Ambi-8 Build and Use

Kit assembly and recording guide

Build your Ambi-8 microphone, connect its eight channels to a recorder, and prepare your recordings for an ambisonic workflow in REAPER.

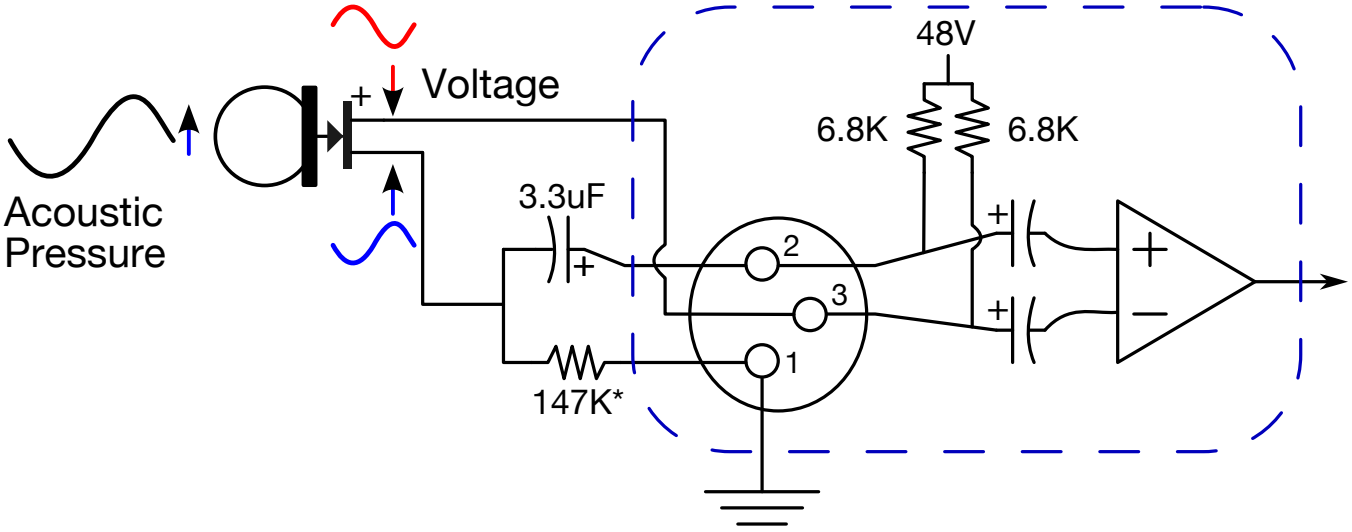
About the Ambi-8

The Ambi-8 is an eight-capsule ambisonic microphone. It uses twice as many capsules as a standard four-capsule tetrahedral microphone and includes built-in cable guides to keep the wiring organized.

The 3D-printed assembly consists of a base, a geometry piece, and eight capsule holders. Each JLI capsule connects to its own XLR connector through a Simple P48 circuit. The capsules fit into the holders, the holders mount in the geometry piece, and the cables run down the guides on the base.

The Simple P48 circuit

Each channel uses one resistor and one capacitor to connect the capsule to a recorder or microphone preamp with 48 V phantom power. The resistor works with the preamp's phantom-power supply resistors to bias the capsule's internal FET. The capacitor couples the capsule signal to the other input of the preamp.



Simple P48 circuit and the microphone preamp input.

Build sequence

Prepare the printed parts, assemble and test all eight microphone channels, mount the capsules, and bundle the cables. The final section covers recording and the start of the encoding workflow.

Parts and preparation

Quantity	Part
1	3D-printed base
1	3D-printed geometry piece
8	3D-printed capsule holders
80 ft total	Mogami W2697 cable, cut into eight 10 ft lengths
8	JLI-160A11UC680 microphone capsules
8	147 kΩ resistors, ¼ W
8	3.3 µF capacitors, 63 V
8	Male XLR connectors
8	Colored XLR boots: brown, red, orange, yellow, green, blue, purple, gray
8 pieces	Heat-shrink tubing

Also used during assembly: a ¼-20 brass insert, E6000 adhesive, cable ties, soldering and wire-preparation tools, a hobby vise, and a heat source for the tubing. A small tripod is useful when bundling the cables.

Software Used

Digital Audio Workstation, REAPER https://www.reaper.fm/

Plugins: SPARTA https://leomccormack.github.io/sparta-site/

JSON preset file for the SPARTA encoder plugin https://www.jlielectronics.com/content/Ambi-8JSON.zip

Prepare the base and geometry piece

1. Install the ¼-20 brass insert in the microphone body.

2. Test-fit the capsule holders in the geometry piece. Leave them unglued for now.

3. Slide the geometry piece onto the base. Look through the lower capsule openings and check where the 45° section of the base aligns with them.

4. Apply a small amount of E6000 to the tip of the base and glue it to the geometry piece. Look through the lower capsule openings to make sure the base has not been pushed in too far.

Assemble the XLR circuits

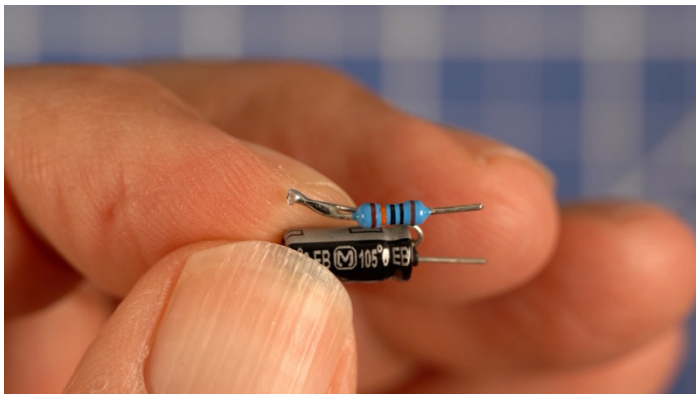
Build one channel at a time. Repeat the completed assembly for all eight channels.

Join the resistor and capacitor

1. Bend the capacitor's negative lead upward so it runs alongside the capacitor body.

2. Twist that lead together with one resistor lead. Position the free resistor lead and the capacitor's positive lead so they point downward.

3. Solder the twisted leads together, then trim the joint level with the top of the assembly.



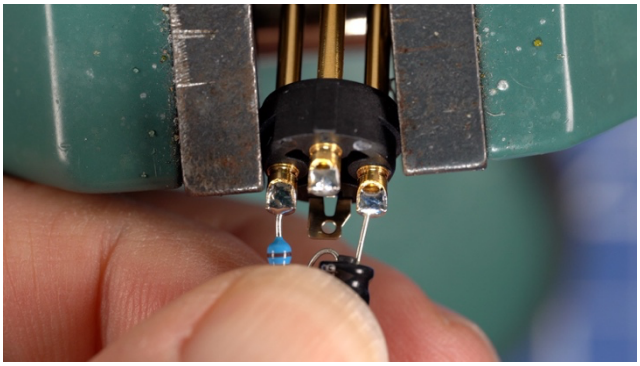
Resistor and capacitor joined at the capacitor's negative lead.

Attach the circuit to the XLR insert

4. Tin all three solder cups on the XLR insert.

5. Solder the free resistor lead to XLR pin 1.

6. Solder the Capacitor lead to XLR pin 2.



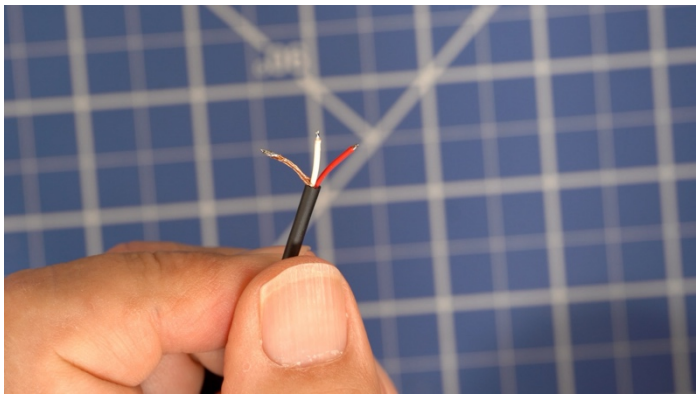
XLR insert with the resistor and capacitor fitted.

Connect the cable at the XLR end

1. Slide a colored XLR boot onto one 10 ft cable before making any connections.

2. Strip slightly more than ½ inch of the cable's outer jacket. Twist the shield strands together, then strip a small amount of insulation from the red and white conductors.

3. Tin the shield and both conductors.

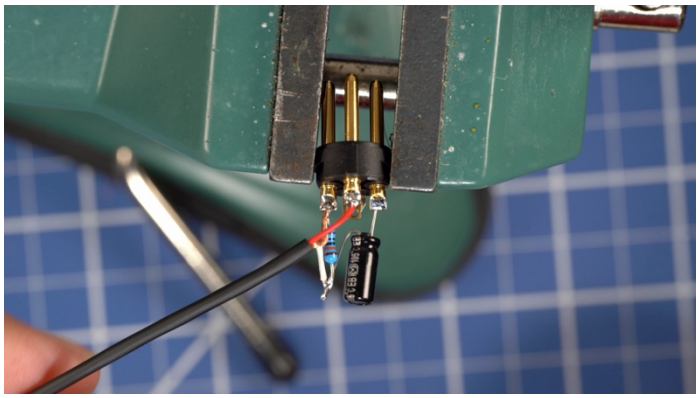


Cable prepared for the XLR connections.

4. Bend the white conductor back. Solder the shield to XLR pin 1, alongside the resistor lead.

5. Solder the red conductor to XLR pin 3. Solder the white conductor to the resistor–capacitor junction.

6. Inspect the connections, then slide the XLR insert into its shell and screw on the colored boot.



Cable conductors soldered to the XLR assembly.

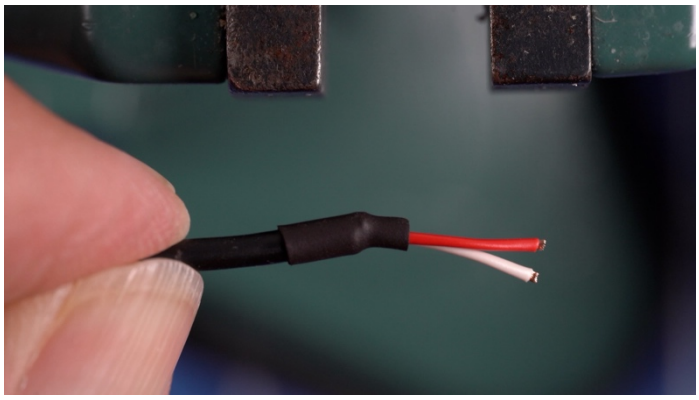
Repeat for the remaining seven cables and XLR connectors, using a different boot color for each channel.

Connect and test the capsules

1. At the capsule end of each cable, strip back ½ inch of the outer jacket.

2. Fold the shield back and cut it off. The shield provides EMI/RF protection along the cable; it is not connected at the capsule end.

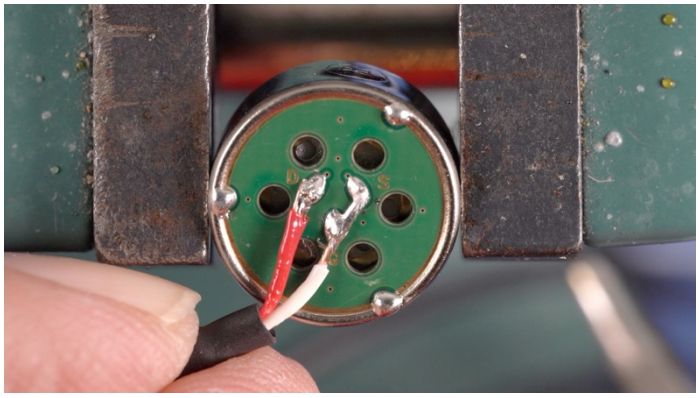
3. Slide a piece of heat-shrink tubing over the cable and shrink it carefully. Too much heat can melt the insulation on the inner conductors.



Capsule end of the cable with heat-shrink tubing fitted.

4. Strip back half the insulation on the exposed white conductor. Tin the exposed white conductor and the end of the red conductor.

5. Hold a capsule in a hobby vise. Use the white conductor to connect the capsule's S and G terminals together. Solder the red conductor to the D terminal.



White conductor bridging S and G, with red connected to D.

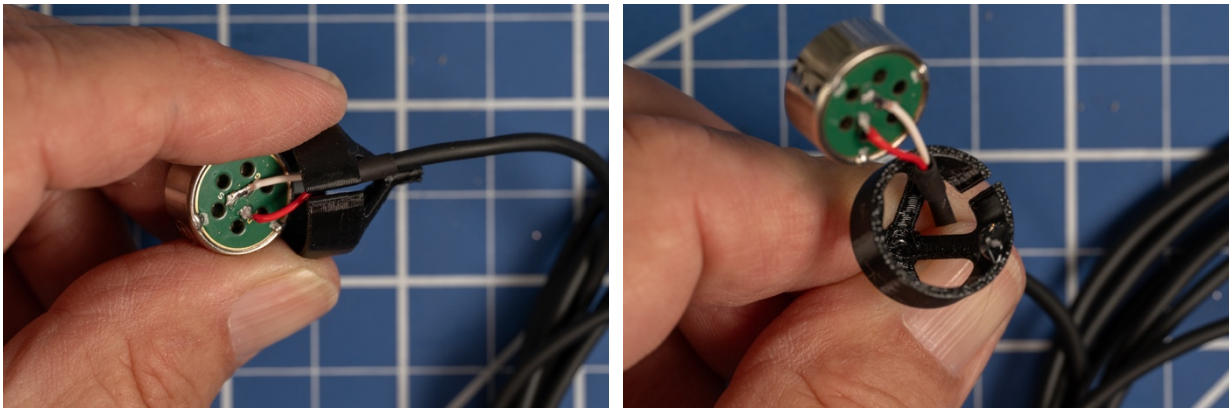
6. Connect the completed channel to a microphone preamp with 48 V phantom power and confirm that it works before proceeding.

Repeat for the remaining seven capsules. Test every channel before mounting the capsules.

Fit the capsules into their holders

1. Place a capsule against its holder and press the cable through the split in the holder.

2. Apply a small amount of E6000 at a few points around the inside of the holder.



Left: route the cable through the split. Right: apply adhesive inside the holder.

3. Press the capsule into the holder until its rim is flush with the top edge of the holder.



Capsule seated in its holder.

4. Repeat for the remaining seven capsules.

Mount the capsule holders

Check the channel positions before applying adhesive. When you face the direction tab, capsule 1 is at the top/front. Capsule 2 is below and to your right; capsule 3 is above and to the right of capsule 2.

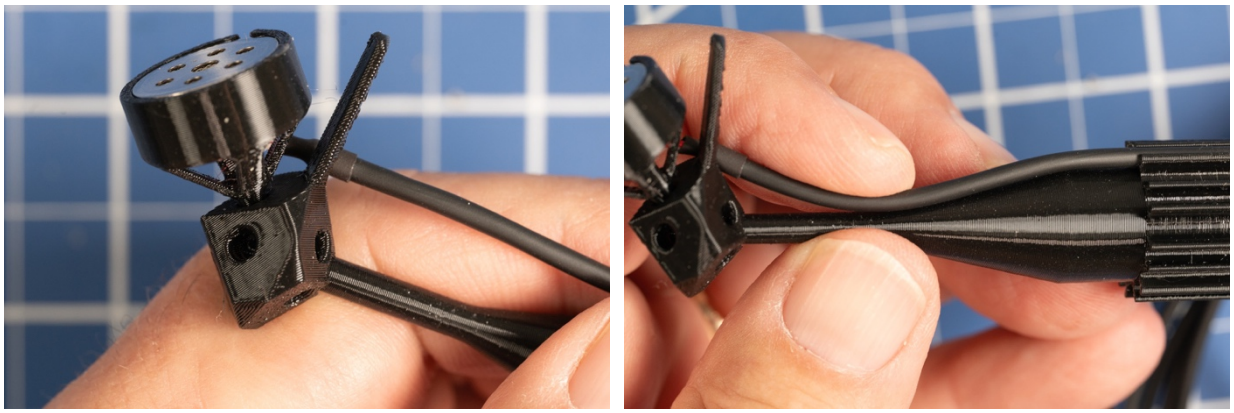
The top ring contains capsules 1, 3, 5, and 7. The bottom ring contains capsules 2, 4, 6, and 8.

Capsule	Boot color	Channel	Ring	Azimuth	Elevation
1	Brown	1	Top	0°	45°
2	Red	2	Bottom	45°	−45°
3	Orange	3	Top	90°	45°
4	Yellow	4	Bottom	135°	−45°
5	Green	5	Top	180°	45°
6	Blue	6	Bottom	225°	−45°
7	Purple	7	Top	270°	45°
8	Gray	8	Bottom	315°	−45°

Orientation reference: face the direction tab. From behind the microphone, with the tab pointing away from you, capsule 2 is on your left.

1. Start with capsule 1. Apply a small amount of E6000 to the mounting pin on its holder, then insert it into the top position above the direction tab on the geometry piece.

2. Bring the cable down the base and press it into its cable guide.



Left: capsule 1 above the direction tab. Right: cables seated in the base guides.

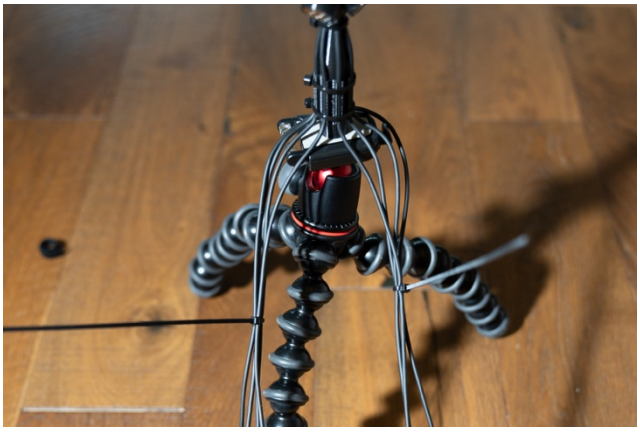
3. Install the remaining holders in the order shown in the table. Let the adhesive dry fully once all eight are in place.

Bundle the cables

1. Mount the microphone on a small tripod or another support that lets you separate and bundle the cables.

2. Place two cable ties around the microphone body to hold the cables in their guides. Trim the excess tie ends.

3. Separate the cables into two groups of four: channels 1–4 on one side and channels 5–8 on the other.

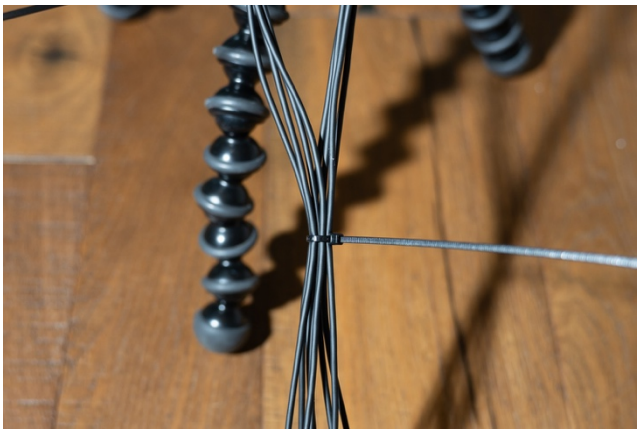


Support the microphone while arranging the cables.

4. Place a cable tie around each group, about 8–10 inches below the microphone.

5. Bring the two groups back together and secure them with another cable tie.

6. Add cable ties every 12–16 inches along the combined bundle. Leave the final 16 inches loose so the XLR connectors can reach the recorder inputs.



Bring the two groups together into one cable bundle.

7. Trim the excess ends from all cable ties.

Record with the Ambi-8

Using the Ambi-8 involves three stages: recording, encoding, and decoding. The software workflow in this guide uses REAPER and SPARTA Array2SH.

Set up the recorder

For recording with a Zoom F8n Pro or MixPre-10, use the following basic setup and keep the channel order consistent.

1. Set the recorder to save a single eight-channel WAV file.

2. Link the input trims so all eight channels use the same gain setting.

3. Enable 48 V phantom power for all eight microphone inputs.

4. Connect the XLRs in channel order: 1 brown, 2 red, 3 orange, 4 yellow, 5 green, 6 blue, 7 purple, 8 gray.

5. Start recording.

Start the encoding workflow in REAPER

REAPER and most DAWs default to stereo operation. The Ambi-8 workflow requires an eight-channel track and the appropriate encoder setup.

1. Transfer the eight-channel WAV file to your computer.

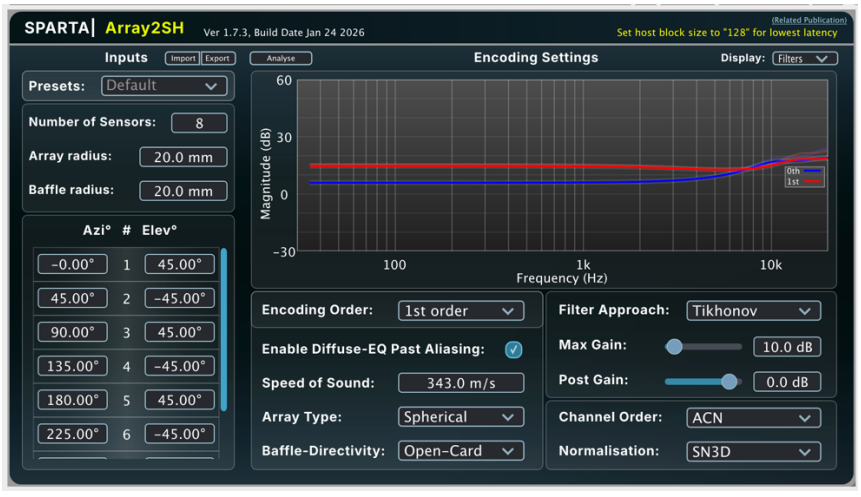
2. Open REAPER and drag the WAV file into the project. If a long recording spans several sequential files, place them sequentially on one track.

3. Check that the track is configured for eight channels.

4. Install the SPARTA plug-ins if needed. Rescan the plug-ins or restart REAPER so they become available.

5. Add SPARTA Array2SH to the track's FX chain.

6. Import the JSON preset containing the correct Ambi-8 settings.



7. Save this as a Preset from the plugin window.

The audio is now in Ambisonic B format. You are now ready to decode it using multiple methods that go beyond this instruction. SPARTA has plugins for Beamforming, Binaural rendering and direct to speaker array setups. For speaker arrays such as 5.1 and 7.1.4 IEM has a decoder that uses an algorithm called ALLRAD. That is open source as well. For paid plugins Audio Brewers is great along with several others. More information can be found here:
https://www.instructables.com/Ambi-8-and-Ambi-12