

Giant Components

// Overview:

Most electronics companies are always trying to make everything smaller and smaller. At SparkFun we do that, but we also like to make super sized teaching tools. This tutorial shows you how to make gigantic components for use with the gigantic breadboard. The secret of the giant components is that each giant component has a regular sized component buried inside the giant component. This way you can plug the components into the giant breadboard and if you plug them in correctly, create a functioning circuit! Each component has its own tutorial below.

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// Giant Resistor Assembly:

Giant Resistor (330 and 10K)

Materials:

One resistor (this tutorial deals with 330 and 10K values, but feel free to make your own), 1/16th" gauge wire (1 foot per resistor), solder, .5" x .5" x 1/8" piece of wood (x 2), Sculpey in the following colors: Orange, brown and gold for a 330 resistor, red, black, orange and gold for a 10K resistor and a light brown or white color Sculpey for the body of the resistor.

Tools:

A way to cook your Sculpey, clay-working tools are optional. You will also need a soldering iron and a drill.

1. Cut the 1/16th" wire into two half foot pieces. (Or just buy wire that comes without covering.)



2. Strip the pieces of 1/16th" wire so you are left with only the conductive portion of the wire. *Note: It may be easier if you use a pair of pliers.*



// Giant Resistor Assembly:

3. Solder one piece of wire to each side of the resistor



4. Roll out thin coils of each color Sculpey depending on the colors that represent the resistor you are making. For example, for a 330 resistor you would roll out two orange coils, a brown coil and a gold coil. For a 10K resistor you would roll out an orange coil, a black coil, a brown coil and a gold coil. Coils should be about 3" long and 1/8" in width.



5. Drill a small hole in each of your pieces of wood. Run one of the pieces of wire attached to your resistor through this piece of wood. Get the piece of wood as close as possible to the resistor. Wrap the wire around the piece of wood at least once. This piece of wood is so that the resistor doesn't spin around inside the Sculpey once has been put together.



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Name: Date:

// Giant Resistor Assembly:

6. Cover your actual resistor (and pieces of wood) with a cylinder of light brown or white Sculpey. The cylinder should be about 1.5" to 2" in diameter and 3" to 4" in length. Make sure your pieces of wire stick out of the side of the cylinder of Sculpey.



7. Wrap the pieces of colored Sculpey around the cylinder so it looks like a giant resistor.



8. Lastly put your giant resistor in your oven to cook it. Time and temperature depends upon the Sculpey instructions.



// Giant Diode Assembly:

Giant Diode:

Note: This tutorial is exactly the same as a giant resistor only the colors of the Sculpey should change to reflect the difference. For this reason this tutorial does not have pictures, refer to the giant resistor tutorial if you need help.

Materials:

One diode, 1/16th" gauge wire (1 foot per resistor), solder, .5" x .5" x 1/8" piece of wood (x 2), Sculpey in the following colors: Black and red.

Tools:

A way to cook your Sculpey, clay-working tools are optional. You will also need a soldering iron and a drill.

Assembly:

1. Cut the 1/16th" wire into two half foot pieces. (Or just buy wire that comes without covering.)

- 2. Strip the pieces of 1/16th" wire so you are left with only the conductive portion of the wire.
- 3. Solder one piece of wire to each side of the diode.

4. Roll out a thin coil of red Sculpey. The coil should be about 3" long and 1/8" in width.

5. Drill a small hole in each of your pieces of wood. Run one of the pieces of wire attached to your diode through this piece of wood. Get the piece of wood as close as possible to the diode. Wrap the wire around the piece of wood at least once. This piece of wood is so that the diode doesn't spin around inside the Sculpey once has been put together.

6. Cover your actual diode (and pieces of wood) with a cylinder of black Sculpey. The cylinder should be about 1.5" to 2" in diameter and 3" to 4" in length. Make sure your pieces of wire stick out of the side of the cylinder of Sculpey.

7. Wrap the coil of red Sculpey around the cylinder of black Sculpey so it look like the regular diode.

8. Put your diode in the oven for the amount of time your Sculpey needs to cook. The heat and time will differ depending on type of Sculpey.

// Giant Photoresistor Assembly:

Materials:

A photoresistor (also known as a light sensor), 1/16th" gauge wire (1 foot), solder, .5" x .5" x 1/8" piece of wood (x 2), Sculpey in the following colors: red and a light brown or white color Sculpey for the body of the photoresistor.

Tools:

A way to cook your Sculpey, clay-working tools are optional. You will also need a soldering iron and a drill.

Assembly:

1. Cut the 1/16th" wire into two half foot pieces. (Or just buy wire that comes without covering.)



2. Strip the pieces of 1/16th" wire so you are left with only the conductive portion of the wire.



// Giant Photoresistor Assembly:

3. Solder one piece of wire to each side of the photoresistor.



4. Roll out a coil of red (in this example we used purple) Sculpey about 1/8" in width and 9" long. Set this aside.



5. Make a flat circle of white Sculpey about 4" in diameter and ½" thick. Set this aside.



// Giant Photoresistor Assembly:

6. Drill a small hole in each of your pieces of wood. Run one of the pieces of wire attached to your resistor through this piece of wood. Get the piece of wood as close as possible to the resistor. Wrap the wire around the piece of wood at least once. This piece of wood is so that the resistor doesn't spin around inside the Sculpey once it has been put together.



7. Cut a hole the size of the face of your photoresistor in the disk of white Sculpey.



8. Cover your actual photoresistor (and pieces of wood) with the white Sculpey. Make sure to secure the photoresistor inside the Sculpey so it doesn't show on either side. One way to do this is to make a small hole in the white disc and push the photoresistor through it, using additional Sculpey to cover the pieces of wood on the back of the giant photoresistor. Another way to do this is to squish the component between two discs of white Sculpey instead of making one disc. Make sure your pieces of wire stick out of the bottom of the disc of Sculpey.



// Giant Photoresistor Assembly:

9. Squish your red coil of Sculpey into the white disc. Make sure the red coil has the same shape as the red part on the top of the photoresistor.



10. Put your resistor in the oven for the amount of time your Sculpey needs to cook. The heat and time will differ depending on type of Sculpey.



// Giant Capacitor Assembly:

Materials:

A capacitor, 1/16th" gauge wire (1 foot), solder, .5" x .5" x 1/8" piece of wood (x 2), yellow Sculpey.

Tools:

A way to cook your Sculpey, clay-working tools are optional. You will also need a permanent marker, a soldering iron and a drill.

Assembly:

1. Cut the 1/16th" wire into two half foot pieces. (Or just buy wire that comes without covering.)



2. Strip the pieces of 1/16th" wire so you are left with only the conductive portion of the wire.



// Giant Capacitor Assembly:

3. Solder one piece of wire to each side of the capacitor. This will be very hard if your capacitor is very small. Be careful of overheating the capacitor, it will break if you do this. *Note: One trick is to solder a smaller piece of copper wire to the leads on the capacitor. This will make things easier because it does not take as much heat to solder to the smaller piece of copper as it does to the larger one. Once you have soldered a small piece to the capacitor you can solder those pieces to your longer pieces of 1/16th" wire.*



4. Drill a small hole in each of your pieces of wood. Run one of the pieces of wire attached to your resistor through this piece of wood. Get the piece of wood as close as possible to the capacitor. Wrap the wire around the piece of wood at least once. This piece of wood is so that the capacitor doesn't wiggle around inside the Sculpey once it has been put together.



5. Cover your actual capacitor (and pieces of wood) with the yellow Sculpey (in our example we used white Sculpey). Make sure to secure the capacitor inside the Sculpey so it doesn't show on either side. Make sure your pieces of wire stick out of the bottom of the piece of Sculpey. A capacitor usually looks like a yellow M & M, but you will have had a chance to look at the capacitor before you started making a giant one. The giant capacitor should be about 1" to 2" tall and ³/₄" to 1" wide.



// Giant Capacitor Assembly:

6. Put your capacitor in the oven for the amount of time your Sculpey needs to cook. The heat and time will differ depending on type of Sculpey.



7. Once your capacitor has been cooked, wait until it cools and then write the capacitor value on the front, mine was a 104.



// Giant LED Assembly:

Giant LED

Materials:

A LED (also known as a light emitting diode), 1/16th" gauge wire (1 foot), solder, 3-7 large glue sticks (as translucent as possible), and a glass jar with a rounded bottom (or anything translucent that is the shape of an LED, I found a lightbulb safety cover at my local hardware store).

Tools:

A soldering iron and a way to melt glue (I suggest a heat lamp or rework station because glue guns tend to yellow the glue) a couple fans (suggested) and a ventilated area to melt glue in.

Assembly:

1. Cut the 1/16th" wire into two half foot pieces. (Or just buy wire that comes without covering.)



2. Strip the pieces of 1/16th" wire so you are left with only the conductive portion of the wire.



// Giant LED Assembly:

3. Solder one piece of wire to each LED lead. Make sure you clip the negative connection wire (or cathode) slightly shorter than the other so you know which wire is which connection. This component is also fairly top heavy so you will need to cut the wires down to get it to stand up in the breadboard. Put the LED aside for a little.



4. Prop the glass jar up somehow so it doesn't spill hot glue all over you. Turn your fans on and start melting glue sticks into the glass jar.



5. Fill the jar at least ³/₄ of the way up and then gently push your small LED into the glue. Don't push it down too far; you want the LED in the middle of the jar, both vertically and horizontally.



// Giant LED Assembly:

6. Fill up the rest of the jar with more melted glue. Make sure you don't spill any!



7. Wait for the glue to dry.

8. If you run too much current through your LED and fry it, don't worry, you can fix it by re-melting the glue around the LED inside the jar. Just melt the top layer close to the LED, take the LED out and make a new LED with extended leads. Keep the glue in the top of the jar heated and liquid while pushing the new LED into the glass jar.



// Giant RGB LED Assembly:

Giant RGB LED:

Materials:

A RGB LED (also known as a red, green, blue light emitting diode), 1/16th" gauge wire (2 foot), solder, 3-7 large glue sticks (as translucent as possible), tape, and a glass jar with a rounded bottom (or anything translucent that is the shape of an LED, I found a lightbulb safety cover at my local hardware store).

Tools:

A soldering iron and a way to melt glue (I suggest a heat lamp or rework station because glue guns tend to yellow the glue) a couple fans (suggested) and a ventilated area to melt glue in.

Assembly:

1. Cut the 1/16th" wire into four half foot pieces. With tape label one red, one green, one blue and one ground.



2. Solder one piece of wire to each LED lead, making sure to solder the wire labeled "red" to the red lead and so on. This component is also fairly top heavy so you will need to cut the wires down to get it to stand up in the breadboard. Put the LED aside for a little.



// Giant RGB LED Assembly:

3. Prop the glass jar up somehow so it will not tip over spill hot glue all over you. Turn on your fans on and start melting glue sticks into the glass jar.



4. Fill the jar at least ³/₄ of the way up and then gently push your small LED into the glue. Don't push it down too far; you want the LED in the middle of the jar, both vertically and horizontally.



5. Fill up the rest of the jar with more melted glue. Make sure you don't spill any!



// Giant RGB LED Assembly:

6. Wait for the glue to dry.

7. If you run too much current through your RGB LED and fry it, don't worry; you can fix it by re-melting the glue around the RGB LED inside the jar. Just melt the top layer close to the RGB LED, take the RGB LED out and make a new RGB LED with extended leads. Keep the glue in the top of the jar heated and liquid while pushing the new RGB LED into the glass jar.



// Giant Battery Assembly:

Giant Battery:

Materials:

A nine volt battery, a nine volt battery snap connector, 1/16th" gauge wire (1/2' foot black, 1/2' foot red), solder, wire wrap, a cardboard or wooden box the same proportions as your battery (must have a top you can remove), an image of a battery (to wrap around the outside of the box), tape (or Velcro) and two screws (or a way to secure the top after you have removed it, Velcro or tape works too).

Tools:

A soldering iron, a hot air rework station (a hair dryer will work too), a printer, a screwdriver and a drill.

Assembly:

1. Cut the connector that does not attach to the 9V battery off the end of the battery snap connector. This will leave you with two exposed wires.



2. Strip the last 1/2" of the red and black exposed wire.



// Giant Battery Assembly:

3. Strip only the ends of both pieces of 1/16th" wire. This will leave you with two pieces of 1/16th" wire with each end exposed.

- 4. Solder the red piece of 1/16th" wire to the red wire on the 9V battery connector.
- 5. Solder the black piece of 1/16th" wire to the black wire on the 9V battery connector.



6. Cut two lengths of wire wrap about 1" in length. Slide these over the solder joints on both the wires you just soldered. Use your hot air rework station (or hair dryer) to heat the shrink wrap so it covers the bare wire and solder.

7. Open one of the sides of the box, make sure you can open and close the box without damaging it because this is how you will replace the battery when needed.



8. Drill two holes through the top of the box later you will run the red and black wires through these holes.



// Giant Battery Assembly:

9. Connect the 9V connector to the 9V battery.



10. Attach the battery to the inside of the box so it doesn't rattle around.



11. Slide the red and black wires through the two holes you drilled in the lid.



12. Close the box and tape your image of a battery to the outside of the box. Make sure you can still open the box.



// Giant Battery Assembly:

13. You've now got a giant functioning 9V battery. You can make it more realistic by adding something that looks like the battery connector to the top of the box.



14. Attention! Make sure you disconnect the battery inside the box when you are not using it! Otherwise it will short out and could cause a fire. If you're really nervous about this you can always solder a switch between the red wire on the 9V battery connector and the piece of 1/16th" wire you are using to extend the connector.

// Giant Piezo Buzzer Assembly:

Glant Piezo:

Materials:

A piezo buzzer, 1/16th" gauge wire (1 foot), solder, black paint, something cylindrical that you can cut (a cardboard tube, an empty can of soup or a plastic cylinder like what blank CDs come in), cardboard, glue, duct tape and a silver pen or silver tape (some way to mark the positive and negative leads on the buzzer).

Tools:

A pencil, a soldering iron and scissors (tin snips if you're using a soup can).

Assembly:

1. Cut the 1/16th" wire into two half foot pieces. (Or just buy wire that comes without covering.)



2. Strip the pieces of 1/16th" wire so you are left with only the conductive portion of the wire.



// Giant Piezo Buzzer Assembly:

3. Solder one piece of wire to each side of the piezo buzzer, make sure you clip the negative connection wire (or cathode) slightly shorter than the other so you know which wire is which connection.



4. Cut your cylinder so there is no bottom and it is about 2" tall.



5. Place the cylinder on a piece of cardboard and use the cylinder as a stencil to create a circle the same width as the cylinder.



// Giant Piezo Buzzer Assembly:

6. Cut out this cardboard circle and set it aside.



- 7. Cut a circular hole the size of the top of the piezo buzzer in the cylinder.
- 8. Paint the cylinder black and then wait for it to dry.



9. Cut two tiny holes in a piece of duct tape about 3" to 4" in length and slide the wires attached to the piezo buzzer through them. Secure the piezo buzzer in the hole you cut in the cylinder by pressing the duct tape on the piezo buzzer to the underneath of the top of the cylinder while fitting the piezo buzzer into the hole you cut in the top of the cylinder.



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// Giant Piezo Buzzer Assembly:

10. Glue the piezo buzzer to the cylinder.



11. Draw (or place tape) a negative and positive and negative symbol on the sides of the giant piezo buzzer, make sure the negative sign is placed on the side closer to the shorter wire and the positive sign is placed on the side of the cylinder closer to the positive side.



12. Punch two holes in the cardboard circle about where the wire leads comes out of the giant piezo buzzer. Slide the cardboard circle up the wire leads on the giant buzzer until the cardboard circle is flush with bottom of the giant buzzer. Glue the cardboard circle to the bottom of the giant piezo buzzer.



// Giant Piezo Buzzer Assembly:









// Giant Potentiometer (Dial) Assembly:

Giant Potentiometer (Dial):

Materials:

A 10K potentiometer, 1/16th" gauge wire ($\frac{1}{2}$ ' red, $\frac{1}{2}$ ' black , $\frac{1}{2}$ ' yellow, although in this tutorial we used three pieces all wrapped in one piece of wire), solder, black or blue paint, a 1" x 3" x 3" cube that you can cut (a cardboard or plastic box of some type or you can even use a soup can if the soda bottle can fit inside it), an empty soda bottle (750 mL), glue, and some duct tape.

Tools:

A soldering iron and scissors (tin snips in you're using a soup can).

Assembly:

1. Strip both ends of each piece of 1/16th" wire. Strip about a half an inch of the wire on both sides. This will leave you with three pieces of 1/16th" wire (red, yellow and black) with each end exposed.

2. Solder the yellow 1/16th" wire to the center connection on the potentiometer. Solder the red and black 1/16th" wire to the connections on either side of the yellow wire. It doesn't matter which wire you solder to connection because only the communication line (yellow, or center) is polarized.



// Giant Potentiometer (Dial) Assembly:

3. Take the top off the soda bottle and cut a hole in it the width of the portion of the potentiometer (dial) you turn with your fingers.

4. Paint the soda bottle black and wait for it to dry.





5. Glue the top of the soda bottle to the dial portion of the potentiometer. Make sure not to let any of the glue drip onto the rest of the potentiometer because this will destroy your potentiometer. Wait for the glue to dry. Make sure this portion is securely glued, you may even want to add more glue once it is dried because this is where the most stress will occur on your giant potentiometer.



// Giant Potentiometer (Dial) Assembly:

6. Paint your cube and wait for it to dry.

7. Hold the soda bottle beside the cube and note where the top of the cube comes up to on the soda bottle. Measure the width of this part of the soda bottle and cut a hole in the center of the top of the cube that is the same size.



8. Cut three 1/8th" holes in a side of the cube. (In our tutorial we used three pieces of wire wrapped into one so we cut one larger hole.)

9. Slide the wires attached to the small potentiometer through the three holes in the cube. (In our tutorial we used three pieces of wire wrapped into one so we cut one larger hole.)

10. Glue the small potentiometer to the center of the bottom of the cube. Make sure you don't glue the potentiometer so it won't turn. (See step 5) This step is crucial so you may want to add more glue once the first round dries, or even use some duct tape to secure the bottom of the potentiometer to the cube.





// Giant Potentiometer (Dial) Assembly:

11. Screw the soda bottle onto the soda bottle top that is glued to the small potentiometer.



12. Add a little additional glue to the holes with the three wires exiting the cube and wait for it to dry.



13. If all went well and you didn't glue your potentiometer to itself you should have a potentiometer you can plug into a giant breadboard. Just be careful with turning it too hard, you can break it if you force it.