KURZWEIL MUSIC SYSTEMS

Questions and Answers About the
Kurzweil 150 Fourier Synthesizer

What is the Kurzweil 150 Fourier Synthesizer?
The Kurzweil 150 Fourier Synthesizer is a multi-timbral sound source, designed to work with any MIDI controller, be it keyboard, guitar interface or personal computer.

Is it a sampler?
No. The Kurzweil 150FS produces its sounds using additive synthesis technology and a highly advanced form of Contoured Sound ModelingTM, Kurzweil's proprietary technique for analyzing and encoding the characteristics of natural sound. The process of converting a sampled sound into a 150FS sound model is so complicated that even we are amazed that we can do it.

It's called a Fourier Synthesizer. Does this mean it only does harmonic sounds?
Actually it should have been called a "partial synthesizer" but then customers might think they weren't getting a complete machine. Each "partial" (sine-wave component) of a sound may have any arbitrary frequency which can either be fixed or a function of the fundamental pitch. "Noise" partials are also available, which is one reason the piano and other acoustic voices are so realistic. One voice may have as many as 64 partials and the total aggregate may be up to 240 partials. When the polyphony exceeds this limit, individual partials (marked as optional in the sound models) are stolen, rather than whole notes.

What about the sounds?
The Kurzweil 150FS comes with 27 Kurzweil-quality acoustic and electronic instrument voices (plus ramp, square and sine waves), including an incredible acoustic piano, and three expansion sockets for adding more sound blocks as they become available. The Sound Modeling Program, a standard feature of the 150FS, enables the musician to develop original sounds.

Is it the same piano sound that's in the Kurzweil 250?
The piano sound is different but just as high quality. It has certain additional features due to the technology used to create the sound. For example, there's more change in timbre from soft to loud and more change in the sound as it decays -- there is no looping as with samplers. There are actually 8 timbre levels in the piano and 5-8 in the other sounds (except the organs).

How do I use the 150FS?
The instrument comes with 93 preset programs for accessing the instrument voices alone or in combinations of splits and layers. In addition, a simple front panel interface allows you to create and store your own preset programs.

What kind of programs?
You can split the keyboard into two or three regions and define up to seven sound layers in each region. Each sound layer can select a different instrument voice and can be separately tuned, transposed and balanced. For example, you can put the acoustic bass on the left side and have piano layered with guitar on the right. Or you can make a great twelve string guitar sound using two guitar layers with one transposed up an octave and slightly detuned.

Can I use the 150FS with my Kurzweil 250 to reduce channel stealing?
The 150FS is a fine complement to a MIDI setup that includes a Kurzweil 250. Nevertheless, the 150FS will not increase the number of channels available for your K250 sounds.

What else can I do?
Each sound layer can be timbre shifted (which alters the harmonic content of the sound). You can also control how effects such as pitch bend, chorusing, vibrato and graphic equalization are applied.

What's timbre shift?
Timbre ShiftTM is an effect that alters the harmonic content of a sound. It is a combination of transposition in one direction with an equal amount of pitch shift in the opposite direction. For example, with one octave of timbre shift, when you play middle C, the sound you get has the harmonic content of the C an octave below, but played at the pitch of middle C.

What is it good for?
It lets you change the tone color of the built-in instrument voices. For example, timbre shift lets you turn the acoustic grand piano into a bright rock 'n' roll piano. You can also select a particular timbre (such as the piano sound at the low A) and play it over the entire keyboard.

How about chorusing?
The 150FS chorusing is software chorusing, not the kind you get with an external effects box. It works by generating extra notes (up to seven) for each MIDI note. Each extra note may be successively detuned, delayed and attenuated so you can create a variety of effects such as phasing/flanging, chorusing and echo. The detune range is enormous (up to 2000 cents) so you can chorus in musical intervals such as fifths -- i.e., 700 cents.

How about vibrato?
The vibrato LFO is a variable symmetry oscillator. There are two waveshapes available: triangle and square; a symmetry control acts like pulse width modulation. You can also select whether the vibrato works above, below or about the nominal pitch.

How do I control the effects?
Each sound layer has parameters that control how the chorusing and vibrato effects are applied. Either (or both) effect can be switched on or off or enabled by the mod wheel and/or by mono or polyphonic afterpressure (aftertouch). Another parameter controls pitch bend, which can be disabled, controlled by the pitch wheel, afterpressure, or both.

You mentioned a graphic equalizer?
Yes. Each program has an eight-band graphic equalizer. Each sound layer has a parameter to turn the equalizer on or off.

How many programs can I have?
The 150FS allows program numbers from 1 to 255. But the size of a program varies with the number of sound layers. A typical number of user programs is 100. This does not include programs provided in the 150FS's ROMS.

255 programs? MIDI allows only 128!
We've thought of that. The 150FS includes a 128 element program list that lets you map MIDI program numbers to 150FS programs. You can split the list two or four ways if you like (e.g., to create four banks of thirty-two programs each).

What about polyphony? How may notes can it play?
The 150FS can produce up to 16 notes at once. You can start up to eight notes simultaneously; beyond that, you'll start to hear delays.

Delays?
Yes, delays. If you create a program with four sound layers, each MIDI note will actually produce four notes. So if you play a six-note chord, you trigger 24 note events. The 150FS will immediately play eight of these voices, and the remainder of the voices (up to 240 partials simultaneously) will be heard as previously-triggered notes are released.

Does this mean I can't use the layering and chorusing?
No. It just means that your demands must be reasonable. Excessive chorusing and layering should be used to create sounds that you would play monophonically (i.e., one note at a time). For polyphonic playing, you should limit the number of notes per MIDI note to three (e.g., three layers or one layer with two-note chorusing or two layers with one-note chorusing on one of the layers).

So how does it work with MIDI?
The 150FS features OMNI, POLY and the Kurzweil MULTI modes of MIDI operation. In Multi Mode, the 150FS is multi-timbral. You can assign separate programs to all 16 MIDI channels. Each channel has separate controls (pitch wheel, mod wheel, etc.). The 150FS is also one of the few instruments that is responsive to polyphonic afterpressure.

Polyphonic afterpressure?
Yes. Afterpressure can be used to control pitch bend, chorus detune and/or vibrato depth on a per-key basis.

What synthesizers produce afterpressure?
Many synthesizers produced within the last few years produce monophonic (channel) afterpressure. The Kurzweil MIDIBOARD is the only one, however, that produces polyphonic afterpressure.

What if my keyboard doesn't have poly pressure?
You should buy a MIDIBOARD. Or, if you have a synth that produces monophonic afterpressure (such as DX-7) you can use that instead. But then the pressure will affect all notes at once. With polyphonic afterpressure, you can control each note individually.

What other MIDI controls do I have?
You have MIDI destinations for: Sustain and Sostenuto pedals like those on an acoustic piano. And a Timbre FreezeTM pedal that works like a sostenuto pedal with a difference: the notes sustain without decaying. And a real soft pedal that alters the timbre of the notes without changing their loudness. The control assignment table is programmable; any MIDI control number may be assigned to any control destination.

Is that all?
No. The 150FS also features programmable MIDI velocity mapping, selectable loudness mapping and programmable intonation.

Programmable intonation?
Right. You can tune each scale step individually. You can also set the key that you wish to play in so that the altered intonation can be applied to any scale.

Can I program my own basic sounds, too?
Hal Chamberlin has developed the Sound Modeling ProgramTM which runs on an Apple IIe personal computer. Sounds with up to 64 dynamic partials and any number of pitch roots and timbre levels may be interactively created using the Apple's graphics capability. This powerful sound creation tool comes standard with the Kurzweil 150FS at no extra cost.

You said it's free. Is any other hardware required?
Your Apple IIe must have a disk drive and a good monitor. The only other hardware you have to buy is the Passport Designs MIDI interface board which costs less than $100.

How does the Apple communicate with the 150FS?
Via standard MIDI using the 150's MIDI In jack. User-created sounds are loaded into the 150FS which can hold up to 64 of them in its non-volatile sound memory. The loading process via standard MIDI is much faster than with samplers due to the very compact sound model format.

How much user sound can the 150FS really hold?
The sound RAM is 64K bytes. The entire factory sound set of 27 complex acoustic sounds only takes 128K while additional ROM sound blocks are a mere 32K each. For the simpler "synthetic" sounds likely to be created with the Sound Modeling Program, you will probably hit the 64 sound limit before the 64K limit. In any case, sounds can be saved on disk. And since they are so compact possibly hundreds will fit on a single 5-1/4" floppy disk.

Can the Sound Modeling Program do everything Kurzweil engineers do in creating sounds?
Actually, it can probably do more. The factory sounds were produced mostly by staring at and editing long lists of numbers from acoustic instrument analyses. The Sound Modeling Program unleashes the power of graphics to accomplish the same things in much less time.

Can I examine and modify the factory sounds with the Sound Modeling Program, too?
Yes. One feature of the program will be the ability to read any ROM sound or previously loaded RAM sound back into the Apple for examination, modification, or storage on disk.

Samplers allow me to simply record live sounds and use them musically. Can I do this with the Sound Modeling Program and the 150FS?
One future enhancement being considered is a Fourier analyzer program that does just that. The recorded and analyzed sound can then be manipulated much more freely than can a sound that's merely been sampled.

What about other computers?
The Apple was chosen initially because it is the computer most commonly owned by musicians. Others are being investigated, so cast your vote.

The KURZWEIL 150 FOURIER SYNTHESIZER

Resident Voices

Program	Display	Description
1	PIANO	Concert Grand Piano
2	ROCKPNO	Rock'N Roll Piano
3	SOFT PNO	Soft Acoustic Piano
4	ELEC PNO	Electric Piano
5	BR E PNO	Bright Electric Piano
6	HARPSCHD	Harpsichord
7	SOFTHPCD	Soft Harpsichord
8	A BASS	Acoustic Bass
9	E BASS	Electric Bass
10	SOFT EBS	Soft Electric Bass
11	VIBES	Vibraharp
12	MARIMBA	Marimba
13	JAZZ ORG	Jazz Organ
14	ROCK ORG	Rock Organ
253	RAMPWAVE	Ramp Wave
254	SQURWAVE	Square Wave
255	SINEWAVE	Sine Wave

Voice Block A

16	AGUITAR1	Steel String Acoustic Guitar
17	AGUITAR2	Bright Steel String Guitar
18	AGUITAR3	Nylon String Acoustic Guitar
19	SYN HORN	Synth Horns
20	SYNSWEEP	Synth Filter Sweep
21	SYN CELE	Synth Celeste
22	SYN BASS	Synth Bass
23	CONGAS	Conga Drums

Voice Block B

80	CLARINET	Clarinet
82	OBOE	Oboe
83	HARP	Harp
87	CHIMES	Chimes
88	HANDBELL	Handbells