# How to Make a Head Stick Pointer for iPhone

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<u>Background</u>

InvoTek was contacted through the RERC by
Ben Chater who wanted to be able to access his
iPhone using his headstick. Ben tried using a
commercial stylus developed for the iPhone but it
did not work reliably for him. We started testing
using on iPod Touch 2G which has the same
capacitive touch screen as an iPhone. Throughout
the design process, we worked closely with Ben via
email. Ben provided guidance on how our
intermediate designs worked for him. He also
provided design ideas to improve usability.
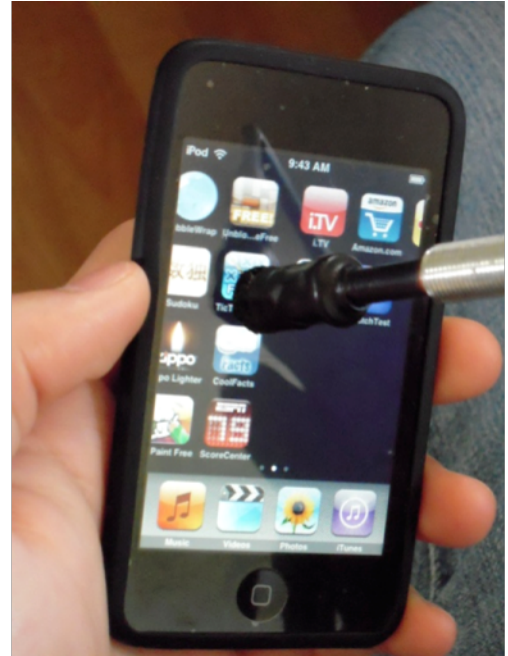
After a couple of tests which included sanding the end of the headstick and covering a wooden
ball with conductive material, Geoff recommended that we try using conductive foam that we had in our
electronics workshop. The foam worked well. We determined that the surface area of the foam
touching the screen was important for reliable operation. We experimentally determined that 3/8-inch
diameter works, but is not completely reliable, while ½-inch diameter works reliably.

<u>What is needed for creating a conductive tip for a headstick</u>

1. Conductive foam - available from Digikey
2. ¼ inch copper tubing – available from any auto supply store
3. Plasti Dip by Perfomix – available from Lowe's
4. ¼ star washer – available from any hardware store.
5. Solder iron and solder
6. Heat Gun and heat shrink

Measurements may be different for your specific headstick assembly. Ben's, which we used for
the measurements, is one that he has been using for a long time and has parts from a number of
different places. The assembly is pictured below at the end of the article while being tested by Erik.

<u>Directions to assemble</u>

1. Cut a 3 inch long section of ¼ inch copper tubing. This is going to be backbone of the tip which
   will insert into the headstick and contain the conductive foam on one end.

2. Solder 4 lines about 1 3/8 inches long along the end that will not be covered in foam. Before soldering, make sure to clean the copper by rubbing it with fine sand paper and wiping it down with rubbing alcohol. This holds the tip steadier when it is inserted into the headstick.

3. Solder ¼ inch star washer (flattened) about 3/4 inch from the end that will contain the foam. Be sure to clean the copper where you solder the same as above. This will be used as an edge to help the user move objects. A vice like the one in the picture below is useful so that fingers are not burned while soldering to the copper.
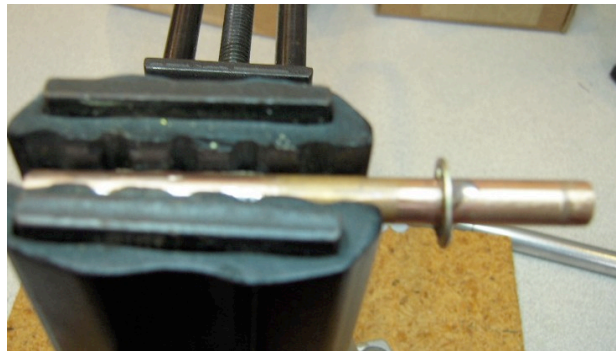
4. Cut a 1- 1/4 inch square of 1/8 inch conductive foam. The thickness of the foam is important since it is the deciding factor in the size of the tip of the pointer. The size of the square is also important because there must be enough to make the arms long enough (described below) to hold the foam in place.

    If you have ¼ inch conductive foam:
    a. Cut the 1 -1/4 inch square as described above.
    b. Cut the thickness of the foam in half so that it is the same thickness as it would be if you had 1/8 inch foam.

5. Cut the foam into the form of an X where each arm is about the width of the tubing (see picture below). By cutting the foam into this shape, there are not bulges on the sides of the pointer.

6. Apply a dot of hot glue on the end of the tubing that the foam will be placed and let dry. This rounds the tip of the tubing so that the copper will not cut through the foam and scratch the screen or track pad it is being used on.

7. Once the glue is dry, apply another small amount of glue and put the foam on the tip. This will help the foam stay in place on the pointer.
8. Bend all 4 arms of the foam down and hold them down with a piece of ½ inch diameter heat shrink. The heat shrink should be about 1 inch long so that only a small amount of the foam is exposed on the end and it extends past the washer. The heat shrink has two purposes:
    a. As it is heated it reduces the diameter of the foam tip.
    b. It extends past the washer which helps hold the foam in place (in addition to the glue dot).

9. Heat the heat shrink starting toward the exposed foam and moving toward the washer while rotating the tubing. The reason to heat the exposed foam side first is that while it shrinks we don't want it to expose more foam (which happens if it is heated from the washer side first). By heating it this way, the foam is squeezed tight and then the heat shrink pulls the foam toward the washer.

10. The next step is to cover the heat shrink tubing with Plasti Dip. The Plasti Dip is a spray on rubber which allows the user to have more grip when using the washer edge. Once the heat shrink is the correct diameter:

   a. Cover the exposed foam with masking tape. If the foam is covered with Plasti Dip, it will no longer work.
   b. Cover the end of the pointer which will be inserted into the headstick with masking tape. We think that this makes the pointer look better but this is optional.
   c. Spray the section of the pointer which is not covered by tape with Plasti Dip.

11. Let the Plasti Dip dry and then remove the tape. Below are pictures of the finished product in the headstick. Also there are pictures of it being used on an iPod Touch 2G and you can see that the user is switching pages on the home screen to see more icons.