

Roller-Bot[®]

Engineers Week 1999

A flashlight activated miniature robot built on a Paint Roller.

The **Roller-Bot[®]** is a small "dumb" light activated robot built on a paint roller and is activated by a light source. Under normal operation the **Bot[®]** will move forward circling in a 10-foot radius as it is activated by directional and controllable light source like a flashlight or laser pointer.

The Roller-Bot[®] consists of 5 electronic parts and 5 mechanical parts. Parts that require gluing, motor and breadboard, have been pre-mounted. The remainder of the project parts can be assembled without hand tools.

Parts List Mechanical

- 3" Paint Roller
- Rubber Band
- Binder Clip
- Sticky Back Velcro[®]
- Solderless Breadboard

Parts List Electrical

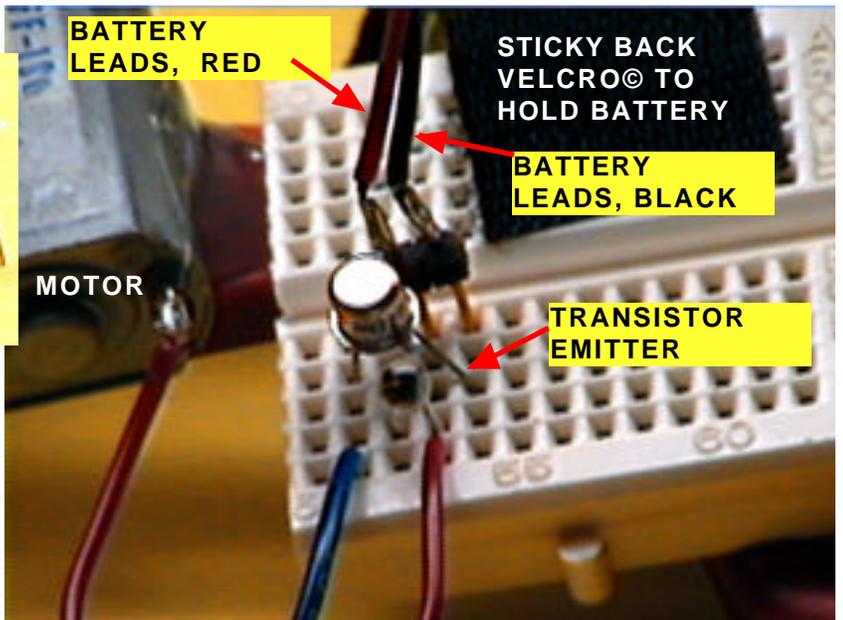
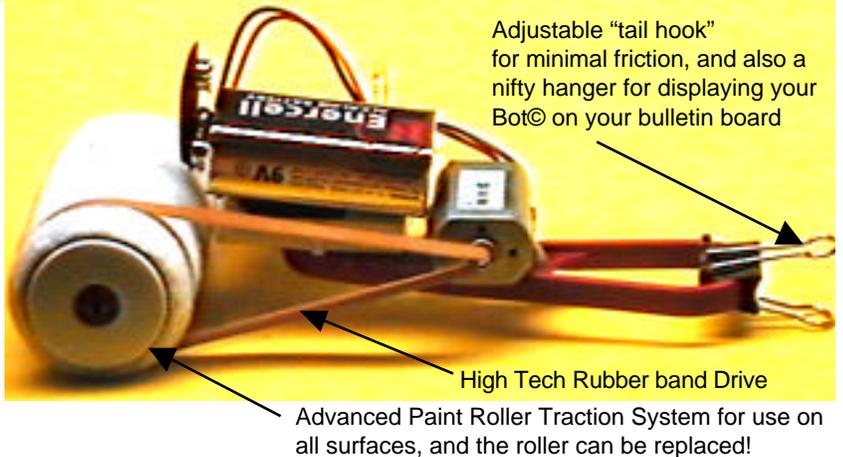
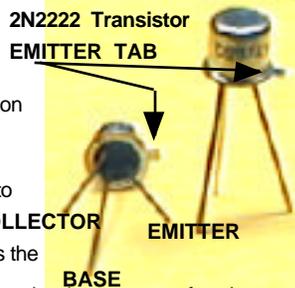
- 2N2222 Transistor
- IR Photo Diode
- Battery Snap
- 9-Volt Battery
- DC Motor

Assembly Note: make certain that the battery is ALWAYS DISCONNECTED while making electrical connections. Failure to do so will cause permanent damage to the 2N2222 Transistor.

STEP 1: Insert the battery leads so the RED is nearest the motor. The battery leads have been attached to a dual pin plug that fits snugly into the socket holes.

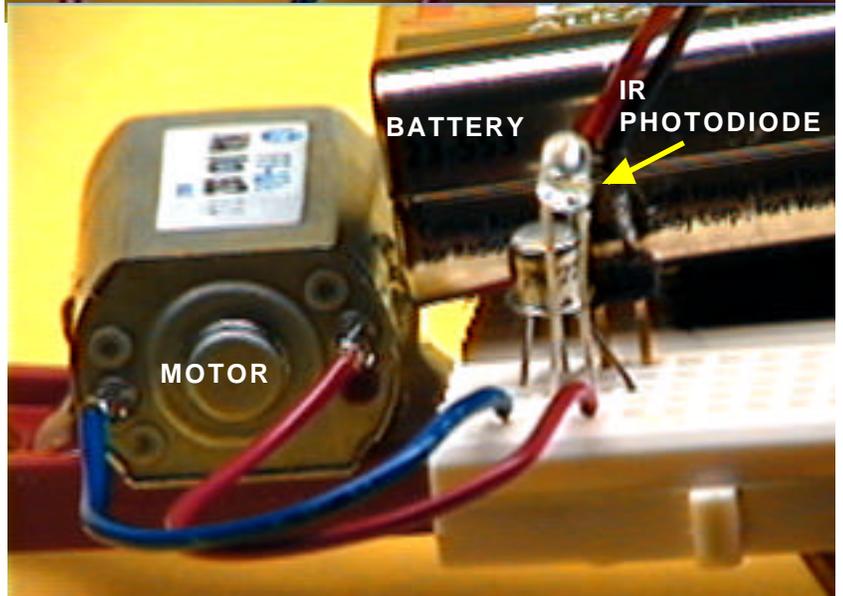
STEP 2: Insert the three wire leads of the 2N2222 transistor in the following manner.

(a) The **EMITTER** is the wire lead on the bottom of the transistor close to a "tab" that sticks out from the transistor's metal case. The **EMITTER** lead should be plugged into the same "row" of holes shared by the black wire from the battery. (b) The **BASE** is the center wire lead of the transistor case. The **BASE** should be connected to the next row of sockets, **SKIPPING THE ROW** that was designated for the RED lead from the battery. (c) The **COLLECTOR**, the third and final wire lead from the transistor, is connected in the very next row of socket holes parallel to the row connected to the **BASE**.



STEP 3: Install the two wire leads of the IR photo diode as follows. One wire lead should be plugged into the same row of socket holes as the RED wire from the battery. The second wire lead from the IR photo diode should be plugged into the row of socket holes that has been designated for the transistor **BASE** connection. The IR photo diode can be installed in either direction. In one direction the Bot[®] will have maximum light sensitivity, in the reverse it will have minimum sensitivity.

STEP 4: Attach the RED and BLUE wires from the drive motor. The RED wire lead from the motor should be attached to the same row of socket pins connected to the RED wire from the battery, and one lead from the photo diode. The blue wire lead from the motor should be connected to the socket pins connected to the Transistor **COLLECTOR**. *If the Bot[®] moves backwards when activated, simply reverse the red and blue motor wires.*



FINAL ASSEMBLY: Attach the battery using STICKY BACK VELCRO[®]. Attach the binder clip on the end of the paint roller to provide the "tail hook". Install the rubber band around the roller and the motor shaft. Connect the battery clip to the battery. **MAKE CERTAIN THAT YOU DISCONNECT THE BATTERY WHEN NOT IN USE OR YOU WILL DISCHARGE THE BATTERY.**

OPERATING NOTES: The Roller-Bot[®] is a light activated device. High levels of ambient light will activate the motor. You can reduce the Bots[®] sensitivity by reversing the leads of the Photo Diode. The rubberband drive on the Bot[®] causes a slight deformation of the roller handle. This causes the Roller-Bot to turn in a circle. Consider experimenting with this and other Roller-Bots[®] to determine if you can propose a method to correct this steering deficiency. email: pld@ee.wustl.edu