



**IEEE**

**Ottawa  
Section**



**IEEE Ottawa Robotics Competition  
Compétition de robotique d'Ottawa d'IEEE**

## Arduino Building Instructions

**Last Revised: 24 January 2016**

- 1.** Solder wires onto all the components
  - a. Solder 6 inch wires onto the 2 QTR-1A (Ultrasonic) sensors.
  - b. Solder 6 inch wires onto the HC-SR04 (IR) sensor.
    - i. Solder 8 inch wires onto both leads of the 2 gear motors. Be careful as the tab on the motors breaks off easily.
    - ii. To prevent fatigue from damaging the joint you can strain relief the wire and wrap tape around it

There are six preprinted holes on chassis. In order to get the screws to fit nicely, you should re-drill it with a 1/8" drill bit. Do the same for the holes on the front support and motor holders.

- 2.** Using two 4-40 x 1/4 inch screws, attach the front support post to the base of the chassis by screwing one screw into each of the holes at the front of the robot base.
- 3.** Place the motors in the motor holders. Make sure that the silver DC motor side fits into the cut-out notch on one side of the holder.
- 4.** Position the motor holders on the base of the chassis such that the screw holes on the motor holder line up with the drilled holes on each side of the chassis. Make sure that the motor axis line up well.
- 5.** Using four 4-40 x 1/4 inch screws, attach each motor holder, containing a motor, to the robot chassis.

- 6.** Attach one wheel to each motor. Make sure that the base of the robot is stable and level. Screw the wheels into the motor.
- 7.** Insert one QTR-1A sensor into each sensor holder on the front support part. Thread the three wires that were soldered to each QTR-1A sensor through the holes found at the sides of the robot chassis.
- 8.** The Arduino Uno can be placed in the Arduino holder on the top of the robot chassis.
- 9.** After the Arduino has been placed in its holder, attach the motor shield to the Arduino by placing it on top of the Arduino and lining up the corresponding pins.
- 10.** The wires that were soldered to each motor can be connected to the motor controller shield by inserting the loose end of the wire into the screw terminal and tightening the terminal by rotating the screw head found on the top of the terminal.
- 11.** Remove the backing from the 170 tie point bread board and place it on the base of the chassis, directly behind the HC-SR04 holder.
- 12.** Insert the HC-SR04 sonar sensor into the holder found at the front of the robot chassis.
- 13.** Insert six AA batteries into the battery pack and slide it into the battery holder under the Arduino holder.
- 14.** Connect the power plug on the battery pack to the power jack on the Arduino.
- 15.** Using jumper wire, connect the 5V and GND pins on the Arduino to 2 SEPARATE rows on the breadboard. Connect the 5V and GND wires that were soldered to each sensor to the respective 5V and GND rows on the breadboard. Be extremely careful not to mix up which wire is 5V and which wire is GND, short circuiting a sensor may damage it!

- 16.** Connect the third and final loose wire on each QTR-1A sensor to one of the analog input pins on the motor shield. Be sure to note the analog pins used.
- 17.** Connect the trigger and echo wires on the HC-SR04 sensor to pins 11 and 12 on the motor shield.

Your robot is now ready to be programmed! The Arduino IDE can be used to program the Arduino as usual. We provided a library that will make it easier to use the motor shield and sensors, you can find it on our library.

**Suggestions:**

It would be a good idea to trim the wire lengths to the shortest length needed once all of the parts have been installed. Extra wire gets messy and makes it harder to fix problems in the electronics.

Using some zip ties to keep cables together and out of the way is a nice touch. This is mostly for aesthetics but as mentioned before, tidy wiring makes fixing problems much easier.

Make sure the wheels can spin freely. If there is any friction between the wheels and the chassis, remove some of the chassis using a file or sandpaper.