ACOUSTOLOGY 02/2004

by Jeff D. Szymanski, Chief Engineer

This month: *"Noise…Noise…Noise…In My Studio!"*

You've trapped the bass. You've absorbed the early reflections. You've absorbed or diffused the late reflections. You've floated your loudspeakers. You've hung out your shingle. You've booked your first session. The band arrives. Halfway through the first track, you discover a "whine." Or a "hum." Or a "hiss." Or a "buzz." Or something else that is *not* what your client had in mind for the vocal track. (Or the guitar track, or the bass track, etc., etc.)

Possible noise sources

1. **Electrical Hum.** This is a tough one. The subject of electrical noise could easily be an entire chapter in a reference book. In fact, it has been! A good source for reading up on minimizing electrical hum is Philip Newell's book, *Project Studios: A more practical approach*. Also, John Volanski covers the subject in *Sound Recording Advice*. Both books can be found through our Book Referrals ink.

   The main thing to remember is that electrical hum is most often caused by poor grounding. Having a dedicated circuit (or circuits) for the studio with an isolated ground is most often the best approach. There are other approaches to getting "clean" electricity covered on the Jensen Transformers' website.

2. **Computers.** The most growing source of noise in the studio is computers. Drives and fans, specifically. Products to minimize noise from computers that *must* be located in the control room with you are covered on one of our FAQs. Obviously, the best approach is to locate the computers in their own dedicated equipment room or closet. This will take some wiring know-how, as well as a dedicated cooling system for the equipment room or closet itself. (Computers generate heat and, like your car, will not perform will if they overheat.)

3. **HVAC.** This is a HUGE topic. Large sections of books have been dedicated to addressing the myriad sources of HVAC noise. The *American Society of Heating, Refrigerating, and Air-Conditioning Engineers*, or *ASHRAE*, has done vast amounts of research. Their various handbooks have sections devoted to noise and vibration control for HVAC systems. I could not hope to cover all the "do's" and "don'ts" for heating, cooling and ventilation systems in this forum. But I would also not expect you to shell out the huge dollars for the *ASHRAE* Handbooks. So, I will cover a few of the key points here and would encourage you to contact us if you have additional questions:

   a. *Location, Location, Location.* Do ***not*** locate any of your heating/cooling equipment anywhere near your studio if you can avoid it at all. The more distance (and walls and ceilings and floors) you can put between you and any of the equipment, the better off you'll be. If you must have a studio room directly adjacent to a mechanical equipment room or closet, please read on…

   b. *Vibration Control.* At the very least, be sure the mechanical equipment rests on some sort of vibration damping pad. Your HVAC contractor can help you select the right type of pad. You can also "float" the unit on some rubber or mechanical springs. Just be aware that the proper type of springs must be used. The wrong type of springs can do nothing or even amplify vibrations from equipment. Get an HVAC or noise and vibration control expert in the loop.

8851 Hague Road • Indianapolis IN 46256-1284 • 317.842.2600 • Fax: 317.842.2760 • 1.800.95.WEDGE • Website: www.auralex.com • Email: auralex@auralex.com

c. *Airflow noise.* Often, the easiest way to minimize airflow noise ("whoosh" or "hiss") is to decrease the air velocity. This sound more difficult than it is. Simply make the air ducts and/or the openings into your room bigger. The volume of air entering the room is more or less constant. (Unless you have a variable volume system – not common in residential applications.) Increase the duct or opening size and you've just decreased the airflow velocity, but you haven't changed the actual amount of air coming into the room. (Think of a garden hose: The water comes out faster when you put your thumb over the end of the hose. But it's still the same amount of water coming out.) If you have a good HVAC expert helping you, let him/her know that you do not want the air velocity to exceed 500 feet per minute (fpm) anywhere in your system.

d. *Lined ducts.* The best ducts to use for a new installation are the flexible, insulated kind. ("Flex" duct looks like big dryer-vent hose. It usually comes in a long, tall box.) Be sure to select – of have your HVAC expert select – the right size of duct for 3.c. above. If you are retrofitting, the right size of duct is even more important. Also, the one drawback to using flexible, insulated duct is that sound passes through it. So, if your ducts are not behind the ceiling – i.e., they are visible in the room – then flexible, insulated will *not* be the way to go. Finally, you can also consider designing or retrofitting with lined sheet metal duct. The minimum lining thickness must be 1".

e. *Duct length.* The more (preferably lined) duct you can run between the equipment and your room, the less noise you'll have to worry about. Bends are also good – the "serpentine" approach is often used for studios. Just be sure not to make sheet metal duct bends too severe. This will cause a noise problem all its own.

f. *Grilles.* The grilles you use to terminate the duct opening in the room are very important. A poorly selected grille can cause all kinds of noise – whistles, rattles, etc. In general, the less detail and the wider the openings in the grille, the better. Again, if you're working with an HVAC expert, let him/her know that you require "air devices" with "NC" ratings of "30 or less" *for the designed airflow*.

g. *A ducted cold-air return.* In homes, this is usually the norm. However, if you are putting a studio in a converted office (commercial) space, the cold air return is very often not ducted. This will require some retrofit as an un-ducted return is a big source of noise. Again, I defer to the HVAC experts.

4. **Exterior Noises.** This can include anything from airplanes passing over to the unwanted (but not unloved) "baby obbligato." Noise that is leaking in through your walls, ceiling, windows, doors, etc. should be addressed through the proper isolation techniques. Many of these techniques are covered on our Acoustics 101 website and on our FAQ page. A key point to remember for the construction of any element – door, wall, etc. – is sealing gaps. For doors, this is often a case of getting good weather stripping or other seals around the perimeter and at the bottom of the door. (Note: For high-grade acoustical seals, visit Zero International's website.)

   For windows and other places you might encounter gaps, I would strongly encourage a good acoustical sealant caulk. If you cannot find one locally, we are proud to announce the introduction of *StopGap Acoustical Sealant*. See the product feature elsewhere in this issue of *AbsorbThis!* for more details. Basically, you want to fill every possible gap. E.g.:

a. Where the wall layers meet the floor layers, leave 1/8" and seal.
b. Where the ceiling layers meet the wall layers, ditto.
c. Where pipes or ducts come through a wall, leave 1/8" around and seal.
d. Around electrical back-boxes. (Outlets, light switches, light boxes, etc.)
e. Where the wall or ceiling layers meet any decorative trim, leave 1/8" and seal.
f. Where the baseboard meets the floor, leave 1/8" and seal.

I think you probably get the picture! Caulk is your friend.

That's about all the space-time I have this month. The above list is by no means exhaustive when it comes to noise sources and how to treat them. We have had requests for help attenuating things as obscure as aquarium equipment noise and even noises that we could do nothing about like the sound of blood rushing through a customer's head! In short, noise can ruin recordings. This can, in turn, ruin your business or at the very least ruin the enjoyment of recording and mixing your own music. Use the above as a guide and – once again – please contact us with additional questions.

Next month: *How do I measure thy sound? Let me count the ways…*