

YAMAHA

DX9

DIGITAL PROGRAMMABLE
ALGORITHM SYNTHESIZER



DEBUT OF THE DX9 DIGITAL PROGRAMMABLE ALGORITHM SYNTHESIZER: HISTORY IN THE MAKING

The word "synthesizer" is not free from the electronic implications and associations that have grown up around it. The reason for this is simple. Until recently there has been nothing in synthesizer technology that could generate voices that are anything more than synthetic-sounding. But times change. A few years ago the first digital synthesizers began to appear, creating a minor revolution in music with their extraordinary simulations of acoustic instruments and percussive sounds. Leading this trend were the Yamaha GS1 and GS2 FM digital keyboards, now world renowned for their unmatched professional versatility and realism on stage and in the studio. Not long after, the Yamaha CE series made its debut, also becoming an outstanding international success. Yet whatever these instruments signified in that revolution of less than a decade ago, what is about to happen now has no real precedent.

The world's first fully user-programmable and preset digital keyboard instruments are here: the new Yamaha DX Series Digital Programmable Algorithm Synthesizers—instruments that are about to alter the whole conception of how synthesized sound should and can sound.

We proudly present the new Yamaha DX9 Digital Programmable Algorithm Synthesizer; an instrumental figure in the revolution that is about to be.



A Totally New Approach to Synthesis

If you're used to conventional synthesizers, one look at the DX9 will tell you that something unique has happened. There are no knobs. Just two linear controls (one for volume), a small liquid-crystal digital display panel, and a number of flat-panel touch switches.

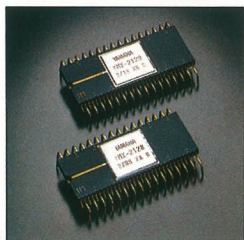
You might also be surprised to learn that there are no VCOs, VCAs, VCFs or EGs, in the conventional sense. But this is precisely why the DX9 can do what it does. It generates sound in a totally unique way to provide the richest, most naturally expressive sound available in any electronic keyboard. This special sound generation technology is called FM Digital Synthesis, and it simply has to be heard to be believed. But if you haven't heard it yet, take it from us—nothing before in the evolution of electronic music technology can match the eerie realism it gives to an array of acoustic sounds, as well as sounds that have never been heard before yet are undeniably "acoustic."

The DX9 demands that musicians reorder their approach to programming and playing a synthesizer, but the rewards in expressive capability are certainly worth it.

Inside the DX9

When the new DX Series Synthesizers were in the prototype stage of their design and development, our engineers were faced with a colossal problem of proportions—how to squeeze the micro-circuitry in two huge racks of circuit boards into a compact, portable keyboard. The DX9, after all, weighs only 12.4 kilograms (27.4 lbs.) and can fit comfortably just about anywhere you'd want to play.

Yamaha technology prevailed, of course, and the entire electronic system has been reduced to two LSI (Large Scale Integration) chips that would easily fit in the palm of your hand. That's what you can do when you have your own semiconductor production facilities.



Original Yamaha DX LSIs

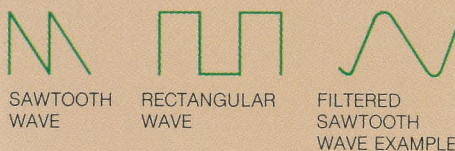
Without these LSIs (and the millions of transistors they represent) the DX9 would not only not fit into your station wagon; it wouldn't fit into your budget, either. You benefit from a tremendous amount of technology and research, and you get it inexpensively thanks to the cost reductions possible with advanced circuit integration techniques.

Operators and Algorithms

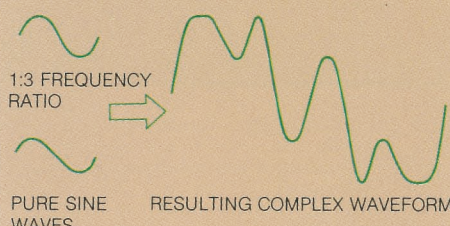
Instead of VCOs, VCAs and VCFs, the DX9 uses "operators" to generate sound.

An operator is basically a digital sine wave generator that can be used alone or in combination with other operators. A combination of operators is called an "algorithm," and this is what the little diagrams with blocks (the operators) connected in various ways on the DX9 panel represent. Each diagram represents one possible combination of operators available to you. The DX9 has 4 operators and 8 algorithms. Within each algorithm, however, you can turn certain operators on or off, effectively providing countless possibilities. The operators are either connected "horizontally" so that each contributes its own unique pitch to the sound—somewhat like a conventional electronic organ—or "vertically". In vertically connected configurations, the upper operator modulates the lower operator at a controllable frequency ratio, resulting in highly complex music waveforms that are the true key to this system's incredible sound—thus, FM (Frequency Modulation) Digital Synthesis. More than one operator can be connected vertically so that the modulated operator then modulates the next operator (the "carrier", the operator doing the modulating is the "modulator") resulting in even greater waveform complexity. Operators can even be modulated directly by more than one operator. As you can see, the possibilities are vast, and each is capable of producing a tremendously vast range of sounds in itself. Furthermore, each operator has a built-in envelope generator that is much more complex than the conventional ADSR types, so that each operator can be made to behave in a carefully controlled manner.

In conventional synthesizers, basic waveforms like these are filtered to create different sounds. The result is simply a variation on the basic waveform shape.



By modulating one pure sine wave with another, an endless variety of complex waveforms can be generated.



Choosing which Operators and Algorithms to use when programming a new voice is the prerogative of you, the musician. You make your own decisions regarding which envelopes or frequency ratios to use. That is, unless you want to rely on the pre-programmed voices provided. And since voices in the DX9 are first built up in digitized form by mathematically combining digitized pure frequencies and creating complex harmonic structures or timbres which are then converted into audio signals, the musician benefits from improved audio quality and greater overall control over voices.

Creating Your Own Voices

The beauty of DX FM Digital Synthesis is that programming complexity will not get in the way of music and the musician. The advanced circuitry in the DX9 was designed to make programming more versatile, and at the same time easier than ever.

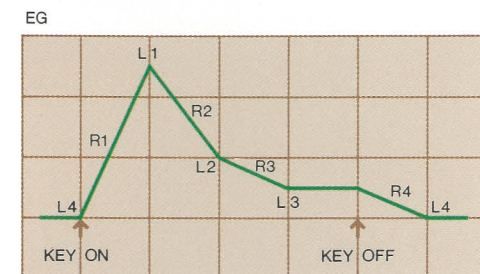
The parameters that can be programmed generally fall into two broad categories—voice parameters and performance parameters. Voice parameters include all features of sound that relate to its internal structure—harmonics, tonality, envelopes. Performance parameters affect, for example, the way the thumbwheel controller affects the sound. The DX9 has 13 programmable performance parameters and 70 voice parameters. And each parameter can be controlled with precision by specifying a digital value using the data entry controls and the liquid crystal display. Sitting down with the DX9 is the best way to get to know it. Perhaps at first you'll want to explore the range of preset voices available. Each one can be called up at the touch of a button, and you can begin editing them immediately. Or you may wish to be even more improvisational and invent a new sound "from scratch." Why not? In a matter of minutes you can be creating, editing, and storing your own sounds in the internal memory. A special backup system maintains the internal memory even when the instrument is unplugged, and your "masterpiece" voices can be stored in an external cassette tape using a conventional, inexpensive cassette recorder.

Yamaha EGs: Another Key to Rich, Clean Acoustic Sound

Because they are so critical in "shaping" and controlling sound, our engineers have spent years perfecting the unique Yamaha envelope generators that go into the DX9's operators. In conventional ADSR EGs, the attack time, decay time, sustain level and release time can be controlled to some extent. In the DX9's envelope generators, however, you have complete control over

The Yamaha DX9: The Synthesizer Redefined

four levels and four rates that form the envelope (see envelope diagram). This offers unprecedented control, and each parameter can be set in 100 discrete increments to ensure precision and repeatability.



And having created a specific envelope for an operator, you can easily copy it to others as is or edit it as needed.

Extensive Keyboard Scaling Control

It's not surprising that the DX9 offers much more keyboard scaling control than conventional synthesizers. This feature makes it possible to "balance" the volume levels of the notes throughout the keyboard range to precisely mimic acoustic instru-

ments or simply to create a desired effect. Many synthesizers have a keyboard follow-on control that permits raising or lowering the level on the keyboard's high-range notes. The DX9, however, offers wide-range keyboard level scaling control, as well as adjustable rate scaling that makes it possible to vary the sustain length of the low notes in relation to the high notes. With rate scaling it is possible to set a long low-range sustain and shorter high-range sustain to more accurately reproduce the sound of an acoustic piano, for example.

This capability greatly adds to the DX9's ability to create remarkably natural reproductions of conventional instruments, while making it possible to create wildly original sounds.

Superiority of FM Digital Control

Why is it best to have a user-programmable electronic computer/keyboard to create and process sounds? Because digital control makes it possible to generate enormously complex harmonic structures that only gigantic analog synthesizers can handle. Why is FM Tone Generation

superior to conventional analog synthesis? Because of the superior control it allows the musician in handling the constantly shifting harmonic structure of any sound. In analog synthesizers, everything depends on filters to control harmonics. With FM Digital Synthesis there is never a need for them because everything is calculated mathematically. The DX9's operators have built-in envelope generators that respond to digitized commands. By eliminating the various stages of processing a sound in analog synthesis (i.e., filtering it, amplifying it, passing it through an EG) FM Digital Synthesis succeeds in reducing noise and distortion in a way that conventional synthesis never can.

You Don't Have To Program To Play

So you can benefit from FM digital synthesis without having to program your own voices, the DX9 comes with 20 voices programmed into the internal memory that are ready to play at the touch of their selector buttons. These presets can be played outright in their supplied form, or they can be edited and updated to create hundreds of new sounds that

are as accessible to the musician as the switches that control them. The DX9 also permits loading or saving voices from or on an external cassette tape. Just about any inexpensive cassette recorder can be used. A special voice cassette is provided with the DX9, so you have 120 pre-programmed voices at your fingertips without having to program at all.

What sets the DX9 apart from ordinary digital synthesizers, however, is its unprecedented versatility in programming. This, of course, is the other remarkable option it gives you. You approach it like a computer, but you don't need to be a programming wizard to understand and soon benefit from all it can do for you. As everyone who has grappled with conventional analog synthesizers knows, this is something new indeed.

16-Note Polyphonic Keyboard

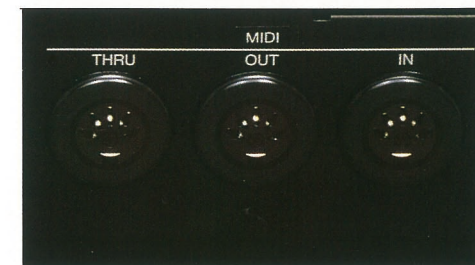
The DX9's sophistication demands a sophisticated keyboard. The keyboard lets you play up to 16 notes at once so you're never limited by a maximum of 4 or 6 voices. Further, the DX9 keyboard has fully polyphonic portamento and glissando



capability for vast expressive potential at your fingertips.

MIDI Compatibility

MIDI stands for Musical Instrument Digital Interface, and is the new universally adopted standard for data transmission between digital electronic music instruments. The MIDI terminal on the DX9 permits controlling the DX9 from another keyboard or even via a computer music interface. The DX9 can also be used to control other



instruments that are compatible with the MIDI system. A variety of computer-based control systems are already appearing, and Yamaha, of course, will not be left behind.

The MIDI system opens up a whole new world of possibilities for digital synthesizer control.

The DX9: A Whole New Way of Programming and Playing Music

When it comes to music the final test of what is good depends on sound, not words. The only way to fully appreciate the tremendous versatility of the new Yamaha DX9 is to hear it perform. Better yet—make it perform. Waiting to be created at your fingertips are whole new worlds of sound. The DX9 represents the musical experience musicians have been anticipating for years. Now the waiting is over. Time for the music to begin.



DX9 SPECIFICATIONS

Keyboard	61 keys, C ₁ ~C ₆
Sound Source	FM Tone Generator: 4 operators, 8 algorithms
Simultaneous Output Notes	POLY mode: 16 notes MONO mode: 1 note
Internal RAM Memory	20 Bank (20 Memory)
External Memory	Cassette Interface
Mode Selectors	STORE, EDIT/COMPARE, PLAY-MEMORY SELECT, FUNCTION
Controls	VOLUME, DATA ENTRY [lever, switch: YES (ON)/NO (OFF)], PITCH WHEEL, MODULATION WHEEL, OPERATOR ON-OFF, EG COPY, OPERATER SELECT
Voice Parameters	ALGORITHM, FEED BACK, LFO (WAVE, SPEED, DELAY, PMD, AMD), MOD SENSITIVITY (PITCH, AMPLITUDE), OSCILLATOR (FREQUENCY COARSE, FREQUENCY FINE, DETUNE/SYNC), EG (RATE, LEVEL), KEYBOARD SCALING (RATE, LEVEL), OPERATOR OUTPUT LEVEL, KEY TRANSPOSE
Function Parameters	MASTER TUNE ADJ, POLY/MONO, PITCH BEND (RANGE), PORTAMENTO (MODE, TIME), CASSETTE (SAVE/VERIFY, LOAD, LOAD SINGLE, REMOTE), MODULATION WHEEL (RANGE, PITCH, AMPLITUDE, EG BIAS), BREATH CONTROL (RANGE, PITCH, AMPLITUDE, EG BIAS), EDIT RECALL, VOICE INIT, BATTERY CHECK, MEMORY PROTECT
Connecting Terminal	OUTPUT, PHONES
Control Terminal	FOOT SWITCH (SUSTAIN, PORTAMENTO), FOOT CONTROL (VOLUME), BREATH CONTROL, MIDI (IN, OUT, THRU), CASSETTE INTERFACE (IN, OUT, REMOTE)
Others	LCD DISPLAY
Dimensions/Weight	101.8(W)×10.2(H)×32.9(D) cm (40"×4"×13")/12.4 kg (27.4 lbs.)
Power consumption	35 W
Accessories	Music Stand, Voice Data Cassette Tape (120 voices), Cassette Interface Cable

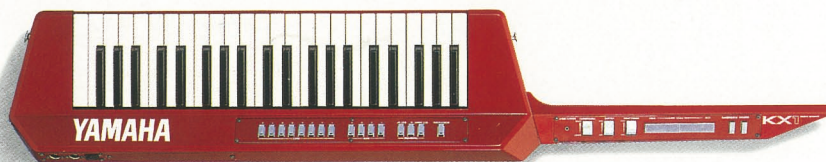
**Specifications and design are subject to change without notice for improvement.*



DX7 Digital Programmable Algorithm Synthesizer

The DX7 offers greater versatility and expressive capability with 6 operators, a choice of 32 algorithms, expanded key scaling control and full keyboard initial and after touch control.

Of course, the DX7 also has 16-note polyphonic capability. 128 pre-programmed voices are provided on plug-in ROM cartridges, and original voices can be saved on optional RAM cartridges. The DX7 is the professional's digital keyboard.



KX1 Remote Keyboard

The KX1 connects to the MIDI terminal on either the DX7 or DX9 permitting remote control of either synthesizer's performance functions. Great for players who like to "move" on stage. The KX1 is battery operated and is supplied with a 15-meter MIDI connection cable.



LC-7S
Carrying Case for DX7 and DX9

For details please contact:

SINCE 1887



YAMAHA

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