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# Making the STM Scanner

by John Alexander

This is the source of the Unimorph disk for STM scanner. It's a piezo buzzer from Panasonic part # EFB-RD24C411. This Unimorph disk moves about  $0.16 \mu\text{m}/\text{Volt}$  in the Z axis, and its' natural resonance frequency is approximately 2.5 kHz. This Z motion is about an order of magnitude higher than for most piezo tube scanners. This larger motion per volt allows this design to use much lower voltage to control the scanner motion.



Front view of the buzzer in case.



Back view

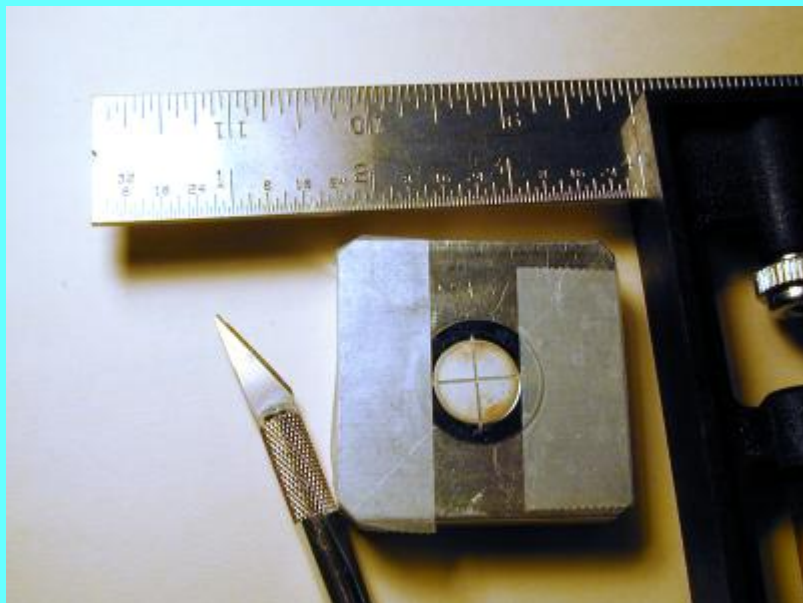
To remove the case cut into the edge at a few places and bend back the edge of the front cover. The disk is just held (no glue) between the front and back half's of the case.



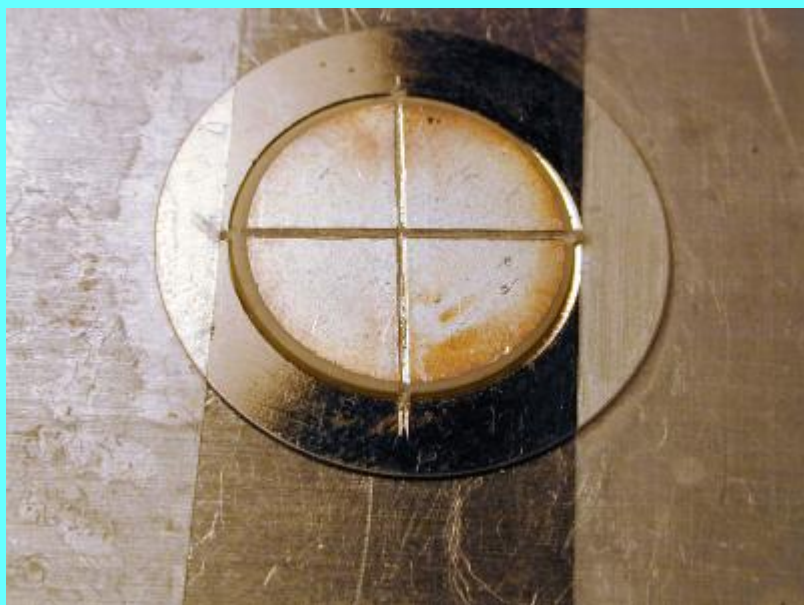
After taking off the plastic case here is the Unimorph disk. The small disk is the PZT ceramic. The larger one is stainless steel.



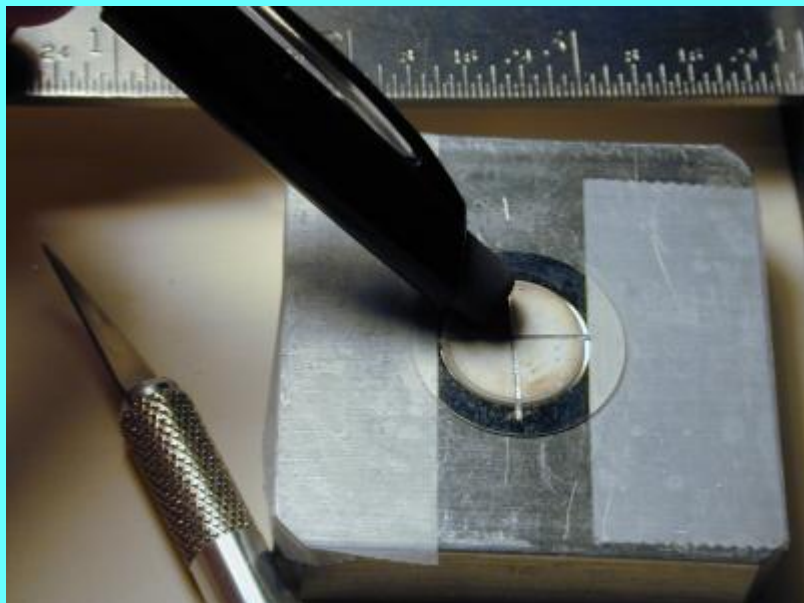
Here is the other side. The stainless steel disk



After taping the disk to a piece of scrap metal divide the electrode into four quadrants by scratching it with a knife. I used a strait edge to keep my cut strait.



The electrode divided into four equal quadrants.



Now to clean the electrodes before making electrical contact rub them with an pencil eraser.

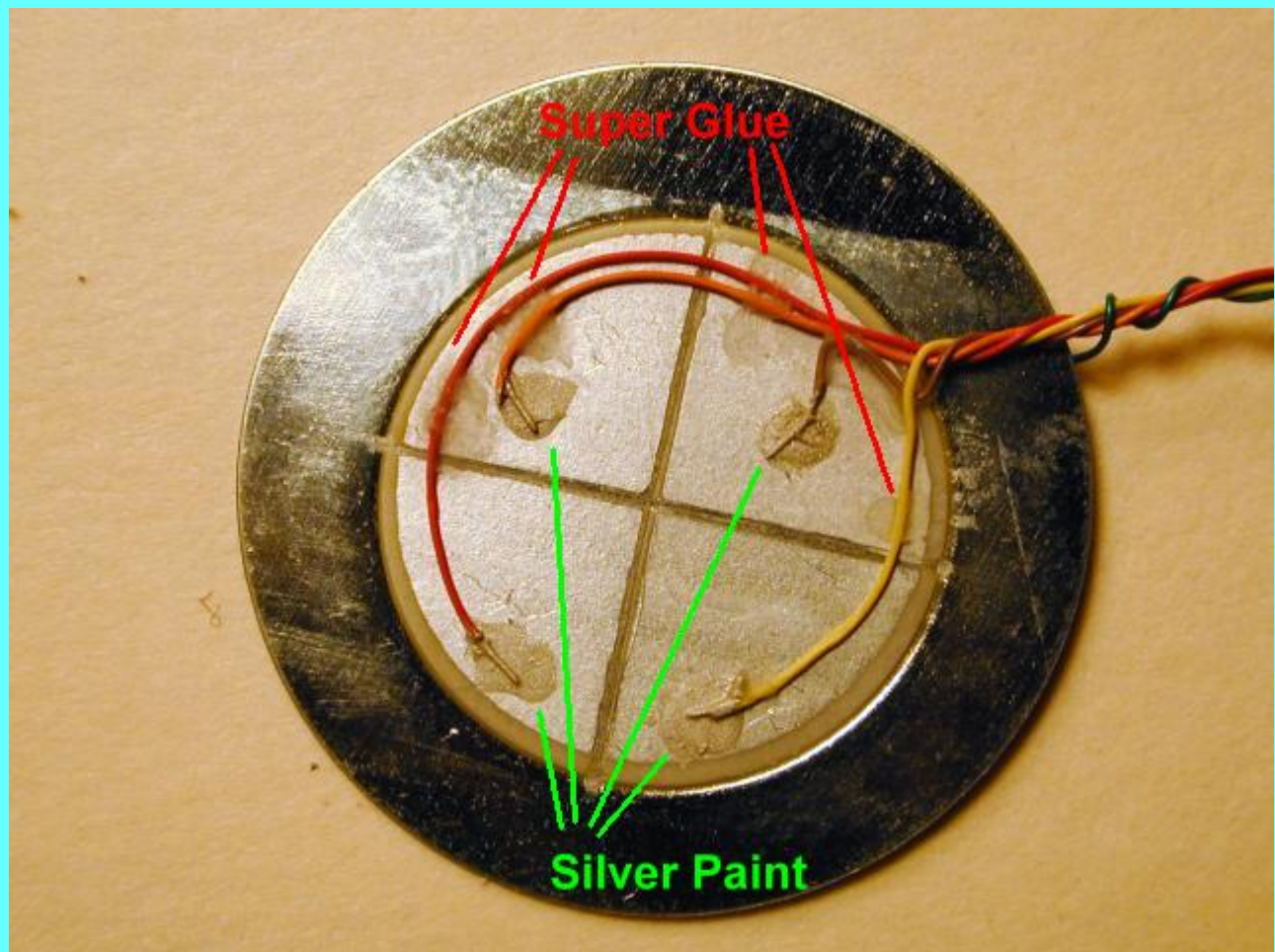


Finished cleaning the disk





Next test that the electrodes are completely separated. Use an Ohm meter to test that there are no shorts between any of the electrodes. Now we are ready to make connections



I used conductive silver paint to make connection to the piezo disk. This has the advantage over solder in that you don't heat up the Piezo ceramic material. Heating the ceramic could depole it. I also use super glue to strain relieve the wires.



Remember the stainless steel disk is the Z electrode.



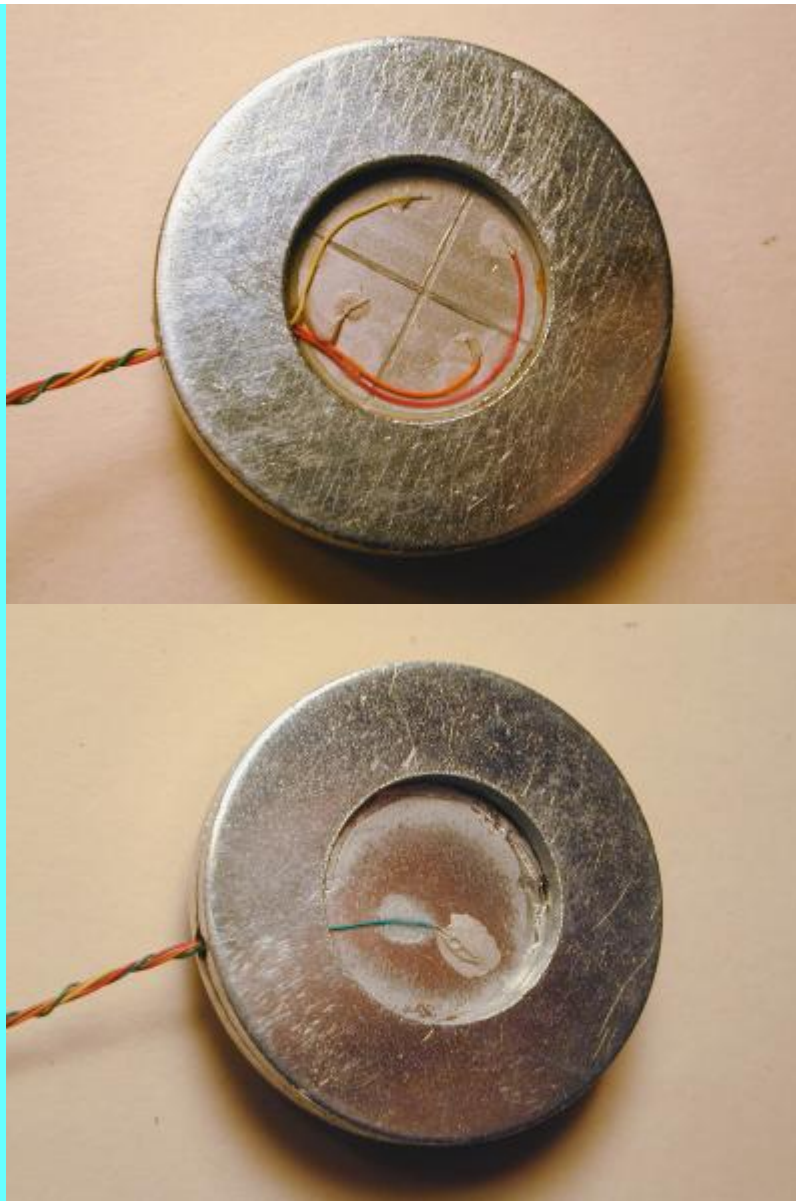
Now for making the mounting for this disk. I used two 9/16" steel washers. They are large enough that the opening at the center is larger than the piezo ceramic disk.



I used a file to make a groove in the washers that the scanner wires will go through. In one washer I made a second groove for connecting the STM tip.

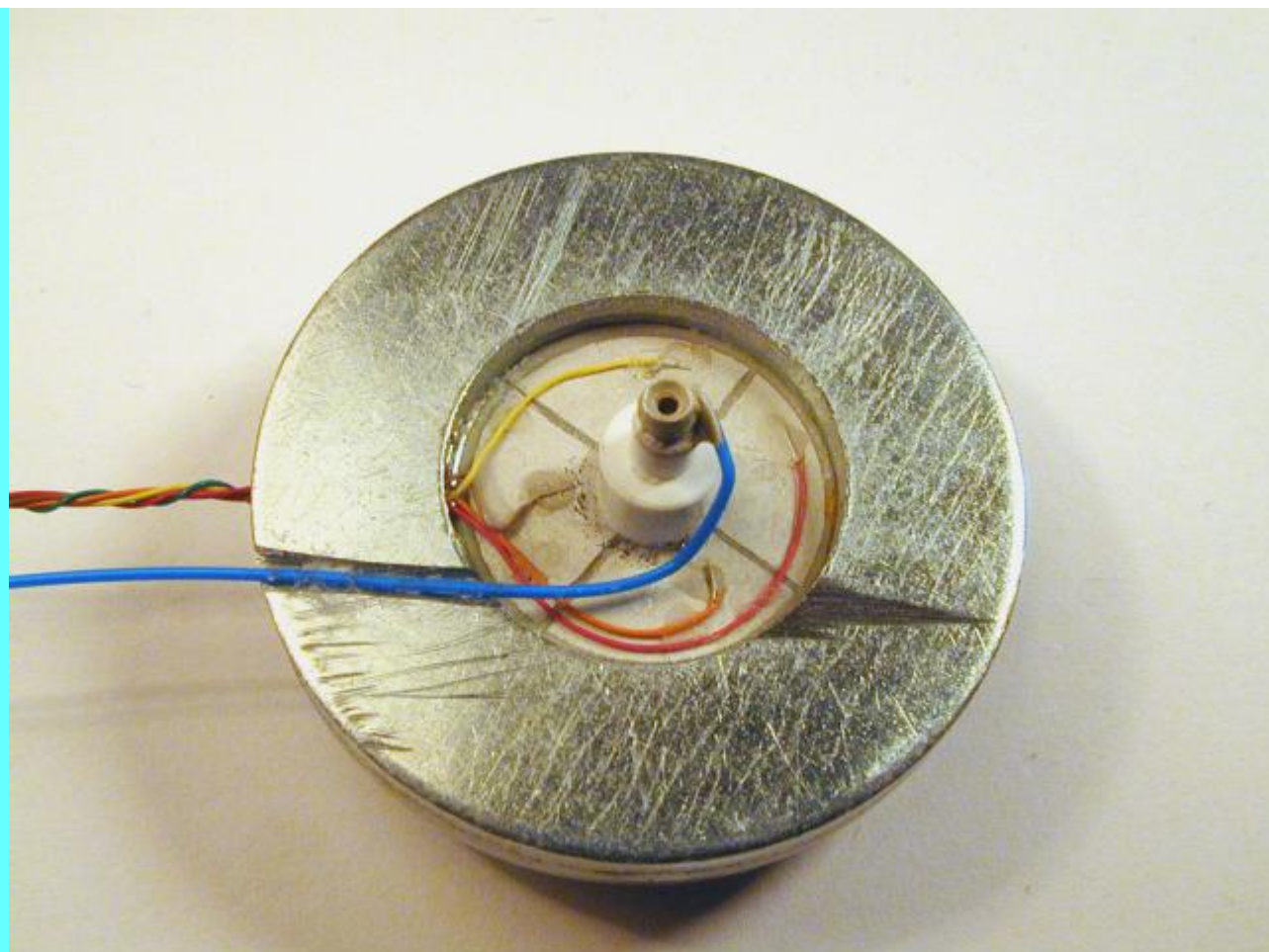


I placed some insulating plastic tape on the washers to insulate the stainless steel disk (Z electrode) from the washers.



I placed the piezo disk scanner in the mounting and glue it with super glue. Note the wires are aligned to the groove.





To finish up the scanner I added two pieces of "Plastruct" concentric plastic tubing to make the insulating standoff. The tip holder is a pin from IC socket inserted in the center tube. again I used silver paint to make electrical contact to the tip holder. This Standoff tipholder is then super glued to the center of the Uimorph Disk. The Scanner is now complete.

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