Maurice

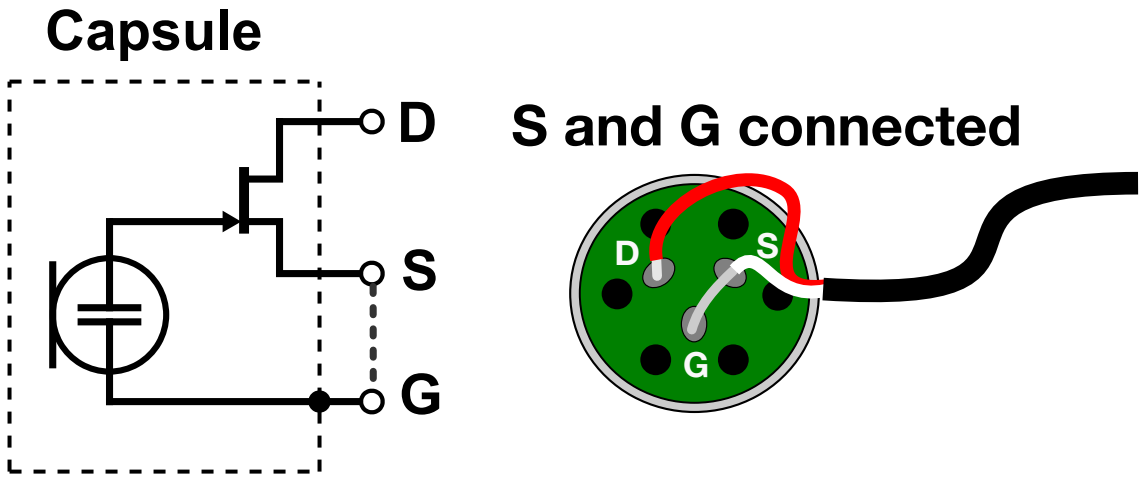
Build Instructions

Maurice is a symmetrical ORTF3D microphone array. There are 8 cardioid capsules set up in four ORTF pairs. Each pair has the capsules spaced 17cm apart and angled +/-55°. Each pair fits in a base that holds them vertically positioned in a cross. The pairs are 17cm apart from each other, all angled symmetrically. This provides excellent height information along with the symmetry needed to decode into binaural with the ability to rotate the sound field. Maurice really shines when used with multi speaker arrays as the audio can simply be mapped directly to the associated speaker channels.

There are two parts to the build. The microphones and the array itself. The array is 3D printed with a few extra parts to allow it to mount to a tripod or light stand.

The Microphone Build

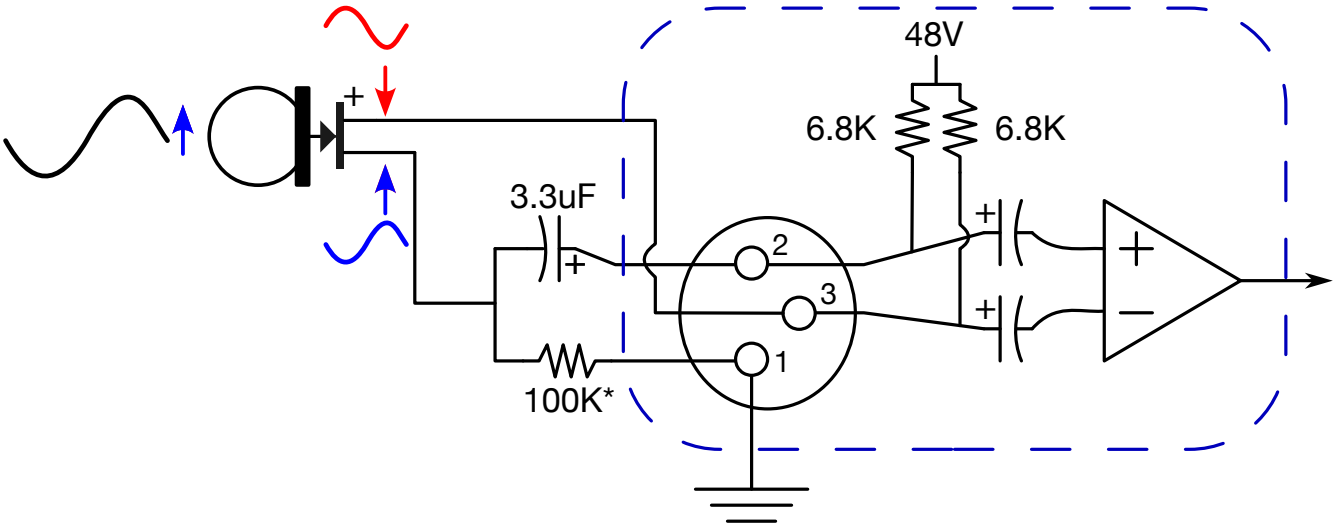
Maurice uses eight JLI-160A11UC680 microphone capsules. It is a “Three Wire” mic capsule which we need to turn into a “Two Wire” capsule by connecting the source “S” and ground “G” terminals on the mic capsule. We will do that when wiring it.



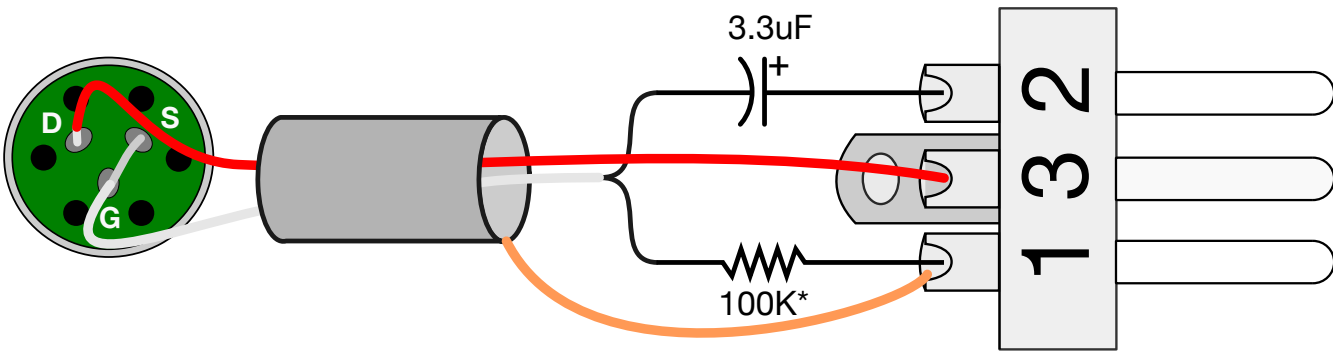
Maurice uses the Simple P48 circuit to connect to a recorder or microphone preamp.

The Simple P48

This circuit belies its simplicity. The key is how it interacts with the microphone preamp and the two 6.8K resistors that supply the 48 Volts. They become integral to the overall circuit.



We are connecting the Drain which is normally the "+" to Pin 3, which is the inverting input to the mic preamp or recorder. That is correct. Incoming sound pressure causes the voltage to go down (less positive) as the FET conducts more. That conduction also causes the voltage on the combined Source/Ground connection to go up (more positive), which is coupled to Pin 2 of the XLR. That is exactly what we want in a balanced audio signal. Note The shield of the Mogami cable is connected to ground at the XLR and **not connected** at the mic capsule end. This provides us with our RF/EMI shielding. The capsule also contains two EMI caps that eliminate Cell Phone and WiFi interference.



Microphone Build

For Maurice to work properly, we need to keep track of the capsules, microphone inputs, and recorder channels. The solution is to color code the XLR connectors. Maurice uses resistor color codes. Each mic element uses 12Ft of Mogami W2697 two conductor shielded miniature microphone cable.

1. Prep the XLR end by tinning the cups for Pins 1, 2, and 3.
2. Fold the negative lead of the capacitor up towards the body.

3. Twist it with one side of the 100K resistor.
4. Solder the connection and trim to the same length as the capacitor.
5. Trim the leads on the capacitor and resistor to about ¼" below the capacitor.
6. Solder the capacitor lead to Pin 2 of the XLR.
7. Solder the resistor lead to Pin 1 of the XLR.
8. Slide the XLR boot onto the cable (so you don't have to slide it over all 12Ft later…)

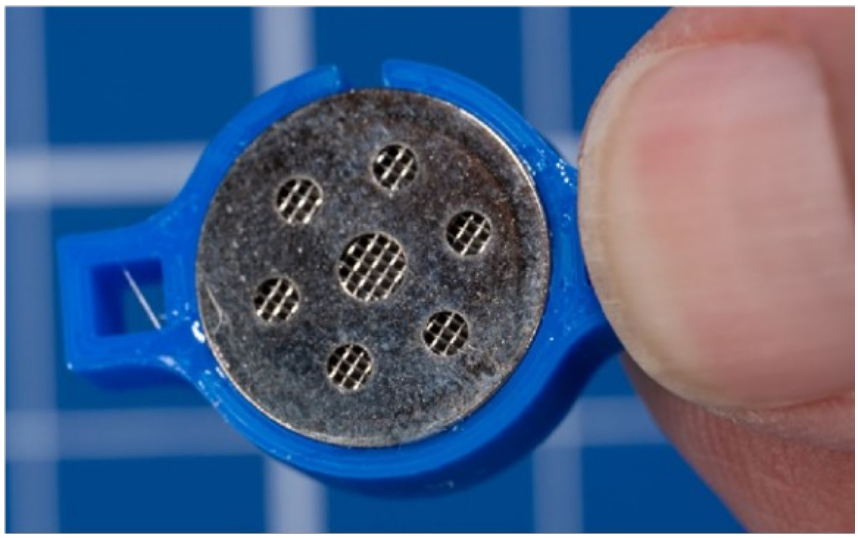
   We are using 8 different colors corresponding to resistor color codes 1-8.

9. Prep the XLR end of the cable:

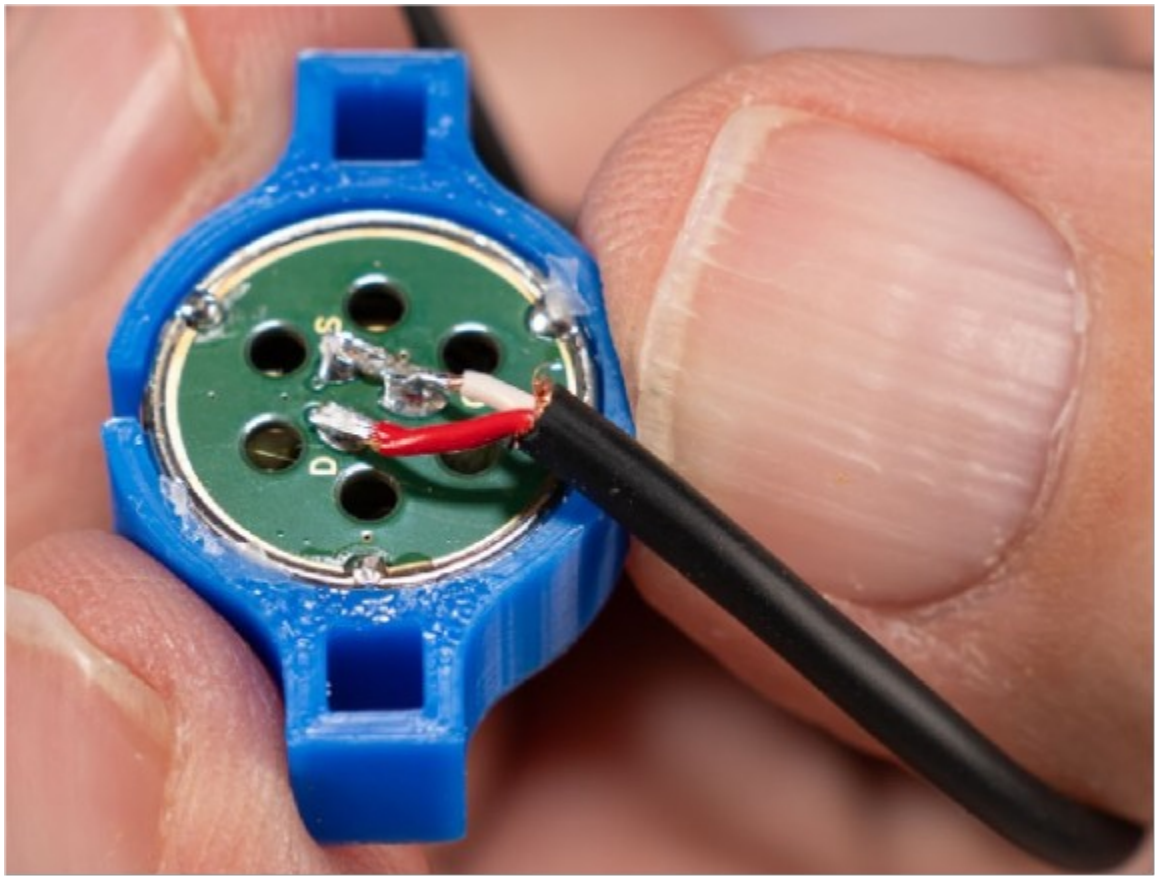
a) Strip back about ½” of the outer sleeve.
b) Twist the shield together and move over to one side. Tin the end of the shield.
c) Strip a small amount of the red and white insulation. Tin both exposed ends.

10. Connect the wires as follows:
    a) Shield to Pin 1.
    b) Red to Pin 3.
    c) White to the junction of the 100K Resistor and 3.3uF Capacitor.

11. Inspect your work and then assemble the XLR end.
12. Repeat for the remaining seven XLR assemblies.
13. Glue the eight capsules to the capsule holders with a small amount of E6000. Let this dry for 4-6 hours before proceeding.

14. Prep the other end of the Mogami wire for connection to the mic capsule.
    a) Strip back about ¾” of outer sleeving.
    b) Twist the shield and pull back to one side.
    c) Carefully cut the shield off as close to the insulation sleeve as possible. We don't want any stray strands touching anything.
    d) Strip back all but ⅛” or so of the insulation from the white inner wire.
    e) Twist that and tin it.
    f) Place the capsule in a hobby vice or other method for holding it in place.
    g) Cut the tinned white wire long enough to connect the “S” and the “G” pads.
    h) Cut the red wire long enough to reach the “D” pad.
    i) Strip about ⅛” inch of insulation and tin the exposed wire.
    j) Clean the soldering iron tip and apply a small amount of solder then connect the “S” and the “G” pads with the white wire.
    k) Solder the red wire to the “D” pad on the mic capsule.



15. Inspect your work and test the mic by connecting it to a preamp and ensuring it works.
16. Repeat for remaining mic capsules.

Assemble the Array

The Parts:

1. The Base: This has a hole in the center to allow it to mount to a light stand using a ¼-20 screw. This uses a knurled nut, knurled bolt, and a rubber washer to adapt it to the light stand. It is also labeled for position and numbered for the ORTF arms. Additionally there are features to help correctly put the arms in their correct orientation.
2. The ORTF arms: There are four of these. Each one is numbered and has a directional arrow pointing up. There is also a tab printed on it that will prevent you from pointing it in the wrong direction. The ends have mounting points for the capsule holders that will angle them 55° up and down.

3. The Capsule Holders: These have two cutouts for the arm ends and fit the capsules we are using.
4. Wire clips. These allow the Mogami wire to clip into the side and to press onto the ORTF Arms to hold the wires in place.
5. Wind Protection: This is optional if you are only using the mic indoors. They fit onto the ORTF arms and allow a microphone “Dead Cat” furry windscreen to slide over them. There are separate instructions for the Wind Protection as it can be added after the mic is complete.

Assembly

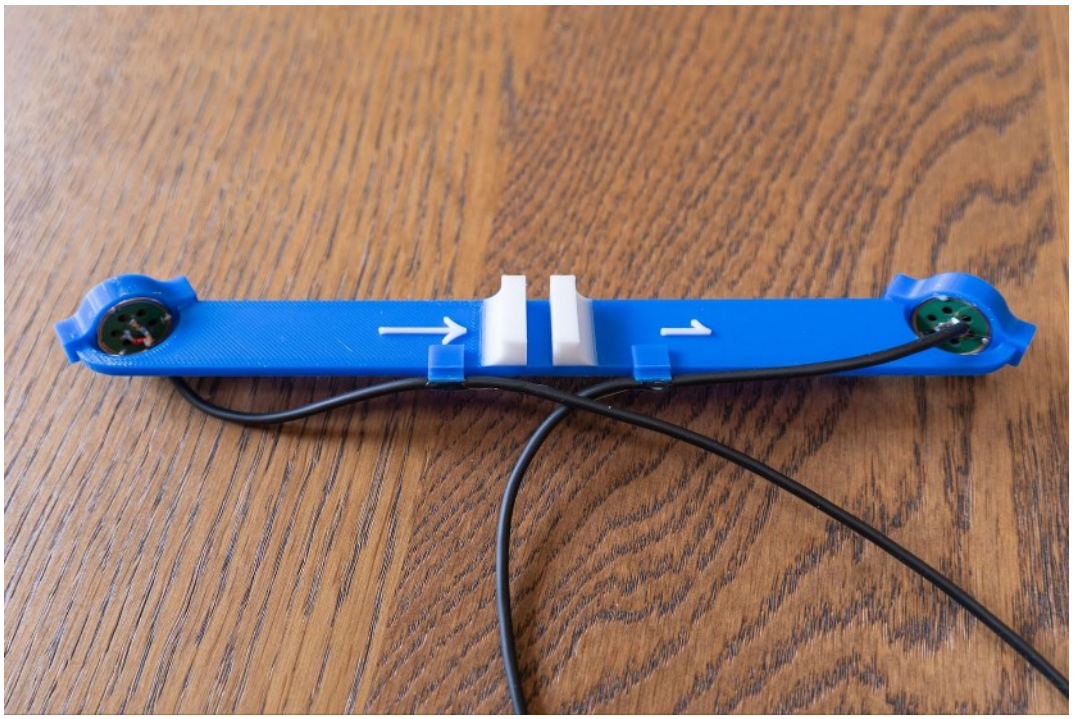
1. Separate out each capsule so you can clearly see which XLR Boot color you are working with

Note: Each Capsule assembly is color coded so it goes in the correct place. See the diagram to ensure you get this correct.

ORTF Arm #	Top Capsule		Bottom Capsule	
One	Brown	Input 1	Green	Input 5
Two	Red	Input 2	Blue	Input 6
Three	Orange	Input 3	Purple	Input 7
Four	Yellow	Input 4	Grey	Input 8

2. Glue the capsule holders onto the ORTF Arms using E6000. Ensure that you have the correct color coding.

3. Let these dry
4. Press on two wire clips on the back of each ORTF Arm.



The next steps are easier if you mount the Base on a small tripod to hold all the arms.

5. Slide each of the arms on the base matching their corresponding numbers.

6. Separate out all 8 wires so that there are no tangles.
7. Test each ORTF pair by connecting them to a recorder and listening with headphones.
8. After testing apply a small amount of E6000 to each of the wire clips to hold the wire in place. Let that dry.

Dress in the wiring

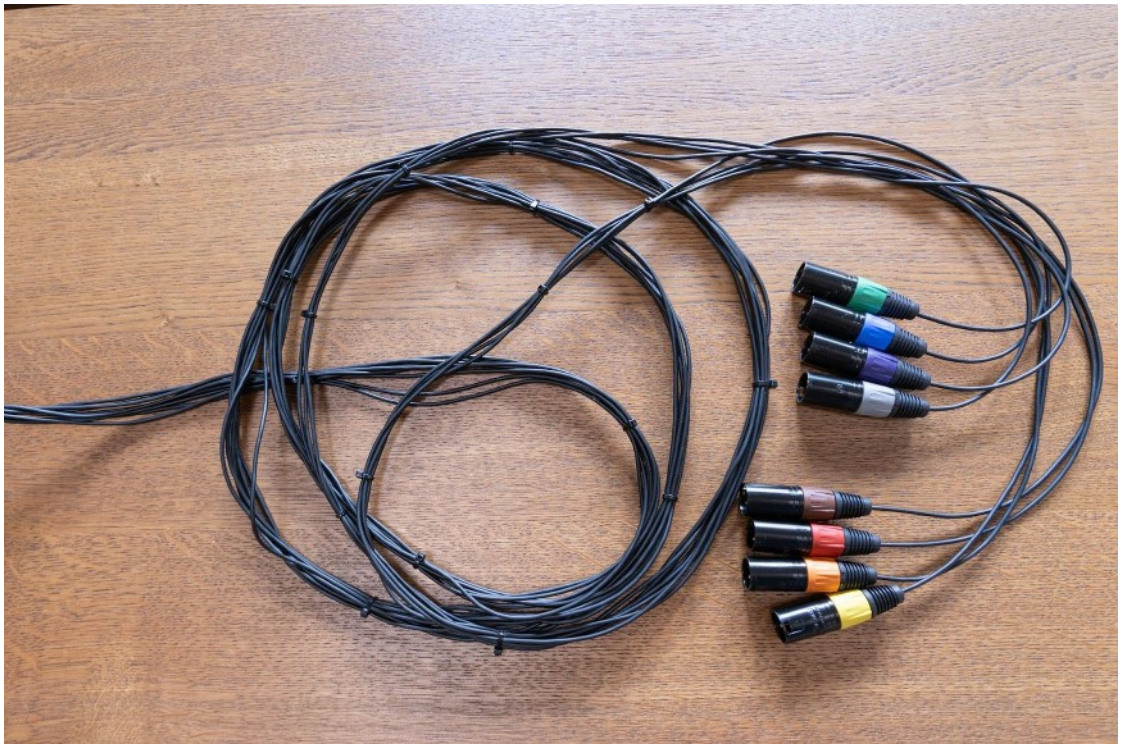
This streamlines the setup and use of the microphone array. Each arm gets two tie wraps combining its two capsules. Then the “Left” and “Right” sides combine their four cables into one with a couple more tie wraps. Then all 8 cables get dressed into one cable leaving about two feet near the end. Now we split back out into two sets of four. In this case, we split out the incoming channels 1-4 and 5-8. This lets us plug into either a MicPre 10 recorder or a Zoom F8nPro, Both those recorders have inputs 1-4 on one side of the recorder and 5-8 on the other side. See the photos for the specifics. This also allows us to slide the arms on and off for ease of storage and transportation.

1. Layout the cables so that they are not tangled
2. Dress in and tie wrap each individual ORTF Arm with a tie wrap as shown.

3. Repeat for the remaining three ORTF Arms.
4. Combine the wires from Arm 1 and Arm 2 together with a tie wrap

5. Add another tie wrap to the four wires about 4-6 inches below the last one.

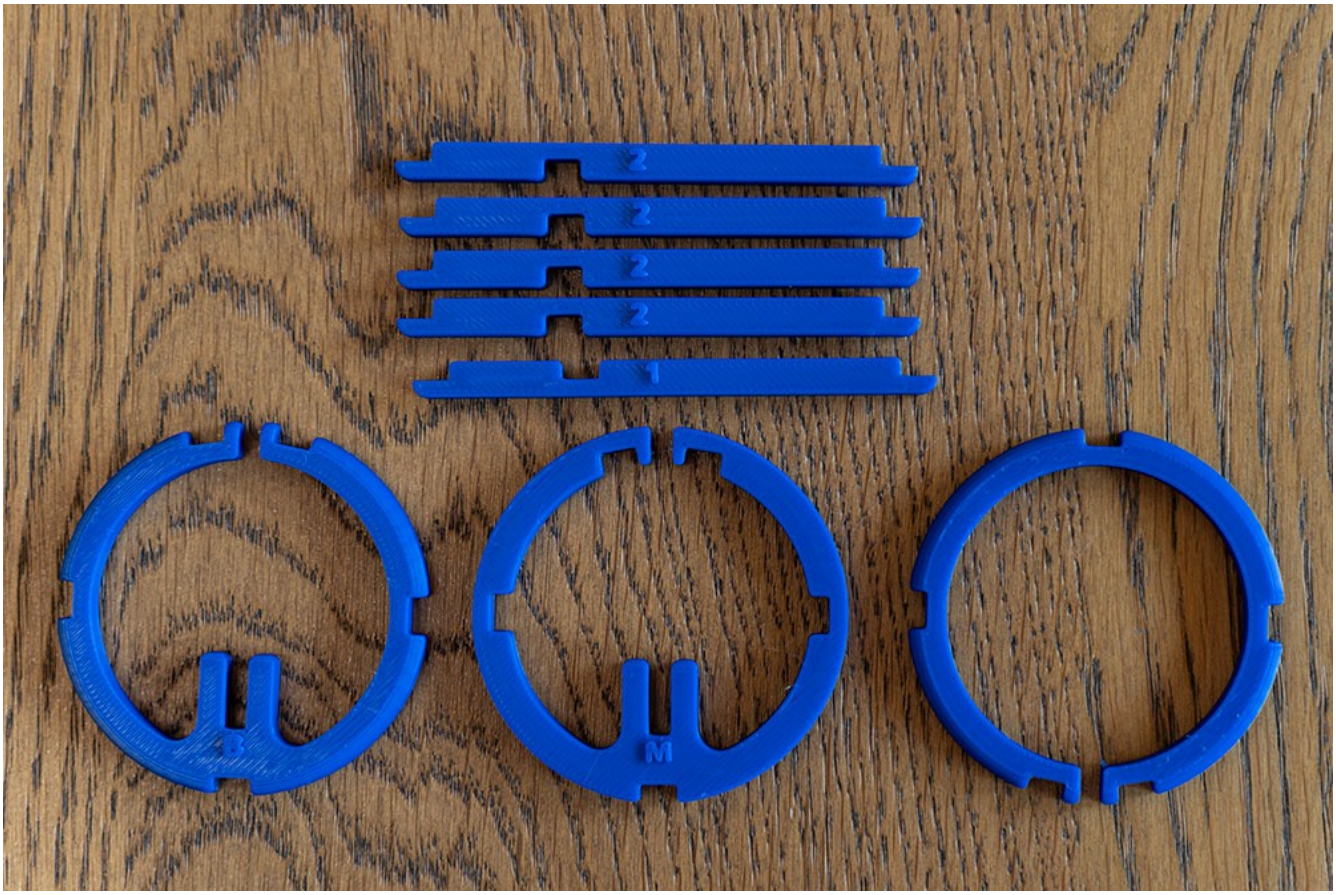
6. Repeat for Arms 3 and 4.
7. Combine all eight cables together into one bundle and place a tie wrap about 4-5” below that last one’s holding each set of four cables together.
8. Continue adding tie wraps every 6-8” ensuring the cables are tight and even. Do this until there is about 24” of cables left.
9. Separate out the rest of the cables into two bundles.
    1. One with the Brown, Red, Orange and Yellow XLR’s
    2. One with the Green, Blue, Purple and Grey XLR’s
10. Continue tie wrapping the two bundles with a tie wrap every 4”- 6” until there is about 10” left. This should only take a few more tie wraps



Wind Protection

Note: This is not necessary if you are only using the microphone indoors.

The wind protection is made from 8 3D printed frames. Then “dead cat” furry wind screens are slid over the frames. The frames are printed as shown below and then assembled with some E6000 glue at the joints.



There are three rings, a Bottom “B” on the right. A Middle with “M” printed on it and a top with no label. The “B” side faces down on the bottom piece. There are four rail pieces the go on the outside of the top and bottom but inside the middle ring they are labeled “2”. They assemble similar to Lincoln Logs. Then there is one rail piece that goes on the outside of all three rings and is the final piece to the assembly. Note that the rails are not symmetrical. The center slot in the rails is off set to one side. This lets us center the capsule in middle of the frame. Snap them together a couple times to get a feel for how they go together and then assembly with a small dab of E6000 at each joint.

Once the eight frames are assembled, the snug onto the ORTF arms as shown below. Use some E6000 glue on the edge of the joint to lock it in place.Once all the glue is dry, you can slip on the actual furry wind screen.