

# Test Your Limits

When Your Reputation Is On The Line, Measurement Is The Answer

by Wayne Dolnick

Every day we face truths, but can we, and do we, accept the consequences? In today's ever evolving, technologically advancing world, a successful project is much more than a laundry list of merchandise and billable time, but a statement as to your capability for future support and maintenance of a job. On the audio side, helping to provide evidence of your technical prowess are any one of a number of test and measurement devices.

A project may start with the bid and progresses to the install, but in between there should be a great many measurements, data analysis, recording and printouts. The consequence of not being prepared technologically to solve acoustic issues, large and small, from the church to the arena, from the project studio to the post room, from the health club to the jazz club you just built, is a distinct lack of referral business.

In order to avoid this consequence it's best to be prepared. A few manufacturers today offer handheld-, and/or laptop-based RTA/SPL devices that offer a whole lot more than just RTA and SPL measuring for a fraction of what their rackmount counterparts cost just a few years ago. And, in some cases, I am talking palm-sized computers that are astonishing in their recording and reporting capabilities.

Wait. Do I sense some mumbling under your breath—you can do it better with your ears than most guys can and quicker than with a tool? I forgot that your ears are indefatigable, but what about your man in the field? Can you rest your reputation on your crew's ears? Forget about what you tell a client. At the end of the day, can you

## Testing, One, Two

FEATURE	DEVICE				
	Catt V8	SIA Smaart	RPG Room	Ivie IE-33	Sencore 295 C
Software	Yes	Yes	Yes	Yes	Yes
Hardware	No	No	No	Yes	Yes
Calibrated Mic	No	No	No	Yes	Yes
Memory	*computer	*computer	*computer	Built-in	Built-in
Battery Power	N/A	N/A	N/A	Yes Serial/A/C	Yes USB/serial/ A/C
Charting	Yes	Yes	Yes	Yes	Yes
SPL	Yes	Yes	No	Yes	Yes
RTA	Yes	Yes	No	Yes	Yes
Sound Decay	Yes	Yes	Yes	Yes	Yes
Distortion levels	Yes	Yes	No	Yes	Yes
Line I/O	N/A	N/A	No	Yes/Unbal.	Yes/XLR, 1/4-inch, RCA
SMPTE Time Code	No	No	No	No	Yes
Frequency Counter	Yes	Yes	No	Yes	Yes
Audience Mapping	Yes	No	No	No	No
Specular Reflection	Yes	Yes	Yes	No	No
Echogram	Yes	Yes	Yes		
Modeling	Yes	No	Yes	No	No
Prediction	Yes	Extrapolated	Yes	User interprets	User Interprets
Irregular shape testing	Yes	No	No	No	No
Multi-position testing	Yes	Yes	No	Yes	Yes
Preferred Curve Overlays	No	Yes	No	Yes	No
NIC/STC	*No	*No	No	Yes	No
Noise/Speech	Prediction	Yes	No	No	Yes
Recalling File	Computer	Comp	Comp.	Screen+ File name	# on-screen or Comp
Oscilloscope	N/A	N/A	N/A	Yes	Yes
Signal Generator	No	Pink & Red Sweep, Pink & Red Sync	No	Sine, Sq., Trian., Pink, White	Sine, Sq., Pink, White
Volt Meter	No	No	No	RMS:PP, dBV, dBu: Nixie	dBu, dBV, Vave, Vrms, Vp-p
RT-60	Yes	RT-60 & T-60	*Macro	Yes ISO-20/ISO-30	Yes
Amplitude Sweep	Algorithm	Yes	No	Yes	1/3, 1/12 octave
External Device Control	No	Yes	No	No	No
DLL (plug-in) Library	Yes	Yes	No	No	No
Config. Recall & Preset	Yes	Yes	No	Yes	No

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sleep soundly knowing the outdoor summer series of your local Philharmonic is going to sound perfect set up by someone else's ears? Are your men bumping the curve for speech intelligibility on the church retrofit or meeting OSHA rules for the paging and warning system? Are you sure?

Your knowledge, combined with one of these devices, can steer you to the sweet sound of a referral. After all, isn't that what we all want—an acknowledgement of a job well done? When doing your business plan for the next fiscal, a wise allocation should be made for one of these devices briefly described within, which, while not a guarantee of new business, surely would help.

## This new crop of devices are no rookies, but powerful computer-based measuring and recording tools.

I have a few suggestions that may help you and your crew save time, money, patience, clients and, germane to this article, allow you to tune a system properly and, in most cases, record and print out the data for future reference. To start with, I am going to take a wild guess that most everyone reading this has owned, used, borrowed or seen a sound pressure level (SPL) device, whether a RadioShack special or a workbench monster, and many have worked with real-time analyzers (RTA) in a rack.

Well, welcome to the 21st Century. This new crop of devices are no rookies, but powerful computer-based measuring and recording tools that, in the right hands, can do amazing things from a basic setup to assisting in balancing of Wembley Stadium. For actual field testing of a few of these devices, I ingratiated myself with a world-famous physical therapist in New York City whose roughly 5,000-square-foot facility treats the average patient and many an Olympian and professional ball player. At the U.S. Athletic Training Center (US-

ATC) in midtown Manhattan, an apparent issue was the lack of warmth of the 70V system in place—or for lack of a better term, the tinny sound. So after a few adjustments, I adjusted the system as best I could with my “golden ears,” which is when I decided to bring in a different kind of tool—the digital kind.

It was an Ivie IE-33 handheld, computer-based RTA/SPL measuring device with a computer strapped to its back. In this case, the computer would be a Hewlett Packard H5500 PDA, whose full-color display and updated graphic capabilities make it not just a pleasure to use, but a want-to-use-and-own tool. Well thought-out,

easy to navigate and wireless, with a BlueTooth PDA thrown in to sync the files you have collected, numbered and named in the field, it is a dream at a relatively affordable price for most contractors doing anything larger than small home theaters.

(continued on page 72)

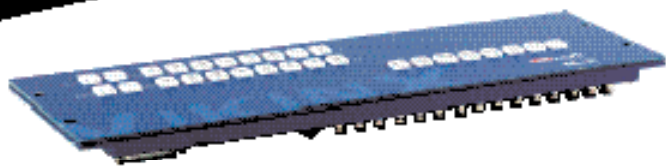
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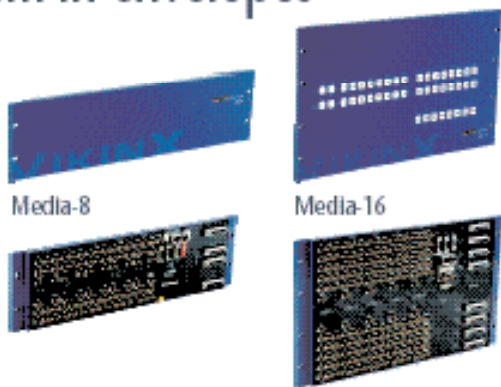


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The substantially-built handheld device by Sencore, model Sound Pro SP295 Contractor Version (left), has an included calibrated microphone equally impressive as the Ivie IE-33 handheld, computer-based RTA/SPL measuring device with a computer strapped to its back.

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What was very informative and pretty cool was the ability to quickly tap changes to items being tested and subsequently recorded. From A, C, to Flat, full octave to 120 point, maximum resolution graphing from 20 Hz to 20 kHz all the while eyeing (and recording) SPL. A little more complicated (four extra taps) was the ability to store an RTA measurement and then another. Either average the two, subtract one from another or leave a "highlight" on the screen of a shot of one for reference when measuring other locations. While I cannot completely cover all this product has to offer (including a calibrated microphone) within these pages, I must point out that charting and printing were effortless. Due to built-in algorithms and macros, one is able to instantaneously convert a file, recorded and stored with a flat weight and pink noise to a "C" weight and vice versa. There's also the additional ability to change (on the fly) from 1/3 octave to 1/1, 1/6, or full spectrum and then print it out, in color. After using the meter in the US-ATC, I was able to properly EQ a 4-zone system running 16 speakers, appeasing the physical therapists and the lifters in a relatively short time.

Next up was a substantially built handheld device by Sencore—the Sound Pro SP295 contractor version, with an equally impressive calibrated microphone. It is apparent from initially unpacking the Sencore that its approach is quite different from the Ivie, with a

robust unit offering many more features. Also apparent is the older screen type used in the Sencore, which while a totally acceptable monochrome super-twist LCD of 64 x 128 pixels, is no match for the Ivie's color and bright HP 240 x 320-pixel TFT display.

While both machines allow for full RTA, SPL level, recording and charting, RT-60, A, C, or flat weighting curves, noise criteria, polarity testing, pink and white noise generation, square, sine, frequency and level (Volt meter), plus averaging modes, the Sencore has a few more tricks up its sleeve.

My first task was to measure a new home studio/5.1 home theater I was building. I had just received

### Off The Charts

The Sencore charting abilities are much more in-depth than the Ivie, if that is what you need, allowing for charting of multiple parameters not discussed within this article. There is one point to note though with regards to downloading and reporting on both of these units. The Ivie IE-33 allows for instant linkup with your laptop via the included HP cradle from either the USB or serial port, while the Sencore SP295 only allows for serial connectivity. If you have (like I do) a newer laptop, you might not have legacy ports, posing a problem. When storing the files in the Ivie, you can name them on the fly into the HP to suit your needs for later recall. Whereas with the Sencore, you can only number the files. This can pose a problem if you stored multiple files at a jobsite for downloading at a later date. Both machines do not have great battery life, with the clear winner, though, going to the Ivie for ability to charge through the USB port or AC adapter.

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my brand new, pinpoint-accurate pair of B&W Nautilus 802s and a Nautilus HTM 1 front speaker, and was attempting to balance the room and ideally place the speakers. These are the same speakers used at Lucas Film and in Abbey Road Studios, so I wanted to make sure I did it right. The goal was to find the perfect location for playback of music for enjoyment and recording, while avoiding the pitfalls of drivers placed too close or too far from a reflective wall, either canceling a portion of an octave or exacerbating a problem.

With speakers of this extreme high caliber, I wanted to extract every possible nuance, which is why I immediately went to the Sencore for dynamic results to chart and study. I say that because, while the sound is magical from these transducers, improving a sound field by properly placing speakers and room dynamics by adding or removing treatment with proper location of said material is paramount to great sound staging, pinpoint localization and proper depth of field. Yes, with great ears, you can get 90 percent of the way there, placing the speakers for optimal listening. But for that last 10 percent and to assist in making acoustic treatment decisions, this meter was invaluable. The Sencore allowed for recording of a time graph, or what they call an energy-time graph to pinpoint room/speaker reflections and configure delay times and speaker phasing. (More on room treatments in next month's issue of *SCN*.)

The first new feature that I used was the built-in cable checker, which I found much easier to use than my old, digital, universal volt meter. Place the balanced XLR, 1/4-inch or RCA terminated wire into the In jack and the corresponding Out jack, and instantly you know if your soldering is professional grade or not.

Another extra was the ability to shoot pink or white noise out of the unit via the XLR, balanced 1/4-inch, or the RCA jacks into your system. While you can perform a similar task with the Ivie, it must be through a built-in mini HP jack, so carry a converter or two. A feature of the Sencore, which I know many people working with sound files like stored trigger points for Broadway plays will appreciate, is a SMPTE time code generator and reader.

Another feature allows for remote testing of the room, via an included microphone extension ca-

## An Array Of Choices For Testing A Choice Of Arrays

Today's test and measurement devices run the gamut from the simple analog RadioShack SPL right on through to computer-based programs whose main goals are to assist in placing large groups of speakers in even larger venues, or designing the space with audience mapping on multiple levels.

I think everyone knows of the RadioShack digital or analog meters, which for under \$50 retail can assist anyone in balancing a basic 2-channel or multichannel room for SPL (sound level as in equal pressure from each speaker to a central point). These will not though, assist in first-reflection questions, pinpointing suck-outs of frequencies and general issues with regard to weighting of measured sound to meet local requirements. But, of course, those blessed with golden ears and setting up a 2, 2.1, or 5.1 room can work with the RadioShack model just fine.

Of course, we have the old-line firms like Bruer & Kujel, and others making what many engineers were trained on. Within this ever-evolving field, the cost of RAM has dropped to almost nothing. DSP is not far behind. What used to be 100 pounds of rack-mounted test gear that may have cost more than \$20,000, can now be handheld, sometimes viewed in color, offer more power and cost, in many cases, less than \$3,000 for a complete system that analyzes, records, transfers, charts and remembers favorite settings.

At the very top end of the measuring and prediction pre-build analysis and measurement tools we reviewed, we have a software program called Catt-Acoustic v8, which allows for complete modeling of rooms of abstract

shape and can measure and report on things like specular reflections with up to 3,000 rays/octave for audience mapping. This program is commonly used by universities and architectural design firms to predict sound results for proper speaker layout, via sound mapping, but it also can be used in its basic form to test and report on room acoustics in real time. With a DLL library (plug-in) from most speaker manufacturers who work in this medium available, loading of information is that much easier. Currently, it's a must-have for acoustic consultants working with architects in designing a multi-level space. (We will see more of these types of programs in the future incorporated within software like SIA).

Obviously if you are building out a custom 5.1 studio, home theater, or church rectory, this program is way beyond anything you would need (or most likely understand). But if you are the contractor and/or consultant working on the sound system for an arena, ballfield, or other multi-purpose, large venue space with multiple issues and needs at hand, this might be the ticket.

Besides the technical merits of a program like this, the unbelievable strength of the macros written within allow for not just charting, but actual viewing of the performance and listening areas from multiple planes. More on these extremely powerful tools later.

Also in the same vein, albeit slightly different, are a set of software programs offered through various pro audio manufacturers. A wholly owned subsidiary of EAW, SIA of course has its SmaartLive v5 and AcousticTools v4, which offer advanced sound analysis and reporting, with device drivers from many of the in-

dustry's top processor and EQ firms for instant adaptability. Some of these include dbx, EAW, Klark Teknik, LAX-Golden Sound DLP20 processors, Martin Mach M20.06, McCauley MCS2.6, Ohm CRED, Outline Genius 6, PSE Supervisor SV600, Panasonic, RCF, Sony, THX digital crossovers, and many others. For under \$1,200, add a laptop with stereo inputs, a calibrated microphone, and you have a mini laboratory on the go.

If you need to determine where the best placement for speakers in a studio and/or home theater is, with a pre-configured analytical measuring device for acoustical treatments and are happy with your old RTA/SPL unit, then look no further than a program from RPG Acoustics called Room Optimizer. This will assist you with sub placement, 2-channel, 2.1-channel, 5.1-channel and THX setups all for under \$200. You plug in a few dimensions, the amount of speakers and let the computer spit out the best and worst options. I used it for 2-channel and 5-channel, with and without a THX curve, and found the speaker placement results very similar to what my ears told me. Sound treatment was another story though, with specific advice for placement in X, Y and Z planes, down to the inch. Worth a serious look, if this fits your needs.

Another set of products offered by Gold Line is quite common among some contractors and has been reliably used since 1961. The company makes various versions of RTA, SPL and assorted acoustical testing devices.

A well-known firm at the higher end of testing devices, Sencore, recently purchased another company famous to many in the home-theater market, Terasonde.

ble which can come in quite handy, especially when testing for frequency response over an extended period of time, say 24 hours. Both units have an RT 60 function, but do so a little differently. The Ivie allows for up to 12 seconds of decay testing, while the Sencore goes all the way to 15 seconds, which, by the way, is enough to test a room of up to 700,000 cubic feet! Although at 340,000, the Ivie would probably suffice.

With the Sencore, you have the ability to send a burst through your speakers to decay, while adjusting the SPL output, to reach maximum delay, which is great for both a studio and amplified rooms. The Ivie approach on the use of RT-60 functionality is brand new. Yes, the traditional popping of a balloon can be used (as with the Sencore). When it comes to recording the result, the Ivie IE-33 allows for instantaneous charting of all 31 octave bands, what the corresponding delays were (relative to the burst), and the ability to add on the fly a Schroeder curve (to flatten the result).

Both Ivie and Sencore provide for pink-noise generation, with the Ivie allowing for an additional pre-recorded playback of either a Wave or test loop and the Sencore allowing for speaker distance input of up to 999.9 feet or meters.

One of the ways Sencore diverts from advanced basic RTA type of function is with the ability to monitor and test ancillary equipment for signal-to-noise ratios. It does this via the I/O jacks and check speakers, drivers and preamps or mixers for total harmonic distortion (THD+N) via the supplied microphone or external input. With seven frequencies available to test, this becomes an invaluable tool in bench testing as well as field testing.

With the Sencore Sound Pro 295 and the Ivie IE-33 manuals offering 68 and 38 pages of instructions respectively, it is obvious that these two machines offer a lot more than what once was built into a single piece of gear. Unfortunately, that's more than I can cover in this short article.

My advice would be to get your hands on these, try them out if

possible, but most definitely put one in your everyday tool kit—a must-have for any serious contractor in the field, without exception. The consequence of the truth will be borne out by your resolve to provide the best product and solution to your client. Without realizing it, using one of these devices properly in accordance with industry standards and including the correlating report to your client is your next best step towards marketing your business.

*In next month's follow-up to this article, we will be using these devices and base results for acoustic material placement within tested spaces. The focus will be on providing the data to the acoustician in order for a recommendation of what if any absorption, reflection or other device might be needed.*

Wayne Dolnick (proaudionow@verizon.net) started out in the audio industry more than 30 years ago, working in live PA and performing installations of residential systems for audiophiles. Now he is a sales and marketing strategist for today's professional audio leaders.