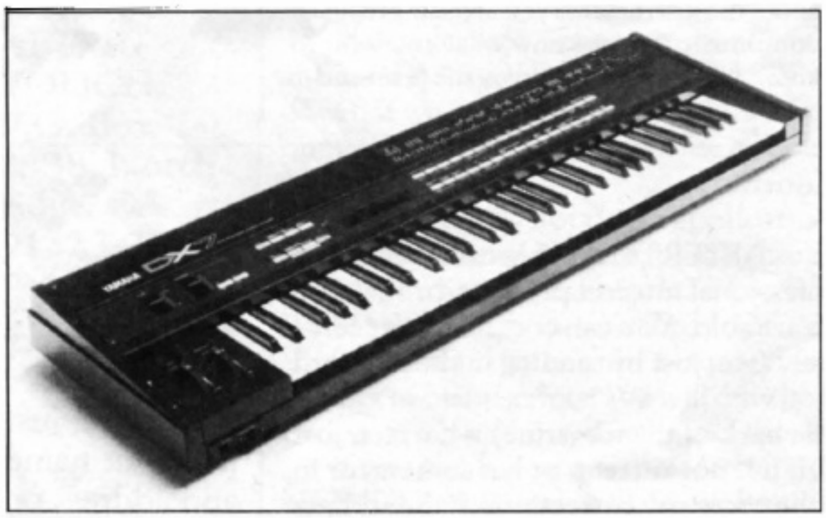
DX7

Programming The DX7 — The Anatomy Of Two New Voices. By Gary Leuenberger.

HERE WE HAVE A new publication, two new DX7 voices, and a new voice data chart. Why the new chart? Well, when you look at the standard DX7 data chart from the owner's manual (the one with all the numbers stacked in little boxes), it can be quite confusing. I think it's much easier to organize the data in a flow chart using the most important aspect of the sound, which is the algorithm.

The first two things I look for when I start to put a sound together are the operator frequencies and output levels. These two things—frequency ratios and modulation index—form the real basis of FM. In this new flow chart we can see them very clearly. All voice parameters will be found in the operator boxes. All parameters that affect the overall voice are in a separate box. The function controls (which affect the overall machine) are in another box. Using this chart, you can see the relationship of the parameters very clearly.

One thing that I really want to emphasize here, before we begin talking about any one sound in particular, is an overall concept, which we call "stuff." I know it sounds funny, but it's now an accepted term at IRCAM (the famous music research center in Paris), and it's accepted by Dr. Chowning (the "Father" of FM digital synthesis). Besides that, none of us can think of a better word. "Stuff" can be the pluck of the guitar, or the spit on a trumpet, or the slap on a conga, or the scratch on a violin—any of those little things which cue our ears into recognizing a sound.



DX7 FM digital synthesizer.

In the PICKGUITAR sound, I've done some very careful editing of my original sound (JAZZGUITAR) to get some realism and musical response. Instead of simply trying to duplicate something when I create a sound, I try rather to create a musically-responsive voice. This is a natural in FM because of the way velocity affects the modulation index to create harmonic changes; the response is similar to that of the piano or other acoustic instruments.

PICKGUITAR

Where do you start when creating a sound? First of all, it's important to develop a basic vocabulary in FM by learning how two operators work together, so you'll know what kind of frequency ratios create what kinds of textures. Then you need to work with the envelopes (starting again with just two operators), so that you have a good basic feel for how they create timbral changes.

Then, when you are ready to create a particular sound, start by looking across the algorithm chart. The one I chose for PICKGUITAR was #8. First of all, there is a basic FM pair (ops #1 and #2) to create the basic, full-bodied harmonic sound of the guitar. It's a simple two-to-one ratio, which gives you the nylon string sound. The envelopes are pretty basic: A fast attack with a medium decay. I work on envelopes in a totally intuitive way: I play as a guitar player would, and adjust the envelopes until I come up with something that feels and sounds pretty good.

Once I get to that point, I add velocity, to give the sound its life. Now that I have the op #1 and #2 stack working the way I want it to, I use the next part of the algorithm to create the "stuff." On that level, if you look at the algorithm menu on the DX7, you'll find that a number of other algorithms would also work: #1, #2, #7, #9, #12, #13, #14, #15, #16, #17, and #18. I chose #8 because, I wanted to use the second FM pair (ops #3 and #4) in conjunction with the first pair, with a little detuning to fatten up the sound and add some of the higher harmonics. You will find that if you take the PICKGUITAR sound and switch through any of the above algorithms (leaving all of the parameter settings the same), you will achieve the same kind of guitar sound with different textures. In algorithm #8, I still have two more operators feeding into op #3, and I use those to create the pick sound—the "stuff."

You'll notice that I have been talking about

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this voice a few operators at a time. When you're voicing or studying sounds, it is very important to turn the operators on and off. As obvious as this seems to me, I find that most students or musicians I talk to just kind of dive into the voice and start moving things around. The thing to do is to look at the algorithm that was used, #8 in this case: Turn off operators 3-4-5-6, and listen to 1-2; turn off 1-2, and listen to 3-4; then add 5-6, and see what's really going on. This is the best way to study a voice, and it's also the best way to create a voice.

In this guitar sound, the critical things in the "stuff" area are as follows: We put the R4s and L4s on the modulators up to 99, which creates what might be called the "afterstuff," (a technique which was originally heard on the DX7 harpsichord voice). I find that when you play the guitar, there are all kinds of picking noises and string squeaks going on; if you play this voice properly on the DX7, those things come alive. The critical part of the voice in that sense is operator #6; it's set at a very high frequency, which gives you that plucked type of sound. There is also a lot of velocity on op #3, which allows more and more pick sound as you play harder.

Any sound on an FM system must be played in the style of the voice. So, a couple of rules about playing this voice: No sustain pedal is allowed, because guitars that I know of don't have sustain pedals. And six notes only are allowed. The way I play the patch is with the root and the 5th in the left hand (like strumming the lower strings), with a four-note voicing in the right hand. Try it—it really works! I'd also like to say that, as a former guitar player, this PICKGUITAR patch is by far my favorite sound on a DX7.

Here are a few editing tricks to try with this voice: If you take operator #2 from its frequency of 2.00 down to 0.50, you get an octave sound—the Wes Montgomery effect. You can also change operator #2 from a frequency of 2.00 up through 4.00, to change the overall lower body of the sound—kind of like changing the brand of the guitar. If you go to the output of #5, you'll find that #5 is governing the output of #6, which is the pluck; so if you increase the output of #5, you will get more of a metal sound (it's a very pleasing change). If you change also the frequency of #5 anywhere from its current frequency of 3.00 up to about 12.00, you're also going to get some pleasing metallic effects.

Here is a good general rule for editing voices: If you start messing with the carrier frequencies and the lower frequencies, you're going to destroy the basic overall character of the sound. On the other hand, if you look for the "stuff" components (which are going to be the funny-looking frequencies or higher harmonics), and just edit the output level or the frequency, you'll most likely get some very pleasing changes.

SLAPCONGAS

The basic foundation of this voice by Dr. John Chowning is once again operators #1 and #2: He has picked the basic FM pair at fairly basic frequencies to form the solid part of a conga sound. The envelopes are shaped very carefully, so that when you slap the key, you're going to get one kind of thing, whereas if you hold the key you get a different type of decay. The frequency ratios are critical in ops #1 and #2, with op #2 being lower than op #1—this is what creates the hollow, conga-like timbre.

The Slap part of the sound, like the "stuff" in the guitar, is in the complex FM stack on the righthand side, ops #3, #4, #5, and #6. Dr. Chowning has voiced the velocity sensitivity very carefully, starting with op #3 set pretty high, decreasing to zero at the top of the stack. This creates an interesting effect: The slap of the conga is always there (because the velocity sensitivity of op #6 is zero), but as you start hitting the keys harder, the rest of the stack opens up and all kinds of wonderful new harmonics appear.

There are very tight envelopes going all the way up the righthand stack. By the way, if you take R2 of op #5—which is at 95 for a very tight slap—and bring it down to about 50 or below, you'll start creating the effect of a snare drum. This is because op #6 has a long envelope and a high feedback level, which creates a noise effect. You can begin to create a number of other drum sounds just by editing that one rate.

If you look across the DX7's algorithm menu, there are so many you could choose from to get the effect of a drum. As a learning exercise, try switching between algorithm #1 and these others (keeping all of the parameter values the same): #2, #5, #6, #7, #8, #9, and #29. They will give you the same overall effect, but they will be different conga sounds. Try to figure out why these algorithms work for the conga sound

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while the others don't.

In playing the conga sound, you have to realize that the basic pitch is important; I have found that the fourth octave on the keyboard is the best for playing. One nice little exercise is to remove the rate scaling. Dr. Chowning has done a nice job of putting high rate scaling on the upper end of the keyboard to give it a realistic conga effect; but if you remove that the harmonics are allowed to come through and you get a woodblock—there is almost a split keyboard effect.

For fun, I've put the mod wheel pitch on 99, and put the LFO on full sensitivity with sample-and-hold. If you move the mod wheel up and touch a key, you'll get random drum effects.

Spend some time with both of these voices, and figure out how they work. There are a lot of DX7 patches out there now, but the true art of programming on the DX7 is still not very widespread. I really believe what we have to do with FM right now is concentrate on learning what areas work, so that it is possible to get inside a sound and fine tune it as much as possible. Give it a try!