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**Recording in the Digital World:  
Complete Guide to Studio Gear  
and Software**

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Chapter 12  
The Studio Environment

Press ESC to cancel sound.

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## Chapter 12.

# The Studio Environment

The recording equipment described in the previous chapters has become small enough to fit into almost any size room. However, before putting equipment into any room there are several concepts to be carefully considered. This chapter focuses on entry-level and mid-level studios with specific recommendations for treating existing rooms to get the most out of the area for digital recording.

## The Nature of Sound

Once a sound is set loose in a room it will interact with everything in its path until it dissipates or is absorbed. The sound quality is dependent upon the shape of the room and the materials on the walls, floor, and ceiling. Professional recording studios often have nonstandard-shaped rooms. The design of the room addresses proper control and handling of sound waves.

Every room has its own sound, referred to as *room tone*. Room tone is the result of many factors. For an exaggerated example, sit in a living room and listen to sounds, and then go to your bathroom (assuming its walls are tiled) or shower stall and listen there. Ever wonder *why* you sound so great singing in the shower? The sound waves bounce off the hard surface of the ceramic tiles gradually decaying and producing an effect called *reverberation*, or reverb. Even without a sound being made, you should be able to hear the difference in the size and construction of the living room and bathroom.

Next, clap your hands in each room and listen to the results. The sound waves reflect off the walls, ceiling, and floor until their energy, or sound, dissipates. In a small room, sound waves bounce back and forth rapidly because the distance they have to travel is small. In a tiled bathroom, the waves reflect off the hard surfaces so the sound lasts longer. Sound reflects rapidly off of many hard surfaces in the space and is not absorbed.

In addition to the initial sound wave reflection, you also hear the wave continue to reflect off the opposing walls over and over until the sound wave dissipates. Diffusion is the term given to the decay of a sound wave.

In some large spaces, you may hear a strange sound called a flutter echo. Flutter echo sounds like the flutter of a bird's wings as it takes flight.

Another way to experiment with various reverberation types is to sample them using your digital audio software plug-ins or outboard effects devices. Try different size room settings and listen to the difference in the quality.

## Professional Studio Design

Professional recording studios typically comprise two separate spaces. One room is the control room. The recording equipment is housed there and the recording engineer sits there during the recording. There is also a separate space where the performers play or sing into microphones. If there is enough room, the recording space can be divided into a main recording area and in an isolation booth, frequently

used for recording vocals.

In a typical control room, the walls and ceiling narrow at the front of the room and angle up and out toward the back. The concept of this design is to permit the sound waves to move through the space and diffuse equally, with no specific frequency range remaining to fool the listener's ear.

Each recording space is specially designed with acoustic properties to fit the room's function. Rooms are typically separated with soundproof walls and double glass windows for complete isolation. This is to prevent noise in one room from leaking or spilling into the other and interfering with recording and/or monitoring.

### Home Studio Options

Simulating the acoustic environment of a professional studio is a difficult task. For most project or home studios, it comes down to making the best of the space at hand. The goal is to create a space that does not create acoustic problems that haunt every recording. Some of the options for the various budgets include:

- Entry-level: modifications might range from nothing to such temporary treatments as baffles acoustic tiles attached to ceiling and wall surfaces.
- Mid-level: modifications might consist of permanent construction of soundproof areas or temporary soundproof structures to create a quality recording environment.
- High-end: modifications might include complete conversion of an existing space or creation of a studio designed from the ground up as a dedicated recording facility. This can be either an addition to a home or a complete self-contained building.

Ultimately the goal is to isolate each track being recorded from any and all unwanted sounds. The key is creating a room that is devoid of excess reverb. If the room is overly live, meaning there is a lot of natural reverb, this will also be recorded through the microphone. If you increase the volume of the track being recorded, it will also increase the volume of any unwanted sound such as room reverb. This makes it difficult to control overall blend and volume when mixing.

### Construction Options

Construction and design of recording studios is a specialized field. It requires experience in a variety of areas including architecture, construction techniques, building materials, and acoustics. For a high-end studio, or if you are building an addition onto your house, consider hiring a contractor who has experience designing and installing studios. An experienced designer can analyze your needs and is aware of the appropriate materials and techniques. It will cost you a little more money but you can sleep securely knowing you did it right the first time. For example, the Wenger Corporation, in Owatana, Minnesota, will develop specifications for studios and will supply the necessary materials. Another option is to contact local construction companies to see if any have experience building recording studios.

Preparing a recording space in your home can range from a major building renovation to simply hanging some sound absorbing materials. It all depends on your requirements, your budget, and how much your family will tolerate before requesting an intervention by Gear Sluts Anonymous.

## Outside Noise

An important part of studio design is to remove as much outside noise from the room as possible. In your studio, you are likely to notice outside noise. Consider how much traffic is on your street, how close you are to a major airport, and the noise made by your kids, your neighbor's kids, lawn mowers, leaf blowers, air conditioners, household appliances, even birds and thunderstorms. We often take these sounds for granted, but they can ruin a recording session or that killer take you've worked hours to produce. You will remember to shut off the ringer on your telephone, won't you?

The studio equipment itself also produces noise. Because of this equipment noise, many professional studios have a separate room for tape decks, hard drives, and other devices. It is not possible to screen out every extraneous sound but it is important to control as much as possible.

There is also the issue of containing the sound in the studio and keeping it from interfering with others in your home or apartment who might actually want to sleep, or neighbors who might have the local police on speed dial.

## Entry Level: Discovering the Studio Space

Rooms come in two varieties: wet and dry. Wet rooms have walls and floors that are hard and therefore highly reflective of sound. This creates an overabundance of room reverberation. Rooms that typically have a high level of reverb include the bathroom, kitchen, basement, garage, and hallway with a stairwell. Basically, all rooms with hardwood floors or stone walls will be wet or ambient. These rooms usually have little in the way of natural sound absorbing materials such as carpets, drapes, or upholstered furniture.

Dry rooms usually have a minimum of natural room reverb and echo because they have surfaces that absorb sound waves such as carpets and drapes. Dry rooms usually include the bedroom, living room, dining room, and clothes closet.

Ceiling height is also an important factor. You may have more height in the living room or first floor space than in a bedroom or second floor room. A higher ceiling will add to the reverberation time of the sound.

Keep in mind that it is easy to add reverb to a recorded track. However, live room ambience is difficult to remove. If you are not sure how it is going to fit in the final mix, err on the side of dryness. Early recording studios used to be constructed with wet rooms until the 1970s, when dry rooms and isolation booths became popular. In a home studio, it is usually best to record in a dry space and add reverb during the mixdown.

Sometimes using different recording space can be an advantage. For example, if you want to add natural room ambience or reverb to a vocal track, try setting up the mic in the bathroom or hallway. Placing a guitar amplifier in an ambient stairwell and fiddling with an EQ might be a stroke of genius when you can't quite find the right sound in a dry recording room.

### Acoustic Materials

If you are designing a studio in your home or apartment, it is a good idea to consider making minor alterations to the room to enhance the sound quality for recordings. This can be done at a minimal to moderate expense depending on the materials you use. In many cases, materials can be used that are not permanently affixed to the room. Merely adding or removing furniture can affect the sound in a room. If a room with a bare floor is a little too wet, try placing area rugs or blankets to dampen the sound. If a room is a little too dry, try removing furniture, drapes, or any other absorptive materials in the room.

Everything in a room absorbs sound to some degree. However, every type of material has its own rate of absorption. The measure of how much sound a particular material absorbs is called the sound absorption coefficient. Materials are rated on a scale from 1.0, total absorption, to 0.0, completely reflective. For example, the absorption rate of carpet changes if it has padding underneath. A padded carpet has a rating of 0.08 for signals in the 125 Hz range and a healthy 0.73 rate of absorption at 4 kHz. Concrete block absorption changes if it is sealed and painted.

The absorption rate varies with different frequencies. One common characteristic of most acoustic room treatments is that they absorb high-range and mid-range frequencies better than low-range frequencies. For the low frequencies a diaphragmatic absorber, more commonly known as a bass trap, is recommended. A bass trap is usually made of a panel of wood mounted over an air space that resembles a rectangular box attached to the wall. When it is struck by a sound wave, the panel resonates at frequencies determined by the rigidity of the wood panel and the size of the air space behind the panel. This dampens sound waves of the same frequency as they strike the trap. Acoustic tiles and foam can be positioned on walls and ceiling to absorb sound waves and eliminate unwanted first reflections.

Analyzing a room to determine the correct treatment for sound recording requires some knowledge of acoustics. If you want to explore the technical side of acoustical treatments read F. Alton Everest's book, *Acoustic Techniques for Home & Studio*, published by Tab Books.

### Mid-Level: Building a Room Within a Room

If you can spread out and use several rooms for various recording needs, it may provide some isolation, both for musicians and the recording engineer. To completely isolate a room for recording, you must build a room within a room. This is expensive. Some options to consider include installing a drop ceiling and/or adding a layer of insulation to all of the walls. You will also need an insulated door and stripping around the doorjamb to seal it. If you are considering this type of setup, remember to consider cable runs, electrical outlets, and proper ventilation. Before you undertake building a room within a room, think for a moment about how long you plan to remain in your current location. These modifications may not enhance the resale value, unless you find someone else who wants a home recording studio. If you are not going to reap the long-term benefits from creating a room within a room, consider some of the less permanent options mentioned in the following section.

## Room Treatments for the Do-It-Yourselfer

As mentioned previously, isolation gives you more control when mixing. This is important if you are blending tracks from several different sources or locations. If you plan to record vocals, consider constructing a separate vocal booth. There are prefabricated units you can buy from Wenger Corporation and other companies, or you can adapt the space using room treatments. For other construction ideas, visit other recording studios in your area.

Baffles can also be helpful. You can use Plexiglas or other materials to baffle off the area around the pickup pattern of a particular microphone. Baffles can be made at home using materials from your local hardware store. For example, purchase a door or dressing screen. Glue some foam or carpet on one side. If you use a door, construct a base so it will stand securely. You could also build a wood frame, fill it with fiberglass insulation, and then cover the frame with bed sheets. (Be sure to follow safety procedures for handling all construction materials.) You also can contract a carpenter if you don't have the tools or if you tend to cut off body parts when you try to be handy.

In addition to the do-it-yourself option, consider purchasing prefabricated materials from companies including Acoustical Solutions or Acoustic Sciences Corporation (ASC).

## Setting Up the Control Room

It is ideal to use multiple rooms, one where the musicians will perform and one for the recording engineer. It is possible to have the recording equipment and microphones all in one room, but it may be difficult to monitor the sound as it is being recorded. Either the engineer must use headphones or the control room monitors must be turned down to a very low level to avoid re-recording too much of the track with the vocal.

In order to produce a quality product, the listening environment for recording and mixing is crucial. If you can use two different rooms, it is best to locate the main recording area, or control room, in a separate room from the main recording area.

Once you have decided where your control room will be located, proper positioning of the audio monitors is a priority. Monitors should be placed at least 18 inches away from back or side walls. This is to avoid unwanted reflections. Make sure the wall behind both speakers is of the same construction. Try to place the speakers in the middle of the room (avoid placing them in a corner). An ideal placement is 6 feet between your listening position and the speaker, with the speakers 6 feet apart, forming an equilateral triangle.

If you are in a small space such as a spare bedroom, there may be unwanted reflections from the opposite wall. Adding some acoustical foam on the opposite wall will absorb or diffuse the unwanted sound. You may also need to add some treatment to the ceiling and side walls as well.

Spend time tuning your room. Start by playing a familiar CD recording at different volume levels and carefully listen to the room sound. Move around the room and see if there are any places that have a buildup of bass frequencies, especially in corners or coves. To address this, add room treatments to specific areas.

### Ventilation

On a less technical note, give some consideration to proper room ventilation. If you are in an unventilated room, heat buildup can be a problem. Some equipment may malfunction if the temperature gets too high. Make sure air can circulate around the rear of the recording gear and amplifiers.

A room air conditioner or central air can be a good investment. Try to find a model that runs quietly. You will have to turn it off for critical listening or when recording live tracks. Ceiling fans can also be an option as they tend to operate more quietly than air conditioning units.

### The Economics of Ergonomics

After your studio space has been defined, you will need furniture to complete the setup. If you are particularly handy, you can make your own, but given the price of materials, some prefabricated units can actually be cheaper. A small studio setup may fit on stock office furniture or a computer desk with a library top. For more complex setups you may want to investigate units built specifically for recording by companies including Raxxess, Omnirax, and Argosy.



Figure 12.1. Omnirax Studio furniture



Figure 12.2. Argosy Studio furniture

These products are designed for audio and video hardware gear. Each company offers a variety of options so it is a good idea to review each company's catalog offerings.

### The Seat of Power

Before you sit down and get to work, consider the chair you will be sitting in while recording, editing, and mixing. You will be spending a lot of time working in the studio, and it is essential that you are comfortable for long periods of time. Visit the local office supply store and look for a quality office chair. It may be several hundred dollars or more, but when you add up the hours you will be spending in it, you will get your money's worth. Physical problems, especially back ailments, can be exacerbated by using an inferior chair. This is especially true if you've already abused your back hauling equipment around to gigs and recording sessions.

## Summary

The recording space environment has a significant impact on the recording quality. There are several options from which to choose with regard to room construction. Entry- and mid-level studios are usually located in a room in the home or apartment. High-end studios are typically custom designed. It is possible to make alterations to an existing room to enhance sound quality.



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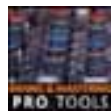
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