

Introduction to Audacity

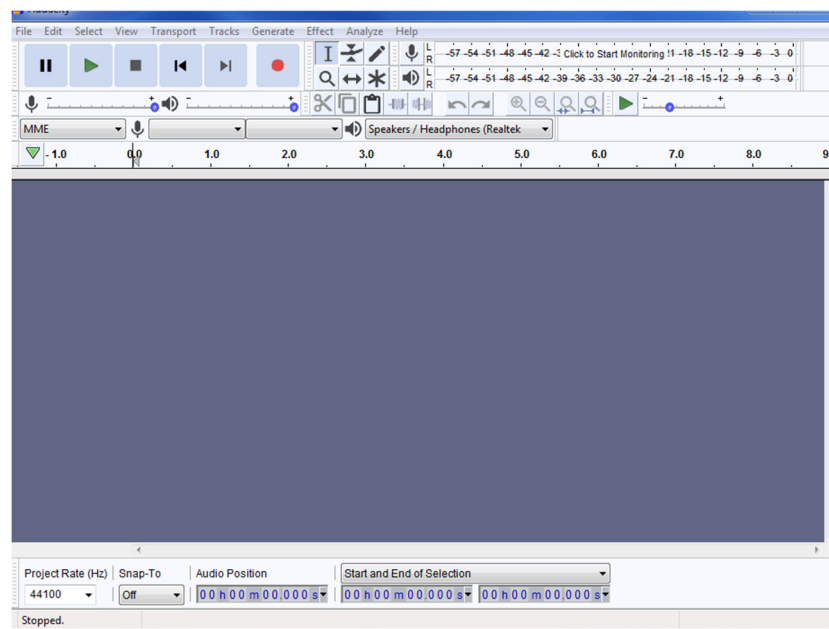
NOTE: This document illustrates Audacity 2.3.2 on the Windows operating system. Audacity is a versatile program that can be used to record audio, edit sound files, and convert them to various formats. Audacity is Open Source; it is free. It is readily available to the public for download at <https://www.audacityteam.org/>. This document is designed to introduce new users to the basic features of the program.

To work with many other audio file types (i.e. OGG, ac3) and to edit audio from a video file download the FFmpeg plug-in. After installing Audacity open the application. From the top line menu select Edit > Preferences. Select Libraries from the menu on the left. Select Download for FFmpeg and follow the instructions. See diagram on last page. [NOTE: versions previous to 2.3.2 also require the MP3 lame encoder to work with MP3 files]

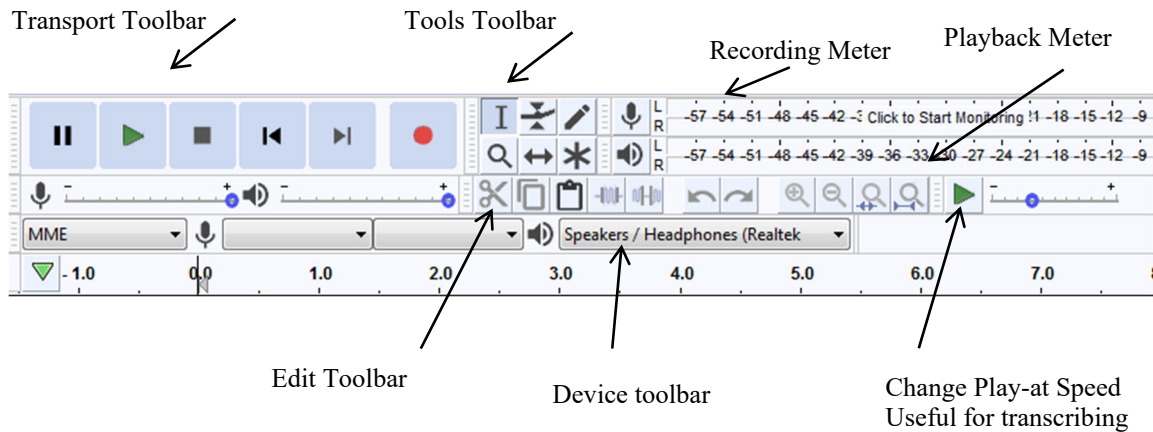
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The Audacity Work Space

When you open Audacity the workspace will resemble the illustration below. *NOTE: The image below is from a Windows computer. The view on your computer may be different.*



The primary components of the program are shown in the following illustration.



Selection tool – select a portion of the sound file for listening or editing

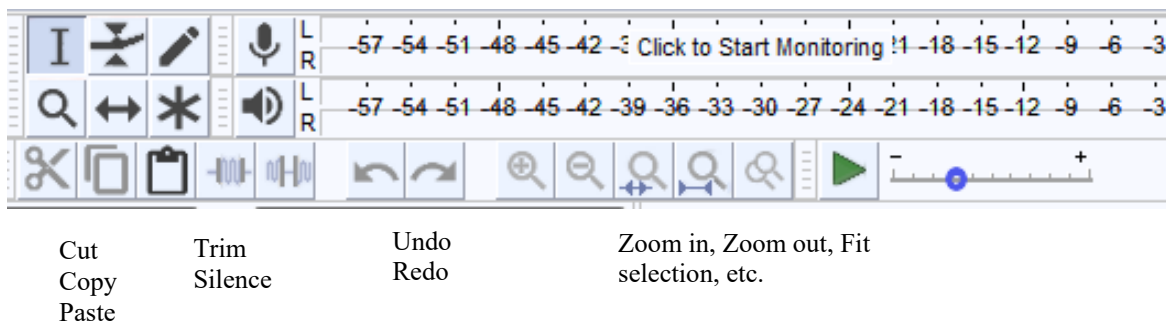
Envelope tool – for special volume changing effects

Draw tool – for modifying samples

Zoom tool – for controlling the view of a selection

Time shift tool – slide tracks to the right or left

Multi tool – allows the use of all tools simultaneously through a combination of keystrokes and mouse position



Sound File Formats

Audacity will import and edit files in many formats. Audacity Project (AUP) – Audacity projects are saved in this format. Projects must be exported into another audio format for replaying by other programs.

Recording Directly into Audacity

If you are using a laptop, the webcam is the default input device. If you are using a microphone or equipment such as a cassette tape recorder or guitar, the operating system and Audacity must reflect this selection. Always perform a test; review for proper recording levels.

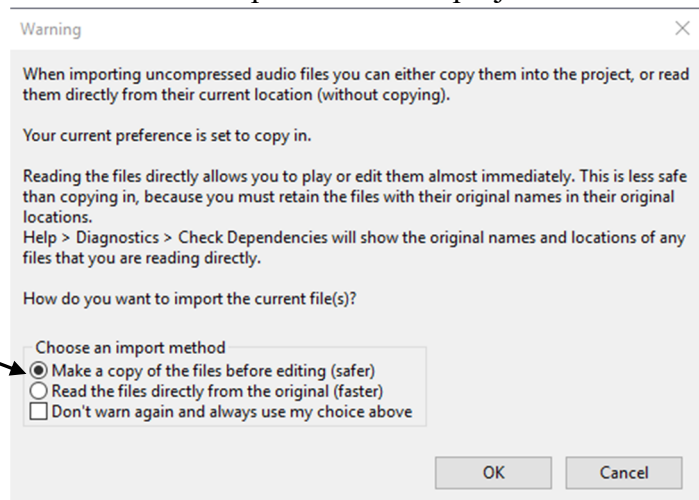
1. Connect the device and turn it on.
2. Identify the input device/port from the sound preference/control in the operating system
3. Open Audacity. Within Audacity, also select the input device.

Preparing to Edit One or More Sound Files in a Project

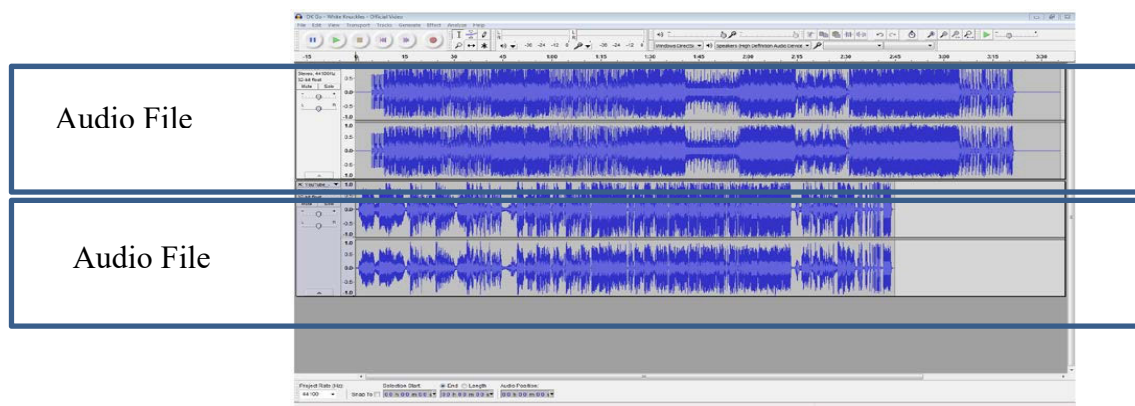
Select Import, not Open– If you select Open, a new session of Audacity opens with each selected file. Import is the command to add and edit multiple files in one project.

Select File> Import > Audio

1. Navigate to the file you wish to import
2. Select the sound file[s]. Click Open.
3. Three options for importing are available. It is almost always best to select “Make a copy of the files before editing (safer)”



The sound files will appear in your workspace as shown below.

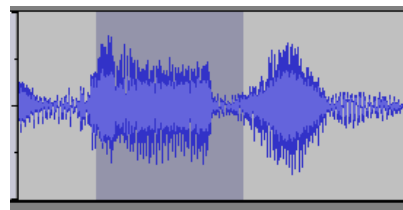


Basic Selecting and Editing a Segment of a Sound File

Click the button for the Selection tool



Place the Selection tool at the starting point for your edit.
Click and drag the Selection tool to highlight the segment of the sound file you wish to edit



The segment is selected and is ready for editing. You can now apply any of several editing techniques to this segment.

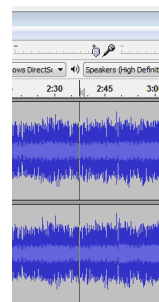
To delete the segment so that it is permanently removed press the Delete key. Alternatively, follow these steps to remove the segment and provide a variety of outcomes:

Select Edit on the Menu bar. A drop down menu appears. Then do one of the following:

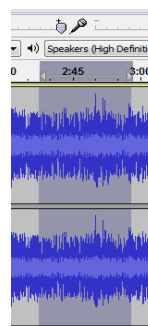
- a. Select Cut to remove the audio and place it in memory for pasting later
 - i. This will close the gap in the track that is created
- b. Select Delete to remove the segment permanently.
 - i. This will close the gap in the track that is created
- c. Select Remove Special > Split Cut to delete the segment, create a gap in the track, but retain the segment in memory for pasting
- d. Select Remove Special > Split Delete to delete the segment and create a gap in the track; the segment is not retained in memory
- e. Select Remove Special > Silence Audio to create a silent area in the track, the waveform will be flat
- f. Select Remove Special > Trim Audio to remove everything EXCEPT the selected segment

Once an audio selection has been placed into the computer's memory using one of the steps outlined above, you can paste it back into an existing track or into a new project.

To paste a selection into an existing track place your cursor at the point in the track where you want the insertion to take place, then click. The illustration on the right shows the play head, the vertical line across the track, at the desired location.

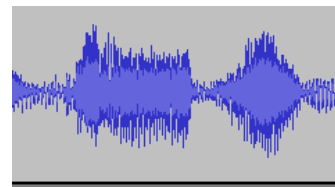


Select Edit on the Menu bar. Select Paste. The selection will be placed in the track and highlighted as shown.



Using the Zoom Tool

Sometimes the default view of the sound file waveform is not detailed enough for making accurate edits. You can also change the zoom value by clicking on View on the Menu bar. The illustration on the right is an example of a crowded waveform. Zooming in on the view will provide more detail and make selecting a sound file segment much easier.



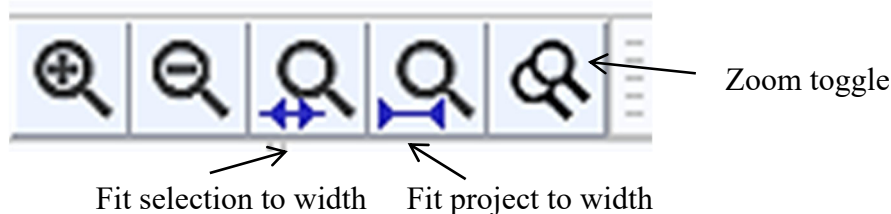
Click the Zoom In tool. The waveform expands showing more detail.



Click the Zoom Out tool to show less detail.



Other options are available as indicated below.



Advanced Editing Options

A number of editing options are available that are more advanced than simple cut and paste. Select the segment of the file you wish to edit. Select Effect on the Menu bar. Select the Effect you wish to apply. Make any adjustments that might be required if a control panel appears. Click OK to apply the effect.

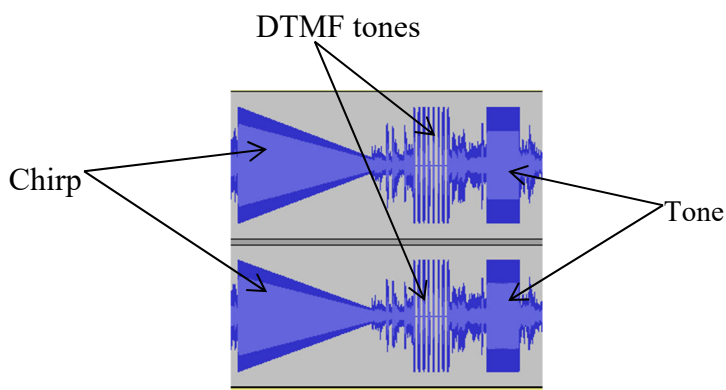
Some Effects of particular interest include:

- Amplify – Used to make a selection louder or less loud
- Change Pitch – Used to change the pitch of a selection without changing the tempo
- Change Speed – Useful when converting recordings made from records at one speed to another speed. For instance, it is possible to play a 78 rpm record on a turntable at 33 1/3 rpm, then use Audacity to correct the speed so that the tracks sound normal.
- Change Tempo – Used to change the tempo of a recording without changing the pitch; this is helpful if transcribing an audio recording.
- Click Removal – This is an exceptionally useful tool to remove the clicks and pops that are recorded when digitizing older records
- Noise Reduction – Under some circumstances this tool can be used to remove odd background sounds. It is particularly popular with users who are trying to clean up tracks that were recorded during interviews.
- High Pass Filter, Low Pass Filter, Notch Filter – Three filtering tools that will remove frequencies outside of specified ranges. For instance, a High Pass Filter allows high frequencies to “pass” while removing lower frequencies. Useful when it is necessary to remove sounds based on how high or low they are.

Other useful edits can be accomplished by trying the options that appear on the list when you click Generate on the Menu bar. Each of the options can be customized. Here are what these effects do:

- Chirp – This is an ascending tone. Its length depends on the length of the selection and the specifications you set. Useful when you need a special effect and particularly interesting when you have several short chirps close together.
- DTMF Tones – These are the **Dual Tone Multiple Frequencies** that you hear when dialing with a touch-tone telephone.
- Noise – Three choices of white, pink, or Brownian noise which sound like fine, medium, or coarse static. Noise is useful for special effects or to mask a segment of a track.
- Silence – Creates silence.
- Tone – Places a tone of the frequency you specify over your selection.
- Pluck – Creates a plucking sound.
- Rhythm Track – Generates a series of clicks or beats.

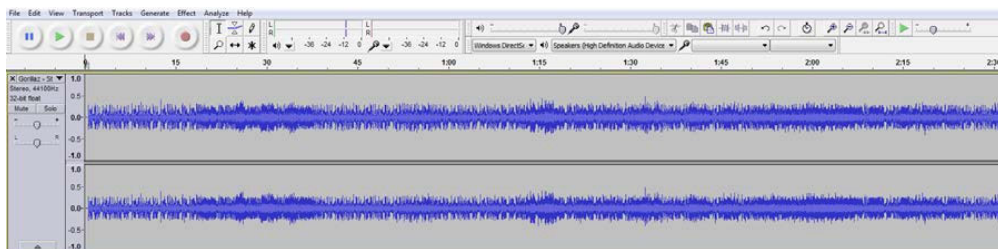
The illustration below shows a stereo track with the waveforms for a chirp, DTMF tones, and a tone.



Tracks

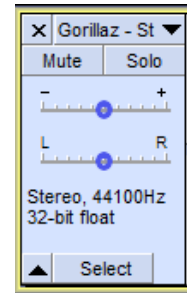
Tracks are a linear representation of the sounds in your project.

The illustration below shows a single stereo track in Audacity.



Notice that there are two waveforms. The top waveform represents the left stereo channel; the bottom waveform represents the right stereo channel. The two waveforms are joined into one track, so in this format you must edit both at the same time.

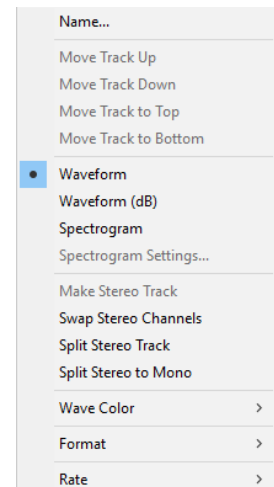
There are controls on the left end of the track that allow you to control the left right balance and left right gain (similar to volume or loudness) of each waveform. To see how they work, experiment with the sliders while playing the track. The illustration on the right shows the control panel with these options.



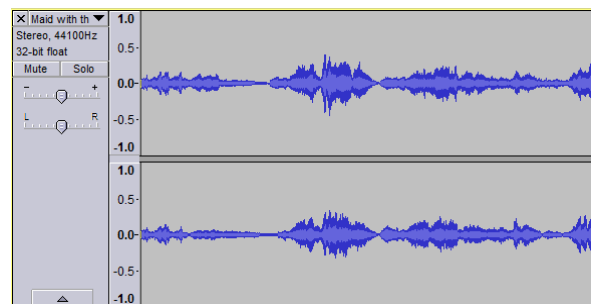
You may not want to edit both channels of a stereo track. You can split a stereo track into two individual stereo tracks or two individual mono tracks.

To do this, click the small down-pointing arrowhead at the top of the track's control panel at the left end. A drop down list appears.

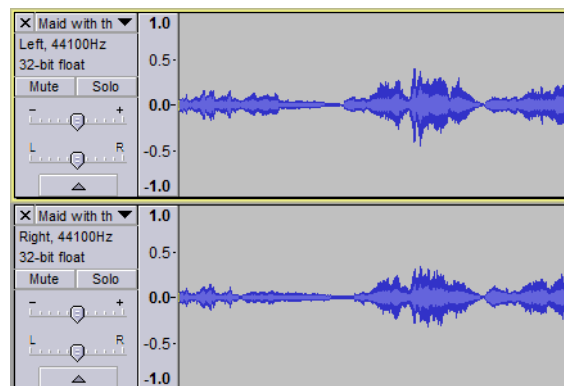
Select either Split Stereo Track or Split Mono Track.



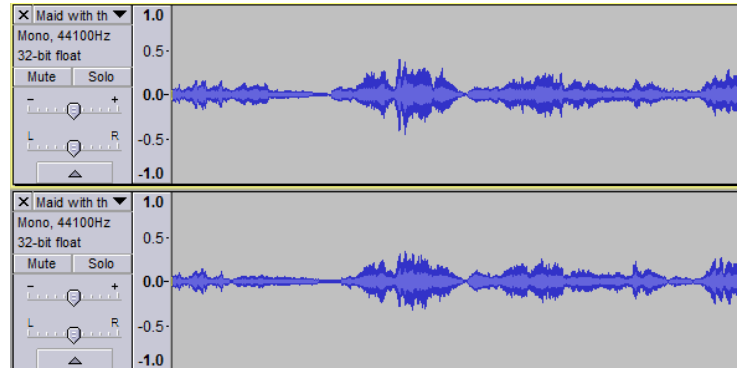
The illustration shows a portion of a stereo track that is not split. Notice that there are subtle differences between the left and right channels.



The illustration shows the results of using the Split Stereo Track option. Each of these tracks retains the same waveform of the original left and right channels. However, they can each be edited separately. Notice that they are labeled Left and Right in their respective control panels.



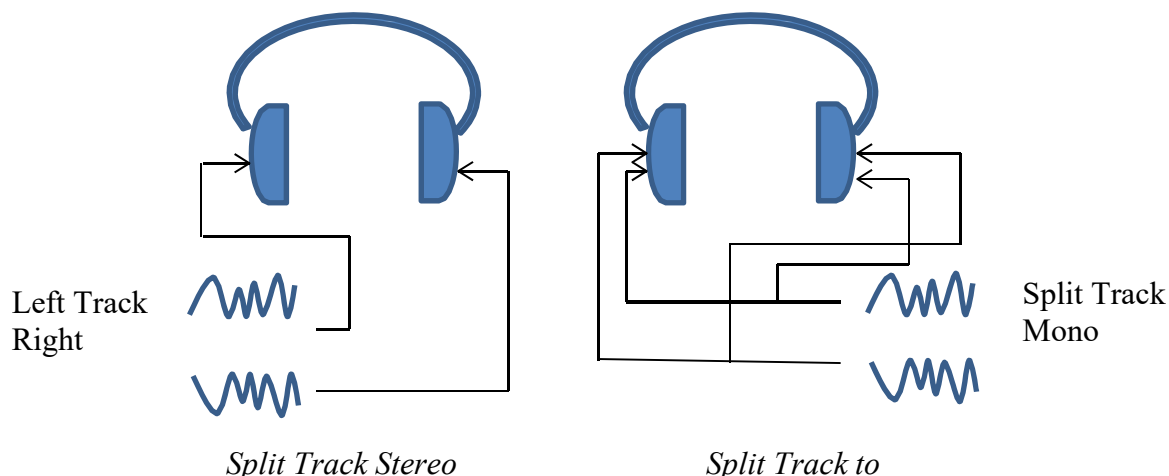
This illustration shows the results of using the Split Stereo to Mono option. Each track retains the waveform of its original left or right channel. Each track is now labeled as Mono in its control panel.



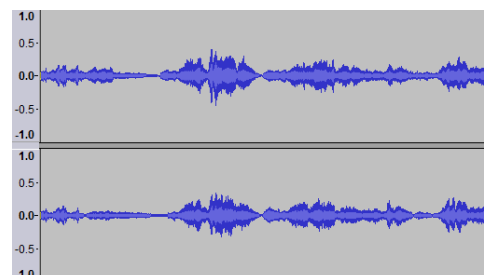
As you can see, each illustration looks remarkably similar, except for the labeling as Left, Right, or Mono. At first, the differences appear to be subtle. Testing with headphones or speakers with good channel separation soon reveals how the options differ from each other. The diagrams below illustrate the differences between Split Stereo Track and Split to Mono options.

Split Stereo Track causes the left and right channels to be completely separate. Experiment by playing the project and clicking Mute in each track. When you click Left Mute the sound from the left speaker (or headphone) goes off. Clicking Right Mute causes the right side to go off.

Split Stereo to Mono causes both tracks to play out of the left and right side speakers (or headphones) at the same time. By clicking the Mute button you can turn off one track, but the other track still plays out of both speakers.

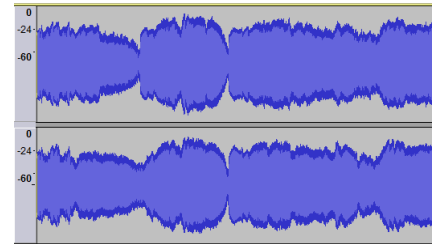


Waveform - The illustration on the right shows a waveform in its normal presentation style. This is how it displays when the project is first started.

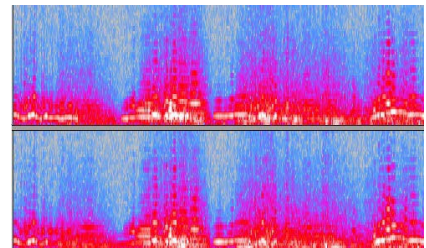


For most applications, the standard waveform display is adequate. However, for “high- end” situations, such as forensic analysis or computerized study, these optional waveform presentation styles can be useful.

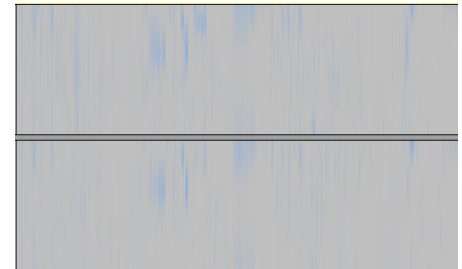
Waveform (dB) – This illustration shows how the waveform looks when the graph shows in decibels the amplitude of the track.



Spectrogram – This display shows the energy levels of the track. Red represents higher energy levels, blue represents lower levels



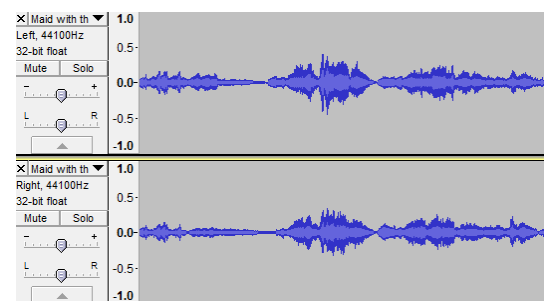
Pitch – This display shows the pitch of the tracks. This is intended to be a “musical representation” and is often used to determine if two examples are similar. For instance, if you have two songs played in different keys on different instruments, this display can be used in advanced analysis to figure out if the songs are, indeed, are the same or similar.



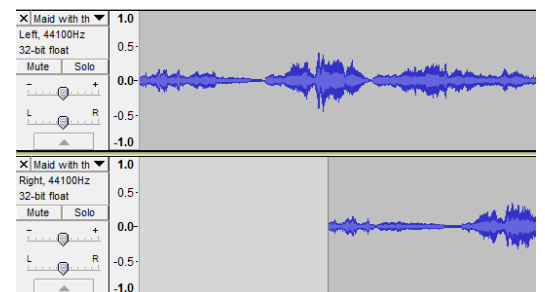
Manipulating Tracks

Time Shifting

Time shifting is the moving of a track to cause it to play earlier or later in a project. The illustration on the right shows two stereo tracks, left and right, that are not time shifted. Both tracks start at the same time.



The illustration on the right shows the same project with the right track time shifted so that it starts to play a few seconds later.





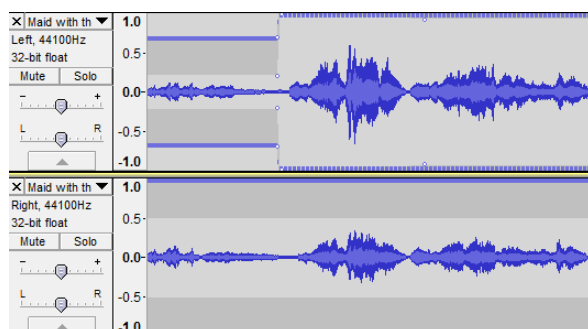
To time shift a track, click the Time Shift tool button in the Editing section of the Tool bar.

Place your mouse pointer on a track. It will turn into a two-headed arrow similar to the one illustrated on the button. Click and drag the track to the new position as required.

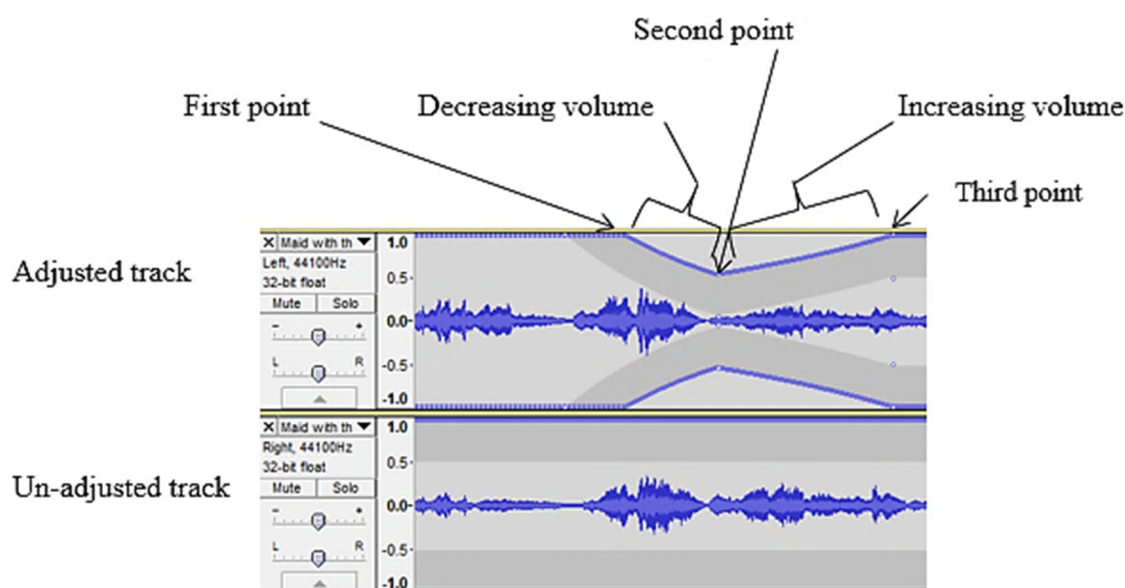
Volume Control with the Envelope Tool

The Envelope tool allows you to control the volume of a track over a span of time by setting levels at specific points.

In the illustration on the right, a point has been set in one track, and then the volume was reduced to the left of that point.



In the illustration below, three points have been set. The first point serves as an anchor. The second point causes the volume between it and the first point to be reduced. The third point is at full volume. The illustration below shows the various steps and elements.



Select the Envelope tool button in the Editing section of the Menu bar.



Move your mouse pointer over a track. It will turn into a pair of white arrowheads similar to those on the button. Click at the place where you want to set a point. Click on the point and drag it up or down to change the volume.

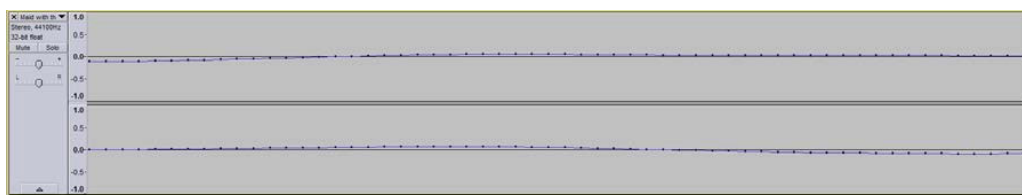
Depending on the placement of the points, the number of points, and some other factors, the volume may change on either side of a point or on both sides at the same time. It will take a little practice to figure out how the envelope tool works, but it is easy and quick to understand.

Waveform Drawing and File-Level Editing the Draw Tool

The Drawing tool is used to draw, or re-draw, waveforms. Using the tool you can change the shape of the waveform to increase or decrease pitch. Specific applications of this tool include finding a pop or a tick sound in a waveform and then reducing it.

Digital sounds, as in the case of an Audacity project, are a series of samples. Each sample represents a specific point in the waveform. In the case of CD quality sound, the samples are made at the rate of about 44,100 times per second. With the Drawing tool you can adjust each individual sample.

Find the area of the track that you wish to edit with the Drawing tool. Zoom in (use one of the Zoom tools) until you can see the individual samples. They appear as a series of dots linked by lines. The zoomed view of the above waveform is shown below. Notice that we have zoomed in far enough to see the dots clearly.



Click the Drawing tool button and move your mouse pointer over the track. The pointer will turn into a pencil shape.

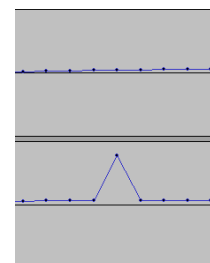


Click on or near one of the sample dots. Drag the sample up or down. The illustration on the right shows an adjusted sample.

You can smooth an area of the waveform to remove radical peaks and valleys. Make sure you have zoomed in enough to see the individual samples.

Select the Drawing tool and move it over the track.

Press the Alt key on your keyboard. The pencil will turn into a paintbrush. Keep the Alt key depressed, and then click the mouse. The waveform will flatten slightly. Repeat this as many times as necessary to smooth the waveform satisfactorily.



In normal mode, when you select the Drawing tool and only click, you will discover that as you move your pencil to the left and right the sample over which you exert control change. For instance, as you move to the right you will move from sample to sample. Moving to the left changes control to the samples that extend in that direction.

You may wish to maintain control over one sample even if your pointer moves right or left. To “lock onto” a sample in this manner press the Control key on your keyboard and hold it down while clicking and holding with the mouse. You will now stay connected to the selected sample even if you move the mouse pointer to the right or left.

Saving Your Project and Exporting To An Audio Format

The project that you are working on in Audacity is saved as an Audacity project file. It will have the file name extension .aup. Your project consists of the .aup file plus a data folder. Audacity writes all the changes and recorded audio to a directory called Projectname_data. Export your Audacity project into an audio format if you intend to use it as an audio file. The format that you select will depend on what your final project will be and your specific needs. For instance, if you intend to use your new sound file in PowerPoint presentation you may wish to export it as an MP3 file. Not all formats are equal. Some are lossless, such as WAV and AIFF, others are “lossey,” such as MP3 and OGG VORBIS. Lossless file formats retain all the data that was encoded into them. Lossey formats are compressed and some data is thrown away. The amount of data lost depends on the level of compression.

FFmpeg import/export library

Audacity is able to import and export to several file formats as soon as you install it. However, some file formats require specialized plug-ins. When you attempt to export to an unsupported file format Audacity will cause a warning box to appear and you are directed to a source for an acceptable plug-in. [NOTE: versions previous to 2.3.2 also require the MP3 lame encoder to work with MP3 files]

Select **Edit > Preferences**.
Select **Libraries** from the menu on the left. Select **Download** for FFmpeg.
This allows Audacity to import and export AC3, M4a, WMA, and audio from video, AC3, M4a, etc.

