Building the Li'l Monster - One Man's Adventure in Console Construction

by Dan Garcia

If you look back over the history of recording studios, you soon realize that in the '40s and '50s engineers used to have to custom build their own mixing consoles. Nobody was selling "ready-to-go" boards for recording purposes back then. What a difference to the world of today. One afternoon I meet this engineer/producer, Dan Garcia, through a former client of mine, Arrica Rose. Dan had produced and recorded her recent album, *La La Lost*. So he mentions that he's built his own console and uses it at his Radio Hill Recorders. I'd always wanted to tackle the same project, but didn't have the time or gumption to *really* do it. Plus I've only become worse at soldering over the years. So I asked Dan a few questions and told him to interview himself for *Tape Op*, because I'm sure this was a crazy experience and maybe he'd have some warnings and wisdom for anyone thinking of attempting this themselves. Me? I'd never try doing this at home. No way. -LC

When did you start thinking about building a console?

I was really lucky to work at Bill Schnee Studio when I first moved to Los Angeles. They were just at the end of building the studio and installing Bill Schnee's custom console. Bill started me on the path of not taking anything for granted. He would listen to everything, constantly comparing one mic with another, every placement and each preamp. Mastering engineer Doug Sax, recording technician Steve Haselton and recording engineer and tech Bud Wyatt would stop in and spend endless hours listening to multitrack machines, tape, transformers and even wire! When I first started working there I couldn't tell what they were listening for, but Bill would say, "Listen to this mix on Tape A. Where is the hi-hat? Now listen to the same mix on Tape B and you'll see how it comes into focus. You can hear the space around it." Schnee obsessed over little things that seemed inconsequential, but were the key to fidelity and detail. When I first showed up, Supertramp was finishing up *Famous Last Words*. They had spent a week in the studio listening to snares - nothing but snares. I'm glad those days are over, but there is still something amazing about the passion to get things as excellent as possible. Just about every piece of gear in that place was scrutinized to the Nth degree. If there was a way to improve it, they would. Bill Schnee Studio has a main console and this super-simple, 24-input monitor section side car, which sounds fantastic There is hardly any circuitry to muddy things up. For the longest time I thought, "That's the console I want to build."

In the age of Pro Tools, why did you build an analog console?

Most of the records I work on are recorded into Pro Tools, and I've felt for a long time that mixing in the box brings out some of the biggest problems with Pro Tools. Early on in the 16-bit days, Rhett Lawrence and I were working on an Earth, Wind & Fire record. He would align all the kick and snare attacks on the same sample of each beat. Anytime the kick and snare would hit together it would clip the output bus. I would solo one or the other and it would be just fine, but not together. After a bit of research we discovered that the internal bus of Pro Tools was something like 26 or 28 bits. If the kick and snare were both fully modulated they would add up to 32 bits and would not fit through the bus without clipping. This led me to try summing out of the box, and I've never gone back. As long as the summing mixer has better headroom than the output of your workstation, you'll most likely hear an improvement summing out of the box. There are many summing boxes out there now and some sound really good, but some are pretty bad. At the point that you get to choose the flavor of the all-important analog portion of your signal path, why wouldn't you choose the fattest, juiciest you can get? On occasion I would need to do a mix in the box and sure, by the time of Pro Tools HD, Digidesign made huge improvements in the internal summing. But the same principles still apply - the better they get the summing, the better it sounds mixing in the box and therefore, it will sound even better out of the box. In addition, I still use a pretty good amount of analog outboard gear, and interfacing all of it with an analog console just makes more sense. I do my automation in Pro Tools, but I still do a bit of hand mixing. Glyn Johns used to say, "Never mark your fader levels and always keep your mix moving." And even now to a degree, I'll mix with that in mind. Bill Schnee always told me to ride the vocals as you print. Everything else you change in the mix will change the vocal balance. I'll usually ride the vocals and tonal instruments while I'm printing the mix.

What's under the hood of the console you built?

The active electronics in the channels are basically two Class A Neve 1272s. One of them has an input transformer, one without. I was scrounging around trying to find a bunch of old Neve 283 amp cards when a buddy of mine, Eric Slaughter said, "Let me build you a new 283 card with really high quality parts. I'll put a regulator on each one to keep the crosstalk and noise down below what the old amps could do." They turned out fantastic, and the headroom is up around +28 dB. We also found the company that made the output transformers for Neve back in the 1970s. They still hand wind the transformers in the same old barn. The faders are Penny+Giles (P+G) pulled from one of the Neve consoles that Brent Averill was building for Don Henley in the late 1980s. The equalizers are these wonderful little Langevin EQ-251A two-band passive EQs from the early '60s. Back when I was at Schnee's, I frequently worked with Jack Joseph Puig and he had a ton of these. He was starting to buy tons of every type of gear imaginable, but at this point he really liked these. He handed me a pair to play around with and I fell in love with them. A lot of my EQs came from the old Producer's Workshop console that they mixed Steely Dan's *Aja* and Pink Floyd's *The Wall* on. They are pretty much the same design as the UA 500 and Pultec EQP1, but in a tiny package. These babies are almost fifty years old, but they used gold switches and dry paper capacitors in them, so they still work perfectly. Late one night I was going through the paperwork for these EQs, making sure I had the termination values right, when I looked down at this Langevin catalog from 1963. It had the address for the old Langevin shop in Hollywood - which turned out to be the exact same building where Lurssen Mastering and my room are right now! For the summing, I went with API Class A/B amplifier cards from the early '70s. They are really great sounding with a stupid amount of headroom. Because this console was purpose-built, I wired up all kinds of options. I can use the output of the summing amps with no stereo bus fader, or I can use the output of the fader API buffer amp, or even a Neve fader buffer amp. All three sound great, yet different. Arrica Rose's *La La Lost* had no fades, so I printed it straight off the summing amps, which gave it a really cool immediacy. Everything inside is connected with Alpha Wire solid core wire, which sounds great, but is a bit of a nightmare to work with.

Why doesn't the console have any microphone preamps?

I feel that preamps have become part of choosing the right mic, so I prefer a variety of flavors in the preamp department. I do use the console for recording quite a bit, whether it's to mix multiple mics down or to EQ, but I really wanted to keep the preamps as a separate entity.

Tell me about designing the panning.

This is the probably the most unconventional part of this console. I really wanted to keep the circuit as simple as possible. The pan always represented a bit of a problem for me. Either you have potentiometers - not the best sounding part of any circuit - or you add an additional switch to put the pan in or out of the circuit. Neither seemed very elegant to me. I was looking at some old console designs and I saw one that had radio buttons for the bus assignment: Left - Center - Right - Off. *That's* right to the point. I'd heard that some of the Steely Dan records were mixed on a Langevin console set up this way, and I thought that would help keep the arrangements trim. All engineers know that if you have two rhythmic parts that clash in a mix, you can pan them away from each other and it forgives a bit of the tension. The fewer places you can stick stuff, the tighter the parts need to be to make it sound good. If you don't believe me, on your next mix *only* pan things hard left, right or dead center - it's a good exercise. I decided to make a little compromise - I used a ten-position Grayhill switch and precision resistors to get L-C-R, plus three spots in between the center and each side. In addition, the bottom of the pan takes it out of the stereo bus entirely, like the float switch on an SSL. Although I'm really pleased with how it came out, I must confess that this was the hardest part of the console for me. I spent so many nights pulling my hair out trying to get the resistor values right - I was close to giving up more times than I can remember. My buddy Mike Wambsgans works over at Record One and has built a bunch of consoles for Allen Sides over the years. He said, "No problem, just use a logarithmic equation divided into eight parts." Whatever that meant. So I tried it to no avail. Without the three in-between positions, it was a piece of cake. In adding those positions and getting the center around 3 dB down, it was a total nightmare. I would get it close, but one position would be too close to hard left or whatever - so I'd change one resistor value, and that would throw the rest of it out of whack. The way it works, each resistor acts in ratio to all the others. It was like trying to thread a needle in the back seat of an aerobatic airplane. In the end, I sat in the studio with a version of the pan and as I mixed, I would try tons of options. Finally one sounded right, so I looked at all the values and showed them to Mike and he said, "Oh yeah, easy. We should have just inverted the log." EASY? I swear I lost a year off my life designing the panning. And yet I'm glad I did it.

Why does your console have no soloing capability?

I started this endeavor years ago, and at one point I designed a complete logic circuit with solo, solo and mute groups and solo and mute resets. It was a pretty big undertaking. I built it out on a breadboard and it worked really well. The circuit board needed to be double sided and that was a bit beyond my comfort level, so I hired someone to lay it out for me. After about a thousand dollars worth of cards showed up, I stuffed several and they wouldn't work. I went back and double checked everything and couldn't find the issue - it made me crazy. I put the whole thing on a back burner and bought a digital console. I was so depressed. Last Christmas, my dad hands me this box and says, "Do you remember this?" It was a logic circuit test set that I had built from scratch when I was about fourteen-years-old. My dad worked at Bell Labs when I was a kid and he would come home with these huge transistors and make flip-flop logic circuits. Growing up, he was showing me how this kind of thing worked, so it was a big drag to me that this was my hold up. I remembered how Al Schmitt would almost never solo anything during his sessions. At one point I asked him about this and he told me, "Why would I listen in solo when no one else will ever hear it that way? Make your adjustments while hearing it all together." I can't say that I'm faithful to that school of thinking, but it made me reconsider the need for a solo on the console. The other part of the story is that it is so easy to solo using Pro Tools, so it's not that big of an issue.

How did you get the circuit right?

It really started with the Langevin EQ-251A equalizers. For a long time I would use a pair in tandem with Neve 1272 line amplifiers to make up the gain lost from the EQ - these are passive EQs. They became the first EQs I would reach for, so when it came time to build the console I knew I had to start there. I built an A/B box to listen to this stuff and would plug it in as an insert while I was mixing. Brent Averill gave me boxes and boxes of parts to listen to. He had a bunch of these wild API faders that had lamps in the fader, they would light up as you moved the fader up - very, very sexy. They sounded great. I built a channel with the API faders and one with the P+Gs. The channel with the API was great because it had this bottom that seemed to go down to DC - like an extra octave below the P+G channel. But the P+G always sounded more musical. I could never put my finger on why, but it kept coming up as more musical, so I went with the P+Gs. I kinda wish I had those sexy little lights though. After I had determined that much of it, I enlisted the help of Eric Slaughter for the rest. He laid out the amplifier cards and the gain trim for the EQ in/out switch. We went around and around with him trying to add more functionality and me trying to simplify everything. It was a good process and it netted good results.

How did you design the physical frame?

Over the years I've owned a couple Neve consoles and did a bit of tinkering with them. When it came time to start this one, I mostly did it from my memory of how those were built. The coolest thing in the process was this place out in Sun Valley. This family runs a metal shop with a water jet cutter. This huge contraption cuts up to twelve-inch thick stainless steel using water with sand in it. I would stay up all night designing the console on my CAD program. When I had a drawing ready, I would email it to these guys and they would call me in the morning saying, "Your parts are ready for pick up!" It was fantastic, like I had a metal "printer." I ended up drilling and tapping each and every hole myself. That was a mistake, because even though it all worked out I wasted a lot of time and nearly a ton of aluminum parts!

What was the process for the graphics?

That was actually a lot of fun. I always liked the look of the gear from the '50s and '60s, so I borrowed from that aesthetic. I used a font for the numbers that looks like little pool balls. The only problem was that I only had numbers up to 10, and my console goes to eleven. Seriously, the EQ actually goes up to 12 and down to 16 in 2 dB steps. So I just halved the numbers, no biggie! The numbers are just to document it anyway since it doesn't change anything else. On the master section I put this little "pointing hand" graphic on a couple switches. Anyone who's worked at Schnee's would recognize it from his "solo follow" switch. That was a nod to my friend and mentor.

I see "talk" and "discuss" buttons on the master section. What are those?

"Talk" is a momentary talkback switch, and the "discuss" position is a locking switch. So if I'm working out lyrics, for example, I can keep the talkback engaged without having to hold anything down with my finger.

How does working on this console change how you work?

One of the features we tend to take for granted with Pro Tools is the instant reset of each song. In many ways, this is a huge benefit, but it also creates a linearity to the production. We keep recalling the last session - make a few tweaks, add a few overdubs and basically save the same basic mix again. Although I was using Pro Tools by version 1, I was dragged into that world reluctantly. I really grew up on 2" analog, where you need to get a new rough mix each time you return to the song. I think a very important thing happens when you push the faders up for each overdub. Starting from scratch each time gives you an opportunity to play with very different balance relationships. Often I'll find myself passing on parts that seemed like a good idea at the time, but that don't really add to the song. I can force myself to do that with Pro Tools, but having it happen naturally keeps me from shortcutting that part of the process. So now I use a pretty standard output assignment during recording and overdubs, and each time I revisit a song I'll have a go at a new rough mix.

How long did it take you to build your console?

Ten years to think about it and ten months to do it. I was still doing sessions, but I spent every spare morning, night and any days off working on it. I had been collecting parts and toying with the design for a long time. In a sense that was important because I only had one chance to get it right - this took long enough that I wouldn't want to start over to make any big changes. On the other hand, the basic design of the console did not change too much over the years.

Would this be something you feel others could do?

Sure. None of this is rocket science - you just need to be driven. A bit of OCD helps too. If you're afraid of missing a season of *American Idol* you may not want to tackle something like this. The process was a very involved one, but not particularly difficult. I'm not a tech - I really came from this as a producer and a mix engineer. I built what I'll use every day, nothing more. I think the key would be to keep it as simple as possible. I have to say it would have been impossible for me to do this without the help of a few friends. A

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lot of the info needed is out there in places like the Jensen Transformers website, old design reference manuals and the *Audio Cyclopedia*. With Google it's easy to find all the info you'll need and then some.

What were some of the things that you learned in the process?

The way to eat an elephant is one bite at a time. After about a month of designing and drafting, I showed up to the studio and said, "Look, here's my console." They all thought I was on crack. It was a small pile of metal parts. But to me it represented the first big step. It was like a specialized Erector Set® - now I can start building. There's a woodworking adage that says "measure twice, cut once - measure once, cut twice". When you are sending out to have these parts cut, measure ten times and then double and triple check it! You really need to take your time and be accurate, because they don't make console putty. Also, grounding is a big part of making the console sound good. The ground provides the amplifiers with a path to get rid of the unwanted part of the signal, the noise, hum and RF. I spent a good amount of time making sure all of the grounds were going to the right places.

So how does this console sound?

Fantastic. I'll confess that I was a bit nervous. After I had just eight channels wired up, I dragged it into my studio and did a few mixes on it, and it sounded really great. After I had all 24 inputs up and running, I put it into service with no meters or master section. There were wires hanging out of the bottom and back, no leather bumper or wood top. I continued to wire it up between sessions. I would print a couple songs and take them next door to Gavin Lurssen (Lurssen Mastering) and have him take a listen. Right away he was loving what he heard. Before I had the meters connected I did a few mixes printing back into Pro Tools and was hitting the stereo bus really hard - way harder than I would ever knowingly do. I happened to be bus compressing with some Neve 32264a compressor/limiters, and they do well with a lot of level. Everything was sounding fine. After I had wired up the meters I needed to recall one of the mixes and the meters were just slamming. I had to pull the stereo bus fader down about 15 dB to get it to a reasonable level. Even up that high it was feeling like there was plenty of gas left. The bottom line for me is that I find I do much less processing in the box, and it has brought back much of the joy of mixing. It's like sitting down at a real piano after playing a synth for too long, or like tasting butter after years of margarine. It's really nice! ⊗

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