

Digital Reverb

After completing this lesson, the student should be familiar with the following concepts:

- When many reflections hit a listener's ear in rapid succession, one continuous sound (reverb) is produced rather than individual echoes.
- Reverb can be generated artificially using digital reverb units.
- There are several different types of reverb. The most common types are room, hall, plate, and chamber reverb.
- Predelay can be used to make listeners perceive a larger acoustic space.
- One can change the decay time of a reverberation unit to cause it to last a longer or shorter period of time.
- One can change the diffusion (density) of the individual reflections so that the reverb sounds thicker or thinner.
- Reverberation are usually connected to a mixer's aux sends so that several channels can share one reverb unit. However, reverb units can be connected to a channel's insert, although this is usually done only for special effects.
- Reverb is used on elements in a mix to make them sound as though they exist in a natural acoustic space rather than a harsh and sterile environment. Reverb is also essential for performers recording in a studio because it gives them a sense of security while performing.
- The advantage of using artificial reverberation is that any imaginable acoustic space can be created and used instantly.
- It is important to use reverb sparingly and not on every instrument in a mix. Although it is the most common effect, it is also the most commonly misused effect.

Glossary for this Lesson:

Chamber- A large room designed and built for the purpose of creating reverberation under carefully controlled circumstances. Reverb chambers have a speaker at one end and a pair of microphones at the other to capture the room's natural reverberation. Chamber reverb is often simulated on modern digital reverb units.

Decay Time- The amount of time reverberation lasts. Larger acoustic spaces are simulated with longer decay times.

Diffusion- The density of reflections returning to the listener. This determines the thickness of the reverberation.

Hall- Digitally created reverb that simulates a large acoustic space (like a concert hall). It is a common reverb type on modern digital reverb units.

Mix- The reverb mix controls the mixture of unaffected sound versus effected sound. Mix is usually expressed as a percentage where 100% is only effected signal and 0% is only unaffected signal. Mix amount is determined by the method in which the reverb unit is connected to the system. When used with aux sends/returns, reverb mix is set to 100% while when used as an insert, it should be set to taste.

Plate- A plate reverb unit contains a speaker which causes a large, tuned metal plate to vibrate sympathetically. These vibrations are then picked up by a microphone. Plate reverb is often simulated on modern digital reverb units.

Predelay- A delay between the start of the original signal and the time at which reverberation begins. Predelay time is measured in milliseconds. Longer predelay times cause the perception of a larger acoustic space.

Reverberation- The sound our ears perceive when many reflections return to us very quickly. Because the ear is not able to distinguish the individual signals we perceive one sound. Reverberation is the most common effect used in any studio.

Reverb- Another term for reverberation.

Reverb Time- Another term for decay time.

Room- Room reverb is digitally created reverb that simulates a small acoustic space, usually more than 125,000 cubic feet. It is a common reverb type on modern digital reverb units.

RESEARCH PROJECT

All of the lessons in this book present an introduction to a particular topic, but certainly do not provide authoritative texts on the topic. If students find a topic that is particularly interesting to them, there are often many more resources available where they can learn more. Public libraries aren't bad for this sort of thing, but the internet is probably the very best resource of all. Many kind people have written tutorials on hundreds of different music technology topics ranging in level from seasoned pro to absolute beginner. Almost all of them are available free on the web. It can sometimes be difficult to find the place to start searching for these texts because they are not what one usually searches for on the web. You might try www.google.com as it is an excellent search engine, or try a site like music machines (<http://machines.hyperreal.org/>).

Digital Reverb

Go To Your (SIMULATED) ROOM

In Lesson Five, we learned about sound waves and how they can bounce around a room. When a sound wave bounces back to us, we hear it as an echo. In the real world, we usually don't hear just one sound wave bouncing back to us. Imagine a large gym that is empty and silent. If you bounce a basketball once against the floor and then catch it, you will hear a "whoosh" of sound following the sound of the ball hitting the floor. This whoosh of sound is called **reverberation** or **reverb**.

In a large room, sound waves hit the floor, walls, and ceiling at different times. This means that they also bounce back to you at slightly different times. If our ears were really sensitive, we would hear many echoes happening very quickly. However, our ears aren't very good at hearing echoes happening very quickly. Instead of hearing many separate echoes, we hear the whoosh of sound which is reverb.

CREATING REVERB

Reverb is probably the most important effect that we use in the studio. Reverb makes it sound like we recorded everything in a really big room instead of a tiny, closet-like space. When recording engineers first tried to create reverb in the studio, they actually built large rooms called **chambers** which had bare walls, floors, and ceilings. They would place a speaker at one side of the room, and microphones at the other side of the room. The speaker would play the sound that the engineers wanted to add reverb to, and the microphones would pick up all of the reverb the room added to the sound. Unfortunately, it costs a lot of money to create a room like this, and you

might as well forget about ever moving it.

Next, a special device was created to artificially create reverb. A large speaker would blast sound at a tuned metal plate which would then vibrate and create something that sounded like reverb. This was called **plate** reverb because of the large metal plate involved.

Today, we can use devices with specialized computers in them to create reverb artificially.

REVERB TYPE

There are many different things that we can change about reverb, and not all reverb units are the same. Although all reverb units are a little different, they usually allow you to change a few basic things about the reverb they produce.

Most reverb units allow you to change the type of reverb they are producing. There many different types of reverb, but the most common types are room, hall, chamber, and plate reverb. **Room** reverb simulates a smaller room, while **hall** reverb simulates a larger concert hall. **Plate** reverb simulates the old plate reverb units used in studios, and **chamber** reverb simulates the reverb chambers which were built in the oldest studios.

Predelay is a short delay between the start of the original signal, and the start of the reverb. This helps us to simulate the delay that occurs in real rooms. There is a very short delay between the sound coming directly from a performer and the reverberation coming from the room. Predelay is usually set

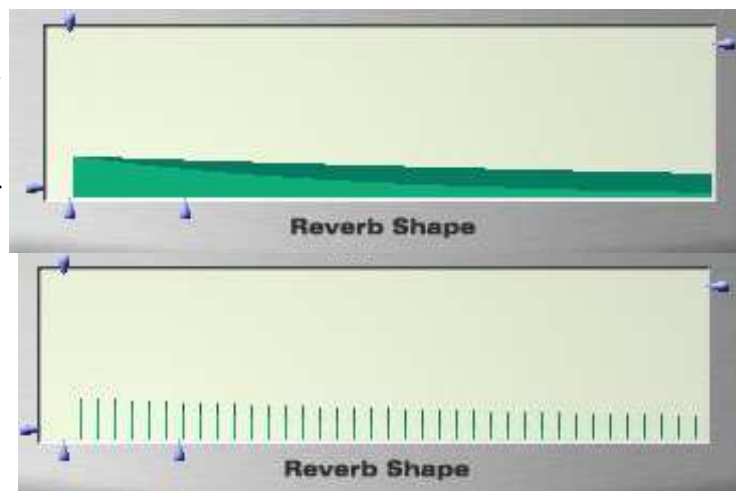
to 30-100 milliseconds. The longer the predelay time, the larger the reverb space will sound to our ears. (Short delay times sound like small



rooms while longer delay times sound like bigger rooms.)

Decay time or **reverb time** is the amount of time from the start of the reverb until we can't hear it any more. Huge, open rooms such as large cathedrals can have up to 6-7 seconds worth of natural reverberation. We usually use reverberation times of 2-4 seconds worth for most studio recordings, however.

A reverb unit's **diffusion** setting allows us to determine how many reflections actually make up the reverberation. If reverb is not diffuse enough, listeners may be able to hear the individual reflections that make up the reverb. In the picture in the middle of this page, you can see pictures of the reflections in two different reverbs. The picture at the bottom has a very low density, and you can see the individual reflections that make up the reverb. Above it is a reverb with a very high density. The reflections are so squeezed together that they just look like a solid color.



HOOKING IT UP

We connect reverb units much the same way we connect delay units. We typically connect a reverb unit's input to a mixer's aux send, and we connect the reverb's outputs to the aux return. This way, many signals can share the same reverberation unit at once. Usually, we want all of the instruments in a mix to sound like they are in the same room, so it is acceptable to use the same reverb on all instruments which are going to have reverb added to them.

HOW REVERB IS USED

The most important function of digital reverberation unit in the studio is to make sounds seem as though they exist in an acoustic space. Without reverb, instruments sound flat and lifeless. They tend

to sound like they are artificial or that they are in a closet. The recording loses part of its sense of realism.

Processing a mono sound through a reverb unit can make it seem like it is in stereo. This is a very important use of reverb. Actually recording a sound like a singer's voice in stereo (which requires two microphones) can cause all sorts of technical headaches and takes up twice as much tape (or space on a computer disk). By recording in mono (with just one microphone) and then sending this signal to a reverb unit, we can give the listener the impression that they are hearing a sound that was recorded in stereo.

There are several signals that we usually don't want to add reverb to. First and foremost, we don't want to put reverb on the kick (bass) drum. This is a surefire way to make a mix sound blurry and confused. Likewise, we usually don't want to add reverb to the bass guitar. Reverb is best used on instruments with high sounds. That way we can hear the reverb "sizzle" and it doesn't clutter or blur the mix as much.

IMAGINE THIS...

We have learned about delay and reverb. It is possible to connect the output of a delay unit to the inputs of a reverb unit. What do you think this would sound like? What would happen if you switched them and connected the outputs of the reverb unit to the inputs of the delay unit? Keep thinking about the order in which effects could be connected as we learn about more effects later in this unit.

Let's Review

1. What creates reverb in a real room? What are two things that studios used to do to artificially create reverb? How is reverb created in the studio today?
2. What are the four things we can change about most reverb units? What does each of those things do?
3. How are reverb units usually connected to a mixer? Why?
4. How is reverb used and what is the most important reason we use reverb?

Experiments:

1. Try connecting a reverb unit to a mixer. What connections do you need to make? What controls do you need to use on the mixer to use the reverb unit?
2. Try changing the reverb's type, predelay, decay time, and diffusion (if your reverb unit offers all of these). What changes do you hear as you change each of these things?
3. Add reverb to different instruments in a mix. What happens when you add too much reverb? What happens when the decay time is too long? How does it sound when you add reverb on things like the bass guitar and bass drum? How does it sound when there is no reverb on anything? What does the mix sound like when there is reverb on all of the instruments?

Words to Know:

Do you know the meaning of these words?

Chamber
Decay Time
Diffusion
Hall
Mix
Plate
Predelay
Reverberation
Reverb
Reverb Time
Room

On the Web:

If you would like to see pictures of some real reverb units or read more about them, check out the following sites :

<http://www.MOTU.com/>
<http://www.tcelectronic.com/>
<http://www.RolandUS.com/>
<http://www.lexicon.com/>
<http://www.alesis.com/>
<http://www.appliedresearchandtechnology.com/>
<http://www.waves.com/>
<http://www.digidesign.com>
<http://www.kindofloud.com/>