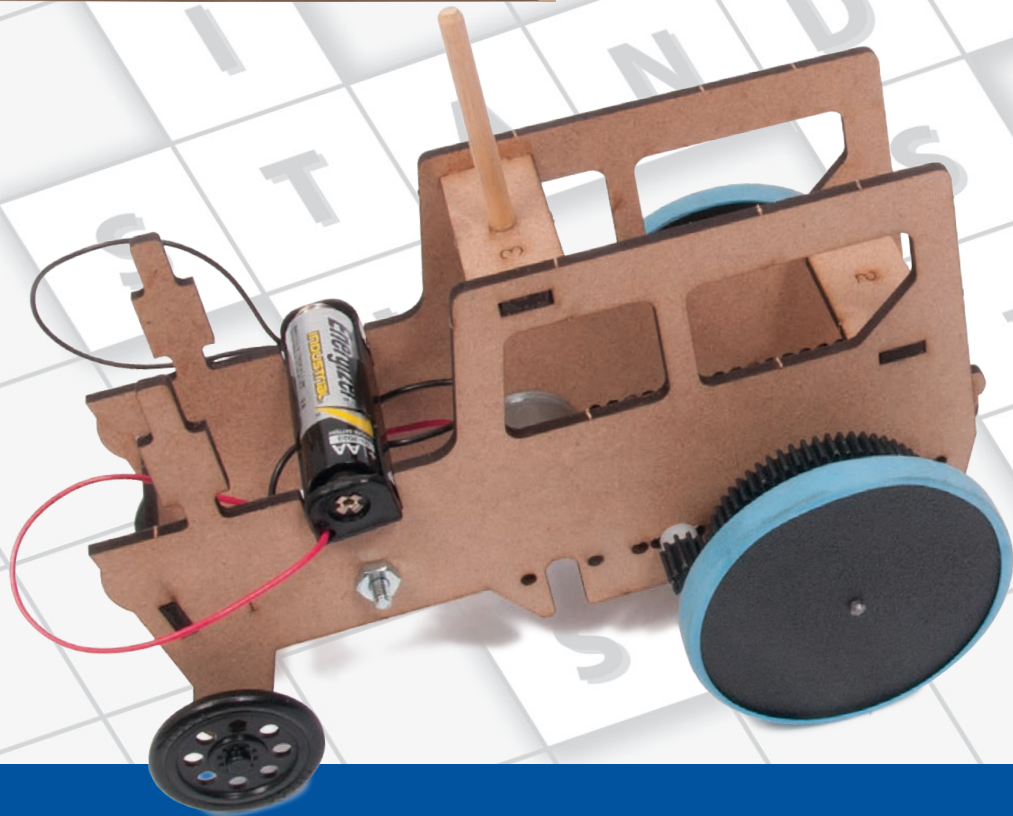
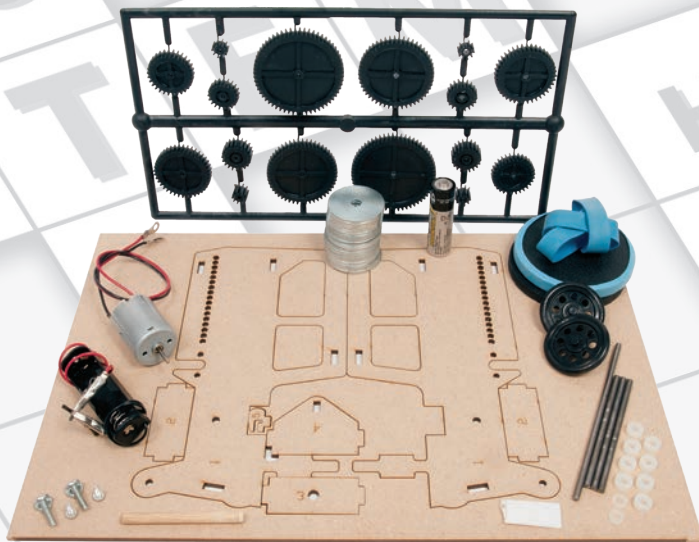


# Pulling Tractor

*User Guide*



## Cautionary and Warning Statements

- This kit is designed and intended for educational purposes only.
- Use only under the direct supervision of an adult who has read and understood the instructions provided in this user guide.
- Read warnings on packaging and in manual carefully.

## Materials Included

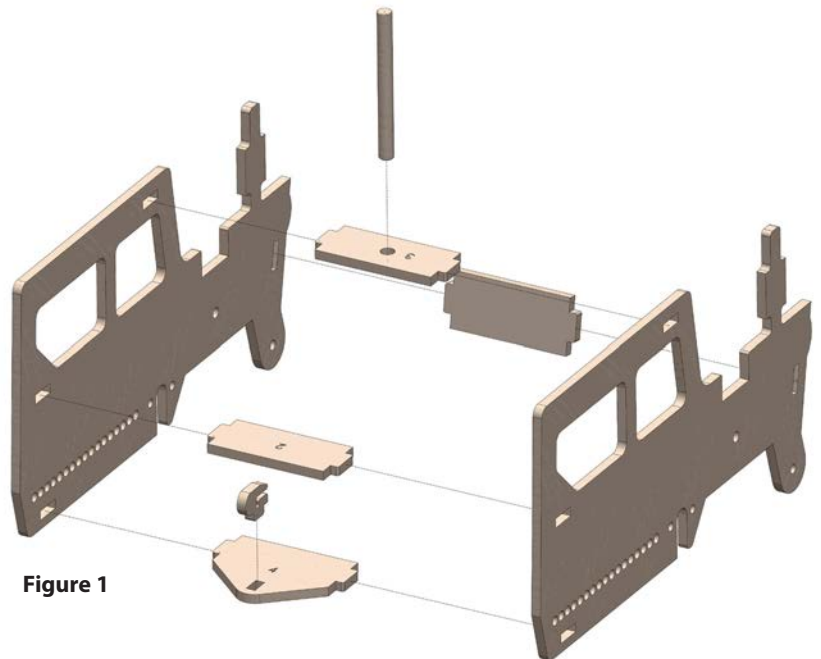
- Sheet of laser-cut basswood parts
- 4 Phillips head screws (two 4-40 x 1/4 Lg. and two 6-32 x 1/2 Lg.)
- Motor with prewired connectors
- AA battery
- Battery module
- Gear font
- 4 axles
- 30 metal washers
- 4 wheels
- 2 self-adhesive foam tabs
- 2 hex nuts (6-32)
- 4 rubber bands
- 8 spacers
- Wooden rod
- 2 #4 nylon washers

## Items Required (not included)

- HD Bond II (or other white glue)
- Phillips head screwdriver

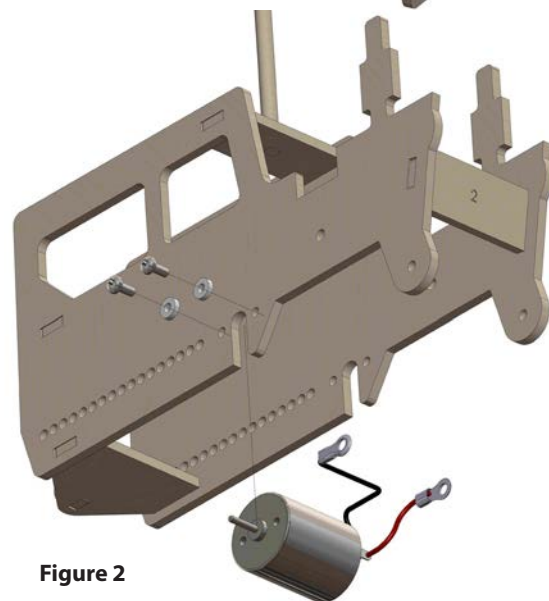
## Building the Tractor

1. Pop out the laser-cut parts from the basswood sheet. Lay a Part 1 piece flat on its side. In the first slot on Part 1, the front of the tractor, glue a Part 2. Moving back on the tractor from the top to the bottom, glue in the Part 3, the other Part 2, and the Part 4 (Figure 1).
2. Glue the other side of all pieces in the first Part 1. Place the other Part 1 onto the parts so they fit snugly into the same notches (Figure 1).
3. Glue the Part 5 into the slot on Part 4 with the hook on Part 5 facing the rest of the tractor (Figure 1).
4. Take the wooden rod and glue it into the hole on Part 3 (Figure 1).



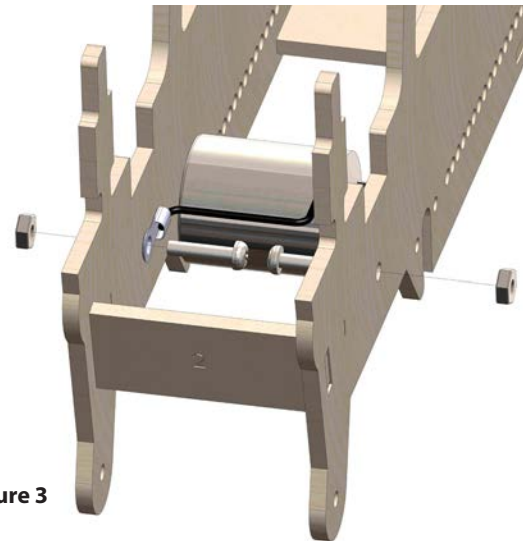
## Installing the Motor and Battery Module

1. On the bottom middle of Part 1, slide the motor into the opening so that the holes on the motor line up with the holes on Part 1. **Note:** You can install the motor on either Part 1 piece (Figure 2).
2. Attach the motor to the tractor body using two 4-40 x 1/4 Lg. screws and the two small nylon washers (Figure 2).



- Place a 6-32 x 1/2 Lg. screw into the hole at the end of each wire coming from the motor. Put each screw through a hole beneath the rectangular indentation near the front of the tractor. Make sure that the head of the screw is on the inside of the tractor, and secure the screws in place with a nut (Figure 3).
- Remove the foam tabs from the paper, and apply one to the bottom of the battery module on each end.
- Remove the backing from the foam tabs, and place the battery module into the rectangular indentation near the front of the tractor (Figure 4).

Figure 3



## Attaching the Wheels and Gears

**Note:** The following is one of many gear combinations you could use. You don't have to use the gears in the instructions. This is just one way to get the tractor moving.

- Insert a 2-3/4" axle through the front hole in the tractor and push a small wheel on each end (Figure 5).
- Remove the 10T gear with a 2 mm hole from the gear font and place it on the end of the motor post (Figure 5).
- Insert a 2-3/4" axle through the third hole from the motor. Put a spacer on each end of the axle. On the end of the axle by the motor post, attach a 50T gear with a 1/8" axle hole and attach a 10T gear with a 1/8" axle hole on the other end (Figure 6).
- Put a rubber band around the edge of both large wheels.

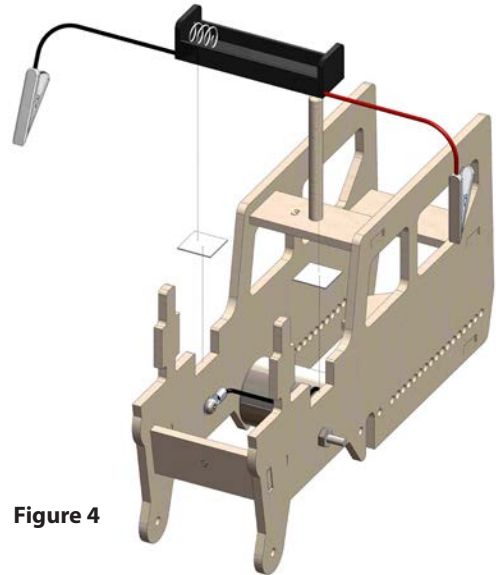


Figure 4

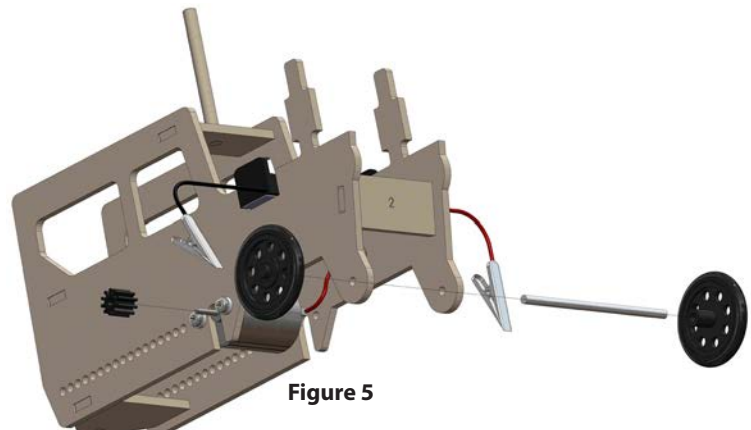


Figure 5

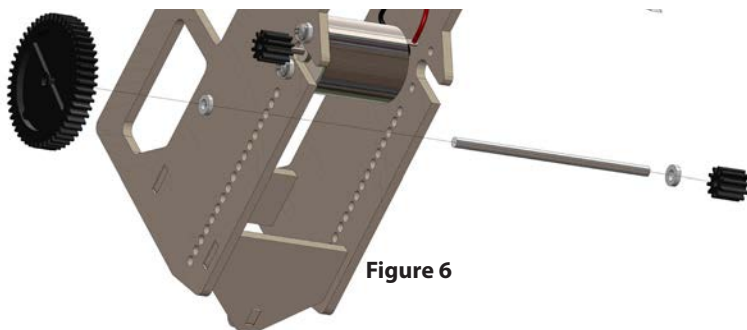


Figure 6

5. Insert the 4" axle through the eighth hole from the back of the tractor. Put four spacers on the end of the axle closest to the motor and put two spacers on the other end (Figure 7).

6. On the end with four spacers, attach a large wheel. On the end with two spacers, attach a 60T gear with a 1/8" hole so that it meshes with the 10T gear in front of it. About 1/2" away from the 60T gear, attach a big wheel to the end of the axle (Figure 7).

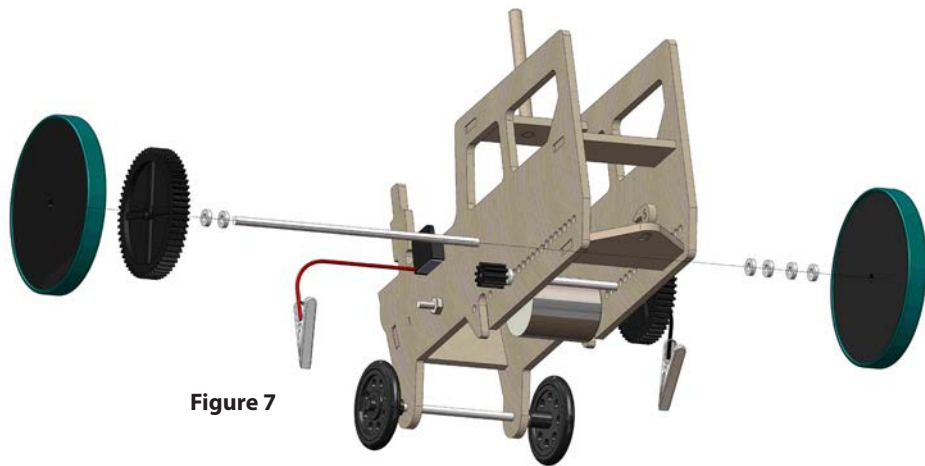


Figure 7

## Driving the Tractor

1. Place the AA battery into the battery module.
2. To make the tractor move, attach the red wire clamp to the screw coming from the red wire on the motor and attach the black wire clamp to the screw coming from the black wire on the motor. This will make the tractor move forward. To make it go in reverse, switch the clamps to the opposite screws (Figure 8).

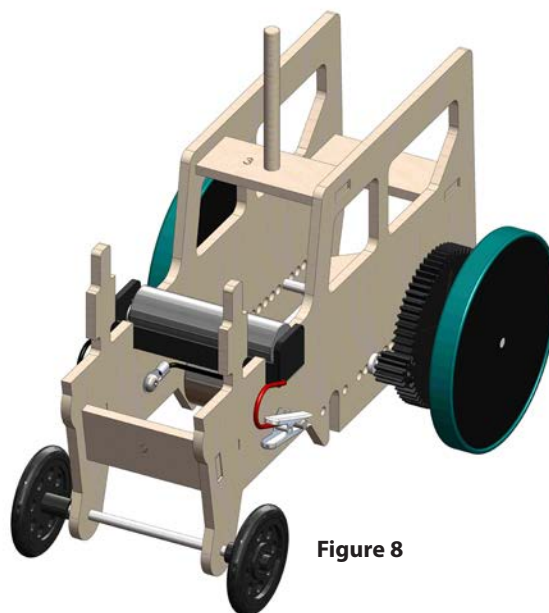


Figure 8

## Activities

- Try out different gear ratios to see which combinations give you the best torque.
- Add metal washers to the back of the tractor to see how that affects the torque of the current gear ratio.

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