Kurzweil Samples Guide

Samples, memory by model, pianos, clavier, mallets and waveforms

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What factory and user samples are, how much sample memory each Kurzweil keyboard has, and a close look at the samples that matter most - the pianos and electric pianos, the Clavier, the mallets and the vector synthesis waveforms: Triple Strike, the German D and Japanese grands, tine and reed pianos, Clavinet, harpsichord, celesta, glockenspiel, bells, chimes and crotales.

Contents

1 What samples are 2

Factory samples and user samples 2

From sample to sound 2

2 Sample memory by model 2

3 The Kurzweil Samples Overview 3

4 The essential samples 4

4.1 Acoustic Pianos 5

4.2 Electric Pianos 8

4.3 Clavier 12

4.4 Mallets and Percussion 17

4.5 Vector Synthesis Waveforms 18

Picture credits 20

1 What samples are

Factory samples and user samples

A **sample** is a recording of a sound - a piano note, a drum hit, a stretch of a string section - stored as digital audio. Almost everything a Kurzweil keyboard plays that is not generated by its synthesis engine starts from samples.

There are two kinds, and the difference matters when you plan what to load:

- **Factory samples** come with the instrument. They are stored permanently in its sample memory (Kurzweil calls the technology *FlashPlay*), so there is no loading time at power-up. They are not part of a backup, and updates of the operating system and of the factory objects do not contain them - an update changes programs, keymaps and effects, never this audio.
- **User samples** are yours: WAV or AIF files and the sample formats of older Kurzweil instruments, loaded into a separate user sample memory. They stay in the keyboard when it is switched off, and like the factory samples they play without loading time.

The keyboard shows how much room is left on its **User Sample Memory** page (reached with the SAMPLES soft button): *Total available* is the free space, *Largest free chunk* the biggest contiguous piece - a large sample must fit into one. After many loads and deletions the memory can be fragmented; the remedy is to back up, clean the memory and load again.

From sample to sound

A sample is never played directly. A **keymap** says which sample - and which recording of it - sounds for which key and how hard the key is struck; a **program** uses one or more keymaps and adds the synthesis, effects and controller settings.

Two terms come back throughout this guide:

- **Velocity layers (VL)**: the same note recorded at several playing strengths, from very soft to very loud. The harder you strike the key, the further up the layers you move. A real instrument does not only get louder when it is played harder - its tone changes as well: a hard strike carries more and brighter overtones than a soft one. Separate layers keep these differences, so the sound stays realistic from soft to loud; more layers also mean smoother transitions between them - and more memory.
- **Sample zones**: the key ranges that one recording covers. A piano recorded on every key has one zone per key and layer; fewer zones means a recording is stretched over several keys. A stereo piano needs two channels per zone.

2 Sample memory by model

Every Kurzweil keyboard has two numbers that decide what you can do: the size of the **factory sound memory** - what the instrument comes with - and the size of the **user sample memory** - what you can add. Both vary between models.

Model	Factory memory	User memory
K2700	4.5 GB	3.5 GB
Forte	16 GB	3.375 GB
K2061 / K2088	2 GB	2 GB
PC4	2 GB	2 GB
Forte SE	2 GB	188 MB
PC4 SE	2 GB	-
SP8	2 GB	-
SP6	2 GB	-
PC3A, Artis, Artis SE	256 MB	-
PC3K	64 MB	128 MB
PC3, PC3LE, SP5	64 MB	-

A dash means: the keyboard cannot load user samples. Figures as stated by Kurzweil.

3 The Kurzweil Samples Overview

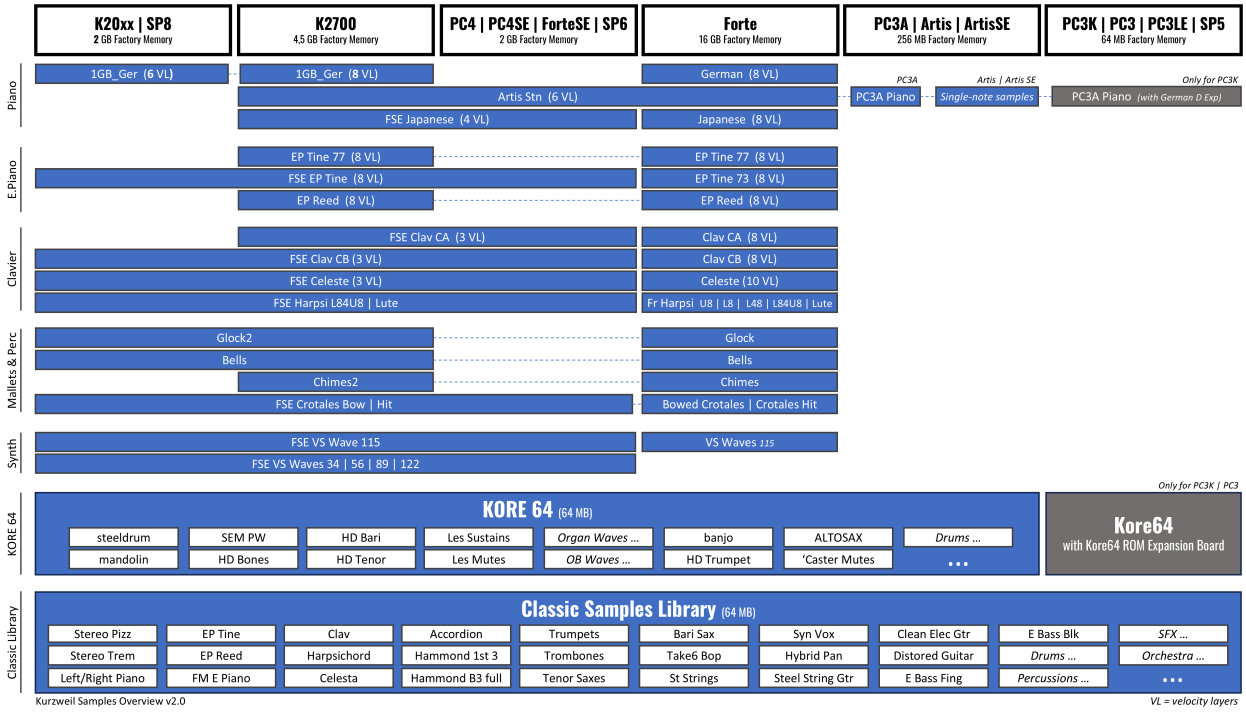


Figure 1: Kurzweil Samples Overview v2.0. Each column is a group of keyboards with the same factory sound memory; a blue bar means that the samples are available on those keyboards. VL = velocity layers.

How to read it. The header of each column names the keyboards and the size of their factory sound memory. A blue bar under a group of keyboards means that these samples are available on those keyboards.

A bar that stretches over several columns always stands for the same samples on all of these keyboards - for example the Artis Stn piano, which the K2700, the PC4 family and the Forte share. A bar in one column only is specific to those keyboards - the German pianos of the different keyboards, for example.

A dashed line connects bars that are technically the same samples: between the K2700 and the Forte they only lie on other IDs, and Glock and Chimes have been given other names (Glock2 and Chimes2). The dashed lines

between the Artis Stn piano, the PC3A Piano and the single-note samples of the Artis connect the same piano in different packagings: four of its six layers are identical, the other two are only slightly adjusted (section 4.1.2). Samples whose name starts with **FSE** are explained in the box below.

The **KORE 64** and **Classic Samples Library** boxes at the bottom show examples of the many samples they contain. These samples are available on all keyboards under the blue box: the box marks the availability, not the position of the examples inside it.

Grey boxes are options that only older keyboards had: the German D Exp piano of the PC3K and the KORE 64 ROM Expansion Board of the PC3K and PC3.

GOOD TO KNOW

When it was launched, the Kurzweil Forte was a pure stage piano: it had no user sample memory, relatively few sounds and limited editing. The focus was on a large 16 GB factory sample memory, whose heart are the high-quality Steinway D-274 and Yamaha C7 grand pianos - every key of them was sampled, in 8 velocity layers. Further essential highlights are the outstanding Rhodes, Wurlitzer and Hohner Clavinet samples. In the following years Kurzweil extended the stage piano step by step, through constant OS updates, into a full-fledged workstation including user sample memory.

For the smaller memory of the Forte SE, reduced versions of the Forte samples were made: the low notes in particular are looped, and the reduced versions use fewer samples per layer and fewer velocity layers. The names of these reduced samples all start with "FSE", and they are found in all Pro workstations from the Forte on (see the Kurzweil Samples Overview above).

4 The essential samples

Samples that appear again and again - in factory programs, in your own multis, in the sound sets you load - deserve to be known by name. This guide mainly describes the samples that were introduced starting with the Forte generation of Kurzweil models and compares them with the Classic Samples of the PC3 generation. The sizes in this chapter refer to the instrument layers only; noise samples, such as pedal and key release noises, are not included, because some of them are used by several instruments.

CATEGORIES AND SUBCATEGORIES

Each chapter ends its introduction with the program category the samples are used in. Kurzweil sorts programs by a **main category** (for example Piano) and a **subcategory** (for example Japanese); both have a number of their own. The subcategory number counts only inside its category - subcategory 2 is Japanese in Piano and Reed EP in E.Piano - so this guide names the subcategory and, where a number helps, calls it the "subcategory ID". It does not join the two numbers.

The Categories & Subcategories guide shows the category list and the display background of every subcategory.

4.1 Acoustic Pianos

Kurzweil has three pianos: the classic **Triple Strike** piano, a Steinway D-274 concert grand - the **German D** - and a Yamaha C7 grand - the **Japanese**. They differ in age, in size, in the number of velocity layers and in how many notes were recorded; the sections below describe each of them.

The programs that use them are found in the category **Piano**, whose subcategories carry the names of the samples: German (subcategory ID 1), Japanese (ID 2) and Triple Strike (ID 3).

KSR, Kurzweil String Resonance, simulates the string resonance of a real piano: when a note is played - especially with the damper pedal down - the other strings of the piano vibrate along with it and add body and shimmer to the sound. KSR adds this effect and makes the piano sound more realistic. It is available on all models from the Forte generation on.

4.1.1 Triple Strike

The **Triple Strike piano** is Kurzweil's classic stereo grand piano with three velocity layers. Kurzweil lists a "Stereo Triple Strike Piano" among the main sound features of the PC3 and presented a "triple strike stereo grand piano" as one of the new sounds of the PC2.

It is part of every modern Kurzweil keyboard. In the Samples Overview it is the "Left/Right Piano" at the left of the bottom row, in the classic sample library that every modern keyboard carries.

Its data - three velocity layers, stereo, a small set - are in the table in section 4.1.4, next to the German D. A small set is also why the Triple Strike piano fits into every keyboard: the PC3 carries it with only 64 MB of factory sounds.

The grand piano has been Kurzweil's calling card from the start: the first instrument of the company, the K250 of 1983/84, was inspired by the question whether a synthesizer could sound like a real piano, and was considered the first really successful attempt at it.

The name Triple Strike stands for the three velocity layers **mp, mf and f**. Kurzweil's earlier stereo piano had no velocity layers; the Triple Strike was the first Kurzweil piano with them, and it won awards at the time.

Triple Strike pianos were first available on the K2500/K2600 with the **Stereo Dynamic Piano ROM**, which contains two additional piano strikes to create a Triple Strike Stereo Piano sample.

Which piano was sampled for the Triple Strike has never been published by Kurzweil.

Sound character: a clear, direct stereo grand. With only three layers the steps between soft and loud notes can be heard, but the sound is immediately playable and sits well in a band mix.

4.1.2 German D

The Steinway Model D

The Steinway Model D, also written D-274, is the flagship concert grand of Steinway & Sons: **274 cm (9 ft)** long, 156 cm wide and about 480 kg. It was first built in 1884, is made in Hamburg and in New York, and is generally described as the first choice of most concert pianists.

A Hamburg-made Steinway Model D is the piano behind the Kurzweil German pianos, which Kurzweil calls **German D**.

In rock and pop: a Steinway grand piano carries songs such as "Let It Be" (The Beatles), "Bohemian Rhapsody" (Queen) and "Your Song" (Elton John).



Steinway & Sons concert grand, Model D-274. [1]

Sound character: the Steinway D is known for a powerful bass, a rich, singing midrange and a brilliant but round treble, with a long, even sustain. It is the sound of the concert hall and of many pop and rock records.

Artis German D

The **Kurzweil Artis** brought the German D: a nine-foot Steinway in 6 velocity layers and 125 MB, which fits into the 256 MB of factory sounds of the Artis. A review of the Artis found it "audibly superior" to the Triple Strike piano.

The six layers run **p, mp, mf, f, ff and fff**. On the Artis itself the piano is not a joint sample: every note in every velocity is a sample of its own, already in the ROM. The object file of the Artis shows it: six keymaps called *Stein p LOOP* to *Stein fff LOOP* (IDs 1000 to 1005) play 53 samples each, named like "01_a0_p" and "03_c1_mp", each a stereo pair of two blocks. The ff and fff layers are the exception: they have samples of their own for only 47 and 19 of the notes, named "ff_..." and "fff_...", not a full row of 53.

The PC3A and PC3K object files and the newer keyboards bundle the recordings into one joint sample object per layer: 106 blocks, that is 53 recorded notes. They are called *PC3A Piano p* to *fff* (IDs 3700 to 3705) and, on the newer keyboards, *Artis Stn p* to *fff* (IDs 860 to 865).

> THE ARTIS PIANO IN THREE PACKAGINGS
>
> Compared by their block data - start and end address, loop, alternate start and sample rate - the **p, mp, mf and f layers** are the same Artis piano audio, only packaged differently: in the PC3A block for block identical to the Artis, on the K2700 and later with the same lengths and loops but at another place in the ROM.
>
> The **ff and fff layers** of the PC3A and of the K2700 and later are slightly adjusted samples: none of their 106 blocks matches the Artis recordings, but they differ only a little in length - for the note A0 in ff, for example, the Artis sample has about 302,700 frames and the PC3A sample 302,660. They should hardly differ in sound.
>
> This is a technical comparison of the sample data; the audio itself was not compared.

Kurzweil kept it. The same 125 MB set is in the **PC4, PC4 SE, Forte SE, SP6, Forte and K2700**, identical in all of them - for the PC4 family it is the only German piano there is. The PC3K got it as an expansion (the grey "German D Exp" box in the overview).

> GOOD TO KNOW
>
> To make room for the high-quality 1 GB German D, the K2061/88 does without the Artis piano samples.

Forte - the 3 GB Steinway

The **Forte** has the largest German D. It has 3 GB, practically unlooped, in 8 velocity layers, and the Forte records all 88 notes in stereo: each layer holds 176 blocks, against 82 blocks - 41 notes - on the K2700.

A piano program is more than the 8 layers: the first Forte program, *Rich 9ft Grand*, uses 13 keymaps - the 8 German layers, two string layers, the damper pedal, pedal release and the Steinway key releases.

K2700 - the 1.3 GB German

The **K2700** uses the FSE samples with 8 velocity layers: the German D at 1.3 GB, from ppp to fff, in stereo, with 41 recorded notes (82 blocks) per layer. The factory samples are named accordingly, "1GB_Ger_ppp" to "1GB_Ger_fff" - the "1GB" is the nominal size, the measured size of the eight layers is 1.28 GB. The K2700 has the Artis piano as well, so it offers two German grands to choose from.

K2061/K2088 - the 1 GB German

The **K2061 and K2088** carry the FSE German D with 6 velocity layers in 1 GB (the six layers measure 0.97 GB), with the same 41 stereo notes (82 blocks) as the K2700. The layers run pp to ff; the K2700's ppp and fff are folded one step inward. The SP8 has the same set.

4.1.3 Japanese

The Yamaha C7

The second grand is Japanese: the Forte pianos are modeled after a "Vintage Yamaha C7", and the sample is called **Japanese**, abbreviated JC7. Kurzweil describes it as a vintage Japanese concert grand.

The Yamaha C7 is a seven-foot concert grand, about 227 cm long. It belongs to the C series, which Yamaha launched in 1967 and has built in Hamamatsu, Japan, ever since; the C7 was its largest model. In 2012 Yamaha announced the CX series as the successor of the C series.



A Yamaha C7 in a studio. [2]

The **Forte** has the full Japanese piano: 8 velocity layers, unlooped, 3.6 GB, every key in stereo. The smaller keyboards - the K2700, the PC4 and the rest of the 2 GB family - carry the **FSE Japanese** with 4 velocity layers. The K2061/K2088 and the SP8 have no Japanese piano at all.

Sound character: a Yamaha C7 is brighter and more direct than a Steinway: a clear attack, a focused midrange and a bright treble that carries well. This is the typical sound of Yamaha grands in pop, rock and jazz productions.

4.1.4 Which keyboard has what

The table puts the Triple Strike piano next to the forms of the German D and the Japanese. They differ in size, in the number of velocity layers and in how many notes were recorded:

Version	Forte	K2700	K2061 SP8	PC4 group	Artis	Layers	Size	Notes per layer	Channels	Length	Loop
Triple Strike	✓	✓	✓	✓	✓	3	12.7 MB	16	two mono (L, R)	3 s	yes
Artis Grand German Piano	✓	✓		✓	✓	6	125 MB	53	stereo	5 s	yes
K2061/88 German			✓			6	1 GB	41	stereo	42 s	tail only
K2700 German		✓				8	1.3 GB	41	stereo	42 s	tail only
Forte German	✓					8	3 GB	88	stereo	44 s	tail only
Japanese	✓					8	3.6 GB	88	stereo	52 s	no
FSE Japanese		✓		✓		4	886 MB	38 to 40	stereo	62 s	no

Model groups: K2061 SP8 = K2061, K2088 and SP8; PC4 group = PC4, PC4 SE, Forte SE and SP6. 1 GB = 1,024 MB, the way the keyboards count. The Triple Strike piano uses two mono samples instead of one stereo sample. Length = median sample length. Loop: "yes" = the loop keeps a held note sounding; "tail only" = the sample plays its natural decay and only a short loop follows at the very end (practically unlooped); "no" = no loop.

The **FSE Japanese** has a longer average sample than the Forte Japanese, although it is the smaller set. The reason is the selection: the Forte set contains many short blocks that the FSE leaves out. The blocks of the ppp, mp and ff layers, for example, average only 2.1 to 2.7 MB, and the FSE takes over just the pp layer of them. Without the short blocks, the average of the FSE Japanese is higher.

In short: the Forte records all 88 notes of a layer in stereo, with long samples that play their natural decay and have only a short loop at the very end after more than 40 seconds (practically unlooped); the K2700 and the K2061/88 record 41 notes in stereo - about every second key - and the Artis piano 53, in only 6 layers and 125 MB. More layers and more recorded notes cost memory - which is exactly why the German D sizes are 125 MB, 1 GB, 1.3 GB and 3 GB. Kurzweil describes the German D of the K2700, the K2061/88 and the PC4 as an optimized version of the Forte grand, derived from the same content with fewer samples.

4.2 Electric Pianos

Kurzweil's electric pianos come from different sources: **samples** of the Fender Rhodes (**tine**) and the Wurlitzer (**reed**), the Classic Samples of three more electric pianos, and programs that **VAST** builds from waveforms - among them the FM electric pianos. The big sets with 8 velocity layers sit in the Forte and the K2700; every other keyboard carries a smaller one.

The programs are found in the category **E.Piano**, whose subcategories are Tine EP 77 (subcategory ID 1), Tine EP 73 (ID 2) and Reed EP (ID 3). Of the 56 E.Piano programs of the K2061, 23 are built on tine samples, 4 on reed samples, 5 each on the Pianet, the RMI Electra-Piano and the CP80, and 12 on waveforms alone; two mix several sources.

4.2.1 Tine and reed - two techniques

Both kinds of electric piano have hammers and a keyboard like a piano, but the sound is not made by a string. The vibrating part is a small piece of metal, and a pickup turns its motion into an electrical signal. What the metal is, and how it is excited, makes the difference:

	Tine piano	Reed piano
Vibrating part	A thin metal **tine**, beside a **tone bar** that strengthens and lengthens the tone	A tuned steel **reed**
Excitation	A hammer strikes the tine	Wurlitzer: a felt hammer strikes the reed. Hohner Pianet: a pad on the reed is lifted by the key
Pickup	Electromagnetic, opposite the tine - as on an electric guitar	Wurlitzer: electrostatic (170 V DC). Pianet: capacitive, from 1977 electromagnetic
Tone	Less sharp than a reed piano; the best-known tine piano is the Fender Rhodes	Sharper, closer to a sawtooth wave; "barks" when played hard
Typical instruments	Fender Rhodes	Wurlitzer 200 and 200A, Hohner Pianet N
Kurzweil samples	EP Tine, EP Tine 73, EP Tine 77, FSE EP Tine	EP Reed
Subcategories	Tine EP 77 (ID 1), Tine EP 73 (ID 2)	Reed EP (ID 3)

Kurzweil sampled the Fender Rhodes and the Wurlitzer; the sample names say only "Tine" and "Reed".

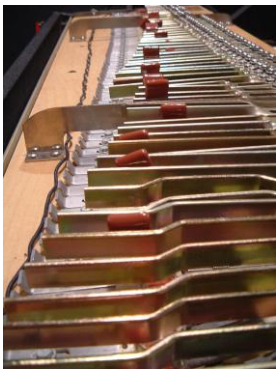
4.2.2 Tine pianos

The Fender Rhodes

- Harold Rhodes developed the instrument in the 1940s; the partnership with Fender began in 1958.
- After CBS bought Fender in 1965, the 73-note Fender Rhodes Electric Piano appeared. The Mark I Suitcase and the lighter Stage piano followed in 1970, an 88-note model in 1971.
- The Mark II came in late 1979 and the Mark V in 1984, the last model of the original company.



Fender Rhodes Mark I Stage Piano, 73 keys. [3]



The tines and hammers inside. [4]

In rock and pop: "Riders on the Storm" (The Doors), "Just the Way You Are" (Billy Joel) and "I'm Not in Love" (10cc).

The '73 and the '77

Kurzweil speaks of the "Classic Tine" ('73 and '77): the numbers are the years of the two Rhodes pianos. They differ in the action:

- In the early 1970s the hammers were half wood, half plastic. Molded all-plastic hammers followed in 1976.
- With the new plastic hammers in 1977 came the return of the key pedestal "bump", which was originally found in the Sparkletop teardrop action of the late 1960s.

Sound character

Played softly, the Rhodes is round, warm and bell-like; played hard, it develops a bark and bite. After the clear attack of the tine the tone fades slowly.

What Kurzweil sampled

Kurzweil sampled the Fender Rhodes in two generations. The **Classic Samples** of the PC3 generation are *EP Tine* (0.9 MB) and _EP Tine Hard_So_ (0.3 MB), one layer each. In the original PC3 objects they are still called *Rhodes* and *Rhodes E Piano*; the second one came with the KORE 64 expansion and is a harder-played Rhodes.

The **new samples** of the Forte generation have 8 velocity layers. The Forte has both as full sets - *EP Tine 73* (364 MB) and *EP Tine 77* (793 MB) - and the K2700 the 77 in the same size; the 2 GB keyboards share one smaller set, the *FSE EP Tine* (146 MB), an adapted variant of the Forte's EP Tine 73. The object file of the K2061 shows it: the FSE EP Tine holds 28 sample blocks per layer where the EP Tine 73 holds 73 - about 40 % of the audio, 146 MB against 364 MB. The EP Tine 77 is unlooped, the EP Tine 73 looped.

4.2.3 Reed pianos

Wurlitzer and Pianet

In the Wurlitzer a felt hammer hits a steel reed and an electrostatic pickup picks up its motion. The Wurlitzer 200 appeared in 1968 and was the most popular model, the 200A followed in 1974; about 120,000 instruments were built between 1954 and 1983.

The Hohner Pianet, built from 1962 to 1983 in Trossingen, works with a pad on a tuned reed; the Pianet N (1965 to 1968, followed by the N II to 1977) was the best-known model.



Wurlitzer 200A. [5]



Hohner Pianet N II. [6]

In rock and pop: the Wurlitzer in "Money" (Pink Floyd), "Dreamer" (Supertramp) and "What'd I Say" (Ray Charles); the Hohner Pianet in "She's Not There" (The Zombies), "Summer in the City" (The Lovin' Spoonful) and "I Am the Walrus" (The Beatles).

Sound character

The Wurlitzer sounds reedy and a little nasal. Played softly it is mellow, played hard it growls and barks; it decays faster than the Rhodes, and its tremolo is part of the typical sound.

What Kurzweil sampled

Kurzweil sampled the Wurlitzer. The Classic Sample **EP Reed** (1 MB, one layer) was called *Wurlitzer* in the original PC3 objects, with the key release *Wurli Key Rel*. The new sample of the Forte generation keeps the name *EP Reed*: 8 velocity layers and 308 MB, in the Forte and the K2700. The other keyboards have only the Classic EP Reed.

4.2.4 Other electric pianos

Three more electric pianos come from older generations of Kurzweil keyboards and belong to the Classic Samples, with one layer each: the Hohner Pianet, the RMI Electra-Piano and the Yamaha CP80.

Hohner Pianet

The Pianet is the reed piano described above. Kurzweil has two Pianet samples, *Pianet* and *Fast Pianet* - called *Piant* and *Fast Piant* in the newer object files - which share the same recordings: 13 notes, 1.2 MB.

Sound character: small, bright, dry and slightly nasal, with a short decay.

In rock and pop: "I Am the Walrus" (The Beatles), "She's Not There" (The Zombies) and "Family Affair" (Sly & The Family Stone).

RMI Electra-Piano

Rocky Mount Instruments built the **Electra-Piano and Harpsichord 368** from 1972, which belongs to the second generation of the RMI 300 series. It has 68 keys and seven stop tabs: Piano, Piano PP, Harpsichord, Harpsichord PP, Lute, Organ Mode and Accenter. Every key has its own oscillator; square or pulse waves, shaped by digital logic and filters, give the bright, percussive, synthetic sound of 1970s progressive rock. The 368X, introduced around 1974, has the same electronics in a lighter plastic case.

In rock and pop: "Watcher of the Skies" (Genesis) and "Close to the Edge" (Yes).

Kurzweil sampled it as *RMI Electra Piano* (1.3 MB, 16 notes), together with the harpsichord stop (*RMI Harpsichorda*) and the Accenter (*RMI Accenter*); the newer object files abbreviate the names to RElectra Piano, RHarpsichorda and RAccenter.

Yamaha CP80

The CP80 is an electric grand piano of the late 1970s: hammers strike real strings, as in a grand piano, and pickups pick up the strings and send the sound to an amplifier, so that the instrument could be heard next to electric guitars on stage. Kurzweil's *CP80 E Grand* (6 MB, 36 notes) is the largest of the Classic electric pianos.

Sound character: clear, bright and percussive, with a precise attack that cuts through guitars and keyboards - closer to a piano than any other electric piano, but harder and more metallic.

In rock and pop: "That's All" (Genesis), "In Your Eyes" (Peter Gabriel) and "New Year's Day" (U2).

Programs built from waveforms

Not every E.Piano program uses a recorded electric piano. Twelve factory programs of the K2061 are built by VAST from the single-cycle waveforms of the Classic Samples Library alone. The six FM programs - FM EP, FM Growler EP, Thick FM Digital, Slap FM Keys, FM Square Bell and FM EPiano Templ - take sine and similar waves as the material for FM synthesis; Elec Piano 1 to 3, Wurly, Pa Ano and Roads shape sawtooth, triangle and square waves like an analog synthesizer.

4.2.5 FM E Piano

One more electric piano is **FM E Piano**, a sample of the Classic Samples Library, which every Kurzweil keyboard carries. Do not confuse it with the FM engine: all new Kurzweil Pro keyboards from the Forte on have it and can generate such sounds themselves with "classic 6 operator FM synthesis".

4.2.6 Which keyboard has what

Version	Forte	K2700	K2061 SP8	PC4 group	Artis	Layers	Size	Notes per layer	Channels	Length	Loop
EP Tine	✓	✓	✓	✓	✓	1	0.9 MB	14	mono	1.8 s	yes
EP Tine Hard_So	✓	✓	✓	✓	✓	1	0.3 MB	11	mono	1.6 s	yes
EP Tine 73	✓					8	364 MB	73	mono	15 s	yes
FSE EP Tine		✓	✓	✓		8	146 MB	28	mono	15 s	yes
EP Tine 77	✓	✓				8	793 MB	73	mono	30 s	no
EP Reed	✓	✓	✓	✓	✓	1	1 MB	18	mono	2.5 s	yes
EP Reed (large)	✓	✓				8	308 MB	65	mono	11 s	tail only
Pianet	✓	✓	✓	✓	✓	1	1.2 MB	13	mono	3.8 s	yes
RMI Electra Piano	✓	✓	✓	✓	✓	1	1.3 MB	16	mono	2.7 s	yes
CP80 E Grand	✓	✓	✓	✓	✓	1	6 MB	36	mono	5.6 s	yes

Model groups: K2061 SP8 = K2061, K2088 and SP8; PC4 group = PC4, PC4 SE, Forte SE and SP6. The table groups the tine pianos, the reed pianos and the other electric pianos. EP Tine, EP Reed, Pianet, RMI Electra Piano and CP80 E Grand are samples of the Classic Samples Library; EP Tine Hard_So came with the KORE 64 expansion and is used on its own in some electric piano programs. Length = median sample length. Loop: "yes" = the loop keeps a held note sounding; "tail only" = the sample plays its natural decay and only a short loop follows at the very end (practically unlooped); "no" = no loop.

4.3 Clavier

Clavier refers to a family of historic keyboard instruments that predate the modern piano: harpsichords, spinets, virginals, clavichords and sometimes early fortepianos. They produce sound by plucking or striking strings in different ways and are known for their distinctive Renaissance and Baroque character. In keyboards and synthesizers the Clavier category is usually used for sounds based on these historical instruments, rather than modern acoustic or electric pianos.

On Kurzweil keyboards the category holds three samples: the electric clavichord - the **Clavinet** - the **harpsichord** and the **celesta**. Each is a sample of its own, with a full set of velocity layers on the Forte and a smaller one on the other keyboards.

The programs are found in the category **Clavier**, whose subcategories are Clav (subcategory ID 1), Harpsichord (ID 2) and Celeste (ID 3).

4.3.1 Clav - the Clavinet

How a Clavinet works

The Clavinet is an electric clavichord, invented by Ernst Zacharias and built by Hohner in Trossingen from 1964 to 1982 - about 38,000 instruments. Pressing a key makes a rubber pad strike a tensioned string, and electromagnetic pickups pick up the string. The model that became the standard is the **D6** of 1971: it has six rocker switches - Brilliant and Treble (high-pass filter), Medium and Soft (low-pass filter), and AB and CD to choose the pickups.

The Clavinet is strongly associated with Stevie Wonder, whose "Superstition" of 1972 was a number-one hit.

In rock and pop: "Superstition" and "Higher Ground" (Stevie Wonder) and "Trampled Under Foot" (Led Zeppelin).



A Hohner Clavinet D6. [7]



Another Hohner Clavinet D6. [8]

The pickup switches

The D6 has two pickups under the strings: the **neck pickup**, farther from the bridge, and the **bridge pickup**, close to the tailpiece. Two rocker switches choose between them. The left switch (C/D) selects whether one pickup or both sound. The right switch (A/B) selects, in position C, which of the two pickups sounds and, in position D, whether both work in phase or out of phase.

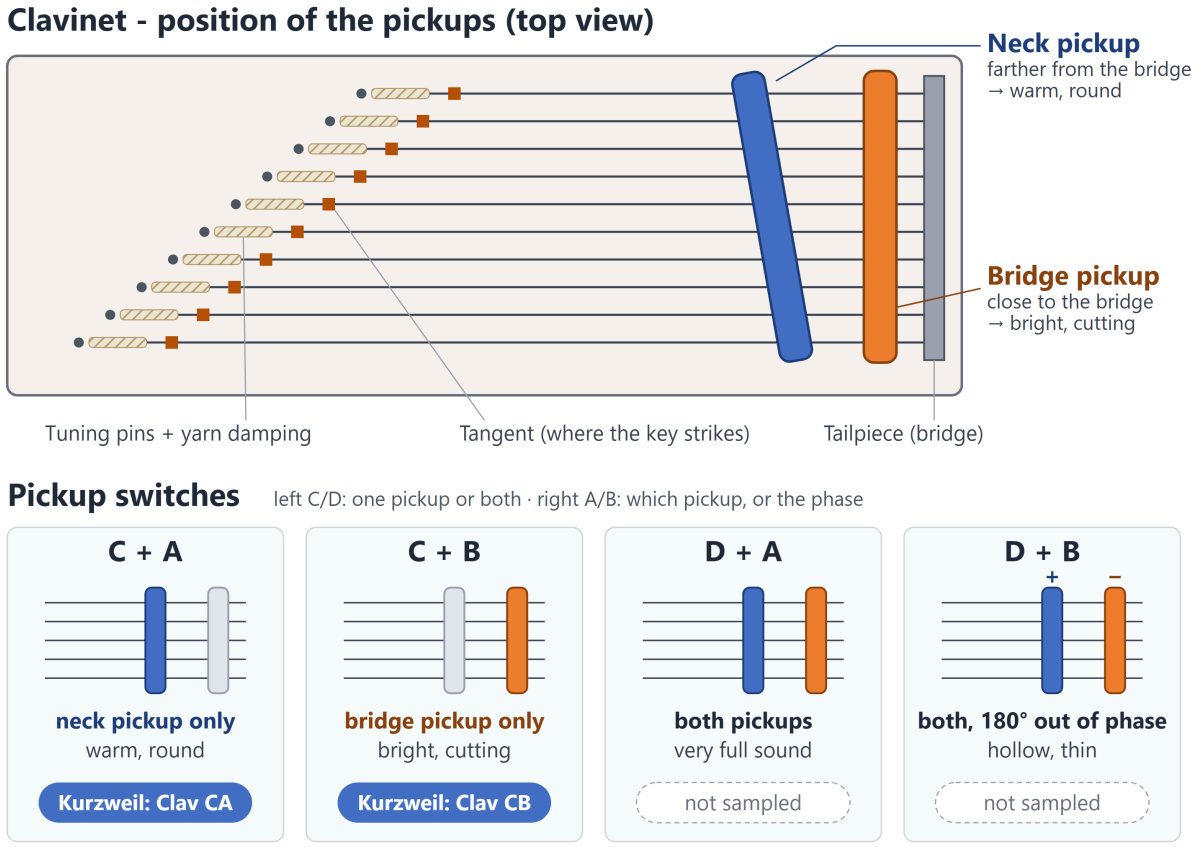


Figure 2: Clavinet D6: position of the two pickups and the four switch settings.

Sound character

Dry, sharp and rhythmic: a snappy attack and a short decay, made for tight sixteenth-note patterns, and very responsive to touch. Played through a wah-wah pedal it is the funk sound of the 1970s.

What Kurzweil sampled

Kurzweil names the sampled instrument "Clavinet D6 (rhythm and treble pickups)". The sample sets are *Clav CA* (457 MB) and *Clav CB* (442 MB): 8 velocity layers each in the Forte, 3 layers as *FSE Clav CA* (82 MB) and *FSE Clav CB* (80 MB) in the smaller keyboards.

4.3.2 Harpsichord

How a harpsichord works

Pressing a key lifts a jack, and a small plectrum - originally a quill, today often plastic - plucks the string; a felt damper on the jack stops it when the key is released. A harpsichord has **no touch sensitivity**: a note sounds equally loud however hard the key is pressed. Its sound is changed with **registers**: many instruments have several sets of strings per note, 8' strings sounding at the normal pitch and 4' strings an octave higher, and a buff stop that mutes the strings with leather to imitate a lute.

In France the double keyboards of the Flemish harpsichords were adapted to control different sets of strings - the so-called "expressive doubles" - and instruments by the Blanchet family and by Pascal Taskin are among the most admired.

In rock and pop: "Because" (The Beatles, on an electric harpsichord), "Lady Jane" (The Rolling Stones) and "Walk Away Renee" (The Left Banke).



A French double-manual harpsichord by Henri Hemsch, probably 1736 - an example of the type, not necessarily the instrument Kurzweil sampled. [9]

Sound character

Bright, metallic and plucked, rich in overtones, with a quick decay. Since the loudness does not change with the touch, the character is shaped by the registers and by the way of playing.

What Kurzweil sampled

Kurzweil describes a "French Harpsichord (five dispositions)": five combinations of registers. The sample is *Fr Harpsi* (360 MB) in the Forte and *FSE Harpsi* (56 MB) in the other keyboards. On the K2061 the FSE Harpsichord consists of three samples: one named L84U8, a lute stop and the key release.

4.3.3 Celeste

How a celesta works

The celesta - Kurzweil writes "Celeste" - is a keyboard instrument whose hammers strike graduated steel plates suspended over wooden resonators. It was invented by Auguste Mustel in Paris in 1886, sounds one octave higher than written and has a much softer, more subtle tone than the glockenspiel.

Tchaikovsky used it in "The Nutcracker" of 1892, in the "Dance of the Sugar Plum Fairy"; Bartok wrote "Music for Strings, Percussion and Celesta" in 1936.

In rock and pop: "Sunday Morning" (The Velvet Underground), "Baby It's You" (The Beatles) and "Title and Registration" (Death Cab for Cutie).



A celesta. [10]

Sound character

Soft, glassy and bell-like, with a quick decay; a gentle, music-box-like tone that sounds one octave higher than written.

What Kurzweil sampled

The sample is called *Celeste* (467 MB, versions v01 to v10) in the Forte, *FSE Celeste* (48 MB) in the other keyboards, and *Celesta* in the Classic Samples Library. Kurzweil does not say which celesta was recorded. On the K2061 the FSE Celeste consists of three samples, named V03, V06 and V09.

4.3.4 Which keyboard has what

Version	Forte	K2700	K2061 SP8	PC4 group	Artis	Layers	Size	Notes per layer	Channels	Length	Loop
Clav	✓	✓	✓	✓	✓	1	0.8 MB	11	mono	2 s	yes
Clav II	✓	✓	✓	✓	✓	1	2.3 MB	19	mono	3.5 s	yes
Harpsichord	✓	✓	✓	✓	✓	-	1.2 MB	12	mono	2.5 s	yes
Celesta	✓	✓	✓	✓	✓	1	0.1 MB	3	mono	0.9 s	yes
Clav CA	✓					8	457 MB	61	mono	19 s	tail only
Clav CB	✓					8	442 MB	61	mono	16 s	tail only
FSE Clav CA		✓		✓		3	82 MB	30 to 31	mono	18 s	tail only
FSE Clav CB		✓	✓	✓		3	80 MB	31	mono	16 s	tail only
Fr Harpsi	✓					-	360 MB	61	stereo	10 s	yes
FSE Harpsi		✓	✓	✓		-	56 MB	26 to 27	stereo	9 s	yes
Celeste	✓					10	467 MB	62	stereo	8 s	yes
FSE Celeste		✓	✓	✓		3	48 MB	20 to 22	stereo	8 s	yes

Model groups: K2061 SP8 = K2061, K2088 and SP8; PC4 group = PC4, PC4 SE, Forte SE and SP6. A harpsichord has no touch sensitivity; its samples are register combinations. Clav, Clav II, Harpsichord and Celesta are the samples of the Classic Samples Library. Length = median sample length. Loop: "yes" = the loop keeps a held note sounding; "tail only" = the sample plays its natural decay and only a short loop follows at the very end (practically unlooped); "no" = no loop.

4.4 Mallets and Percussion

The next samples in the overview are struck metal: glockenspiel, bells, chimes and crotales. The programs that use them are found in the category **Mallets** on the Forte; the PC4 generation has no Mallets category, there they sit in **Drums/Perc**, subcategory Percussion (ID 2).

4.4.1 Glockenspiel

The glockenspiel is a set of pitched bars of aluminium or steel in a keyboard layout, played with hard mallets; it is a metallophone, like the vibraphone. Its range is limited to the upper register, typically two and a half to three octaves, and it is often written two octaves below the sounding pitch.



A glockenspiel. [11]

The samples are *Glock* (37 MB) on the Forte and *Glock2* (37 MB) on the K2700 and the K2061/K2088; the K2061 object file shows that Glock2 carries the same audio as the Forte's Glock.

In rock and pop: "Little Wing" (Jimi Hendrix), "No Surprises" (Radiohead) and "Born to Run" (Bruce Springsteen).

4.4.2 Chimes

Chimes, also called tubular bells or orchestral bells, are metal tubes - usually brass - hung in a frame and struck on the top edge with a hammer. Their tuning depends on the length of the tube; a standard set spans about one and a half octaves.



A set of chimes by Yamaha Deagan. [12]

The Forte has *Chimes* (86 MB), the K2700 *Chimes2* (86 MB); the K2061/K2088 have none. The factory objects carry two different chime recordings under the name "Chimes": an older one that every keyboard has and a newer one on the Forte.

In rock and pop: "Tubular Bells" (Mike Oldfield) and, with chimes in the drum kit, "Xanadu" and "Closer to the Heart" (Rush).

4.4.3 Bells

Bells is in the Forte, the K2700 and the K2061/K2088 alike. Kurzweil only lists "Bells". What was sampled - handbells, orchestral bells or something else - is not documented. The factory objects include a keymap named "Bells alt tuning", so the bells are available in a second tuning. The sample measures 44 MB. The K2061's Bells carry the same audio as the Forte's.

4.4.4 Crotales

Crotales are small tuned discs of bronze or brass, about 10 cm across. They are struck with hard mallets, and can also be bowed; the sound resembles a small tuned bell, but brighter, with a much longer resonance. Modern sets are chromatic and span up to two octaves.

Kurzweil lists "Bowed and Hit Crotales": two ways of playing them. The Forte has *Bowed Crotales* and *Hit*, the smaller keyboards *FSE Crotales Bow* and *Hit* (86 MB each set). Programs that use the crotales hits find no sample on the PC3 family and the Artis, which have no crotales at all.

In rock and pop: "YYZ" (Rush), "Awaken" (Yes) and "I Am Trying to Break Your Heart" (Wilco).



Crotales. [13]

4.4.5 Which keyboard has what

Keyboard	Glockenspiel	Chimes	Bells	Crotales
Forte	Glock (37 MB)	Chimes (86 MB)	Bells (44 MB)	Bowed Crotales | Hit (86 MB)
K2700	Glock2 (37 MB)	Chimes2 (86 MB)	Bells (44 MB)	FSE Crotales Bow | Hit (86 MB)
K2061 / K2088, SP8	Glock2 (37 MB)	-	Bells (44 MB)	FSE Crotales Bow | Hit (86 MB)
PC4, PC4 SE, Forte SE, SP6	-	-	-	FSE Crotales Bow | Hit (86 MB)

A dash: no sample of that name - the older Chimes of the Classic Samples Library are on every keyboard.

4.5 Vector Synthesis Waveforms

At the top of the overview there is one more group, which belongs to the Synths rather than to an acoustic instrument: the **VS Waves**. Kurzweil lists these "Vector Synthesis Waveforms" among its instrument samples and uses them as raw material for synth programs.

In the overview the Forte has **VS Waves (115)** and the smaller keyboards the single waves **FSE VS Wave 115** and **FSE VS Waves 34, 56, 89 and 122**.

In rock and pop: the Prophet VS shaped Prince's album "Sign o' the Times", for example in "If I Was Your Girlfriend", "U Got the Look" and "Play in the Sunshine".



The Sequential Circuits Prophet VS of 1986. [14]

"Vector synthesis" is the method of the Sequential Prophet VS of 1986, which mixes four oscillators with a joystick and holds 127 single-cycle waveforms numbered 0 to 126. The VS Waves are samples of these waveforms; the numbers 34, 56, 89, 115 and 122 are available in the new keyboards.

Keyboard	Sample	Size
Forte	VS Waves 115	4.5 MB
K2700, K2061 / K2088, SP8, PC4, PC4 SE, Forte SE, SP6	FSE VS Wave 34	2.8 MB
	FSE VS Wave 56	2.8 MB
	FSE VS Wave 89	2.8 MB
	FSE VS Wave 115	1.6 MB
	FSE VS Wave 122	4.0 MB

The sizes are rounded; the five FSE waves together measure 14.1 MB.

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