A Beginner's Guide To Sound Recording and Editing

Using Audacity and the Zoom H1 Portable Recorder

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A Beginner's Guide

To Sound Recording and Editing

Welcome!

Welcome to the sound effect creation guide for video games. You will be shown how to record sound effects with a portable audio recorder, transfer them to a computer for editing, and then implement them into a videogame engine or movie editing tool. I've tried to make this guide broad enough to be usable with any audio editor and game engine. This guide is not a tutorial for Audacity or Unreal Development Kit, but instead an overview of the fundamental principles for creating video game sound effects completely from scratch. As this guide is general purpose, some software specific details may be missing. However the principles between most tools remain the same, only with interface differences. Please consult your software documentation if a specific task is unclear.

What you'll need

In this guide, we will be using a *Zoom model: H1 portable audio recorder* for the sound recording device. This particular audio device produces high quality stereo recordings and only costs 99 US dollars.

 I strongly recommend you also buy headphones so you can listen to your sounds while recording live.

Ideally, you will also want to have at least one type of wind filter and a tripod.

To be accessible, the guide will only use free software available to anyone.

 Audacity will be used to demonstrate sound editing. You can follow along with any other audio editing tool such as *Sony Vegas* or *Pro-Tools*, but *Audacity* is free and open source. As such, it is the most convenient to use for the average hobbyist.

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This chapter covers:

- – Getting to Know your H1 recorder
- – What to Record?
- – The Recording Process

Getting to Know your H1

Before we begin recording, let's first get to know your *H1 recorder* in further detail.

Stereo microphone

Recording/peak indicator

Mic/line input jack

Liquid crystal display (LCD)

Input level buttons

Fast forward button

Play button

Fast reverse button

Record button

Delete button

Power button

USB jack

The Zoom H1 is an affordable portable stereo recording device. On the front end, it is equipped with an excellent stereo XY microphone setup capable of recording very high quality sound.

Right of the LCD screen are several buttons designed for navigation of audio. It also has an external microphone line and a USB port for transfering your recordings to a computer.

Stereo microphone

REC FORMAT switch

Line/headphones output jack

Volume adjustment buttons

AUTO LEVEL switch

Tripod mount

LO CUT switch

Battery compartment cover

microSD card slot

Built-in speaker (mono)

The back side contains a mount for screwing into a tripod, which I highly recommend investing in.

Several switches provide quick access to certain features. If you have the space, use WAV instead of MP3 due to its higher quality.

I do not recommend switching the low pass filter on. Save the effects for post production.

I personally do not like to use auto-level. You are better off adjusting the microphone sensitivity manually with the input level buttons.

Also, you should use the headphones port to listen to audio playback. The built in speaker is of cheap quality and does not play back sound in real time while you are recording.

What to Record?

Recording sound is a more involved task than it may initially appear. You will first need to determine exactly what you want to record. There are primarily two places you can record sounds. 1) Outdoors in a so-called "field environment." 2) A professional sound studio and recording booth.

Field environments are uncontrolled and are often filled with unwanted variables and sounds. However, the vast amount of sounds that occur naturally in every-day life are valuable and provide a massive selection of sounds to choose from. With proper procedure, you can record effective sound effects even in noisy and cluttered environments. Here are suggestions for sounds I have recorded in a field environment:

- Birds
- Wildlife
- Cars
- Sporting Events
- Public Parks
- Waterfalls and Rapids
- Construction
- Footsteps in various mediums

⚠ **CAUTION**   If you are recording wildlife, please be aware of the animals. They may frighten easily and run away, or worse, attack you. Please be respectful of wildlife.

⚠ **WARNING**

Some types of sounds may be more dangerous than others. Use common sense and pay attention to your location in regards to dangerous objects such as cars, power tools, explosives, etc.

Recording Process

1. Set up your microphone as described in section 1.

2. Screw your portable microphone into a tripod if you have one. If you do not, you will either have to hold the microphone in your hands and hold incredibly still, or place the microphone on the ground. Also, I strongly recommend you purchase a wind filter, especially if you are going to record outdoors.

3. Check your volume levels on the LCD display by hitting the record button (it will not record when you first press it, just preview the audio levels). If the level bars are spiking to the top, your microphone sensitivity is too high. Lower it to avoid clipping. I've found that working with audio that's too soft is much easier than audio that's too loud, but you should try your best to get the volume bars to hit the sweet spot in the middle.

4. Hit the record button again while the LCD screen backlight is active and you will begin to record sound. Make sure you are dead quiet and do not interfere with the recording.

   Important: Always, ALWAYS record more than you think you need. If you want to make a 2 second sound, record at least 2 minutes. If you're making an ambient loop, record for several minutes.

5. Press the record button again when you have finished. I recommend you listen to your sound off the H1 immediately after you are done recording to ensure you have a raw sound of acceptable quality.

Conclusion:

Recording procedures for initial setup between field and studio recordings aren't too different, but there are a few subtle but important differences. In a field recording, the odds are you are recording a sound that is not created by you, thus you have far less control. In a studio recording, you are probably making the sound either with your voice, someone else's voice, or are using some object in a creative way to make sound. The differences in your control will make your approach to recording different. In a studio, you might be tempted to record less audio, but I would advise you stick to the *more than you need* rule anyway. Its much better to have more audio than needed and cut, than to realize you don't have enough and need to create more content by going back to the studio.

Using a Sound Editor

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This Chapter Covers:

– Transfering Audio Files
– Splitting Up Sounds
– Organizing your Library
– Editing Individual Sounds

You should by now have finished recording all of your sounds, but you are scratching your head with what to do with all those raw sounds! Have no fear though. There's plenty you can do, but before you play around with all these sounds there are some basic steps you should take.

Transferring

You now likely have many raw audio files on your H1's SD card. On their own, these are practically useless unless you just want to listen to them off the device. That's no fun, so you should first transfer the files. You can connect the *Zoom H1* via USB and copy the raw sound files to a directory, or you can remove the micro-sd card from your *H1* and plug it into a micro-sd card slot. COPY, DO NOT CUT AND PASTE THE FILES. It is very important that you back up your work! If you alter a master file, your raw material will be gone forever. If you are unhappy with your final product and want to redo a sound effect, then you will kick yourself for modifying and saving over the master audio file.

Splitting up Sounds

Once you are done transferring all sound files, you should begin to split up and isolate the individual pieces of the raw file you want to make into sounds.

1. Open your audio editor. For this procedure, I will be using Audacity (figure below).
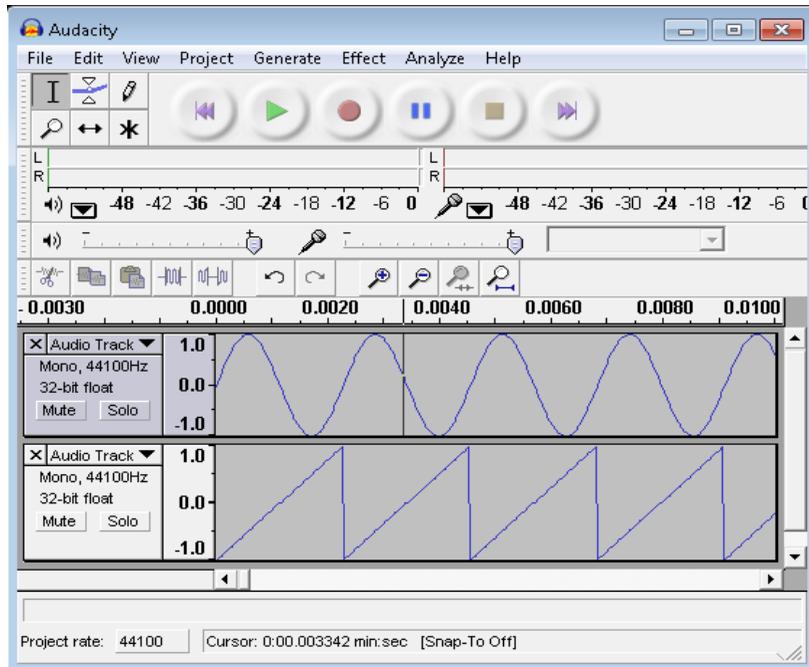
2. Go to **file -> import** and select the master sound file your desired sound is contained in.

3. Navigate on the audio track to the portion of the waveform where your sound is located.

4 . Trim the excess audio so that your sound effect is the only element left on the track. You can accomplish this several ways. First, carefully select the area of audio you wish to isolate.

    a. Go to **edit->trim** and every piece of audio outside your selection will be deleted. I do not recommend this method because you will have to use multiple projects and will need to re-import the raw audio in a new project every time you want to make a new sound effect from the same raw audio. For some people though, it seems to be part of their workflow, so use whatever one of these methods works best for you.

    b. Create a new track. Go to the edit menu and select *split*. The selection will be moved to a new track. Alternatively, you can copy and paste your selected audio onto the new track to completely preserve the raw sound clip. This is my preferred method because you can export individual tracks in most editors and this allows you to keep everything in one project.

    NOTE: If you are using Audacity 2.0 or newer, these steps will be slightly different. Trimming is achieved by selecting **Edit > Remove Special > Trim Audio.** To split audio samples onto a new track, select **Edit > Clip Boundaries > Split New.**

5. Zoom in close to the isolated audio clip. You may notice that the waveform cuts in sharply. Correct this depending on how the sound effect is intended to be played back.

    a. If it is a loop, you can test to ensure it sounds acceptable by holding shift then pressing play in Audacity. If you hear a click

sound, it means the end and beginning of the sound do not match in amplitude and are causing a voltage spike in the feedback. Correct this by adjusting the amplitude.

b. If your sound is intended to only be played once, you should worry about the attack and decay sounding correct. Play with the endpoints of your isolated sound clip.

> *TIP:* when zoomed close in, the pencil tool can be
> used to adjust the amplitude of individual sample points.

Organizing your Library

An organized workspace is the key to productivity. As with any work environment, this applies to sound effect design. It's possible you will work with hundreds of sounds, thus it's import you remain organized. Ensure that you follow a standardized naming convention and clearly label the type of sound. I personally name my sound files as *sound-name_type_ number.*

Sound-name is a name that describes what the sound exactly is. For instance, an explosion sound effect would be named *explosion*. *Type* describes the sound further. If the explosion were recorded from fireworks, then the type would be *fireworks*. *Number* is just a quantitative label in case there is more than one sound that would fit the name. For personal usage, you can create whatever naming convention you want so long as you are consistent, but be aware that different companies have different naming conventions for their assets. If you want to keep your job, make sure you follow them. Also, make sure your names make sense logically and accurately describe the sound.

I HIGHLY recommend that you use directories and sub-directories to further categorize your sounds. Inevitably you will have types of sounds that fit into a certain theme, so you should organize your sounds based on categories. For example, *Nature* might make a good highest category, with *animals* being a sub-directory, and the name of that animal as a sub-sub-directory. I usually have my directories follow the naming conventions I decided earlier. For instance, I may have a parent folder called *explosions* and a sub-folder called *fireworks*.

WARNING: If you skimp on either of these, you will pay in the next section and much later when you want to quickly find certain sounds to use. You will not remember what sounds you recorded after an extended period of time, so do <u>not</u> carelessly name your files or haphazardly place them in arbitrary folders.

Editing individual sounds

Now that you are nice and organized, you should have a bunch of sound files scattered across your directories. You may notice however that the sounds aren't always polished sounding. This is where editing and mastering sounds comes in. Due to the length of this guide, I won't cover everything there is about editing, but I will give you some tips to get started.

The most important concepts in sound editing are Dynamic Range, Compression, and Equalization.

Dynamic Range is the difference in decibels (dB) between the loudest and quietest sound. A CD is technically capable of having a

dynamic range of 90 dB, but most popular music is compressed to have a dynamic range of 10 dB. In audacity, click on *effects* and select *compressor.* The threshold slider will literally compress the active range of the dynamic range lower. Make sure "Normalize to 0 dB" is selected to make sure your audio is brought up to normal volume levels after compression.

Equalization refers to adjusting the volume levels of the audio's frequency. Old stereo receivers often had "bass" and "treble" knobs present. If you've ever adjusted these before, you are familiar with equalization. All it is is adjusting the volume of certain ranges of the frequency, but this can be very powerful in polishing sounds. In audacity, there are several filters related to equalization, including a high-pass and low-pass filter that lower the treble and bass ranges of the audio respectively. In the effects menu, there's a filter simply called *equalization* that allows you to adjust the audio's volume over its frequency range via a curve and coordinate points. This tool is very useful for giving sounds certain aesthetic qualities. Play around with the filter and see what you can produce.

Conclusion:

There are many other audio effects you can use. Experiment and go crazy. Just make sure when you are done, you export your sounds SEPARATE of your master sounds. Once again, you do not want to overwrite master files in case you are dissatisfied with your results and wish to try again and revise.

Syncing Audio to Video 3

One of the most common uses of sound effects is for enhancing video productions with a richer soundtrack. Many audio editors today allow you to view video on the sound timeline. Audacity sadly does not yet have this feature built in, so if you are using it, you will have a tougher time with this section. (If you're a good programmer and know how to implement this, please go help out on the Audacity sourceforge page! It's an open source project). However don't despair! I've had to do it and it's not impossible. It just takes more work and more careful concentration. Never the less, if you have access to more expensive software like Sony Vegas or M-Audio's Pro-Tools, you are better off using their video playback functionality to sync audio.

If you are using Sony Vegas or Pro-Tools, import your silent video footage into the timeline. If you are using Audacity, open your video in a separate movie codec such as Quicktime or Windows Media Player. I suggest you add a precise timestamp to the video to ease the audio syncing process.

In Audacity, you will have to frequently check and make sure you are placing sounds on your timeline at the same marker on the movie's time stamp. To alleviate this process, I suggest you create a "click track," a sort of metronome audio track in Audacity to keep better track of your timing.

TIP: Generate a short sine wave at the two second marker of audacity. Also leave two seconds of blank space in your video before it actually starts. Set the starting position of your video to the two second mark on the time stamp. You will then be able to manually sync your video and audio by hitting play on your video as soon as you hear the tone at the two second marker in Audacity.

1. Play the video at least once with a notepad and paper ready. Take notes of where sound effects should be placed. Write down the time stamp of where a sound should be placed followed by what sound should be placed at that particular time.

2. Navigate through the audio timeline and place sound effects where you've determined they should be. Repeat this step for every sound until you get the timing right with the video. Make sure you play the video with the audio to ensure your sound is synced properly.

3. Keep related sounds together on different tracks. We will export these as *stems,* or audio tracks containing a series of related sound effects.

 4. Export your individual tracks by going to **File->Export Multiple**. Select a directory of your choice and then click **Export**.

5. Open a **New Project.** Go to **File->Import Audio** to import your stems. If you did the previous correctly, they should sync up with the video. You can now edit entire tracks to your liking by playing with audio parameters such as the volume.

6. If you have created a stereo track, you can create panning effects by adjusting the volume of one track relative to the other.

     a. For instance, if you want something to travel from the left ear to the right ear, start by adjusting the volume of the right track to be lower then the left.

     b. Then gradually decrease the left track's volume while increasing the right track's.

7.

Use **File -> Export** to save your tracks as one sound file. The most common formats include .wav, .mp3, or .ogg. I recommend using .ogg if you can because it compresses audio without sacrificing the quality. It is also open source and sounds far superior in my opinion to its proprietary brother .mp3.

Conclusion

That's all for now. I hope this guide was helpful and that you'll be underway in creating awesome sound effects for any purpose.