Audio Recording Basics



Audio Safety

When you're working with audio (especially using headphones), it's easy to turn the volume all the way up by mistake when nothing is playing. Then when you hit play, you blow out your eardrums.

Be careful! When in doubt, turn the volume down, press play, and bring up the level slowly.

Can I make a decent recording without buying new stuff?

Yes. If you have a smartphone made in the last few years, you can probably make voice recordings good enough for podcasting or radio.

On an iPhone, you can use the built-in **Voice Memos** app. To record high-quality audio, go to **Settings > Voice Memos > Audio Quality** and select **Lossless**.



When making an audio recording, turn your phone upside-down (charging port facing up) so you can speak directly into the mic.

When I'm ready for dedicated audio equipment, what should I get?

You'll need a microphone, an XLR cable, and some kind of audio interface or recorder. Let's discuss mics first.

Microphones

As a baseline, you should look for a mic that has a three-pin XLR connection. (More on this topic below.)



If your goal is to sound good, the cheapest mic you should consider is the Shure SM58 (which costs \$100). You've probably seen them onstage at every live show you've been to, and they're great for radio and podcasting as well.



It's easy to find mics for \$30–\$60 that look identical to the SM58, but they all sound awful. Don't waste your money trying them out.

You'll also see all-in-one "USB mics" marketed at wannabe podcasters and streamers, which visually look slick and expensive. But they always make you sound like you're in a cardboard box.

Balanced vs. Unbalanced Cables

XLR audio cables are referred to as "balanced" because they have a feature that reduces electromagnetic interference. Two of the three pins are dedicated to audio (signal and ground), while the third connects to a shielding layer around the signal and ground wires. The third pin connects to "chassis ground" on both sides.

Microphones with unbalanced cables, such as karaoke mics, usually sound a bit noisy. And the noise gets worse if you use a longer cable.

Audio interfaces

To connect your mic to a computer, you'll need a USB audio interface with one or more XLR inputs.

The cheapest interfaces that sound good are made by Pyle, like this one that costs \$50:



Or you can get a Focusrite Scarlett, which is what all the public radio folks are using these days. This one is \$130:



If you're looking for a mobile recording device, check out devices from Zoom and Tascam.

What does it mean for something to sound "bad"?

If your recording has a lot of hissy **noise** in the background, that's considered bad. There are many possible sources of noise, but a low-quality audio interface is often to blame.

When using cheap audio hardware, you'll often notice **attenuated upper frequencies** in your recording. (Attenuated means diminished, or dampened.) If the upper frequencies are attenuated, you'll notice the recording doesn't sound bright and lifelike the way you'd expect.

You may also hear **attenuated lower frequencies**, where the bass seems to be missing. Sometimes the lower frequencies just sound muddy or indistinct. Low-frequency issues come up more often when you're recording music.

Another common problem is **background noise**. If there's a fan or refrigerator running in the room where you're recording, it will sound more noticeable on the recording than it is to your ears.

Finally, the room you're in matters. A room filled with hard surfaces (which reflect sound) will end up sounding echoey or tinny in your recording. If you record under a pile of blankets (which absorb sound), your audio will sound unbearably dull. The ideal recording environment has a mix of hard and soft surfaces.

Install Audacity

Open the Software Manager and search for "Audacity." For this tutorial we're using version 2.4.x, which is the option on the left in the image below.

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Click Install to start installing Audacity. You'll need to enter your password.

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System Audio Settings

Open **System Settings** and click on **Sound**. Then click on the **Input** tab. If your computer has a built-in mic, you'll see it listed here.

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If you're using a USB audio interface, plug it into a USB port now. Your new device should appear in the input list.

Click on your device's icon to make sure it's selected. If the input volume is turned down, you can turn it up to 100%.

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Getting Started with Audacity

Next you'll launch Audacity. If you just installed it, click Launch in the Software Manager window.



When you open Audacity, you'll see an empty project that looks like this:



Select the Audio Input

At the top of the Audacity window you'll see a microphone icon next to a dropdown menu, which you can use to select the input device. Click on the menu and select your device if you see it listed. If you aren't sure, you can leave "default" selected.

In the dropdown immediately to the right, make sure Mono is selected.



Set Recording Quality

In the menu bar, go to Edit > Preferences. Then click on Quality in the left column.

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If your goal is to make a high-quality recording for radio/podcasting/etc., the quality options above are good defaults.

For the **sample rate** you'll want to use **48000 Hz**, which is slightly higher than CD quality (44100 Hz). The sample rate is the number of sound pressure level (SPL) values recorded every second.

For the sample format you'll use **32-bit float**. This value is also known as **bit depth**. In digital audio, a recording's bit depth determines how many different energy levels can be represented in

a single sample. In other words, a recording with a higher bit depth can reproduce sounds at a wider range of volume levels. For reference, 16 bits is the standard bit depth for CD audio.

It's important to record at a higher bit depth than you're planning to use in your final product, because doing so lets you increase the volume of your recording without introducing unwanted noise.



How to speak into a mic

To get the best audio quality, you'll generally want your mic to be 2–6 inches away from your mouth.

Rather than speaking directly into the mic, try aiming the mic at the indentation under your bottom lip. If you speak straight into the mic you're more likely to end up with popping sounds on the recording when you use the letter P.

How to interview someone with one mic

When you're recording an interview with one mic, you should hold the mic the whole time. Passing the mic back and forth creates handling noise.

Before you start recording, say "I only have one mic for this interview, and I want to make sure I record your full responses. Can you pause for a moment after each question until I point the mic at you?"

As a general rule, people like to be involved! It's better to think of the person you're interviewing as a creative collaborator rather than a passive subject.

Recording with Audacity

Audacity is a free, easy-to-use tool for recording audio. It also has editing features, but we won't use them for this workshop.

Click the red Record button at the top of the window to start recording.



Speak into your mic, and you'll see your voice represented by a real-time waveform onscreen.

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Click Stop to end your recording.

Avoid Clipping

If your audio input is too loud, you can end up with **clipping**. You can recognize clipping because the top and bottom of the waveform look like they're clipped off.



Keep an eye on your levels as you record. If you see the level meter flashing red, that means your audio is currently clipping.

Clipping sounds like a glitchy mess, and it's almost impossible to fix. If you end up with clipping in your recording, your best bet is to re-record.

If you're dealing with a recording that already has clipping and you *need* to fix it, you can try using a program called iZotope RX. But it's expensive, difficult to use, and doesn't always work.



Test Your Audio

Press Play to play back your recording.

If you can't hear anything, find the dropdown menu next to the speaker symbol and make sure the correct output device is selected.

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Export Audio to a WAV File

To edit your audio file in another program, you'll first want to export it as a **WAV** file. WAV files are lossless, which means they contain exactly what you recorded. They aren't compressed to save disk space like MP3 and AAC files are. WAV files are consequently rather large, around 12 MB per minute of audio.

Go to the menu bar and select File > Export > Export as WAV.

In the window that pops up, enter a name for your file and make sure **32-bit float** encoding is selected under **Format Options**. Click **Save**.

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You'll be prompted to enter metadata, which isn't required. Click **OK** to finish saving.

Clear the Audacity Timeline

Before you make another recording, you'll want to clear the timeline. Click the **X** at the top left corner of your audio track to delete it.



Quitting Audacity

When you quit Audacity, you'll see a popup window that asks if you want to save the project to a file. We're only using Audacity for recording, not editing, so you can click **No**.

Save changes to <untitled>?</untitled>									
Save project before closing?									
No	Cancel	Yes							

Getting Started with Reaper

Reaper is an audio editing program, also known as a **digital audio workstation** (**DAW**). If you don't already have Reaper installed, go to <u>http://reaper.fm</u> and download it.

When you launch Reaper, you'll see a popup window encouraging you to buy a license. Wait for the countdown to finish and click **Still Evaluating**.

About REAPER v6.78/linux-x86_64 rev f121cd (Mar	14 2023)	Ø					
Credits Purchase EULA Changelog							
REAPER IS NOT FREE.							
It is a paid software product. If you use it more than 60 days you are required to purchase a license.							
You have been evaluating REAPER for approximately 5 days. You have run REAPER 3 times for a total of 6:09:56.							
REAPER licenses are very reasonably priced. We offer discounts for personal non-commercial use, and for very small businesses.							
We are showing you this message, instead of crippling this evaluat REAPER, because we do not feel that technological enforcement of is in the best interest of our customers.	ion version of If licensing policy						
Purchase REAPER license key online							
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Visit http://www.reaper.fm/ for updates	Still Evaluating						

Although the window says "REAPER IS NOT FREE," you can use it for free as long as you want. The trial period never expires.

When you open Reaper, you'll see the timeline area on the top right side of the window.



Find the WAV file you just recorded and drag it onto the Reaper timeline.



You'll see the audio clip appear in the timeline, like this:

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Click on the audio clip and drag it all the way to the left. Otherwise you'll have a silent gap at the beginning of your project.



On the left side of the audio track, click on the bottom edge and drag down to zoom vertically. This will let you see your waveform more clearly.



To zoom in on the horizontal axis, press + (plus sign, i.e., shift and =) on your keyboard. To zoom out, press - (hyphen). You can also zoom by scrolling up and down with the wheel on your mouse. Here's a zoomed-out view of the file:

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Click the Go to start of project button to send the cursor to the beginning of the timeline.



Now press **play** to start playing your audio. As it plays, you'll see a green level meter on the left side of the audio track.



Remove a Segment of Audio

In many cases, you'll simply want to remove a bit of audio from the beginning and end of a recording before sharing it.

Pause playback and click on the timeline to move your cursor to the point where you want to make a cut.





To make the cut, press S or go to Item > Split items at cursor in the menu bar.

Click on the audio clip you want to remove, then press delete.



Render the Project to an Audio File

To export your project to an audio file (such as a WAV or MP3), go to **File > Render** in the menu bar.

Enter a filename and adjust the options as needed. The settings below are for a lossless WAV file.

When you're ready to render, click Render 1 file in the bottom right corner.

Render to File 🛛 🛛 🛛					
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Do not render files that are likely silent Save copy of project to outfile.wav.RPP					
Save outfile.render_stats.html					
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If you're planning to post your recording on the web (e.g., as a podcast), you'll want to export it to an MP3 file. The options below will make a 128 kbps MP3, which is the most common compression rate for podcasting. If your recording contains music, 320 kbps is better.

Render to File 🛛 😣				
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IX Use project sample rate for mixing and FX proc	essing 2nd pass render			
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Tracks with only mono media to mono files Dither master Dither stems Multichannel tracks to multichannel files Noise shape master Noise shape stems Only render channels that are sent to parent Render stems pre-fader Metadata Embed: Metadata Stretch markers/transient guides Take markers				
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Bitrate: 128 kbps 💌	Write ReplayGain tag LAME 3.100			
Silently increment filenames to avoid overwriting	Add rendered items to new tracks in project			
Do not render files that are likely silent	Save copy of project to outfile.wav.RPP			
Queued Renders	Dry Run (no output) Render 1 file			
	Cancel Save Settings			

Increase the Volume with a Hard Limiter

If your recording sounds quieter than you're expecting, you can increase the amplitude. Unfortunately, increasing the amplitude across an entire recording is likely to introduce clipping at points where the volume is highest.

The proper way to raise the volume on your recording is to use a **hard limiter**. With a limiter effect enabled, parts of the audio that would otherwise clip have their volume automatically reduced to the maximum possible level.

To get started, click **FX** on the left side of the audio track.



In the window that pops up, select VST: ReaLimit (Cockos) and click Add.

	Add FX to Track 1 "Monologue"		
EX Options			
Filter:		-	Clear filter
 ✓All Plugins VST VSTi JS Instruments Cockos Recently used ✓Categories Delay Dynamics EQ External Gate MIDI Pitch Correction Reverb Sampler Surround 	Video processor VST: ReaCast (Cockos) VST: ReaComp (Cockos) VST: ReaControlMIDI (Cockos) VST: ReaDelay (Cockos) VST: ReaEQ (Cockos) VST: ReaFir (FFT EQ+Dynamics Processor) (Cockos) VST: ReaGate (Cockos) VST: ReaGate (Cockos) VST: ReaInsert (Cockos) VST: ReaInit (Cockos) VST: ReaNINJAM (Cockos) VST: ReaPitch (Cockos) VST: ReaStream (Cockos) (8ch) VST: ReaSurround (Cockos)		
		Add	Cancel

A window will appear with options for the limiter effect.

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VST: ReaLimit (Cockos)				
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Add Remove	Constant gain	Release: 15	5.0 dB/sec Performanc	e: High quality 👻

Move the threshold slider down slightly, then press play to test the volume level.



When the volume level sounds good, close the settings window.

Go to File > Render to render your project to a WAV or MP3 file.

If you open the new file in Reaper or Audacity, you'll notice the waveform is thicker because the audio is louder.