by anthony grimani

Why You Must Measure

There really is no excuse today for not using decent measurement equipment to tune your customer's home theaters sound systems. I know you will probably say that this stuff is expensive and complicated to use. Is that a good enough reason to deny your customers a chance for audio perfection? I don't think so, and in fact the measurement gear keeps getting simpler, more cost effective and definitely easier to use.

I think that by now all of us have seen the benefits of proper alignment of video display systems. Whether you have opted for an ISF lecture and certification, or have sprung for a color analyzer, you know that it makes a serious difference on picture quality. Well, the same goes for sound. Tune it right, and it will sing.

The amazing thing is that you can make some extra money in the process. Imagine that all of your home theater installation bids included a calibration service. It could go from a simple two-hour job to a 20-hour meticulous debug, qualification and equalization marathon. As I see it, if you have taken on a $300,000 theater project, you owe it to your customer to offer up a $3,000 service of verifying that every piece of gear fully works, and that it is best tuned for the room.

I could go into a lengthy lecture about the difference it makes to final sound quality. Instead, let me just say that putting in a pricey sound system, and not measuring its operation with technically competent test gear, is close to criminal. I use that strong word because without care in adjustment and calibration, you will deliver about $5,000 worth of audio performance for upwards of $100,000. I think you could get indicted for that, whether or not you did in fact inhale.

"There are a number of products and simple solutions on the market today"

Let me give you and example. I just finished tuning a *pricey* home theater. During the calibration process, I discovered that the processor inverted the signal polarity in the left and right channels only in Dolby Digital mode. All other modes were fine. What would this system have sounded like had it been left as is? Well, downright funky on the majority of movies, because the L/R speakers would be out of phase from the center and the surrounds. At some seats in the room, spacious program material sounded very odd, to say the least. I couldn't have figured this out, had I not brought along an acoustic polarity testing device.

Over the years I have come across all kinds of strange issues, which are ultimately endemic with the level of complexity of our more high-end installs. Often, I could hear that something was wrong, but it was only the test gear that helped locate the problems. It's like building an F1 racecar; it's going to be complicated, and you better have the right tools and knowledge.

So what are these tools? There are a number of products and simple solutions on the market today. For the kind of work we all do the choices range from about $500 up to $3,000. A

starting point is a software program that you can run on your PC laptop called SIA Smaart. It offers a whole bunch of measurement options, and requires that you have an external microphone with a preamplifier. You can also take chances and use the laptop's soundcard microphone input preamp. Some laptops have decent ones, and others are so bad you don't even want to think of it.

Decent test microphones can be purchased from Gold Line or Earthworks. Its up to you to put the pieces together, but the SIA website www.siasoft.com offers the mics and more, to complete your rig. Ultimately you are looking around $1,000 to get the thing together and running.

Next, you should look at the Gold Line 30MP. For around $875 you can get a hand-held 1/3 octave analyzer that will get you started in a simple way into the world of audio analysis. Up next is the Gold Line DSP30 se-

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HOME THEATER MODULE

New Processors Provide Studio-Quality Sound for Mass-Market Products

NORWOOD, MA—Analog Devices has released the third generation of its SHARC audio processors, designed specifically to meet the needs of a broad range of consumer products. According to the company, they feature high integration for lower system costs, support for the latest audio decoders and postprocessors and numerous audio-specific on-chip peripherals. Through its programmable design, the SHARC processor offers manufacturers the ability to support new audio formats and post-processing technologies, enabling faster time-to-market for a broad range of products with different feature sets and price points.

Analog Devices' family of SHARC audio processors

For more information, visit www.analog.com/SHARC.

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installed today with stable, four-year-old product. Remember how cool that stuff was four years ago? It's still cool to your customer.

Here's the upshot: Eliminate the design aspect from entry-level systems.

•Mid-priced systems. The temptation to treat mid-priced systems any different than entry-level systems is a dangerous decision. The mid-priced customer is looking for a higher level of performance and functionality, and you can still provide that with a limited number of offerings.

What distinguishes a mid-priced from entry-level system is usually the scope of the project. More sources, more zones, greater control. That means your toolkit has a broader scope, but still a limited offering per category.

As with your entry-level toolkit, choose a limited selection of mid-priced components that work well together. And keep using these same components year after year. Of course, manufacturers are constantly introducing new models, and you will have to choose which ones to integrate into your mix. But typically, a manufacturer will stick to a price point, and simply introduce replacements as their offerings mature.

The danger most CI companies get into is confusing the design strategy for mid-priced and high-priced systems. By treating a mid-priced system like its high-priced cousin, the CI dealer adds a level of complexity to a job that doesn't offer enough profitability.

The strategy for mid-priced systems: eliminate product design by pre-engineering, and focus solely on installation design.

•The high-end system. The high-end customer is looking for performance and functionality requiring a custom designed system. This customization often requires architectural modifications, thereby widening the scope of the job.

Not to say that you shouldn't rely on a handful of high-end favorite components. But unlike a pre-engineered solution, these high-end components may only serve as the foundation for the project. In addition, you'll most likely need a bevy of special offerings, from pro gear, to custom programming, to custom-built speakers.

The amount of engineering and design time in a high-end project is immense, and it's here where design fees need to be a separate line item on the proposal. And why not? This customer is looking for a customized solution, and realizes they'll have to pay for this service.

The strategy: everything about a high-end system is design, and the design hours (and dollars) allocated to the project should be at least 15 percent of the project's total. It's with high-end systems only that you should be spending any significant time choosing just the right products. Which makes sense, since you're charging for that design time.

Next month we will delve into the details of running an efficient installation department. If that's even possible!

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ries. For about $1,200 you can get a digital analyzer that can interface with a laptop to store all the data for your records, and to show your customer all the fine work you did in adjusting the speaker locations and equalizing out the speaker/room interactions. For another $1,000 you can get a multiplexer (the Gold Line MX4) that gives you four precision test mics and an automated switcher; this will afford you a better measurement of the actual sound character of the room by averaging over four locations.

Another option is the Sencore SP295 analyzer set. This $1,600 unit does a number of analysis functions, and can create a final report for your customer to oogle over. An optional multiplexer is also available for about another $1,000.

In the world of cute, portable and really impressive, comes the new kid in town. The Ivie IE33. Based on a Compaq iPAQ platform, this little pup does a lot of stuff right for the money, and size. It can do spectrum analysis from high resolution though 1/3rd octave to full octave width. It can do polarity tests, oscilloscope measurements, signal generation, and then some. It can store the data in its memory, and you can dump it all to a PC to create a work report. Ivie is no newcomer to the world of audio analyzers. Their IE30 and PC40 have been staples of the audio engineering community for years; and they haven't lost their touch. All this functionality and portability will set you back a mere $1,500, and will make you a real dangerous audio specialist!

Notice that I keep bringing up this business of "report for your customers." That's because I think that the completion and measurement report, that shows your customer that you used advanced technologies to qualify and tune their system, is a crucial asset in getting paid at the end of the long and arduous path that a custom high-end theater project can be. Anything you can do to show them that you did responsible and qualified work is a feather in your cap, and dollars in your account.

Wireless

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proper isochronous MAC layer is required for QoS, multipath is the next challenge wireless entertainment technology must solve for full QoS. Every transmitted RF signal generates echoed images caused by signal reflections off objects between the transmitter and receiver. This effect is known as multipath. The receiver "hears" the primary signal that is being sent directly from the transmitter, but it also "sees" the secondary signals that are bounced off nearby objects. These bounced, or reflected, signals will arrive at the receiver distorted and a bit later than the original signal. Due to this misalignment, the reflections will cause interference or distortion of the received signal. Worse, the multipath environment is continually changing. Human bodies absorb RF and people will certainly walk around their homes while someone may be watching a DVD. Even opening and closing window blinds and refrigerator doors constantly changes the multipath environment. In other words, any movement within a home changes its multipath characteristics, thus continually altering the RF environment.

One approach to dealing with multipath is to actually use multipath and take advantage of it. For instance, Magis' Air5 technology uses an intelligent antenna architecture consisting of five individual receive antennas that continuously monitor the RF environment and determines which two out of the five antennas are the "best" to use for optimal reception (see Figure 1). The resulting two signals are then processed by an embedded CPU using patented algorithms that recreate a new signal which is "stronger" than either of the original two. The choice of which two

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