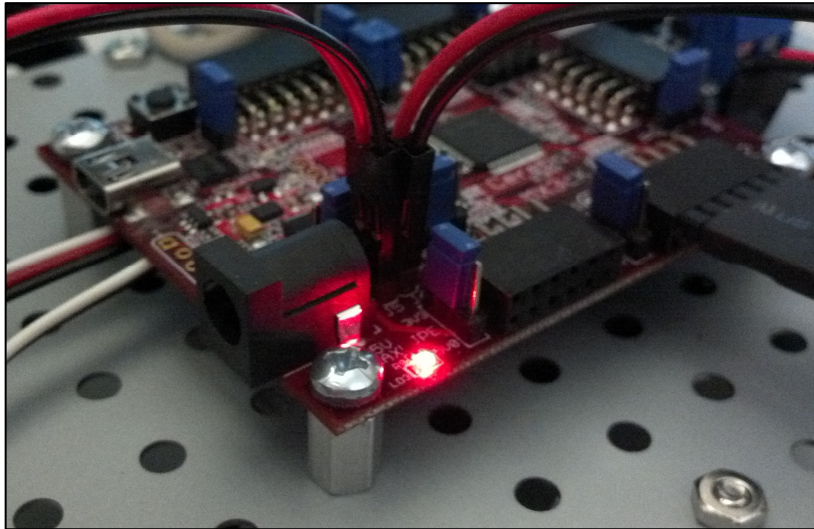
You can now use MPIDE to program the *LineFollowingSRK* demo project to the board. Again, this demo project can be downloaded from the Line Following Servo Robot Kit product page at digilentinc.com. Once the board is programmed, place the robot on a lightly colored (preferably white) surface with a black line between the two middle sensors. Turn the board on and press BTN2. The robot will start moving. To stop the robot, press BTN2 again. If the robot is moving in the opposite direction than expected, then check that step 10 above has been followed correctly.