

Building the Robot

Build a robot that uses the ATmega Board as a controller.

Site: [iCODE](#)

Course: Machine Science Guides (Arduino Version)

Book: Building the Robot

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Date: Thursday, August 7, 2014, 01:49 PM

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Building the Robot

The ATmega Board provides an ideal controller for small-scale servo robots, like the one shown in Figure 1. This robot is built with the components included in Machine Science's [Robot Base Kit](#) and [Sensor Expansion Pack](#).

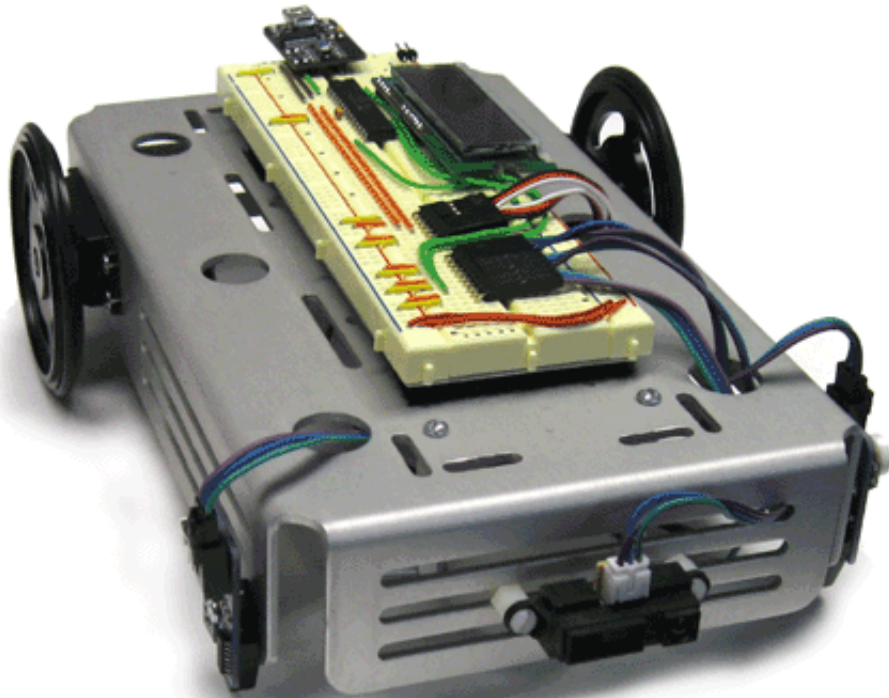


Figure 1. A servo robot controlled by the ATmega Board.

Important

This tutorial assumes that you have built the ATmega Board and learned how to write simple programs to control input and output devices. If you have not already done so, please return to the [tutorials](#) covering those activities.

Collecting Your Components

In order to build the robot, you will need the components listed below and shown in Figure 2.

Part	Quantity	Description
A	1	Anodized aluminum chassis
B	2	Servo motors
C	2	Plastic disc wheels (with O-ring tires)
D	4	Aluminum standoffs (1.25" 4-40)
E	1	Cotter pin (3.5")
F	1	Plastic ball (1.5" diameter)
G	1	Press-on velcro strip (6")
H	10	Machine screws, round head slotted (3/8" 4-40)
I	10	Machine screw nuts (4-40)



Figure 2. Robot components.

Connecting the Servo Motors

The servo robot is propelled by two servo motors--each secured with four machine screws.

1. Insert the servos into the chassis, as shown in Figure 3. *NOTE: Be sure to orient the servo motors exactly as shown, with the wires protruding near the two round holes in the chassis.*

2. Secure each servo with four machine screws, attaching the nuts on the inside of the chassis.

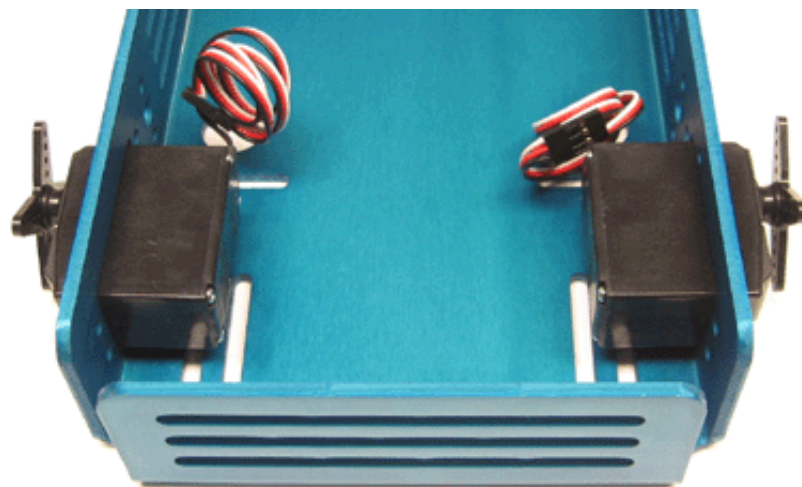


Figure 3. Servo motors correctly positioned in chassis.

Attaching the Wheels

1. If your servo motors have a four-pointed plastic star on each axle, remove this piece and save the black metal screw, as shown in Figure 4.

2. Fit a rubber O-ring tire over each wheel.
NOTE: Some wheels may already have tires in place.

3. Push the two wheels firmly onto the servo motor axles.

4. Secure the wheels using the black metal screws from each axle, as shown in Figure 4.

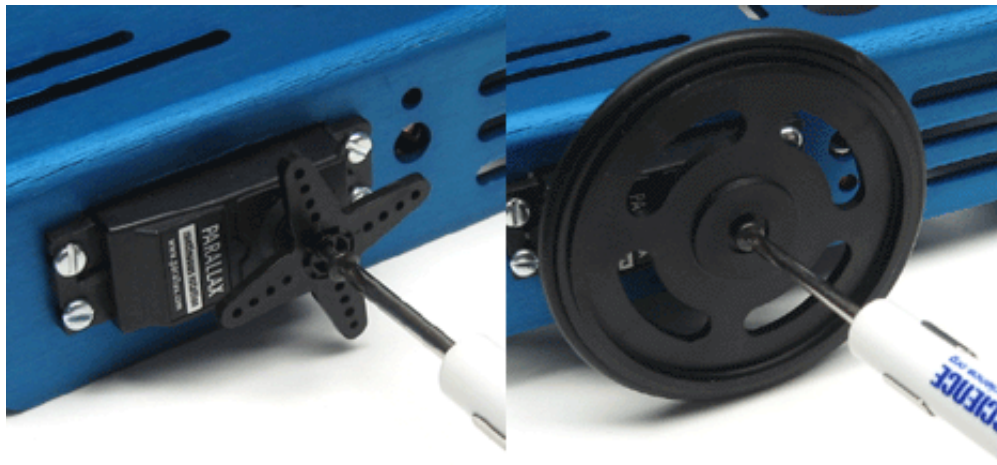


Figure 4. Removing the plastic star (left) and attaching the wheel (right).

Adding the Front Caster

The front of the robot is supported by a *caster*--a plastic ball attached to the underside of the robot chassis by two aluminum rods, called *standoffs*. The plastic ball is suspended between the standoffs by a cotter pin, which serves as an axle. The ball rolls when the robot is traveling forward or reverse and slides when the robot turns. There are two different ways to mount the caster, depending on the contents of your kit.

1. If your kit has 1.5" 6-32 standoffs with holes drilled through the ends, insert the cotter pin through standoffs and the plastic ball, as shown in Figure 5 (left).
2. If your kit has only 1.25" 4-40 standoffs, mount the cotter pin and the ball to the standoffs with two 4-40 machine screw nuts, as shown in Figure 5 (right).



Figure 5. Two ways to mount the cotter pin and plastic ball.

3. Insert the standoffs into the two round holes at the front of the robot, as shown in Figure 6, and secure each end. If you have 1.5" 6-32 standoffs, use two 6-32 machine screw nuts to secure the standoffs. If you have 1.25" 4-40 standoffs, use two 3/8" 4-40 machine screws to secure the standoffs. **NOTE: In either case, be careful not to overtighten the standoffs .**



Figure 6. Caster secured to robot chassis.

Mounting the Battery Pack

The battery pack mounts on the underside of the robot chassis, and is held in place by two velcro strips.

- 1. Disconnect the battery pack from the ATmega Board.**
- 2. Using scissors, cut two 1.5-inch strips of double-sided velcro tape.**
- 3. Keeping the two sides of the velcro together, peel the backing from one side of each strip and press the two strips onto the battery pack, as shown in Figure 7.**

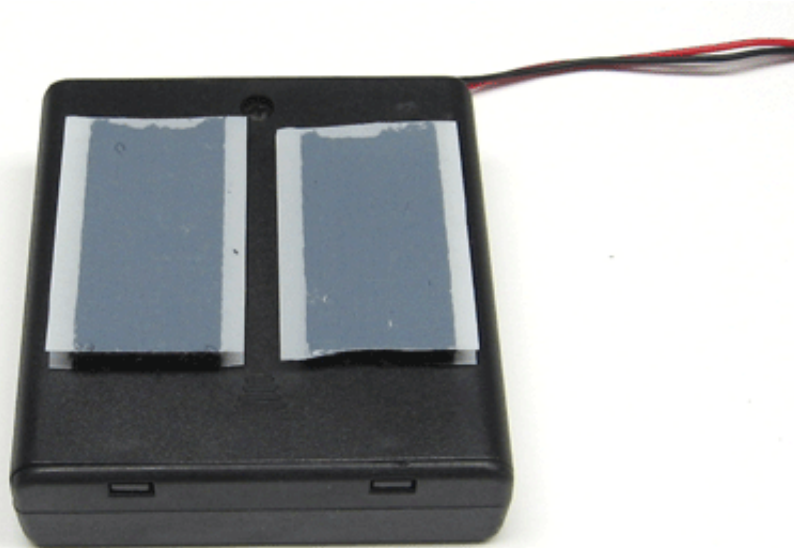


Figure 7. Velcro strips attached to the battery pack.

- 4. Peel the remaining backing from the velcro strips, and press the battery pack onto the underside of the robot chassis, as shown in Figure 8. Be careful to orient the battery pack so that the red and black leads can reach your power connection on the breadboard.**

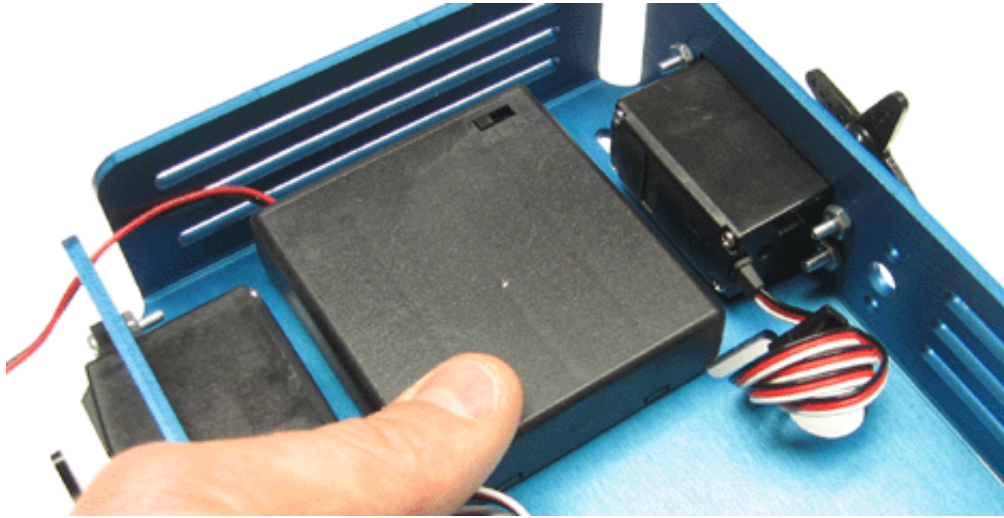


Figure 8. Mounting the battery pack.

Attaching the ATmega Board

The ATmega Board is secured to the top of the robot chassis with velcro strips. As with the battery pack, the orientation of the ATmega Board is critical to ensure that all of the necessary electrical connections can be made in the next step.

- 1. Using scissors, cut two 1.5-inch strips of double-sided velcro tape.**
- 2. Keeping the two sides of the velcro together, peel the backing from one side of each strip and press the two strips onto the underside of the ATmega Board, as shown in Figure 9.**

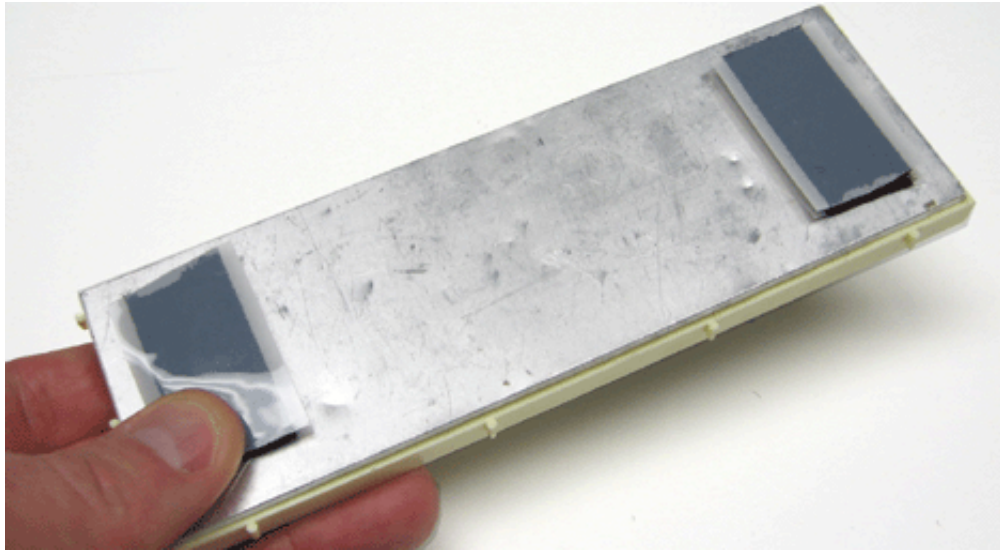


Figure 9. Velcro strips attached to the underside of the ATmega Board.

- 3. Peel the backing from the velcro, and press the ATmega Board onto the robot chassis, as shown in Figure 10. Align the board's front edge with the holes where the standoffs protrude through the chassis.**

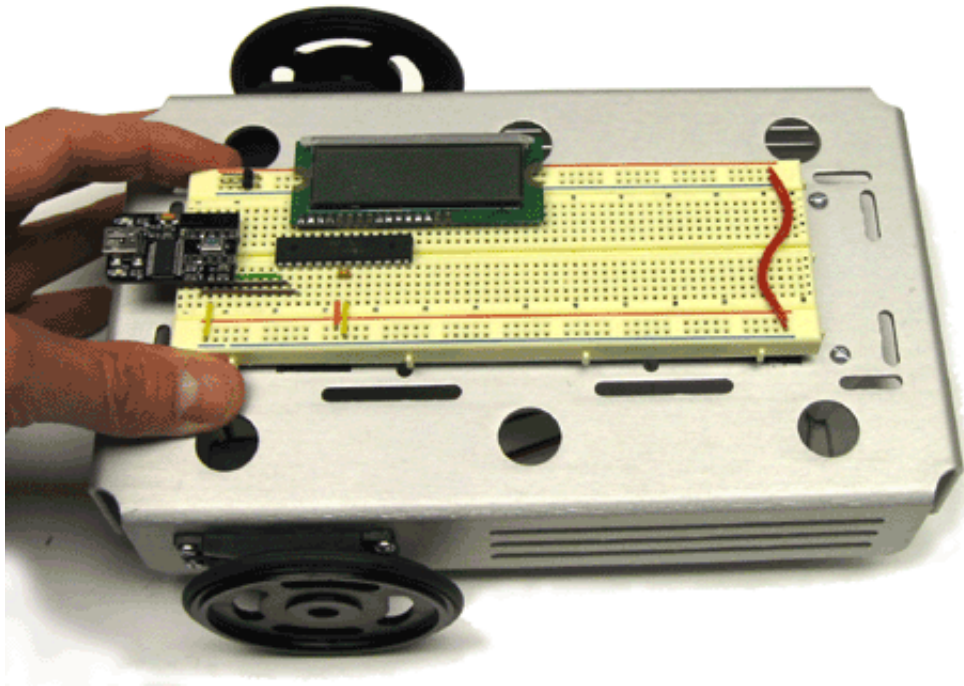


Figure 10. Positioning the ATmega Board.

4. Reconnect the leads from the battery pack, taking care to properly align the red and black wires.

IMPORTANT NOTE

It is unsafe to power the servo motors using USB power. Be sure to remove the jump wire connecting USB power to the breadboard before connecting the servo motors. Failure to do so can result in permanent damage to the USB programming board.

Connecting the Motors to the Board

Using the schematic shown in Figure 10, connect the servo motors to the breadboard. Note that, for each motor, the white wire is the signal lead, which connects to the chip. The red wire connects to power, and the black wire connects to ground.

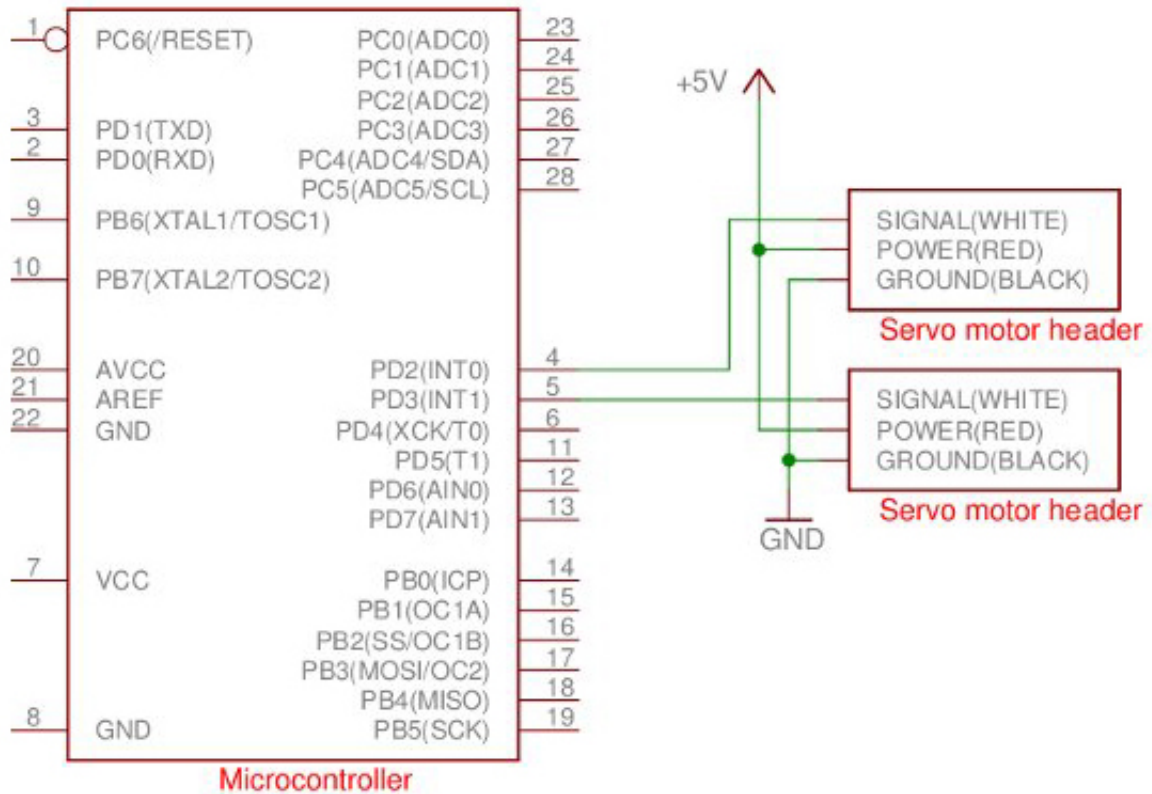


Figure 10. Robot motors schematic.

Figure 11 shows one possible way to connect these components, using a six-prong bent connector and a few pre-bent jump wires.

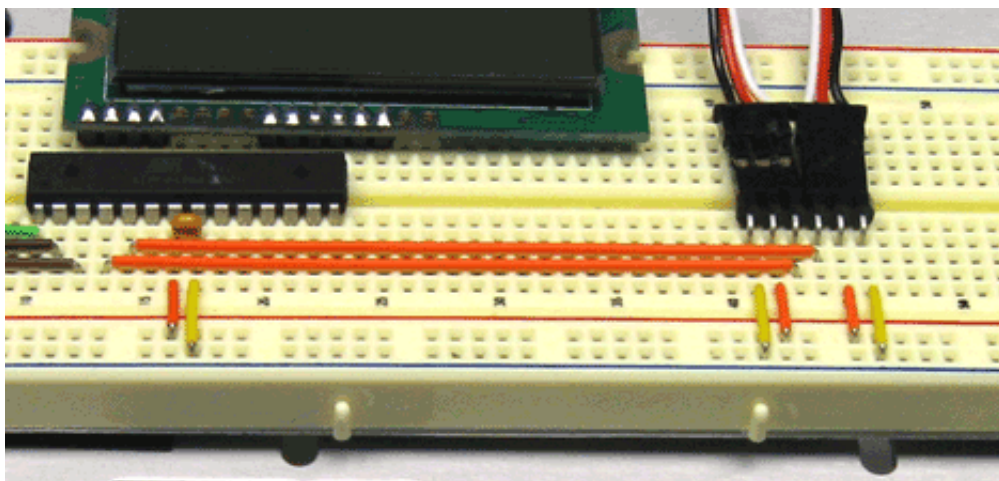


Figure 11. Connecting the motors to the breadboard.