

# Ray Catcher Sprint Kit

**Instructions**



**56689 V1218**

If you are competing in the Junior Solar Sprint competition, it is encouraged that you create your own design. Find the current rules for the JSS competition on the Technology Student Association website:

[http://tsaweb.org/competitions-programs/junior-solar-sprint-\(jss\)](http://tsaweb.org/competitions-programs/junior-solar-sprint-(jss))

A set of generic rules are also provided for your use. Follow the rules as you design and build your solar vehicle.

These assembly instructions are intended for those who are not participating in the Junior Solar Sprint competition. They represent one of many ways to assemble the vehicle.

## Materials Included

Your kit includes the following items (the solar panel and motor are official parts required by the Junior Solar Sprint competition):

- 1 Ray Catcher solar panel (2.9 V, 1,100 mA)
- 1 Motor 280
- 2 alligator clips
- Junior Solar Sprint rules and regulations
- Panel warning sheet

## Making the Chassis

1. Using a pencil, draw Line A down the center of one balsa wood sheet (Figure 1).
2. Turn over the balsa sheet. Draw Line B  $\frac{3}{4}$ " from one end of the sheet (Figure 2).
3. At the same end, draw a  $\frac{5}{8}$ " x  $1\frac{1}{2}$ " notch 1" from the top of the sheet (Figure 2).

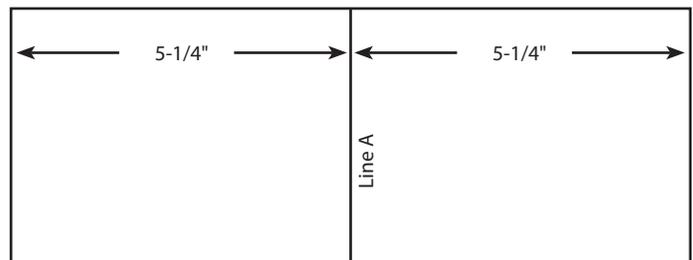


Figure 1

4. Draw Line C  $2\frac{1}{2}$ " from the other end of the same sheet of balsa wood (Figure 2).

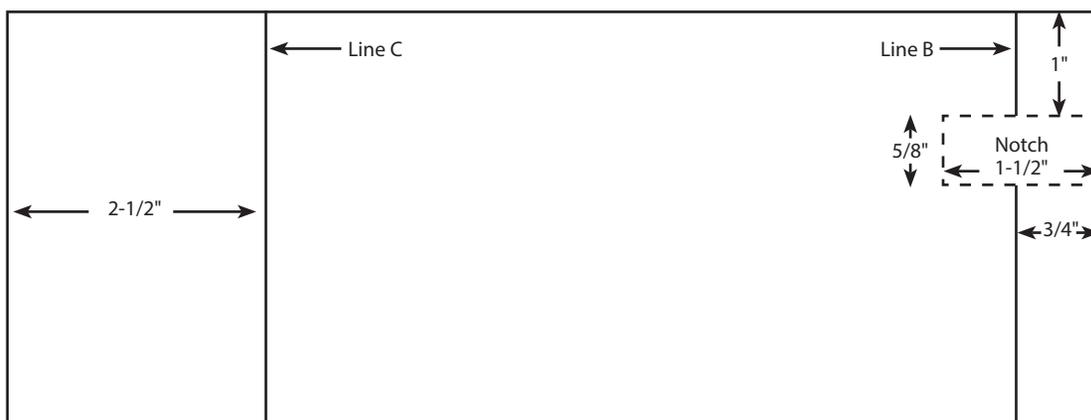


Figure 2

- Using a hobby knife or a coping saw, cut out the notch drawn in Step 3.
- On the other sheet of balsa wood, draw a line 1-1/8" from one of the narrow ends. Cut along the line to produce a 1-1/8" x 4" panel support member.

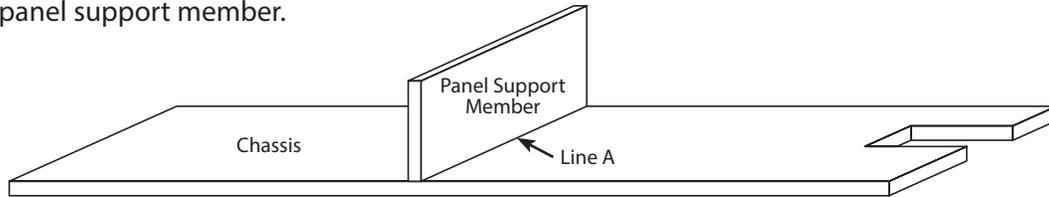


Figure 3

- Using a cool-melt glue gun, run a small bead of glue along one of the 4" edges of the panel support member and attach it firmly at Line A (Figure 3). After it is in place, run an additional bead of glue on each side of the joint between the chassis and the support member.

## Wheels, Gears, and Axles

Installing wheels and gears on axles can be difficult. The gears and wheels should fit snugly to the axle and provide power to the wheels. Your teacher has troubleshooting tips on what to do if the gears and wheels are not snug.

### Rear Axle Assembly

- Deburr the axles by brushing the ends against sandpaper. This makes it easier to push the axles into the wheels.
- Detach Gear I from the gear font. Using a sharp knife, carefully remove any plastic flashing between the gear teeth.

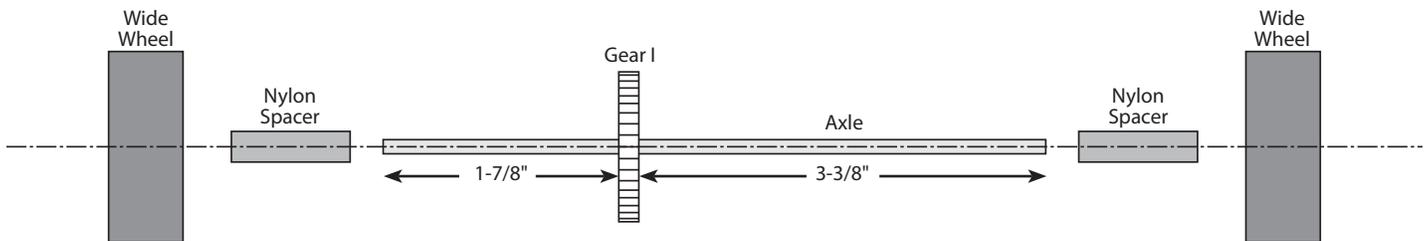


Figure 4

- Place the gear on a table. Insert one of the axles into the gear. Slide the gear 1-7/8" from one end of the axle. It should be 3-3/8" from the other end of the axle (Figure 4).
- Slide two nylon spacers onto the axle, one on each side of the gear (Figure 4).
- Place one of the rear wheels flat on a table. Keeping the spacers in place, insert one end of the axle into the wheel. Slide the axle into the wheel until it is flush with the opposite side of the wheel.
- Lay the other rear wheel flat on the table. With the spacers still in place, slide the free end of the axle into the wheel until it is flush with the opposite side of the wheel.
- Stretch a wide rubber band around each of the wide wheels. These act as tires and provide traction for the vehicle.

### Front Axle Assembly

- Place one of the front wheels flat on the table. Insert one end of the remaining axle into the wheel until the end of the axle is flush with the opposite side of the wheel.
- Slide two nylon spacers onto the free end of the axle.
- While keeping the spacers on the axle shaft, slide the free end of the axle into the other front wheel until the end of the axle is flush with the opposite side of the wheel.

## Attaching Axle Assemblies to Chassis

1. Position the notched chassis on the table so the notched end of the balsa wood sheet is hanging over the table edge and Lines B and C are facing up.
2. Carefully position the rear axle assembly so:
  - Gear I is centered in the notched area of the chassis.
  - The axle is positioned along Line B.
  - The nylon spacers are positioned within 1/16" of each wheel.
3. When the rear axle is positioned as described in Step 2, use small C-clamps or ask a friend to hold the rear axle assembly in the correct position. Now gently apply a bead of cool-melt glue along the sides of the nylon spacers where they touch the chassis. Hold the rear axle assembly in place until the glue dries.
4. Place the front axle assembly along Line C. Position the axle so the wheels are equidistant from the chassis.
5. Slide the spacers to within 1/16" of each wheel. Hold this assembly in place and gently apply a bead of cool-melt glue along the sides of the nylon spacers where they contact the chassis. Hold the front axle assembly until the glue dries.

## Attaching Motor Assembly to Chassis

1. Remove Gear F from the gear font and cut off any excess plastic between the teeth of the gear.
2. Insert the shaft of the motor into Gear F to within 1/8" of the body of the motor.
3. Set the chassis on the table with the axle assemblies facing down.
4. Using a cool-melt glue gun, create a 1/2" x 1" rectangle of glue about 1/8" deep (Figure 5).
5. While the glue is still liquid, place the motor on its side (with vent holes up) on the glue so Gear F sits directly on top of and engages Gear I (Figure 5). Be sure not to block the vent holes with glue. Hold the motor in place while the glue dries.
6. Apply another bead of cool-melt glue behind and in front of the motor. This will keep the motor in place if the vehicle comes to a sudden stop or crashes.
7. If the motor dislodges, use the tip of the glue gun to soften the glue on the chassis where the motor was. Add a small amount of glue and reattach the motor as you did before.

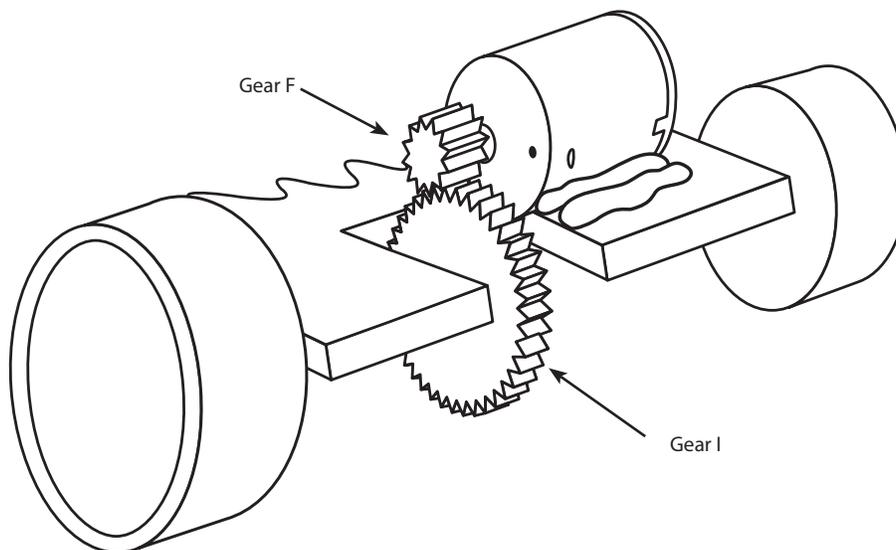


Figure 5

## Battery Holder Assembly (optional)

1. Connect the alligator clips to the battery holder assembly by inserting one of the two leads through the small hole in an alligator clip.
2. Using a pair of pliers, bend the tabs on the alligator clip over the lead.
3. Solder the lead to the alligator clip. Be sure to heat the metal around the lead thoroughly so solder flows freely and attaches to the clip.
4. Repeat Steps 1-3 for the second lead of the battery holder.
5. Position the battery holder behind the panel support member (Figure 6). Use a cool melt glue gun to attach the battery holder to the chassis. Make sure the leads are on the same side of the chassis as the motor terminals.

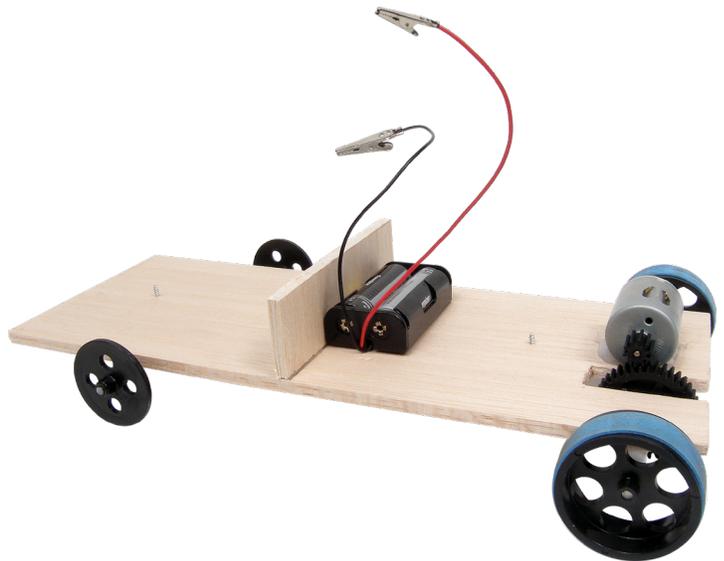


Figure 6

## Motor Connections

1. Solder the two wire leads on the solar panel to the two alligator clips. **Tip:** To protect the connection, place a dab of cool-melt glue on the solder joint.
2. Connect the alligator clips to the two motor tabs.
3. Take the solar vehicle outside and expose it to sunlight. If the wheels do not spin forward, switch the alligator clips on the motor.

## Final Assembly

1. Using a cool-melt glue gun, run a small bead of glue on the top, extreme front of the chassis. Allow the glue to dry. This will provide a ledge on which the solar panel or solar panel blank can rest.
2. Run another bead of glue along the front edge of the chassis to provide a bumper for your vehicle.
3. Position the solar panel blank on the chassis so it rests at the front of the vehicle and on the panel support member. The blank is used to show the position and effect of the solar panel on the vehicle as you test your vehicle with the battery pack. When you are ready to do a solar test or race, use the solar panel that your teacher provides and replace the blank with it.
4. Stretch one of the narrow rubber bands around the front of the chassis and the solar panel blank. Stretch the other narrow rubber band around the chassis and panel blank and position it at about the center of the panel blank.
5. Connect the battery pack's alligator clip with the red lead to the motor terminal that has a round dot. Then connect the alligator clip with the black lead to the other motor terminal.

## Optional

If you are running your car on a guide wire or fishing line, use the screw eyes to keep your car in line. Insert the screw eyes into the bottom of the chassis, one toward the front of the vehicle and another toward the rear, centered between the sides and in-line with the direction of travel.



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