A New Paradigm in Live Sound

How to tap into a new world of effects and processing options

By: Alan Hardiman

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Live sound has taken a quantum leap in the last 24 months with the introduction of digital signal processing (DSP) plug-ins to the mixing environment; this represents nothing less than the definition of a new paradigm in live sound. Plug-ins—software programs optionally added to a digital mixing console—greatly extend a console's functionality at a fraction of the price of equivalent hardware processors, provide almost unlimited possibilities for creative sound processing, and replace many racks of outboard gear—while occupying no physical space whatsoever.

Live digital consoles are available from a number of manufacturers, including Yamaha, DiGiCo, Midas, and Innovason, but, for the past two years, only Digidesign has offered comprehensive, integrated plug-in capabilities on its VENUE platform, represented by the expandable D-Show desk and the newer, smaller, non-expandable D-Show Profile. Some 500 of these consoles have been sold since they were introduced in 2005, due in large part to their seamless integration with third-party DSP plug-ins, offering dynamics processing, EQ, filtering, reverberation, delay—and much more. Other companies are bound to follow suit, and, in fact, Digico already offers plug-in capability on its live consoles through a MADI interconnect to an external PC running third-party software.

"The D-Show console is becoming more and more popular with people in the theatrical world," said Scott Kalata, director of sales at Masque Sound. "What's attracting people to it is certainly the plug-ins, and it's very reasonably priced for what it does. The board is proving itself extremely reliable and sonically very good. It has really become a key element of our rental inventory." Kalata mentioned the Broadway musical,

LoveMusik, designed by Duncan Edwards, and the Las Vegas show, *Faster Than Magic*, featuring Pamela Anderson, as examples of productions making use of the console. "I picked the Digidesign console because I like the way it sounds," said veteran front-of-house mixer Mark LeCorre, whose live credits include Avril Lavigne, Dido, The Tragically Hip, INXS, and Live 8, among many others. "I really love the fact that you can use all the ProTools plug-ins."

Any ProTools XP-compatible TDM plug-ins can be authorized for use on the console, and many other manufacturers have followed suit. The plug-ins offer many advantages, as opposed to discrete hardware. They require less maintenance. They eliminate hardware costs related to patch bays, racks, cabling, and connectors, not to mention transportation, storage, and labor. And they don't take up additional space—an all-important feature in many live theatre applications. Also, you can have access to this processing, including the sound of some extremely rare vintage devices, on just about any console channel or output as needed.

"I'm using the Sony Oxford EQ plug-in a lot; it's just a good-sounding EQ," said LeCorre, when I caught up with him during the Tragically Hip's *World Container Tour* earlier this year. "It's somewhere between absolutely digital—neutral sounding and musical sounding. With the Focusrite Red EQ plug-in, for example, it sounds great and can be really effective on some instruments, but I find it can be almost too colored. The Oxford EQ has five bands of EQ and high- and low-pass filters, as opposed to four bands and only high-pass on the console. The console has a digital and an analog EQ setting. I really like the combination of using the Oxford to get the basic sound I'm looking for. and using the analog EQ

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setting on the console to tweak the EQ during the show. For reverb, I'm mostly using Digidesign's Revibe. I also loaded the TL Space reverb, which I really like and use in the studio a lot—it's very natural-sounding and gives you the sound of being in a real space, but I find, being in big hockey arenas, that I've got too much of being in a real space already! If I get into theatres and smaller spaces like that, I'll be using that plug-in a lot more."

He adds that he uses "all the Bomb Factory" plug-ins and many of the other Digidesign TDM plug-ins that he uses with ProTools. "I have the ability to use whatever plug-ins I want. I can have an 1176 or an LA-2A [compressor] wherever I want, or a Fairchild 660—how often do you get to have any of those in your rack?"

The console consists of a 19" format stage rack, a similar-sized front-of-house rack, and a control surface. The stage rack handles I/O for stage microphone and line-level sources, as well as output signals. A single rack can accommodate up to 48 remote-controlled mic preamps and analog-to-digital (A-to-D) converters, and up to 48 outputs, and is typically situated near the stage. The whole system operates at 48kHz, 24-bit, with a 48-bit internal mix architecture. The FOH rack contains the digital mix engine and embedded control computer, and provides connectivity for eight analog I/Os (expandable to 16) for outboard gear that the FOH mixer needs to keep close at hand, as well as two-track digital and analog connections, intercom facilities, and outputs for near-field loudspeakers. The stage rack connects to the FOH rack via a digital snake, a standard BNC coaxial cable that can run up to 500'. The system is expandable to 96 mic inputs; 32 effects returns, 24 buses, and left/right/center (mono) buses are standard.

The control surface combines a central assignable channel section with two encoders per channel to control various parameters, such as aux sends, panning, and EQ, including dynamics and plug-in control. It is available in two versions: The D-Show, expandable to 56 faders; and the D-Show Profile, a smaller non-expandable alternative with 24 faders and one encoder per channel.

"Mixing this show, it still comes down to the vocals, because, at the end of the day, that's what the majority of people are listening to," says LeCorre. "They want to hear the lyrics, so, most of the time, you're dealing with the limitations of how loud is the singer versus how loud is the band. In the case of the Hip, Gord Downey is the loudest singer I've ever heard; he's got so much power. But, when he's holding the microphone versus when he's playing guitar and it's on a stand, he cups the mic, rap-style; suddenly it's peaking at 1.6-2kHz, maybe 3kHz—it's just huge. I have a multi-band compressor on him for that and I try to nail that as much as I can. I use the McDSP MC2000 multi-band compressor plug-in, and it does a great job of smoothing out the high mid-band without having to EQ out the peaks to the point it becomes unintelligible."

LeCorre offered a caution to young mixers who may want to exploit all the control offered by mixing with plug-ins: "It's pretty easy to overuse a digital desk when you have a compressor-gate on every channel. Digital compressors tend to be a little faster than what you may be used to with analog compressors, and you have to be careful not to over-compress, and lose the dynamics of the mix. There's a bit of a challenge there."

Monitor mixer Tim Murray (Our Lady Peace, Chantale Kreviazuk, The Philosopher Kings, and David Usher) has also become a fan of live mixing with plug-

Digidesign D-Show software

Digidesign Revibe

Trillium Lane Labs TL Space

Sony Oxford EQ, Bomb Factory BF76 Peak Limiter, Fairchild 660, and McDSP MC200 multi-band compressor

Top: Eventide Harmonizer. Bottom: Digidesign Smack!

ins. "They save you whole racks of space, and you don't have to carry the gear because it's built right into the software. It's just click, and away you go. You don't have to patch it or insert it anywhere—it's just there. My favorites are the Sony Oxford EQs and filters. Most of the plug-ins are good quality and they sound pretty good. Some of the vintage stuff is cool, as well—the Fairchilds and the Bomb Factory, the LA-2A. They're reasonable facsimiles of the original boxes—they definitely don't have that real-world analog charm that the vintage pieces have, but they're pretty damn close," he said.

Modeling vintage hardware

One factor influencing Murray's perception is the very real variability that exists between various units of the same model of analog processor, particularly the differences that accrue to a particular piece of equipment as it ages and its internal components depart from their original pristine specifications.

Robert Scovill, market manager for Digidesign's live sound division, noted that "you can go out and get twelve 1176s, and you might get 13 different sounds. When we've done this sort of thing for Digi plug-ins, we've spent a great deal of time and money going out and resourcing a considerable number of the same devices, to find one that we feel is the most representative of the line and then modeling it."

A second factor is the style of modeling behind the plug-in. "You can do 'black-box' modeling, which is taking an actual device and using phase cancellation to create something that, based on its ability to cancel with the original, sounds very close to it. By today's standards, that's probably the bottom end of the scale, although there are some very good plug-ins that have been developed this way," Scovill said. Then there's component modeling, "where they'll completely disassemble the device—let's say like an LA-2A-model—every single component of it, and digitally reassemble it back into the device. Those are very, very accurate models. Think about it in terms of practicality for the live sound field: What you want is the essence of what that hardware device did. How many people in the live sound world want to go out and drop $28,000 for a Fairchild 660, when they can have a plug-in that gives them the essence of what that box is—and they can have 50 channels of it running? That's just one example."

"This is one of the big reasons I am using this desk," LeCorre added. "I can have as many channels as I like of any vintage

compressor. I'd never even seen a Fairchild before, only read about them. Now, I never mix a show or a record without several channels of them. The 1176 is my snare drum sound, but I've only ever got to use a real one on a couple of records and a few live shows. The Bomb Factory 1176 is unbelievably similar to the real thing—noise and all."

A noteworthy trend in the industry is the development of hardware products incorporating plug-in algorithms in a separate rack-mount unit, complete with power supply, tangible front-panel controls, and real connectors on the rear panel. One such unit, the Waves MaxxBCL, has found its way into LeCorre's FOH rack.

"The limiter's great," he said. "It's easy to over-use, but, even if you're just catching a couple of dB of the peaks, it can really help. I had it out when we did a club tour and it really helped, especially where the PA is under-powered and all the house guys are going, 'Man, I don't think I've ever heard it so clear or so loud and you're not hitting any red lights!' It's really helpful there."

Why use the hardware version and not the console plug-in? "I have the Waves Gold Bundle for ProTools," says LoCorre. "It cost $2,600 and I was really looking forward to the plug-in version coming out for the Venue. With any of the plug-ins that I have in ProTools, the license works also for the versions you can download for the Venue desk, but Waves, for some reason, decided not to do that. That means I'd have to buy the Waves Live bundle, which is very similar to the Gold bundle, and they want $10,000 for it. And they don't give you any credit for already owning the Gold Bundle. Maybe they're thinking there's more money in the live market than there really is. Everybody else's plug-ins ported directly over to the Venue. I wasn't going to go out and spend $10,000 on the live plug-ins when I can just go out and rent the MaxxBCL hardware box for limiting."

I asked Waves' vice president of U.S. and international sales, Mick Olesh, to explain Waves' pricing policy for the Live Bundle, but he declined to speak on the record for this article.

Latency? Not a problem

Latency—digital processing delay—is one concern often felt by those considering live digital mixing. Input-to-output latency on the Venue system, however, is only a little over two milliseconds at present. Latency on the plug-ins is on the order of zero to three samples, according to Scovill. "The plug-ins being native on the console—you're not talking about getting out to a DSP hardware box; this runs natively in the console DSP—you're going to have the lowest latency plug-ins possible. But going out to an actual hardware device, you're talking about another three to five milliseconds of total path-length there. So that would make it nearly impossible to use them on monitors, especially for singers on in-ears."

Murray said the only time he has noticed any delays due to latency "has been in the studio, when we're running the Waves plug-ins using huge amounts of DSP. Then you run into it. But I've never experienced that live. When I was mixing FOH for Our Lady Peace, I had Sony Oxford EQ on all 32 inputs and I was running multi-band compressors on many rails using lots of DSP, and I didn't have any latency issues. I had quite an extensive amount of plug-ins and it wasn't balking at all," he said.

Chris MacBride, sound mixer and lighting designer for the

Markham Theatre for the Performing Arts in Ontario, agreed. "I didn't notice any issues with latency or delay," he said of his experience mixing the musical *Once Upon a Mattress* this past January. "With five reverbs and a couple of delays, a pitch shifter, and a couple of compressors, there were no latency problems at all.

"It was fantastic," he added. "It's so easy to get the sound you're looking for, whereas, on the hardware, you're messing around with a knob, just kind of shooting in the dark to get what you want. Being able to see what's happening on the screen, I found it a lot easier to get exactly what I was looking for much more quickly, particularly reverb and delay times. I'm a very visual person, so if I can see a picture of something it helps me a lot."

Programming and recall
"*Once Upon a Mattress* was just a short little three-day run," continued MacBride. "I was running 48 inputs and I had only one day on the console before we opened. Having the software plug-ins made life a lot easier, because I was able to pre-program it and then make small adjustments once I put audio through it. That just saved so much time and made such a difference, especially for such a short run. I had one rehearsal and then we opened.

"We're a road house, so we don't produce any of our shows. It's all rentals and we have a professional season, usually one-day productions with the occasional two-day thing, and most of the musicals are in for four to seven days with very quick turnaround. We decided to go digital just so that we can start saving files for a lot of our repeat clients. Then, when they come in again, we can pull up their files. They're not waiting on us as much, and we don't have to redo the same thing every year, which cuts down on labor time, too." Markham Theatre has purchased two Digidesign Profile consoles, one for front-of-house and one for mixing monitors.

"We're trading up from our 40-channel Soundcraft Series Five analog console, which is usually situated in our rush seating area. Without any console back there, we can put in 14 seats. With the Series Five and racks, we got down to two seats per side. With the Profile and its rack we'll be able to put in five seats per side. So we're gaining back a number of seats," he said, noting the positive impact of the smaller work surface on the bottom line.

The virtual sound check
A significant benefit of the Venue-ProTools combination in live mixing is that mixers can record shows directly into ProTools on a channel-by-channel basis, and, the next day, flip a console switch and play back those tracks as if the band was onstage playing live. System engineers can now perform system alignment, adjusting primary EQ and other parameters, then put up the real live tracks of the band with dynamically accurate material instead of using a highly compressed and mastered CD.

"You get the power response of the room with your band, and you can tune your system to the band. I find that so helpful," LeCorre noted. "You can hear if there are any anomalies in the room, and what the power response of the room is. It sounds virtually the same as the live show—with the exception that you don't get the sound coming off the stage into the room, because the performers are not up there at the time. But you really do get what was coming off the preamp. It's pretty great. And if you're trying to learn how to use the desk or you want to spend some time programming a complicated show, it's amazing,

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because you can sit without the pressure of 10,000 people in front of you, and go through every song-verse, chorus, bridge—and break it into different scenes or snapshots for every section."

The ability to record and play back 128 simultaneous tracks using two ProTools HD systems is just one factor that makes this possible. Scovill pointed out that it's more than just semantics that differentiate the virtual sound check from conventional multi-track tape playback through the console. "When you bring ProTools back into D-Show you actually have full control of the input, including preamp gain. If you find you need more gain from a track and make the gain change at the input attenuator, when you go back to the mic preamp it's smart enough to tell you that you've made a change in input gain and it gives you the option applying that change to the microphone pre amp. It's a seamless loop of microphone versus hard drive.

"There's no guessing anymore, and you get the added benefit of being able to program in preamp gain changes into your show, which helps ensure you have properly record levels as well," he added. "Previously, if you had tape machines coming in, you'd have them entering the console on an insert return or line level input. If you had to make any changes to input gain or recorded level, you never really knew exactly how that was going to translate once the mics were back online. In addition to the lack of input gain control, you were offered no control of polarity or high-pass filters, because of the entry point of the tape signal. These are significant caveats for setting up gain structure and refining your mixes. With D-Show, once you come back from

ProTools you're essentially replacing the mic preamp—with full control of high pass, polarity, and even channel delay. It's as easy a replication of the mic signal as you can get."

Bringing the stage closer to the studio

Of course, the same configuration of plug-ins used in the studio to achieve a unique sound for an album can be readily configured during live performance, making it easy to replicate that unique recording onstage without recourse to sampling or a playback. Bill Coons, director of Contact Distribution, the Canadian distributor of the D-Show consoles, added this scenario: "At the end of the night, a band, having just played to 16,000 fans in an arena, can get on the tour bus with the entire show on ProTools LE on a laptop, and head toward their next date. In two hours, they could pull over for coffee and upload mixes of the show to their website. The next morning, anyone who saw the show the night before can download mixes to their iPods and listen to well-produced product on their way to work. These consoles offer a huge opportunity to everyone involved in music—from musician to technician—to create better product faster than ever before. Indie artists have already figured out this demand for instant gratification from their fans, and now we have a delivery process for truly high-quality product."

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