Using AudioMoth with External Electret Condenser Microphones

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From hardware version 1.2.0 using firmware version 1.5.0 onwards, AudioMoth is compatible with external electret condenser mono microphones, commonly known as plug-in powered (PIP) microphones.

1 Microphone Compatibility

AudioMoth has a DC-coupled audio input that is compatible with electret condenser microphones. These microphones can be bought fully assembled from many sources. For example, MicBooster sells assembled microphones that use the sensitive Primo 258 electret condenser capsule (see Figure 1)[1].

Certain hydrophones that incorporate a common source JFET buffer can also be used. These include the Aqurian H2d and Aquarian A5 hydrophones[2][3]. In addition, the Aquarian PA-1 amplifier can be used to buffer other bare piezo hydrophones[4].

Figure 1: *Fully assembled Primo EM258 Mono module, with 3.5 mm plug and 1 m cable, picture from www.micbooster.com*

AudioMoth will automatically switch from its standard internal MEMS microphone to the external electret condenser microphone by simply plugging an external 3.5 mm jack plug into the 3.5 mm socket. Plugging in a 3.5 mm jack during a recording will result in the current WAV file closing and a new recording immediately starting from the external microphone signal. External microphones are powered from a dedicated ultra-low noise analog regulator on AudioMoth and this connects directly to the electret condenser microphone through an RC circuit (see Figure 2). In addition to the standard software-controlled amplifier present on hardware versions 1.0.0 and 1.1.0, AudioMoth versions from 1.2.0 onwards also apply 20 dB gain to the raw microphone signal through an analog pre-amplifier.
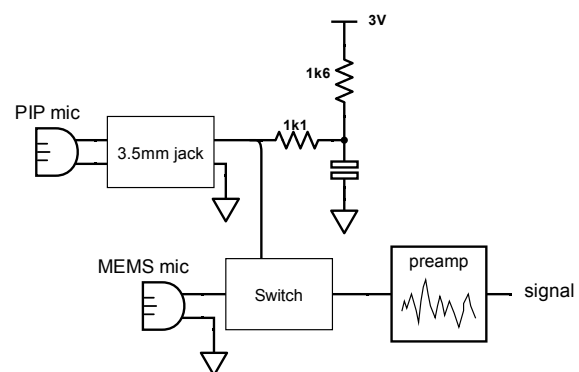

Figure 2: *The AudioMoth external microphone circuitry and the internal microphone switch*

2 Jack Configuration

For compatibility, the CUI Devices SJ2-35464A-SMT-TR[5] 3.5 mm stereo jack socket is required (Figure 3). This socket is hand-soldered to the front-facing PCB surface. AudioMoth connects only to the tip and sleeve of a jack plug and leaves the ring unconnected. The tip corresponds to the left audio channel and the sleeve corresponds to the ground. Because the right channel is unconnected on AudioMoth, different mating plugs can be used. Figure 4 illustrates the various combinations of how PIP capsule microphones can be configured.

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[1] https://micbooster.com/primo-microphone-capsules/97-primo-em258-mono-module-with-35mm-plug-10m.html
[2] https://www.aquarianaudio.com/h2d-hydrophone.html
[3] https://www.aquarianaudio.com/a5-hydrophone.html
[4] https://www.aquarianaudio.com/pa1.html
[5] https://www.cuidevices.com/product/resource/sj2-35464a-smt-tr.pdf

AudioMoth is compatible with any of these configurations; however, if two capsules are wired up to a stereo jack plug, only the left channel will be recorded. If you are wiring up your own capsule assembly, we recommend wiring up the jack plug according to the "Mono" column in Figure 4. It is also possible to hard-wire a capsule microphone to the board itself. Figure 5 shows the pad layout on the outer PCB surface. The jack detect must be pulled low to enable the external microphone.
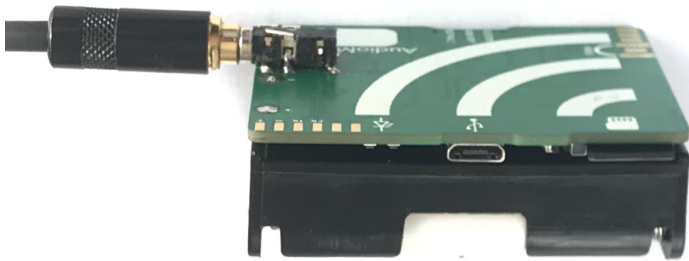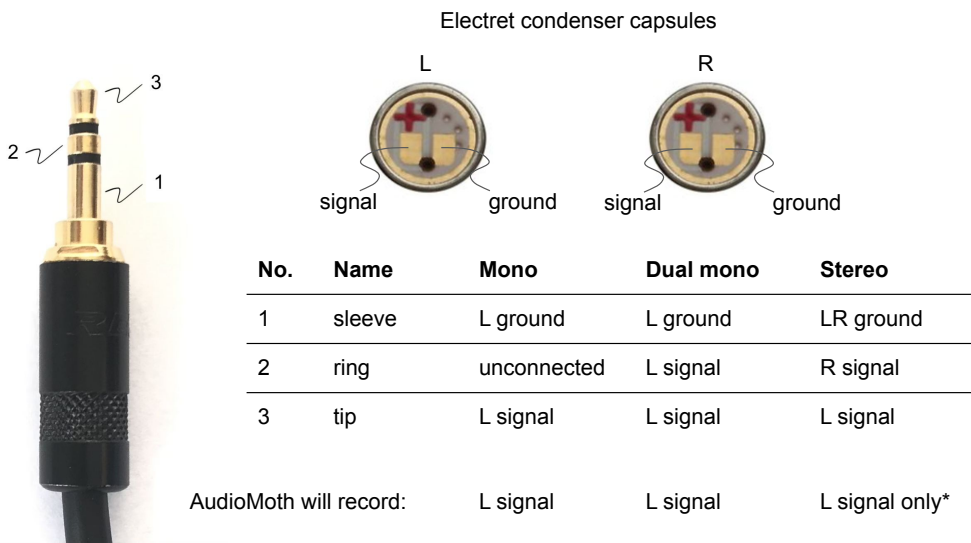
Figure 3: *The CUI, SJ2-35464A-SMT-TR 3.5 mm jack socket soldered to the front-facing AudioMoth PCB surface*

Electret condenser capsules

No.	Name	Mono	Dual mono	Stereo
1	sleeve	L ground	L ground	LR ground
2	ring	unconnected	L signal	R signal
3	tip	L signal	L signal	L signal
	AudioMoth will record:	L signal	L signal	L signal only*

* AudioMoth connects to the tip and sleeve of the jack plug, so the R capsule signal is ignored

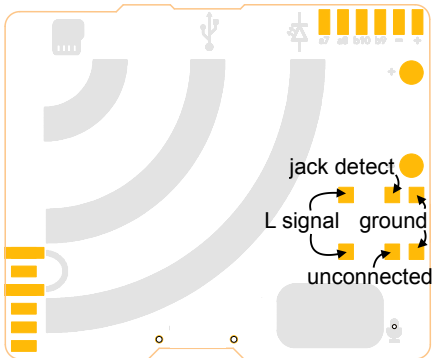**Figure 4:** *Table of differently wired 3.5 mm stereo jack plugs*

Figure 5: *Pad layout of 3.5 mm jack socket footprint. To use a hard-wired external microphone the jack detect pad must be pulled low*