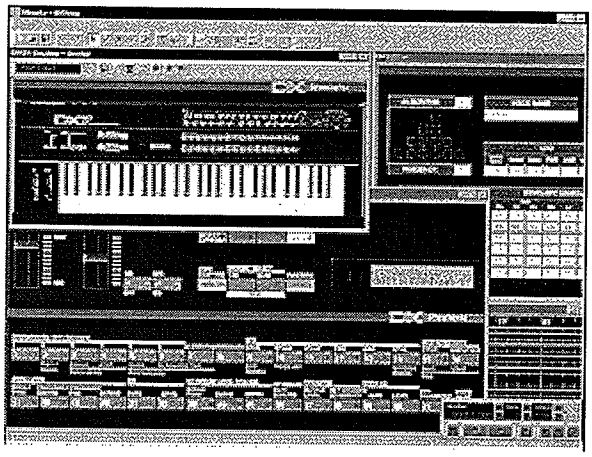
PLG100-DX



7th Heaven

The DX7... It's back, and it's even better than before! And added to the SW1000XG you practically get a super souped up version of the SY77, but without the hiss!

That's right... nearly 20 years after the first release of what is still the best selling synth of all time, Yamaha release the Daughterboard version of the DX7 (based upon the final release version MK2 DX7 but with all the features of the DX family), featuring all of the original sounds, controls editability, plus loads more features as the 3rd daughterboard for the new SW1000XG or MU100.

Introducing PLG100DX

Overview

So you think FM is poor sounding?

Well you are probably right, when you hear the tinny pathetic little warblings of your puny sound card with its 2 operator chipset. But then remember what it was that made FM great... the control and flexibility of the sound. The fact that over 160,000 people bought very expensive DX7 keyboards including some of the biggest names in music history, meant that this baby had something special

Six operators of pure power, and without all the bugs and the noise of the original! None of this toy town 2 operator stuff, or even the flimsy 4 ops of the DX21 and DX27... No this is the full monty, the real deal, the numero uno.

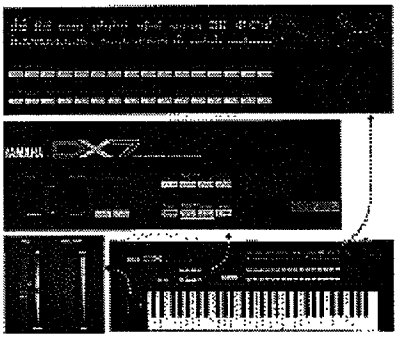
Look on the newgroups to see just how popular and sought after this old beast is... why? Those pulsing bass sounds,

the ability to edit, and program up to 256 of your own sounds, and the fact that you now can put a full DX7 out of a digital output with multiple 24 bit resolution effects processing, makes this almost as big a deal as the launch was in 1983. Some of the greatest synth designers ever worked on this machine back in the late 70's and early 80's and thats what made it great!

It's a DX7... not some toy FM synth. This is the machine that you heard on almost every pop single in the 80's, and the machine that defined the pulse bass sound of the 90's. Combine this with the SW1000XG and you have one serious piece of hardware. Anyone who was anyone owned and loved a DX7.

When is it coming out?

It has a SRP of US$350, the same front end of the DX7 as option 1, and a full editor laid out in much the same way as many of the classic DX7 Editors for option 2. And it is 100% a DX7 on a daughterboard.



You wanted retro... we give you retro!

Bear this in mind also... The SY77 and SY99 were acclaimed because you had the ability to add AWM voices to DX voices and use the 2 at the same time. Well what do you think you can do with the PLG100DX plugged onto an SW1000XG! Use your imagination! And come out in digital on SPDIF with far better effects and AWM samples than either of the SY's had! It's too cool to be true! PLG100DX... the thinking person's daughterboard.

Some of the More Famous People to Use a DX7

Underworld, Talking Heads, Brian Eno, Depeche Mode, D:Ream, Front 242, U2, A-Ha, Enya, The Cure, R Sakamoto, Duran Duran, Genesis, Marillion, Phil Collins, Hall & Oates, Talk Talk, and practically every other band that had a hit in the 80's.

Some Further Reading for DX Trainspotter Types

- **FM Theory and Applications** (J. Chowning and D. Bristow)
  Yamaha Music Foundation, 1986, ISBN 4636174828
  (Written for use with a DX series synthesizer, explains basic theory of FM synthesis, Bessel functions, and so on)
  Note: the graphs for J10 and J11 on page 176 have apparently been accidentally interchanged.

- **Yamaha DX7 Digital Synthesizer** (Yasuhiko Fukuda)
  Amsco Publications, London/New York/Sydney/Cologne 1984
  ISBN (UK) 0-7119-0653-X

- **The Complete DX7** (Howard Massey)
  Amsco Publications, 1986

- **The Classic Yamaha DX7** (Lorenz Rychner)
  Alexander Pub, 1987, ISBN 0-9390-6705-6

- **Yamaha Easy DX7 : A Complete Guide to the DX Synthesizer**
  Hal Leonard Pub Corp, 1986, ISBN 0-8818-8452-9

- **600 Voices for the DX7**
  Amsco Publications, London/New York/Sydney/Cologne 1986
  ISBN (US) 0-8256-2499-1 (UK) 0-7119-1166-5

A link to one of the best DX7 resource pages on the web:
http://www.math.uga.edu/~djb/dx7.html

Synthesizer Specifications

If you need to see the specs on a DX7 then where have you been for the last 20 years? The original specs and some of the updated PLG100DX specs for comparison:

Synthesis Type :	Digital FM (6 Operator)
Polyphony :	Max : 16 Typical In Use : Up to 16
MultTimbral :	1 parts
Oscillators/Voice :	1-6
Effects :	Effects Units : 0 (up to 6 on the PLG100DX)
Different Effects :	Over 60
Keyboard :	Keys : 61 Velocity Sesitive & channel/polyphonic after touch (on PLG100DX)
Memory :	Patches : 32 (unlimited using sysex on the PLG100DX)
Connections :	Audio Outputs : 1 (&Phones) (digital stereo out/Digital bus out to DSP Factory or Analog out) on the SW1000XG) Midi Outputs : 1 (&Thru) Midi Inputs : 1
Signal to noise :	95dB+ (analog), 100dB+ digital bus

A Potted History (Courtesy of Keyfax - The Synth Bible)

"The DX7 was immediately and universally praised and immediately and universally sought after. From 1983 to 1985, no other synth could get a look in. And this was not simply an important product in synth history; it was the key pivotal instrument. The DX7 not only redefined what a synthesizer sounded like or could do but also redefined the synthesizer market."

"The DX7 did not happen overnight. This was not some idea scratched out on the back of a cigarette packet and knocked out within the year. The first DX7's may have steamed out of Japan in 1983, but the story actually began in California 15 years earlier..."

"...Stanford University electronic music composition teacher John Chowning was experimenting with vibrations in the late 1960s until he discovered that he could produce musically complex, harmonically interesting results by modulating one sine wave with the output from another, using high speed vibratos. Thus in 1967, the seeds of modern Frequency Modulation (FM) synthesis were sewn. (FM as a concept had already been broadly accepted, but Chowning's work made it controllable and valid in the musical mainstream.)

"Chowning did not run from his studio on campus screaming 'Eureka!' Instead, he tinkered away for a number of years, perfecting this, recalculating that, making noises and drawing the occasional scathing comment from colleagues who figured that he must be using up all the University's quota of oscillators, such was the succession of harmonically rich sounds that continued to emanate from his wooden hut of a studio on campus. Of course, he was not. He was using just two; one as a carrier, one as a modulator.

"In 1971, digital synthesis guru Max Matthews of Bell Labs told Chowning that if he could tame his system to make recognizable brass and organ sounds, he might have a salable product on his hands. He approached the Stanford's Office of Technology Licensing with his discoveries, and they approached a number of American organ manufacturers to see if they were interested in acquiring this new technology. They were not. Wurlitzer, Lowry, Hammond and others all turned the offer down..."

"More as a last-ditch effort than anything else, Stanford turned to Yamaha, who produced a small range of Electone organs (at this time, everyone figured FM would only be of interest to organ manufacturers) and had an office in California.

"A young engineer by the name of Mr. Ichimura was dispatched to Stanford to check things out. Mr. Ichimura understood digital and, as an engineer, appreciated the concept of FM in radio terms. So, it only took him about ten or fifteen minutes to comprehend the essence of what Chowning had cooking. Chowning knew that Ichimura was impressed by what he'd seen and heard and so was not surprised when he learned that Yamaha wanted to take out a year's exclusive option on FM.

"In the ensuing few years, a number of things developed. Under the wing of Yamaha's organ division (the division that had actually taken out the option), a prototype FM instrument was built under the direction of Dr. Mochida, entitled the 'MAD.' This monophonic FM synth, built in 1973 by two young engineers by the names of Hirokato and Endos, is possibly the first all-digital synth ever made. By 1975, a polyphonic version had also been built.

Over at Stanford, meanwhile, things weren't quite so rosy. John Chowning's job was as an electronic music composer and teacher at Stanford, and the University's approach was very much this: 'To hell with all this fancy synthesis stuff, where are the compositions?' To put it as bluntly as Californians get, they 'let him go.'

"When Yamaha returned to Stanford in order to 'do the big deal' - take out a ten-year license on FM - Chowning was nowhere to be seen (actually, he was in Europe). All very embarrassing. Somewhat hastily, the University contacted Chowning and offered him the post of Research Associate, a job he says he was by then in no position to turn down. Installed as Director of the University's Center for Computer Research and Musical Acoustics (CCRMA, known as 'carma'), Chowning was later offered a professorship in 1979.

With Chowning ensconced at Stanford again and a new ten-year license in place, serious work began on producing marketable products utilizing FM synthesis. There was, however, one final shootout between two tech- nologies that Yamaha had been developing side by side: FM and a home-grown 'summation' additive synthesis. Chowning, who by now was paying occa-sional visits to Japan, recalls a big meeting at which the two competing technologies were displayed and discussed. In the end, FM, which wasn't dependent upon digital filters that would have been very expen-sive to produce, won out. Not only was it more memory-efficient, but it also had the potential for far greater player-control.

"From then until the DX7's launch in 1983, John Chowning only occasionally heard whispers of "DX" as he slipped through factory corridors on his visits to Japan. The GS1 was the first FM-sporting instrument to be released, in 1981, though in spite of the ripple of excitement it caused in the industry, the GS series was always intended to be a market-tester."

The 1983 Debut

With the launch of the DX7, all hell was let loose; Yamaha simply couldn't make enough of them. But by now, this was far removed from John Chowning's world. In fact, he saw and heard his first DX7 synthe-sizer in a bar in Palo Alto. Chowning remembers the occasion vividly: 'My wife and I had been out to see a movie and we stopped off at a local bar for a nightcap I knew the keyboard player in the bar, and when he saw me he waved me over excitedly to come and see this incredible new instrument he had sitting on top of his piano. I was astonished. It was an awesome moment. I had no idea that people had been waiting in line to buy DX7's. I had no idea at all.'"

Design & Programmability

"And so the product of Chowning's (and many other's) labors ended up as a 16-voice polyphonic digital synthesizer, offering 32 internal memories plus a ROM/RAM cartridge slot. The DX7 keyboard was not weighted, but it responded to velocity and aftertouch. Further expression can be extracted from a Breath Controller, Yamaha's own invention, a mouthpiece/pacifier affair by which you can more or less convincingly simulate the breath-to-tone response of a wind instrument.(Unfortunately, very few players felt comfortable with this object stuffed into their mouths.)

"The DX7 panel is not an object of particular beauty. There are plenty of dedicated controls, though switches are squishy "membrane" types and the display screen is minuscule. Along the top of the panel runs a collection of "algorithm" diagrams, so you can see at a glance the type of sound you are likely to produce (effectively) using each of these oscillator configurations. An envelope generator and a keyboard-level scaling graphic are perched on the end.

"Chowning's FM theories manifest them on the DX7 as a series of "operators" (which can be thought of as oscillators) that the instrument offers to the user in a number of different configurations or "algorithms." The operators are all sine waves, and each can be either a carrier wave or a modulator wave, depending on its position or relationship with another wave in a particular algorithm. The DX7 can use six operators per voice.

"In any given program, the novice programmer can simply switch operators on or off and begin to learn what role each performs within a sound, but things do get rather more involved when you consider that each operator can also specify a particular pitch, volume, envelope and such, and so each is almost a complete mini-synth in its own right. In a flat operator-plus-operator algorithm, the system can work as simply as drawbars on an organ, but once operators begin to interact, then the sonic results become vastly more complex and unpredictable (which is why the system sounds so good, of course). In fact, a maneuver such as changing an envelope setting of the top member in a stack of

interacting operators can exert all manner of unexpected influences on those further down; it is this level of programming intensity that has led to the theory that the three essential ingredients of FM programming are trial, error and luck.

"The individual parameters do not befuddle as much at the general level of interaction. Indeed, Yamaha retained many analog-style features and terminologies. The LFO, for instance, offers triangle, saw up/down, square, sine and random waves and can be set in terms of speed, delay, routing (pitch or volume) and amount. Although the envelope generators, which Yamaha bravely but wisely entombed in silicon rather than taking the 'flexible' software route, have their rate and level system emblazoned on the control panel, such multistage envelopes are notoriously complex to set, especially without any help via movable graphics on the display screen. If I may borrow from Howard Massey's excellent book The Complete DX7, one rule of thumb is to remember that envelope generator control over a carrier will affect volume over time and envelope generator control over a modulator will similarly affect tone. There is also a separate four-stage pitch envelope generator. (The tangible benefit of hardware envelopes, by the way, is speed.)

"Many parameters that are sewn into the fabric of a program on more modern instruments are global parameters on the DX7. These include pitch bend range, mod wheel assignments, aftertouch response, glissando, poly/mono assign, etc. All of these are called Function parameters and are accessed using the same buttons as the presets or voice programming parameters. Said buttons - the offending squishy membranes - thus have three separate purposes."

Those Famous Factory Presets

"Though FM programming has been somewhat unfairly classified as hopelessly complex, it is reasonable to say that 155,000 out of the instrument's 160,000 customers have been content to play the presets. Credit for this fact goes squarely to the two consultant programmers who voiced the DX7, Dave Bristow in the UK and Gary Leuenberger in the U.S. This Lennon-and-McCartney team of programmers, whose work spans from the GS1 to the SY series, extracted every possible ounce of musicianship from the DX7, ranging from the classic Fender Rhodes electric piano facsimile (which has since entered synth folklore, known as "DX piano' to all subsequent copyists), to the sonorous collection of fretted and fretless basses, to hand percussion, bells, marimbas, ripping brass and sound effects.

"Leuenberger explains how he created the DX piano: 'It was a very intuitive thing that began on the GS series, which has just four pairs of operators. Having come from a background of B-3s, I knew what to expect by adding sine waves together. After learning what happens by changing the envelope for a modulator and a carrier, I made the foundation 'rubbery' tone with one-to-one ratio but with different envelopes. Then I did the same using another pair of operators and detuned one against the other. With a third pair, I produced a sound like something hitting metal, which, to my intuitive sense, sounded like a 'tine' [Rhodes metal rod] sound, so I added that in. Finally, by apportioning velocity control to these components, it turned into this beautiful, real-sounding musical instrument.'

"Bristow and Leuenberger also recommend embracing the concept of "stuff." Stuff is some character-inducing component part of a sound that can be used in several tones. Bristow explains creating a Wurlirzer tone: "I had this real high operator noise ("stuff") which I added to 2:1 ratio square-wave, clarinet type of sound, so providing the fart necessary for a convincing Wurlitzer electric piano. Put a bunch of velocity on it and some tremolo... that's how it was made.

"Adding non-integer, weird ratios for just a fraction of a second colors your perception of a sound. Later I discovered that this wasn't actually FM at all, but AM, amplitude modulation - that the frequency is going up and down so much over a short period of time that they were creating their own side bands."

"Bristow and Leuenberger's experiences with DX7 programming were emotional & moving (Bristow remembers the final sound presentation meeting in Japan at which all the engineers were packed into a room with tears in their eyes, some of them hearing music on this instrument for the first time after laboring over oscilloscopes and technical data for two years), madcap and occasionally murderous (they had just one week to compile the instrument's first 128 presets), but both agreed, when interviewed recently, that they would do it all again for the same unmentionably low fee..."

To find out even more about all of the Yamaha PLG series cards, please visit www.yamahasynth.com

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