



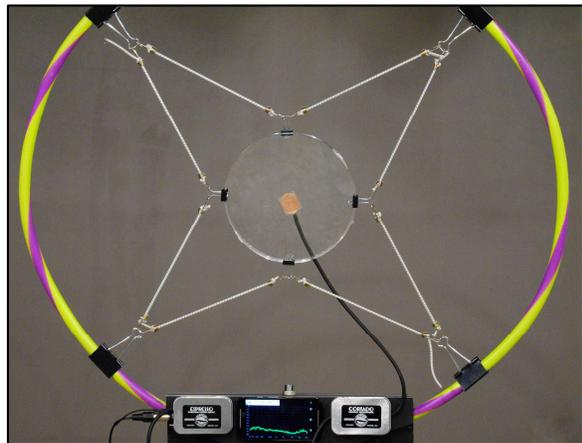
## Essentials of Hula Mic Design

*Use a hula hoop, a clock and  
a contact microphone to make  
this crazy vocal mic*

by Glen van Alkemade

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Here is a wacky, simple project from Zeppelin Design Labs: Convert a hula hoop, a clock and a contact microphone into this crazy vocal mic. Now, a contact mic only responds to vibrations inside solid objects, and not to air pressure as condenser and dynamic mics do – and would therefore be pretty useless as a vocal mic. But by sticking the piezo-electric sensor to an object that does respond to air pressure (the "resonator"), you can sing through all sorts of unusual odds and ends. We suspended the clear plastic lens of a cheap wall clock in the middle of a hula hoop, using binder clips and bungee cords. Then to the resonator we stuck a [Cortado Balanced Buffered Contact Mic](#) from Zeppelin Design Labs, though you can use other contact mics as well.



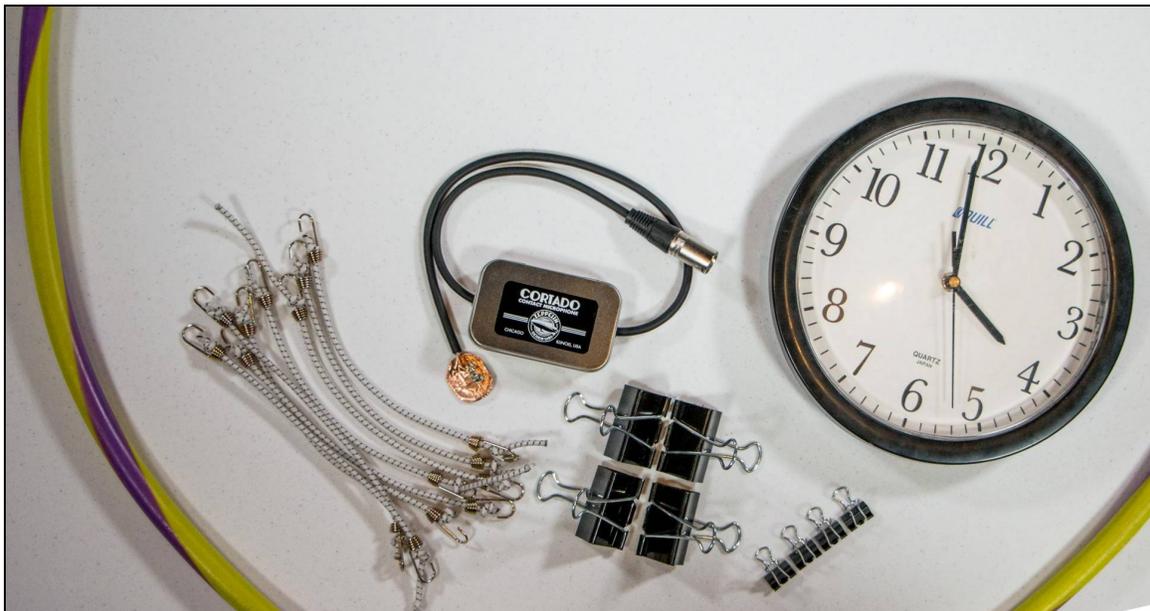
In this article, we will review how we made our Hula Mic, along with pointers and ideas for making a variety of other Hula Mics of your own.

### What You Will Need:

1. Hula Hoop. Ours is a 3/4" (19mm) tube that forms a 34" (86cm) hoop. You could also use a bicycle rim or a barrel strap.
2. Four large binder clips to fit snugly to your hula hoop. We used 1" (25mm) wide clips.
3. Four small and four medium binder clips, to attach to various resonators.
4. Eight mini bungee cords, 1/8" (3mm) cord about 8"-10" (20-25cm) long. We bought parts at the hardware store to make our own custom-length cords. This is discussed in detail in Step 5.
5. A resonator. We used the lens from a cheap wall clock. Other (better-sounding) possibilities are discussed in Step 1.
6. A bit of poster putty, and/or a scrap of carpet tape.
7. A contact microphone. We recommend the [Cortado Balanced Buffered Contact Mic](#) from Zeppelin Design Labs, as you might expect. Contact mic selection is discussed further in Step 6.

Optional Accessories, as pictured above:

8. Bracket to support the hula hoop.
9. Mic stand.
10. [Espresso Portable Phantom Power Supply](#) by Zeppelin Design Labs.
11. [Adapter cable](#) to record straight into a SmartPhone. Available from Zeppelin Design Labs.



### Step 1: Choose a Resonator

Pop the lens off the nearest plastic wall clock. Use a large, straight screwdriver and a small hammer to pop the clips out of the housing.

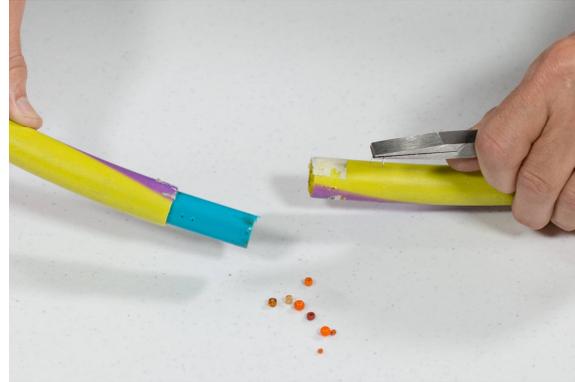


You can use any lightweight, rigid object for the resonator. Several factors will influence the sound you get, including the object's density, mass and rigidity. Generally speaking, we got better results with lower mass, lower density, higher rigidity materials – and Styrofoam fits that description best. (The heavy plastic clock lens produced some weird noise.) Try a Styrofoam clamshell, plate or bowl; a flimsy disposable plastic plate or tumbler; a clear plastic carry-out box from the deli; an aluminum pie plate; and so on. Each object will color your voice differently. [This goofy video](#) demonstrates the variety of sounds achievable with different resonators. Experiment!



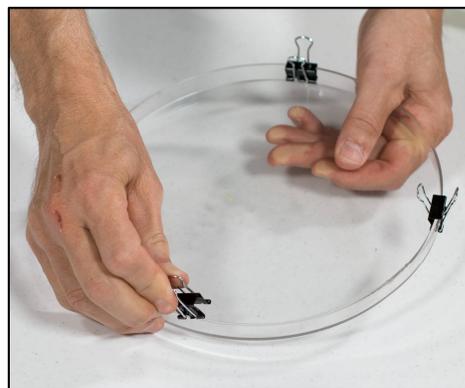
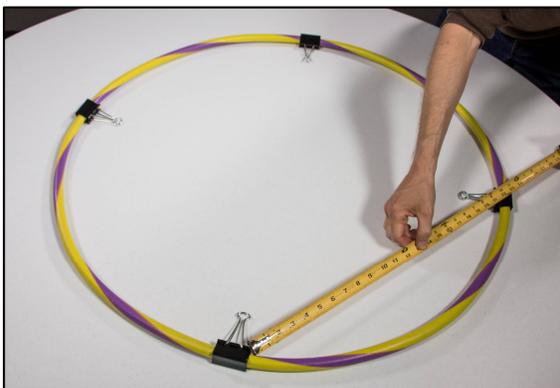
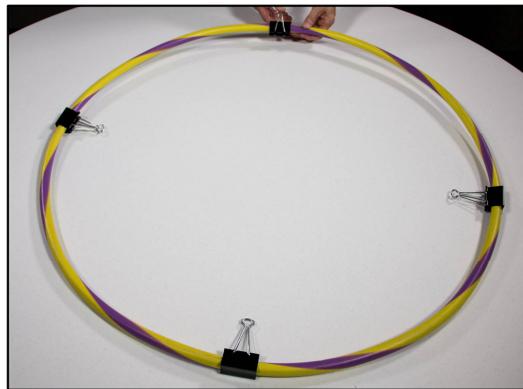
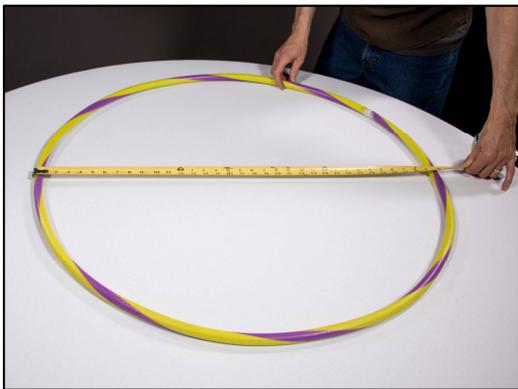
### Step 2: Silence the Hoop

If your hula hoop has something rolling around inside it, as they usually do, pop the hoop open and remove the offenders. The last thing you need inside your microphone is a noisemaker. We easily opened our hula hoop by pulling out a staple, which we pressed back into place again after the surgery.



### Step 3: Attach the Large Clips to the Hoop

Your hula hoop may not be round. Measure it this way and that to identify the two places where the diameters are about the same. Attach the four large binder clips to the hula hoop, roughly at these points of equal diameter. Attach them from the outside as shown, so that the wire handles extend toward the center of the hoop. Measure the distance between clips and shift them around until they are evenly spaced.

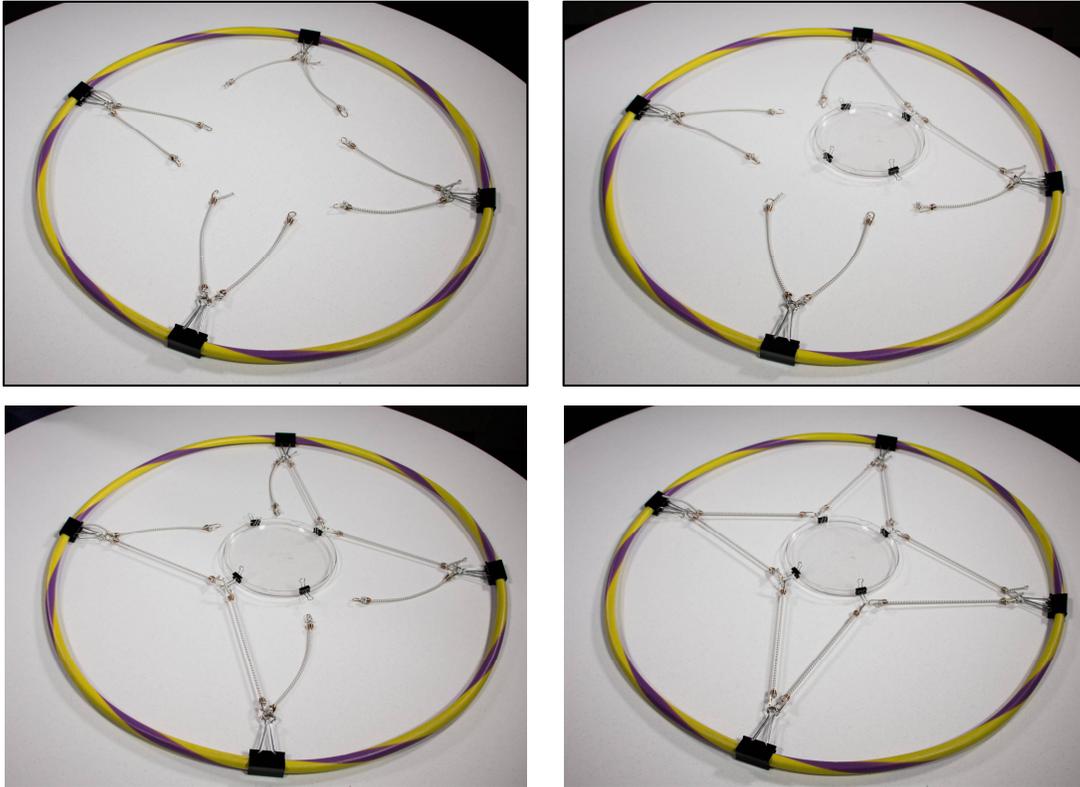


### Step 4: Attach the Small Clips to the Resonator

Attach the small clips to the clock lens (or other resonator). Choice of clip is related to choice of bungee cord, so you may need to swap these out for the medium clips in a moment.

### Step 5: Suspend the Resonator in the Hula Hoop

Hook a pair of bungee cords to each of the large clips on the hoop. Now hook one cord each from two adjacent large clips to one of the small clips on the resonator as shown. Repeat for the opposite small clip. Now repeat for the other two small clips.



The length of bungee is important. The cords should hold the resonator in place firmly enough that it does not flap around during use, but not so tightly that the hula hoop collapses, or the clips pop off, or the resonator is pulled apart. We found that about  $\frac{1}{2}$ " (1.5 cm) extension of  $\frac{1}{8}$ " (3 mm) diameter bungee cord did the job. You can either work with whatever ready-made mini-bungees are available at the hardware store, or buy materials for making your own custom cords, as we did.

If you use pre-made mini bungee cords, you may find there are only a couple of lengths available to choose from. You may need to experiment with different resonators and different clip sizes to find a combination that works with your bungees and hula hoop.

If you make your own bungees, you can use any resonator you like. Cut the cord about 2" (5 cm) longer than you think you need; tie a tight knot close to one end of the cord; tie a loose knot an inch or two (3-5 cm) from the other end. This will make it easy to adjust the cords until you find the optimum length. Adjust all cords to match, and suspend the resonator as above.

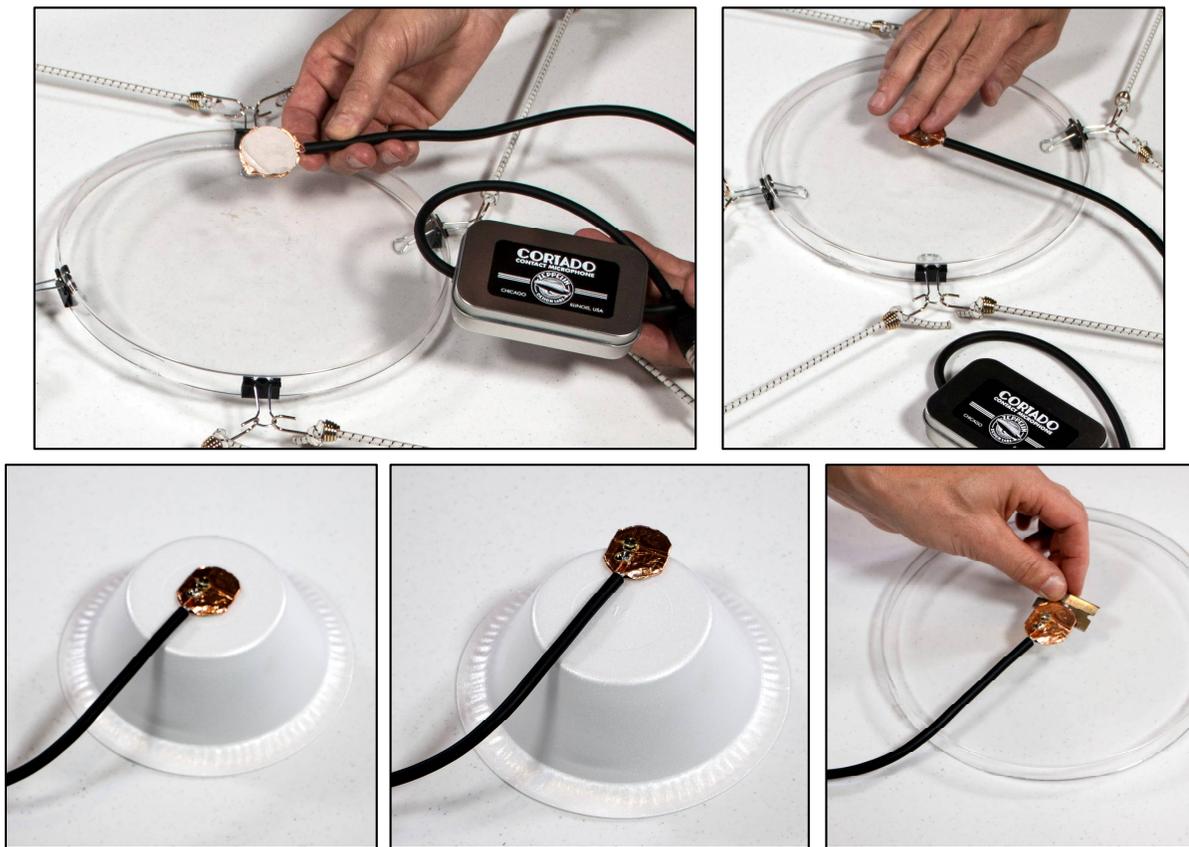


### Step 6: Attach the Contact Mic

At first, when you are experimenting with lots of resonators, use Plasti Tak, Blu Tack, Poster Putty, or Removable Adhesive Putty (all the same thing) to attach the piezo. When you are ready to mount the piezo permanently, use good, wide, double-stick tape (carpet tape).

Stick the piezo contact to the center of the resonator, on the convex side if there is one. We consider this the back of the mic, the side facing away from the vocalist. This allows the mic cable to dangle down the back of the mic without conflicting with the lip of the resonator. Also, by singing into the concave side, the resonator will reflect the vocalist's voice back to him or her, aiding the singing performance.

Work a little blob of putty until it is very warm and soft. Stretch it completely and evenly over the smooth side of the sensor and press it FIRMLY but GENTLY to the resonator. The performance of your mic is heavily dependent upon how completely the piezo is coupled to the resonator, but our tests also show the frequency response of the hula mic is SIGNIFICANTLY AFFECTED by piezo placement. For starters, just put the piezo in the center of the resonator, but you will get a very different sound if the option exists to project the piezo partially off the edge of the resonator, such as on the bottom of a bowl.



**CAUTION:** Piezo-electric sensors are delicate! Do not bend them or press hard on their centers. We usually remove the piezo from the resonator using a razor blade or utility knife blade.

## About contact mics

You can use a simple contact mic or pickup that consists of nothing more than a piezo transducer, a wire, and an unbalanced jack. These are usually meant to be used as instrument pickups, in conjunction with a preamp or DI box. From there, you should be able to send the signal into a recorder, mixer, or an instrument amp. For a quieter, stronger signal with wider frequency response, we prefer a balanced, mic-level output. The [Cortado](#) by Zeppelin Design Labs contains a tiny preamp that balances and buffers the signal from the piezo, matching its impedance to your recorder or mixer.

The Cortado requires phantom power, which your recorder or mixing console will typically provide. If phantom power is not available, or if you want to use your hula mic at the beach to record straight into your Smartphone, you will need a portable Phantom Power supply, such as [the Espresso](#) from Zeppelin Design Labs. With a Cortado, an Espresso and a special [adapter cable](#), you can go completely mobile. Imagine the response you will get when you conduct man-on-the-street interviews with a Hula Mic!



With the Espresso Portable Phantom Power Supply, you further have the option of unbalancing the signal and matching its level and impedance to an instrument amp. This should work as well as the simple piezo pickup described above, but with wider frequency response and lower noise floor.

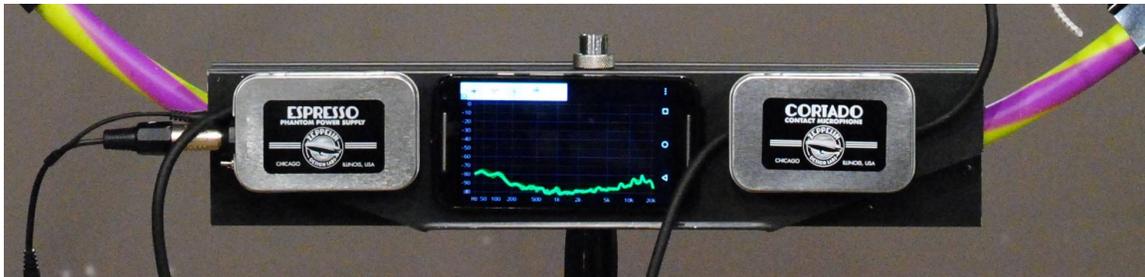
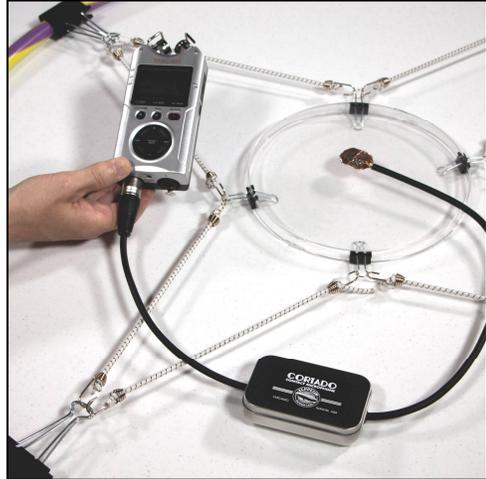


### Step 7: Plug in and Sing!

Mount the mic to a mic stand using an improvised bracket like we did; or use duct tape; or hang it from the ceiling with string; or have two lovely assistants hold it up for you on stage. Strap the contact mic cable or preamp to the hula hoop, to eliminate stress on the piezo.

Plug the mic into your recorder or amp and start singing!

You need to stand back a bit from a resonator this size. We found 12"-18" (30-45cm) worked for most resonators. Different resonators will display different frequency response, sensitivity, and directionality characteristics. Experiment, and have fun!



### Conclusion

So there you have the Hula Mic. The essential elements are a large hoop, a responsive resonator, a suspension system and a contact mic. Please visit our forum at [www.zeppelindesignlabs.com](http://www.zeppelindesignlabs.com); post your questions and suggestions, and post pictures of your very own version of the Hula Mic!

