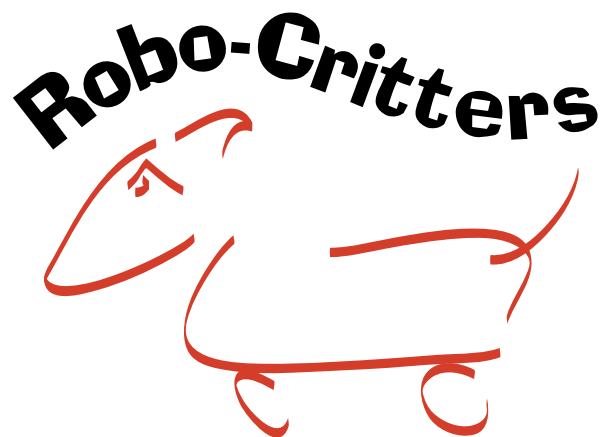


# Manitoba Robot Games

Presents



This **Robo-Critter**, robot building kit, was designed by Bill Smart and Ian Elwood-Oates especially for first time robot builders and is ideal for children in Grades 4 to 6.

With help from an adult, these Construction Details will help guide your elementary student to build a working **Robo-Critter** robot which can be entered in the next **Manitoba Robot Games - Robo-Critter** Competition .

Visit [www.mbrobotgames.ca](http://www.mbrobotgames.ca) for details..

## How to Build a Robo-Critter

### What you will need

- 1 MRG **Robo-Critter** Kit which contains;
  - 2 - 3 - 4.5 volt DC electric motors
  - 2 - rubber wheels
  - 1 - formed wire motor mount
  - 1 - MRG 2 channel controller
  - 1 - 5" x 10" piece of Fomecor.

Approx 12" PVC electrical tape or duct tape.

A hotmelt glue gun, general purpose glue sticks and a bowl of water.

A soldering pencil, stand, damp sponge and rosincore solder.

A very sharp knife and cutting board.

2 "AA" size batteries.

A grown-up who can show you how to solder, glue and cut safely.

## Designing your Robot:

- 1 Make a sketch of how you want your robot to look.

*Some things to consider...*

*Will the robot have its wheels in the center, front or rear?*

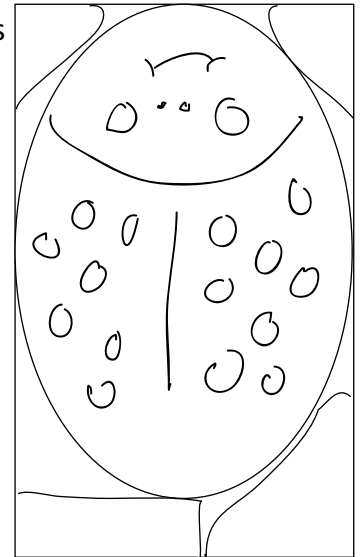
*What do you want the robot to do best?*

- 2 When you have decided on a design, transfer your cutting plan to the Fomecor.

## More on Design:

- \* *If the driving wheels are in the middle, be sure to add some skids front and back so that the robot will rock only slightly on its wheels.*
- \* *If the driving wheels are in the front (a tail dragger design) then keep the tail low.*
- \* *If the driving wheels are at the back you will probably need a wheelie bar to stop the robot flipping backward on full forward acceleration.*

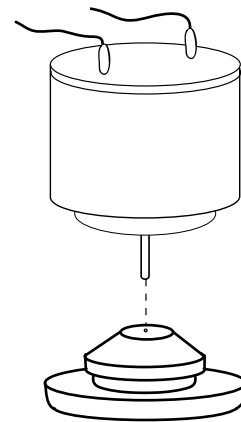
Steps  
1 & 2



## Adding wheels to your motors:

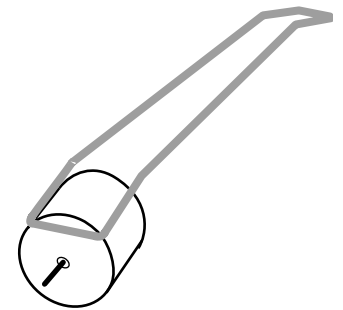
*Though it may be hard to see, the wheels have been pierced in the center of the wheel, from the small side.*

- 3 Put the wheel, large side down, on a hard surface and place the shaft of the motor in the center of the small side as shown. With the motor in an upright position, carefully push downwards on the back of the motor with both thumbs. Push as far as it will go to slide the wheel onto the shaft. *If it is very hard to get the wheel onto the motor shaft, try re-piercing the center of the wheel with a compass point or stick pin.*



## Mounting the Motors:

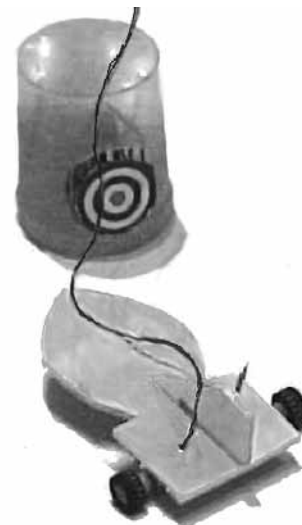
- 4 Hold the formed wire motor mount so that the ends hang down.
- 5 place a motor underneath one of the ends so that...
  - the wheel is on the outside
  - the two solder tabs on the back of the motor are horizontal and parallel to the wire motor mount.
  - the end of the wire motor mount acts as a stop to position the motor.
- 6 Use some PVC tape to secure the motor tightly to the wire motor mount.
- 7 Do the same with the second motor.



## Completing the Body of your Robot:

- 8 Cut out the body from the Fomecor, saving all the pieces as some will be used for skids and fins.
- 9 Glue the axle to the underside of the Robot using a scrap of fomecor to 'sandwich' the motor mount to the body.

*If you are intending on entering your robot in the next **Manitoba Robot Games** then be sure to adjust your robot so that it will be able to strike a 2" diameter target whose center is 1 1/2" up from the ground.*

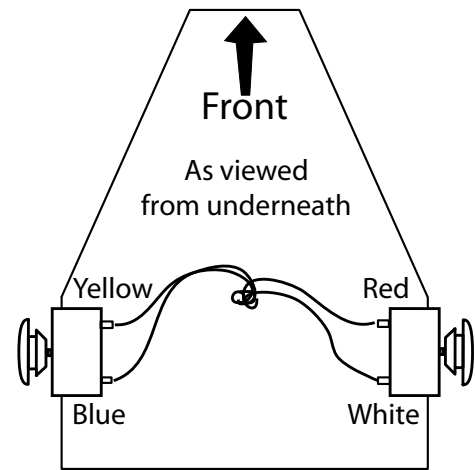


## Assembling the Control Box:

- 10 Follow the instructions that come with the control box.
- 11 Be sure to grease all moving parts.

## Making the electrical connections:

- 12 Make a small hole through the body of your robot just large enough to be able to pass the 4 wires through.
- 13 Tie a knot in the wires so that the knot will sit at the hole but the ends of the wires will be long enough to reach the solder tabs on the motors.
- 14 Connect the wires to the motors as shown on the right.
- 15 Strip about 10-12mm (1/2") of insulation from the ends of the wires and twist the strands together
- 16 Thread them through the holes in the solder tabs and fold them back to make a "U".



*At this point you can install the batteries and test that the wheels turn in the correct rotation.*

- 17 Follow the instructions below to solder the controller wire directly to the solder tabs on the back of the motors.

## How to Solder the Connections:

- \* When the soldering pencil is hot, wipe the tip on a piece of damp sponge or a piece of folded wet paper towel to remove any insulating oxides from the tip.
- \* Melt a small amount of solder on the tip and wipe again. The tip should now be a shiny silver colour.

*As the wire may get too hot to hold, it is a good idea to hold the wire with a pair of needle nose pliers. Don't heat for too long! The motors can be damaged if too much heat is applied to the solder tabs.*
- \* Touch the silvered part of the tip to both the wire and the tab on the motor- count slowly to three... Add some solder - count to three...
- \* Watch to see the solder melt, then flow between the wire and tab then slowly slide the tip away while still holding the wire in place. You can blow on it a little to help it cool.
- \* When the solder has cooled and set, give the wire a little tug to check that the connection is sound.
- \* Solder all four wires in the same way, then you will be ready to test your robot.
- \* Be sure to insulate any exposed wire joints that may touch another to avoid short circuits.

## Safety Notes...

Place a bowl of water in easy reach when using any hot tools such as hot glue guns and soldering equipment. Skin that has come in contact with a hot element should be cooled immediately in water to reduce damage to the tissues.

Solder is made from Tin which is food safe and Lead which is poisonous to humans, especially children. Children cannot expel lead so it is accumulated in the body. Lead poisoning reveals itself by the loss of melanin causing a whitening of hair, memory loss and can be fatal with sufficient exposure. Lead is easily absorbed into young bodies through contact with soft tissues. Be sure to wash hands thoroughly after handling/before eating and do not place Lead in the mouth.

When soldering, the rosin core becomes corrosive when heated and much of it is leached off as smoke. Position yourself so that the fumes do not rise into eyes or nose. Do not wear a peaked cap when soldering.

When using sharp knives...  
Always cut AWAY from fingers.

## **Powering up your Robot**

\* Install two "AA" size batteries in the controller. Be sure the + ends point in opposite directions. Close the battery cover and enjoy driving your new Robo-Critter!

**If your robot goes in circles** when you push both levers forward, decide which motor is going in the wrong direction then de-solder the wires to that motor and reverse them.

## **Congratulations!**

**Your Robo-Critter robot is now ready for a test run.**

### **Tip**

Place empty 600ml soft drink bottles on their side and aim your robot for the caps. They are the same height as the center of the competition targets.

If you have any further questions about building the robots please email  
[ian@mbrobotgames.ca](mailto:ian@mbrobotgames.ca)

If you want to look at the Competition Rules on the Web, go to

<http://www.mbrobotgames.ca>  
then follow the links.