

Behind ELEVEN

The Making of a Modern Classic

The quest for tone is a lifelong journey for many guitarists. Finding the right guitar—or guitars—is just the beginning. Each amp and cabinet adds a new spectrum of tonal possibilities. And of course, when it's time to record, the selection of microphone and mic position adds another set of options. Though the journey can be a long one, access to the right equipment can turn the quest for tone into a creative experience.

The new Digidesign Eleven amp and cabinet modeling plug-in offers guitarists—as well as vocalists, keyboardists, drummers, producers, and engineers—new avenues in the continuing quest for tone. Unlike previous attempts at amp and speaker modeling, Eleven goes far beyond sounding “sort of like” the real thing. A comprehensive approach to amp and cabinet cloning brings players a much wider range of nuances from an impressive collection of classic gear and newly designed creations. Most importantly, those nuances allow players to interact with the equipment just as they would with real amps and cabs. With Eleven, individual expression is in the driver's seat on the road to tone.

Designed by Musicians

The Digidesign musician-engineers who developed Eleven understand the quest for tone through their own personal experience. Chris Townsend, one of the lead engineers on the project, started to craft his own guitar effects in college. “I bought this digital signal processing evaluation board that you could connect to your computer,” he says, “and I wrote guitar effects algorithms, like echoes, reverbs, and even distortion algorithms. I didn't really have a master plan—I just wanted to be able to use it as a guitarist. I owned a small Mesa Boogie tube amp, and I thought it would be cool if I could make that distortion sound on my DSP board. But it took me ten years to get there.”

Bobby Lombardi, who studied composition and psychoacoustics before beginning his tenure as Senior Product Manager at Digidesign, understands the value of tone for composing. “The way a guitar and amp work together and react as a single instrument can really inspire you to create,” says Lombardi. “That's a vibe you just don't get from a lot of existing software and hardware modelers.”

First Steps

Digidesign recognized the growing demand for guitar amp and cabinet emulating plug-ins years ago. “For a long time, Line 6 Amp Farm was the only TDM guitar amp simulation plug-in,” Lombardi recalls. “So we encouraged the development community to work on some new products to give users additional options—and we thought we could contribute to that field as well.”

The Digidesign team began the Eleven project by evaluating other plug-ins and a wide range of hardware modelers. “We bought all these hardware units and figured out what each one got right and got wrong,” says Lombardi. “In some cases, there might be a box with really good speaker modeling but bad amp modeling. But unfortunately, many of them don't let you bypass the section you don't like to build a perfect hybrid.”

Looking under the hood at specific algorithms wasn't always an option, but Townsend researched patents and did a lot of listening to figure out what accounted for the successes and failures. “With some of the hardware units, it seemed like they took a soft clip model and placed an EQ tone stack in different places within that model to change the sound,” says Townsend. “They didn't really model each part of the amp. This challenge we took very seriously when developing Eleven.”

In Search of Amps

The next step in developing Eleven was acquiring the best possible collection of classic amps and cabs. “We tried to purchase each amp from a golden year of production,” Lombardi notes. “We weren't going to model an amp produced during a year in which cost reduction measures were taken, because when components are changed, it can affect the sound. For the Marshall JCM 800, for example, we were really specific: We wanted an '81, '82, or '83.”

Just locating the desired amp was tough enough, but the Digidesign team also made sure the amps and cabs hadn't been modified in any way. “All serial numbers had to be checked out,” says Lombardi. “We had to make sure the parts in that vintage amp truly came from that vintage amp, and not from some other scrap amp.”

Townsend examined each component in each amp, making sure it matched the original schematic. “Sometimes the schematics had mistakes!” he says. “The official Fender Tweed Bassman schematic, for example, was wrong. Fender had updated the tone stack without changing the schematic. For others, like some

of the Marshalls, we couldn't get accurate schematics for every year. Marshall had a very small operation back then, and there were component changes from year to year—even week to week. So we had to do a lot of research to make sure everything was where it should be.”

Ultimately, choosing one amp or another required some serious listening. “In every aspect of this project, listening was crucial,” says Townsend. “We listened and listened some more until we had the best-sounding amps.”

Comprehensive Modeling

Digidesign went to great lengths to model essentially every component in each amp. “Chris had to get in there and get his hands dirty on every little piece, doing volt measurements to create the model,” Lombardi says. “It was an incredibly painstaking process. He created models for the tubes, tone stack, power supply, preamp, power amp—you name it.”

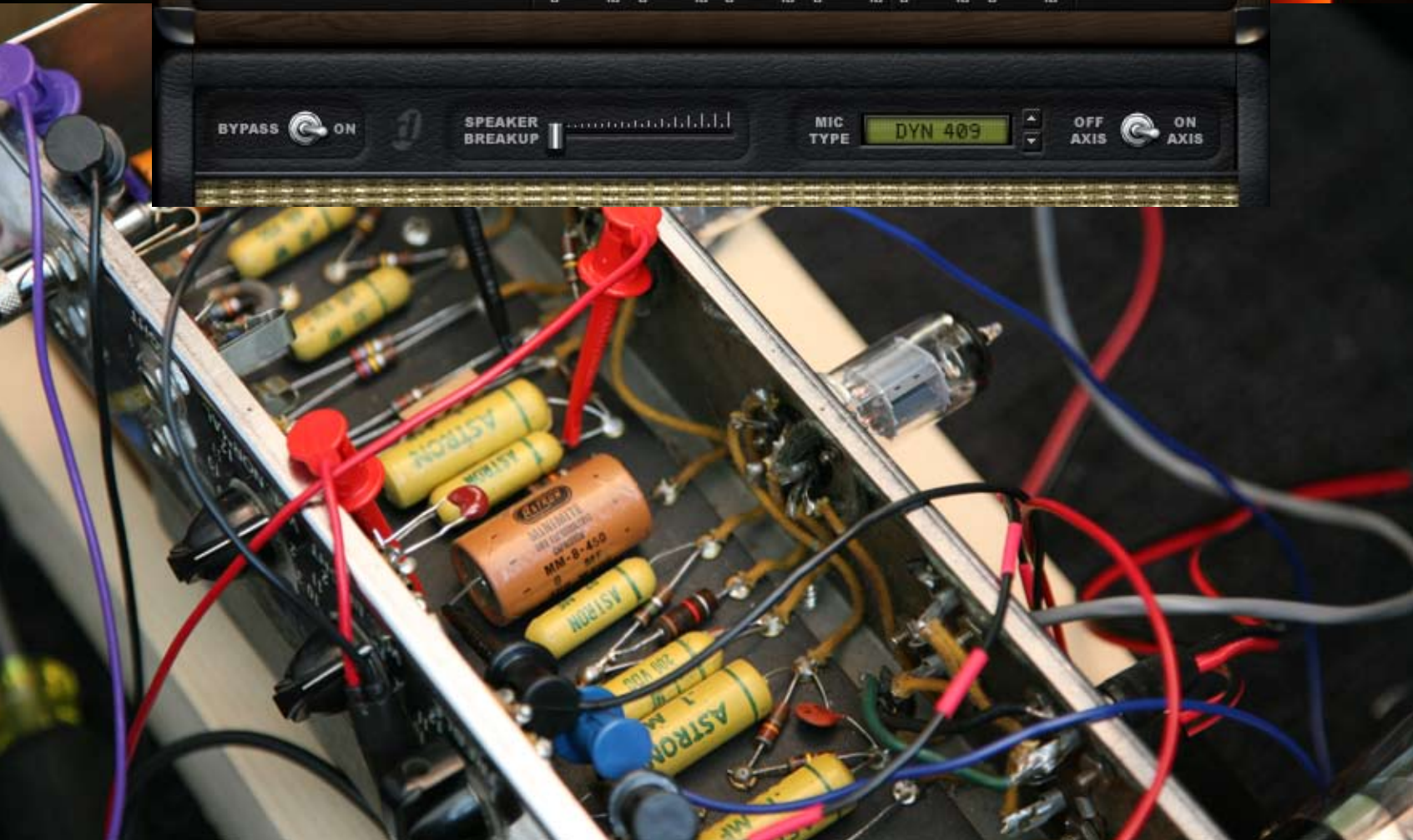
By modeling each of those components, Eleven provides players with a much more authentic re-creation of the original amp control set than other amp simulators. “Diehard tone seekers who want to experience the VOX AC30 or Marshall Super Lead will be able to dial up the same settings on Eleven as they would on the real amp,” says Lombardi.

The Digidesign team also emulated aspects of amps and cabinets that are frequently overlooked in other modeling units, like power amp sag and speaker cone breakup. “There are some classic guitar tones that come from speaker cone breakup,” explains Townsend. “With a guitar speaker, you're feeding a wide bandwidth signal through a 12-inch speaker, and different parts of the cone move differently. One part might be

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Townsend at work modeling an amp for Eleven.



To achieve maximum realism, Digidesign developed an entirely new amp emulation approach in which every stage of the amp's signal path is modeled.

moving out while another is moving in. That happens all the time, even at low volumes. When you drive the speaker hard, those cone breakup modes change non-linearly. It becomes a chaotic system, and the result is part of each cabinet's unique tone."

The cone breakup model proved to be one of the toughest aspects of the project for Townsend. "Once we understood how a speaker actually works, we came up with a model to try to emulate that chaos," he says. "But we also used our ears as the guides, always making sure the final result was musical, not just mathematical."

Cabinet Convolution

Eleven uses a convolution process to capture the sound of each speaker cabinet through a wide variety of mics. To make sure the Digidesign team captured the sweet spots of the amps, they hired an expert guitar recording engineer, John Cuniberti, whose engineering work at the Plant in Sausalito, CA, and elsewhere has spanned three decades and included artists from Stevie Wonder to the Dead Kennedys. For the Eleven project, Cuniberti's engineering work on six Joe Satriani albums was an important credential.

"We went into the studio and had John set up the cabinets and mics," says Townsend. "We played actual guitar tracks through each one until we found the perfect position for the mic. Then we measured the frequency response using test signals. The measurements we made were at real-world volumes, usually in excess of 120 dB, to get the most realistic results."

It sounds straightforward, but the Digidesign team had to repeat this process for each cabinet, with a large collection of mics in a variety of positions. "Yeah, it was a little time-consuming," laughs Lombardi. "We also captured about three or four signals per mic, per position. Then there was a lot of listening to find the best one."

But the resulting sounds are completely pure, Lombardi says: "The impulse responses that we created from these recordings are absolutely unadulterated. What you're getting is the sound of that speaker through that mic. You're getting the vintage cab sound, with no EQ applied."

The Flexible Classic

Given the number of guitar amp models, speaker cabinet models, and microphone models available in Eleven—let alone all the tone adjustments available within each model—players have an enormous number of tonal possibilities at their fingertips. And should they need even more options, both the guitar amplifier and speaker sections of the plug-in can be bypassed independently. "There are really a number of complex routings you can try," says Lombardi. "You could use your own amp and send the signal through an Eleven cabinet. Or you could use the amp without the cabinet. You could even take the output of your amp, bypass the speaker cabinets, and send the output to a couple of Aux Input tracks in Pro Tools, then use multiple cabinets with multiple instances of the plug-in, or multiple mics on the same cabinets. It's really endless."

Though Eleven offers an impressive array of amp, speaker, and mic combinations, it's easy to find the exact sonic configuration you're looking for.

"With some other modelers, I'd tweak the parameters endlessly or run through every preset, but still feel like I'm listening to the same sound with different EQ," notes Townsend. "In the real world, every amp is capable of a huge range of sounds. That's the way we made Eleven."

"Every amp in Eleven is an actual amp," says Lombardi. "It's not just one tone that an amp is known for. With Eleven, you get the tone of that amp when it's cranked down, cranked up, or at different tone settings. You have access to every little nuance in the actual amp."

The extensive work that went into producing Eleven enables players to interact with it in much the same way as they would with real amps and cabinets. "There's an organic feel to Eleven that's really cool," says Lombardi. "With real amps, the tone produced differs from player to player. Think of how different the VOX AC30 sounds on a Beatles tune versus a Radiohead tune. And that tone changes even more through the expressiveness of each individual player. It's that responsiveness, that interaction, that we were after with Eleven, and I really think we nailed it." ¹

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