



Viewpoints: Experience & Science Combined

Real Time Installation at Ultra Sound Rehearsal Studios (Doug's Viewpoint)

By Doug Jones

Instead of fighting this month, Jack and I decided to write about our recent trip to New York to work at Ultra Sound Studios. I suspect that, although we saw the exact same things and witnessed the same events, our accounts of what happened and certainly our explanations of what happened and why will be quite different.

The client, Ultra Sound, is a rehearsal studio complex in downtown Manhattan. Our task was to align, adjust, tweak, tune, or whatever, five rooms with new sound systems that Jack had specified. I had specified the acoustics treatment based on sketches that were sent me. The systems were quite high-tech and, depending on your particular preferences, some of the best gear money could buy — speakers by Martin, amps by Lab.Gruppen, control by XTA and consoles by Midas — not bad for a rehearsal studio.



Mirror underneath speakers, with 835s in front. 3150Hz anyone?

The acoustic treatment was designed to make the users comfortable in the rooms. If the rooms are too live, everything will seem too loud and it will be hard to get a good mix. If the rooms are too dead, the musicians will not be able to hear themselves. Treating small rooms is tricky because there is not much to work with and small changes can make very audible differences.

Of course, we also needed the sound systems in the rooms to achieve high levels of gain before feedback.

Before I get into the nitty-gritty of my part of the gig, I want to give you a sense of what these studios were like. You walk into a small room, about 20 by 17 or so. One wall is covered with a mirror. Above the mirror is a pair of Martin WT3 speakers aimed into the room. The wall opposite the mirror is essentially covered with a most amazing collection of vintage tube guitar amps and speaker cabinets. A high-quality drum kit and keyboard selection complete the equipment package.

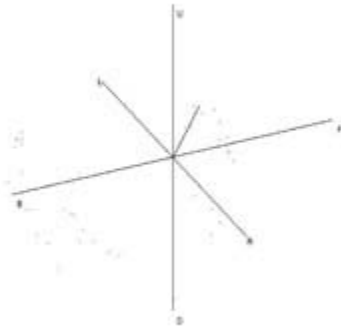


Figure 1

The notion is that a band comes in, plugs in, faces the mirror and works out their act. The sound system is then a combo FOH/Monitor system. It has to sound really good, and it must be really stable (it can't feed back), and it has to be able to get ridiculously loud. Now multiply this room times 21! There are 21 rehearsal rooms that make up Ultra Sound studios. Although there is some variance in the size of the rooms, they all contain the same complement of gear. When the upgrading is complete, they will all have the same PA systems! Let's just say that the use of the word Ultra was not hyperbole.

On the flight in from Chicago, we tried to work out a game plan. Jack was to do "whatever voodoo he do" to try to get the systems to be stable and sound as good as possible. I was then going to fire up my various analyzers and point out the inevitable weaknesses of Jack's approach. In this way, Gene (the owner) would get the best of both worlds, and (if he wanted it) documentation to boot.

In addition to tweaking the systems within an inch of their lives, I wanted to make sure that the acoustic treatment I had specified was doing what it was supposed to do. Gene wanted to make sure that these five rooms met his expectations before he upgraded his entire facility.

BACK TO NY

We arrived in New York on a Monday around noon. Our intent was to work until we dropped, crash, get up early, work some more then fly out Tuesday afternoon.

So we show up, place our jawbones back into their respective sockets after checking out the incredible display of amps and such, and get down to work. Jack unpacks his collection of CDs and gets to work making various noises. I unpack my trusty TEF and try to fire it up. Alas, the TEF was fried.

I turned to the IASYS I brought along to evaluate and found that it was not working right either. I always carry a Terrasonde Audio Toolbox, just in case, and I wound up using that for the first pass measurements.

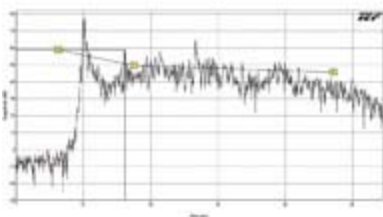


Figure 2

The first thing that the measurement showed us was that a woofer was out. Apparently, it was fried from the factory (sorry Martin). Surprisingly enough, none of our ears picked up on that. The moral of that story is always checkout new loudspeakers before you install them!

I can honestly say that, in the almost 30 years I have been doing this stuff, I have seen bad speakers from every

manufacturer.

By this point in our visit, I am feeling frustrated that I could not participate very much because my tools were not working. I did feel vindicated to some extent because of the woofer, but with all due respect to Terrasonde, it isn't a TEF20! There were a lot of measurements that I wanted to make that were just not possible. The worst part about it was I had to put up with the wisecracks from a certain colleague about how his ears still worked just fine. In an attempt to salvage this trip, I put in a call to Goldline, and they agreed to rush ship me a loaner TEF for the next day! What incredible customer support. Thanks to Greg and Marge Miller for coming to my rescue!

The next morning the TEF was there as promised, and I began looking at the systems. Jack had done a good job of tuning the systems including the crossovers and delays. There was not much to clean up. There were some areas where I thought he had over EQ'd the system, and I had him return some of the cuts he had made.

A look at the direct sound also confirmed that we were right in our decision to angle the speakers in so the horns were pointing at the primary mic location. This brought some brightness back to the system that Gene felt was missing. This supports the old adage that you should point speakers at the people who are listening to them...

MANY TOOLS FOR THE JOB

One of the tools I had brought along was Goldline's PET setup. PET is a system using the TEF for making Polar Energy Time curves. It allows the users to not only see the energy as a function of time of arrival, but it also shows the angle of incidence of the sound as it impinges on the mic.

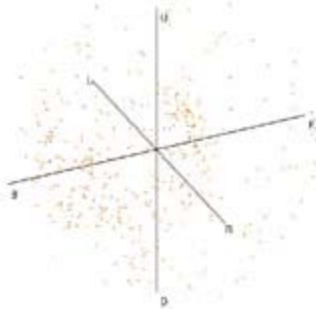


Figure 3

The measurement is made by placing a cardioid mic in a special jig that is calibrated with marks that show the azimuth and elevation. The mic and in the jig is placed at the point in the room that needs to be investigated. In this case, we put the mic in the position of the lead vocal mic. We wanted to see where the reflections came from in the room back to this position. Six measurements are made: ahead, left, right, behind, straight up and straight down. The computer then processed the data into a 3D display as shown in Figure 1.

The dots in the display form a "cloud" around the center or origin. On the computer, this display can be rotated, so the user can view this cloud from any angle. The dots that form the cloud are sources of energy back to the measuring mic.

This display is accompanied by a conventional looking Energy Time Curve (ETC, Fig. 2), which is actually a composite ETC made up of the six individual measurements. The useful part is the horizontal line marked 0-1-2. This is a type of threshold cursor. The spikes that rise above this

line are from the cloud in Figure 1, the rest are ignored.

This cursor can have numerous break points, so it can be moved around to allow the user to examine any part of the sound field he wants. If the cursor is placed deep in the measurement, you will see a dense cloud as in Figure 3.

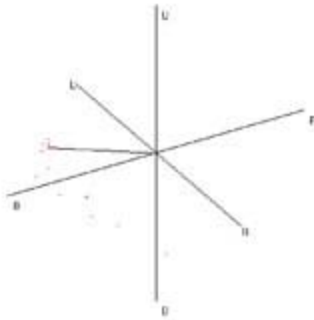


Figure 4

In Figure 1, I am using the cursor (a line extending from the origin to one of the dots) to identify one of the sources of sound energy. The length of the cursor corresponds with the time of arrival. The angle of the cursor is the angle of incidence. These data are displayed at the top of the graph. It says, "Elev(ation) 33.1³/₄, Azi(muth) 326.7³/₄."

Now here is the fun part. You take the microphone out of the jig, being careful not to move the jig. Replace the mic with the supplied laser pointer and set the jig to the coordinates shown above. Turn on the laser and you will see where the sound is coming from or bouncing off to arrive at the mic. In this way, you know exactly where to put acoustic treatment to kill any reflections that you don't want. (See Figures 2 and 3)

If you wanted to explore one particular reflection or a group of reflections, you could move the threshold cursor up and the result would be a very sparse cloud, making it easy to find a troublesome reflection. (See Figure 4)

In this case, the reflection was coming off the face of a guitar amp. Obviously, we couldn't cover the amp in sound absorbing material, but it might be possible to move the amp or rotate it so the reflection goes somewhere other than the primary mic.



Rack detail. The feedback eliminator is no longer required.

OK, we have some cool toys and lasers and stuff. I can hear Jack's supporters saying that it probably doesn't matter anyway. In fact, most, if not all, the reflections that I found and treated were clearly audible — not as discrete sounds, obviously, but audible in how they changed the character of the speaker. I believe this reflection study allowed us to tune the system to that level of gain before feedback.

The most important lesson we can take from this experience is that Jack's approach and my approach do not have to be in opposition.

Sure, it makes for good reading (I hope), and we will continue to battle it out in these pages and in our classes. But in the real world, where speakers are moving air and real people are listening, amazing results can be achieved

by applying science and art.

Could I have tuned those systems alone? Probably. Jack could have as well. Neither one of us alone could have achieved the results that we achieved together. Jack and I are probably too old to change much, but if you are starting out in this biz, what an incredible opportunity you have — Don't take sides. Learn the science — learn the art. You won't regret it.

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