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# About the Instruments

## Q. What are the EX5, EX7, and EX5R?

**A.** The EX5 is a 76-key synthesizer, the EX7 is a 61-key synthesizer, and the EX5R is a rack-mountable tone generator module. Except for having or not having a keyboard, and minor controller differences, the EX5 and EX5R have essentially the same features and functions. The EX7 is a simpler version of the EX5, with differences in tone generator structure and features.

[Details](#)

## Q. What is the maximum polyphony of the EX instruments?

**A.** The EX5 and EX5R AWM tone generator sections have a maximum polyphony of 126 notes, plus the output from the VL, AN, and FDSP tone generator sections. The maximum polyphony of the EX7 is 64 notes from the AWM tone generator stage plus the output from the AN and FDSP tone generator stages. The actual polyphony, however, will depend on the tone generator stages used simultaneously, the number of elements used in voices, and effect settings. The number of notes available decreases in proportion to the number and type of elements used. For example, If an EX5 or EX5R voice uses two AWM elements, the maximum polyphony is 64 (in the same situation on the EX7, maximum polyphony would be 32).

Voice Type	EX5/5R Polyphony	EX7 Polyphony
AWM/Drum*	126	64
VL+AWM	1+AWM	—
FDSP	16	8
AN(Poly)+AWM	2+AWM	1+AWM
AN(Layer)+AWM	1+AWM	—
AN+FDSP	AN: 1; FDSP: 8	—

\*Please note that the actual polyphony may be reduced under certain conditions.

# About the Tone Generation System

## Q. What is Extended Synthesis?

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**A.** Each EX family synthesizer incorporates multiple highly-acclaimed synthesis engines from Yamaha, with which is most appropriate for your desired sound you can play the instrument.

[Details](#)

## Q. What is AWM Synthesis?

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**A.** AWM (Advanced Wave Memory) is one of popular synthesis from Yamaha, that enables sound creation using sampled waveforms provided (preset). AWM provides you an advantage of realistic and natural reproduction. Even more, the EX family synthesizers allow for user sampling to add a new waveform and use it with AWM as well as preset ones. With the EX, you get virtually unlimited expandability in AWM waveforms.

Please, listen to the Audio Track No. #05 Pf: Natural Grnd, #09 Or: Jimmy Perc and #15 Gt: Steel.

[Details](#)

## Q. What is VL?

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**A.** VL refers to the name of another musical instrument product from Yamaha, and actual name of the synthesis adopted to that product and EX is VA (Virtual Acoustic). Based on a DSP (digital signal processing) technology, VA synthesis can create a virtual musical instrument that is called a physical model, simulating an instrument itself, not its sound or timbre. Simulated instruments such as sax or flute (wind instruments), guitar or violin (string instrument) are especially highly acclaimed in its realistic sound. This innovative synthesis is available with the EX5 and EX5R.

Please, listen to the Audio Track No. #12 Br: Trumpet.

[Details](#)

## Q. What is AN synthesis?

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**A.** AN is a synthesis that fully simulates an analog synthesizer based on a DSP technology called Analog Physical Modeling. AN synthesis has an advantage to create a fat and heavy lead or bass sound.

Please, listen to the Audio Track No. #17 Ba: Boogie On A.

[Details](#)

## Q. What is FDSP synthesis?

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**A.** FDSP (Formulated Digital Sound Processing) synthesis has advantages of VA-based physical modeling and AWM technologies and implementation of their natural time variance of timbre and realistic tone. Using 10 different types of FDSP, including simulations for electric piano and electric guitar pick-ups, you can create a realistic sound or an unprecedented effect in many nuances.

Please, listen to the Audio Track No. #07 Pf: Jazz Chorus, #08 Pf: Chorus Bell and #20 Pd: Silverlake.

[Details](#)

## Q. Can VL and AN voices be used together in a performance setup?

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**A.** Unfortunately, no more than one DSP-based synthesis engine (VL, AN) can be used at a time. But you can use the EX sampling feature to sample the VL and/or AN sounds you want to use, and then use them in AWM elements.

# About the Voices

## Q. How many voices are there?

**A.** The EX5, EX7, and EX5R come with 512 preset voices (265 preset + 256 internal), and 128 performance setups. The internal voices and performance setups can be edited and rearranged as required.

## Q. What types of voices are provided?

**A.** When initially shipped the EX Preset banks contain a range of keyboard type voices, while the Internal banks contain a variety of voices which are ideal for dance music. Thanks to the Extended Synthesis system and the EX series sampling capability, these instruments are capable of producing an extraordinary range of sounds suited for use in dance music, pops, rock ... even jazz and classical genres.

Several voice demonstration are provided as audio tracks on this CD-ROM. Play these demos on a standard audio CD player for maximum quality. The best way to hear the extraordinary range of voices available, however, is to actually play them on the EX series instruments.

## Q. What do the characters preceding the voice and performance names mean?

**A.** The two characters preceding the voice and performance names indicate the voice “category,” and are useful for identifying and locating specific types of voices.

LCD	Category	LCD	Category
--	No Assign	<b>Pd</b>	Synth Pad
<b>Pf</b>	Piano	<b>Fx</b>	Synth Sound Effects
<b>Cp</b>	Chromatic Percussion	<b>Et</b>	Ethnic
<b>Or</b>	Organ	<b>Pc</b>	Percussive
<b>Gt</b>	Guitar	<b>Se</b>	Sound Effects
<b>Ba</b>	Bass	<b>Dr</b>	Drums
<b>St</b>	Strings/Orchestral	<b>Sc</b>	Synth Comping
<b>En</b>	Ensemble	<b>Vo</b>	Vocal
<b>Br</b>	Brass	<b>Co</b>	Combination
<b>Rd</b>	Reed	<b>Wv</b>	Material Wave
<b>Pi</b>	Pipe	<b>Sq</b>	Sequence
<b>Ld</b>	Synth Lead		

**Details**

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## Q. Is the VOICE mode for simple voice sounds?

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**A.** Up to 4 elements can be used in a single Normal Voice, so extremely complex sounds can be produced in the VOICE mode. In addition, 2 voice “scenes” can be specified to allow advanced real-time voice variation. Voice can be layered in the PERFORMANCE mode, and Drum Voices which have a different structure from the Normal Voices are provided for even more versatility.

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## Q. What is the structure of Drum Voices?

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**A.** A single Drum Voice can have as many as 128 different elements. Normally these would be different drum and percussion instruments assigned to different keys of the keyboard. Sampled data can also be used, so instead of simple drum sounds you can assign loops and break beats to different keys as required. And since different filter settings can be applied to each of the 128 elements, extremely precise sound control is possible.

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## Q. When is the PERFORMANCE mode most useful?

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**A.** When using the sequencer to play up to 16 voices with individual settings, or when layering 2 voices for a thicker sound, or when programming a split keyboard setup. This mode also provides a range of MIDI settings which give the EX5 and EX7 advanced MIDI master keyboard capabilities.

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## Q. What is the preset wave capacity?

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**A.** 16 megabytes. But thanks to advanced Yamaha compression technology, this is actually equivalent to about 29 megabytes of uncompressed wave memory. 1 megabyte of sampling DRAM is also provided with the basic EX configuration.

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## Q. How can I initialize the memory?

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**A.** Turn the power on while holding the [EXIT] button. This erases all internal voice, performance, system, and MIDI parameters. To restore the initial factory settings, use the supplied floppy disk.

# About Sampling

## Q. Do the EX instruments have sampling capability?

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**A.** Yes. Sampled waveforms can be used in AWM and drum voices. The EX Key Map feature also makes use of sampled waveforms.

## Q. What is the sampling frequency?

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**A.** Samples are recorded by the EX instruments at 44.1 kHz. Samples read from AKAI®, AIFF or WAV files, however, can be of any standard sampling frequency.

## Q. Is the sampling memory expandable?

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**A.** In addition to the 1 megabyte of DRAM initially provided, two SIMM slots are provided for up to an additional 64 megabytes (65 megabytes total). The optional EXFLM1 board can also be installed for an additional 8 megabytes of non-volatile sample memory.

## Q. What type of expansion SIMMs can be used?

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**A.** A pair of 72-pin DRAM SIMMs are required, each with a capacity of 4, 8, 16, or 32 megabytes.

### Precautions When Purchasing DRAM SIMMs

## Q. Is waveform editing software available?

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**A.** The latest version of the Yamaha freeware TWE for Windows and Macintosh can be used. This application was originally released for use with the Yamaha CBX-D3/5 HD Recorder and A3000 sampler.

## Q. Are the EX instruments compatible with A3000 data?

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**A.** A3000 Program Voices cannot be used by the EX instruments, but files can be transferred back and forth using AIFF or WAV format. If you have the Yamaha TWE installed on your computer, it is most convenient to transfer sample files via the computer. Since the A3000 is a dedicated sampler which uses a different sampling system from the EX instruments, no direct compatibility is provided.

## Q. Can the EX instruments load and use AKAI® format samples?

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**A.** Yes. AKAI®, AIFF, and WAV files can be read and used as required.

# About the Features

## Q. Does the Arpeggiator only work in the VOICE mode?

A. The Arpeggiator can be used in both the VOICE and PERFORMANCE modes.

## Q. Is there a Micro Tuning function?

A. A total of 32 preset Micro Tunings are provided.

No.	Type	Key	Comments
00	Equal temperament	—	The "compromise" tuning used for most of the last 200 years of Western music, and found on most electronic keyboards. Each half step is exactly 1/2th of an octave, and music can be played in any key with equal ease. However, none of the intervals are perfectly in tune.
01~12	Pure major	C-B	This tuning is designed so that most of the intervals (especially the major third and perfect fifth) in the major scale are pure. This means that other intervals will be correspondingly out of tune. You need to specify the key (C-B) you will be playing in.
13~24	Pure minor	A-G#	The same as Pure Major, but designed for the minor scale.
25	Werckmeister	—	Andreas Werckmeister, a contemporary of Bach, designed this tuning so that keyboard instruments could be played in any key. Each key has a unique character.
26	Kirnberger	—	Johan Philipp Kirnberger was also concerned with tempering the scale to allow performances in any key.
27	Vallotti & Young	—	Francescantonio Vallotti and Thomas Young (both mid-1700s) devised this adjustment to the Pythagorean tuning in which the first six fifths are lower by the same amount.
28	1/4 shifted	—	This is the normal equal tempered scale shifted up 50 cents.
29	1/4 tone	—	Twenty-four equally spaced notes per octave. (Play twenty-four notes to move one octave.)
30	1/8 tone	—	Forty-eight equally spaced notes per octave. (Play forty-eight notes to move one octave.)
31	Indian	C-B	Usually observed in the Indian music (white keys [C-B] only).

## Q. What can be done with the Controller Set feature?

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- A.** A voice can include up to 16 controller sets, each of which is a combination of one or more assignable controllers like Knob and/or Modulation Wheel with a controllable function. By fully utilizing 16 controller sets, you can have a variety of sound controls for unexpected realtime effects.

**Details**

## Q. What can be done with the Key Map feature?

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- A.** Pattern sequence data and sampled waveforms can be played via different keys on the keyboard. For example, hi-hat and snare patterns could be triggered from different keys, sampled loops can be played back with sequenced patterns, and more.

**Details**

## Q. How many songs can be handled by the Song Sequencer?

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- A.** Only one song can be maintained in internal memory at one time. Sequential playback of more than one song without delays between songs can be accomplished using Standard MIDI File type 0 data on disk with the EX SMF Direct Play function.

## Q. What is a "scene"?

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- A.** The positions of all six control knobs can be memorized in the VOICE or PERFORMANCE mode and instantly recalled as required.

## Q. What is convenient about the Controller Knobs?

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- A.** By assigning appropriate parameters to each knob, they can make voice editing easy and intuitive, allow editing several parameters at once, and more. Operations that would normally necessitate going through several display layers can be accomplished easily and in real time while playing.

The EX series instruments provide a wide range of assignable controllers in addition to the 6 controller knobs for unprecedented control versatility.

## Q. Is it difficult to make the required knob assignments?

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- A.** When initially shipped the knobs are pre-assigned to a range of appropriate voice parameters and can be used immediately without programming. The preset assignments can be used as a starting point for your own settings.

## Q. Can the EX controllers be used to control external instruments and MIDI devices?

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- A.** Yes. All controllers can be used to transmit appropriate MIDI data.



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**Q. Is arpeggiator data transmitted via MIDI?**

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**A.** Yes. Arpeggiator data can be transmitted via any specified MIDI channel.

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**Q. Can the EX sequencer play SY99 song data?**

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**A.** Yes. The EX instruments handle SMF data as well as Yamaha's own ESEQ format, so SY99 song data (ESEQ format) can be played directly.

# Other Points

## Q. What does the “DSP Resource Full !!” alert display mean?

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**A.** The EX series instruments employ DSP technology for outstanding voicing and effect capability. The available DSP capacity is not unlimited, however, and the “DSP Resource Full !!” alert will appear when this capacity is exceeded.

**Details**

## Q. Is a voice editor available?

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**A.** At the current time Yamaha has no plans to release a freeware voice editor application.

## Q. Are the EX instruments XG Format and GM compatible?

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**A.** No. Such compatibility has been omitted in order to provide the highest possible quality and music production power possible.

## Q. What does “SONDIUS-XG” on the EX panel mean?

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**A.** Sondius-XG is a license program developed by Yamaha and Stanford University, joint owners of patents related to Virtual Acoustic Synthesis. Thus the Sondius-XG logo is displayed on the EX5 and EX5R, but not on the EX7 because it does not include VL tone generation.

## Specifications

		EX5	EX5R	EX7
Keyboard	Type	Regular 76 keys	—	Regular 61 keys
	Touch Response	Velocity sensitive / Aftertouch	—	Velocity sensitive / Aftertouch
Tone Generator	Synthesis type	AWM, VL, AN, FDSP, Sampling(44.1KHz)		AWM, AN, FDSP, Sampling(44.1KHz)
	Polyphony	128		64
	Voice	512 (Preset 256 / Internal 256) *Up to 4 elements for each Normal voice / up to 128 elements for Drum voice		
	Voice Type	AWM / VL+AWM / FDSP / AN+AWM / AN+FDSP / Drum		AWM / FDSP / AN+AWM / Drum
	User Wave	*Sampled Wave available in AWM and Drum mode		
	FDSP Type	1MB DRAM *Optionally expanded up to 72MB (64MB SIMM + 8MB Flash Memory)		
	Performance Voice	EP Pickup / EG pickup / Water / PWM / Flange / Phaser / Self FM / Tornado / Ring Mod / Seismic(10 types)		
	Multitimbres	Internal 128		
	Others	16 parts		
Effects	Reverb	Micro Tuning setting available, Voice Category Search function		
	Chorus	12		
	Insertion	17		
Song Sequencer	Track	79		
	Capacity	16 + Pattern/Play Effect/Tempo		
	Song Number	Approx. 30000 notes		
	Recording Mode	1		
	Format	Multi / Step / Overdub / Replace / Punch In		
	Note Resolution	SMF Format 0 for SAVE and LOAD / SMF Format 1 and ESEQ for LOAD only		
	MIDI Sync	1/480 per beat		
Pattern Sequencer	Track	Internal / MIDI Clock / MTC		
	Pattern	8		
	Recording Mode	User 50		
	Note Resolution	Multi / Step / Overdub / Replace		
Key Map	1 User kit of up to 128 samples / patterns *Complete 8 track patterns, single pattern tracks, or sampled waves can be assigned to each key.			
Arpeggiator	Arpeggiator Type	Preset 50 / User 50		
	Recording Mode	Step / Overdub / Replace		
	Track	4		
	Note Resolution	1/480 per beat		
SMF Direct Play	SMF Format 0 direct playback available			
Display	LCD	64 x 240 (Backlit) with Contrast knob		
Connectors & Terminals	Headphone	1/4" Stereo Phone		
	Output	1/4" Phone x 2		
	Standard Individual Output	1/4" Phone x 2		—
	A/D Input	1/4" Phone x 2		1/4" Phone x 1
	MIDI	2 IN / 2 OUT / THRU	IN / OUT / THRU	
	Sustain	1 Assignable	—	1 Assignable
	Foot Switch	1 Assignable	—	1 Assignable
	Foot Controller	1 Assignable	—	1 Assignable
Storage	Foot Volume	1 Assignable	—	1 Assignable
	Internal FDD	3.5" 2HD/DD		
Controllers	SCSI Devices	Optional SCSI devices available via optional ASIB1		
	File Type	All Data / Synth All / Voice / Wave / SMF / SONG / Pattern / Arpeggio *SMF Format 1/ ESEQ / AIFF / WAVE / AKAI® format Loading only		
	Pitch Bend	1	—	1
Included Accessories	Modulation	2	—	2
	Control Knob	6 Assignable		
	Ribbon Controller	1 Assignable	—	1 Assignable
	Breath Controller	1 Assignable		
	Scene Control Switch	2		
	Master Volume	1		
	A/D Input Gain	1		
	Rotary Encoder	1		
Options	Flash Memory board	Owners Manual, Demo disks		
	SIMM	1 pair of EXFML1 Flash Memory Board (8MB; 2 x 4MB)		
	Individual Output	1 pair of 72-pin DRAM SIMMs (Max 64MB; 2 x 32MB)		
	Digital Output	EXIDO1 Individual Output Board for Additional 4 Output Expansion		
	SCSI	EXDGO1 Digital Output Board for AES/EBU with Word Clock In ASIB1 SCSI Interface for 50-pin Half Pitch connector *EXIDO1 and EXDGO1 cannot be installed simultaneously.		
Dimensions	1268(W) x 407(D) x 129(H) mm (49 1/8" x 16" x 5 1/12")	480(W) x 397(D) x 138(H) (18 7/8" x 15 2/3" x 5 5/12")	1061(W) x 407(D) x 129(H) mm (41 3/4" x 16" x 5 1/12")	
Weight	20 kg (44 1/8 lbs.)	9.8 kg (21 5/8 lbs.)	15 kg (33 1/8 lbs.)	

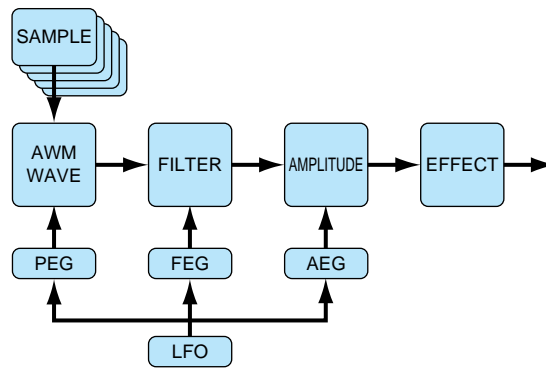


## ■ AWM Synthesis

AWM, or “Advanced Wave Memory,” is Yamaha’s original system for effectively using sampled waveforms in synthesizers and tone generators. Although the basis for all AWM voices is a sampled waveform — a sample of a “real” existing instrument, a classic synthesizer sound, or other electronically created sounds — the AWM system provides an extensive range of envelope generator, filter, modulation, and other parameters which can be applied to the basic waveform. Furthermore, up to four elements, each with its own “wave” and a complete set of editable parameters, can be assigned to each voice. The strength of AWM synthesis lies not only in its outstanding sound quality (it uses 16-bit, 44.1 kHz samples), but also in its extraordinary ability to “shape” and control the sound of the samples.

AWM synthesis also allows the creation of “drum voices” in which different drum and percussion instruments with individual volume, pitch, and timbre parameters can be assigned to individual notes of the keyboard (from C-2 through G8).

The EX5, EX5R, and EX7 feature a built-in sampling system which is capable of sampling sounds from external sources (line or microphone) as well as internal voices. Waveforms sampled using this feature can be used in AWM voices, so your capacity to create totally new AWM voices is truly unlimited.

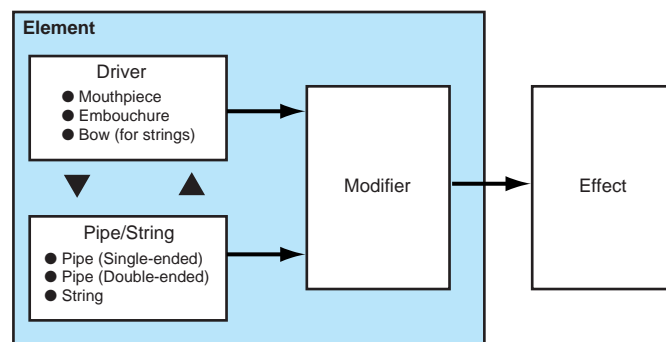


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## ■ Virtual Acoustic Synthesis (EX5 and EX5R only)

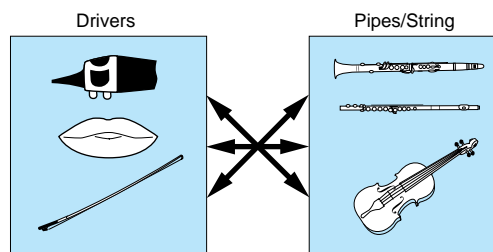
Yamaha’s Virtual Acoustic (“VL”) Synthesis tone generation system does not use oscillators, function generators, preset waveforms or samples to produce sound. Rather, it applies sophisticated computer-based “physical modeling” technology to musical sound synthesis. In the same way that computer “models” are used to simulate weather systems or the flight characteristics of aircraft in the design stage, the VL system simulates the very complex vibrations, resonances, reflections and other acoustic phenomena that occur in a real wind or string instrument.

VL synthesis offers many advantages in terms of musical performance. Not just in terms of sound, but also in terms of the “behavior” that makes acoustic instruments so “musical.” For example, simply playing a note in the same way does not always produce precisely the same sound — the instrument is responsive and “alive.” Rather than simply controlling parameters like volume or pitch, you can control characteristics such as breath and reed pressure with appropriate complex effects on the timbre of the sound.



### The VL “Instrument” or “Wave”

The VL “instrument” or “wave” defines the fundamental tone or timbre of the sound. The instrument model consists primarily of a driver — the reed/mouthpiece, lip/mouthpiece, or bow/string system — and a resonant system corresponding to the tube and air column or string. One of the remarkable features of the Virtual Acoustic Synthesis system is that just about any driver can be used with any type of pipe or string. The EX5/5R provides a range of 272 preset VL “waves” which integrate all of the necessary characteristics, and which can be assigned to voice elements in much the same way as AWM waves (VL voices can have 1 VL element plus up to 3 AWM elements).



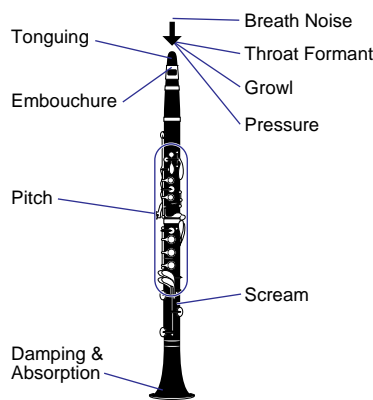
### Controllers & Modifiers

The input to an acoustic wind instrument comes from the player’s lungs, trachea, oral cavity, and lips. In a string instrument it comes from the player’s arm movement, transmitted to the string via a bow. These factors actually form an important part of the sound generating system and, in the VL model, are known as “controllers” (note that these are parameters, not physical controllers like the modulation wheels or knobs). The player also influences the sound of the instrument by playing the keys, tone holes, or frets, and this aspect of control constitutes another part of the “controllers” system.

In essence, the controller parameters determine how the instrument “plays.” All of these parameters can be assigned to any external controller that can be used with the EX5 and EX5R: Foot Controller, Modulation Wheel, Controller Knobs, Ribbon Controller, Breath Controller, etc. The pressure parameter, for example, could be assigned to a breath controller so the player can control the dynamics of the instrument by varying the breath pressure applied to the controller — a natural, instinctive way to play wind-instrument voices. At the same time the growl and throat parameters might also be assigned to the breath controller in order to achieve life-like response and effects.

Modifiers, such as the Harmonic Enhancer and Dynamic Filter, are applied after the VL controllers. Although these may appear to be simple effects, they are actually intimately related to the VL sound-producing model and have a significant effect on the sound.

Some of the controller and modifier parameters provided by the EX5 and EX5R are listed in the chart below.

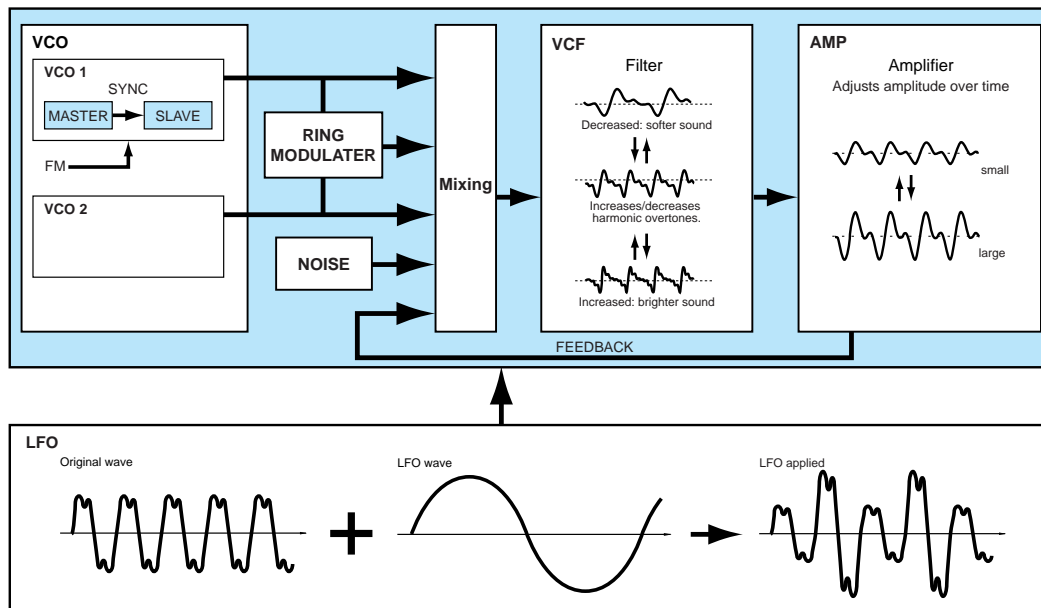


<b>Throat Formant</b>	Controls the characteristics of the "player's" throat or bowing arm.
<b>Pressure</b>	The amount of breath pressure applied to the reed or mouthpiece, or bow velocity applied to the string.
<b>Growl</b>	A periodic pressure (bow velocity) modulation which produces the "growl" effect often heard in wind instruments.
<b>Embouchure</b>	The tightness of the lips against the reed or against each other, or the force of the bow against the string.
<b>Tonguing</b>	Simulates the half-tonguing technique used by saxophone players by changing the "slit" of the reed.
<b>Pitch</b>	Changes the length of the air column or string, and thereby the pitch of the sound.
<b>Scream</b>	Drives the entire system into chaotic oscillation, creating effects that can only be achieved with physical modelling technology.
<b>Breath Noise</b>	Adds breath noise to produce exceptionally realistic effects with many wind instruments.
<b>Damping &amp; Absorption</b>	Simulates the effects of air friction in the pipe or on the string, and of high-frequency losses at the end of the pipe or string.
<b>Harmonic Enhancer</b>	The Harmonic Enhancer determines the harmonic structure of the sound to the extent that it can produce radical timbral variations within an instrument "family" (e.g. saxes).
<b>Filter</b>	This modifier is similar to the dynamic filters found in many conventional synthesizers, with high-pass, bandpass, band elimination, and low-pass modes.

## ■ AN Synthesis (Analog Physical Modeling)

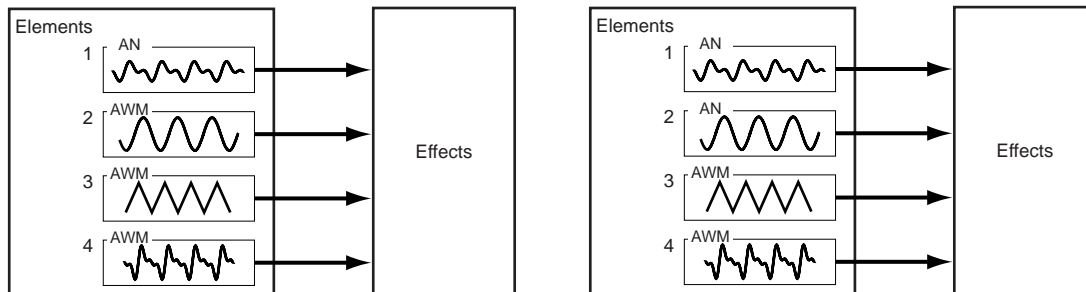
Although synthesizers have come a long way since the days of VCOs (Voltage Controlled Oscillators), VCFs (Voltage Controlled Filters), and VCAs (Voltage Controlled Amplifiers), modern digital tone generators can't quite reproduce the punch, power, and interactive control capabilities of such older systems. Yamaha AN Synthesis (Analog Physical Modeling), however, offers all the benefits of traditional analog synthesis with the stability, reproducibility, and precise control of digital technology. It is capable of accurately reproducing the sound of classic analog synthesizer without patch cables, setting charts, or the frustrating instability that was the bane of the analog age. AN Synthesis also offers many features that were simply not possible in pure analog systems. It is, for example, also capable of FM synthesis similar to the type that made the legendary Yamaha DX7 one of the most popular synthesizers of all time.

In addition to single-element AN voices, the EX5 and EX5R allow two AN elements to be layered to create even thicker analog synth sounds.



### AN (Poly)+AWM Voices / AN (Layer)+AWM Voices

As shown in the diagrams below, a single AN element can be combined with up to three AWM elements in AN(Poly)+AWM voices. In the EX5 and EX5R, two AN elements can be combined with up to two AWM elements in AN(Layer)+AWM Voices. AN + FDSP voices are described in the FDSP Synthesis section, below.



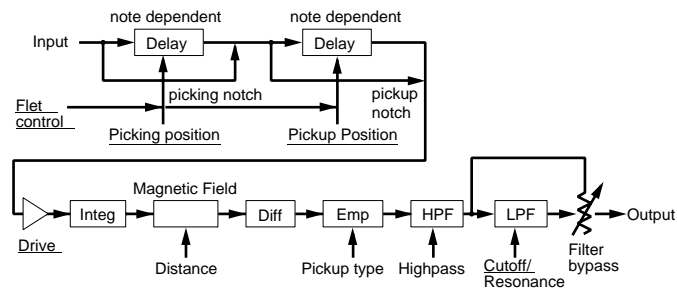
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## ■ FDSP Synthesis (Formulated Digital Signal Processing)

FDSP, or “Formulated Digital Sound Processing,” is actually an adjunct to AWM synthesis. It adds a sophisticated note-dependent effect processor to the basic AWM synthesis system. In contrast to a standard effect stage, the FDSP synthesis stage uses individual note and velocity data to control effect parameters, thus making it possible to simulate the characteristics of a number of real-world musical components, as well as produce totally new effects. For example, FDSP can effectively model the frequency and velocity dependent characteristics of electromagnetic guitar or piano pickups, thus adding more realistic response to these types of voices, or adding a whole new dimension to other sounds. It can also alter the delay time of flange or chorus type effects according to the note played, thus producing totally new sounds that are responsive and “alive.” Many other effects are possible.

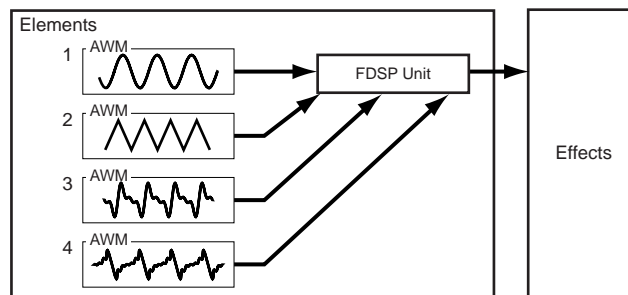
### FDSP System Overview

This block diagram is only one example of an FDSP configuration. In this case the FDSP system is used to model the response of an electric guitar pickup.



### FDSP Voice Element Structure

In an FDSP voice up to four AWM elements can be fed to the FDSP stage or routed directly to the normal effect stage as required.



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## ■ Selecting By Category

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In both the Voice and Performance modes the [F7] function key is marked “[CTG],” for “Category.” Press the [CTG] function key to select voices belonging to the same category (e.g. all piano voices in the “PF” category) in sequence, beginning with the currently selected voice.

**B a c k**

## ■ Precautions When Purchasing DRAM SIMMs

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Some of the commercially available DRAM SIMMs may not work on the EX5/5R/7. Yamaha cannot be held responsible for malfunction of DRAM SIMMs. BEFORE purchasing, please consult (which to buy) the shop where you bought EX5/5R/7 or your nearest Yamaha (or the authorized distributor) listed at the end of owner's manual.

Important Notices About DRAM SIMM Type/Configuration.

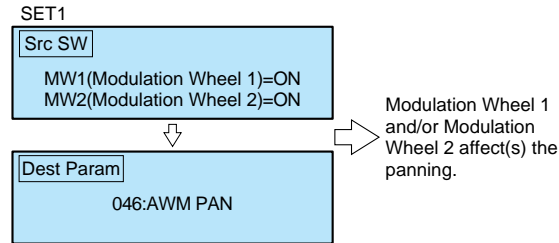
- You need to use 72-pin DRAM SIMMs (4, 8, 16, 32MB) with the same memory capacity in pairs.
- You need to use DRAM SIMMs with access time of 70ns or less.
- Both types, parity and non-parity types can be used. It is also possible to use the EDO type.
- DRAM SIMMs corresponding to ECC cannot be used.
- For the EX5/7 (keyboard), you need to use DRAM SIMM with its height less than 32mm.
- Yamaha recommends to select the DRAM SIMMs that meet the standard specification for internal configuration set by the JEDEC\*. However, be aware that the recommendation does NOT always assure that the DRAM SIMMs operate with the EX5/5R/7.

\* The JEDEC (Joint Electron Device Engineering Council) is a technical electronic device association. This association sets regulations for standard terminal configuration in electronic devices.

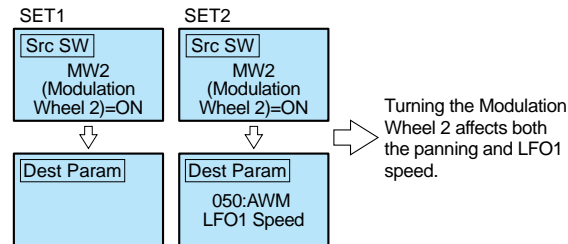


## ■ Example

Suppose that Control Set 1 has a combination of MW1 (Modulation Wheel 1) as Src and LFO1 PWD (LFO1 Pitch Modulation Depth) as Dst when Control Set 2 has a combination of MW1 as Src and Pan as Dst. As rotating Modulation Wheel 1 upward, you will have a double effect like a sound panned left to right while the pitch modulated deeper. This is a typical example using multiple controller sets to control multiple Dst from a certain Src.



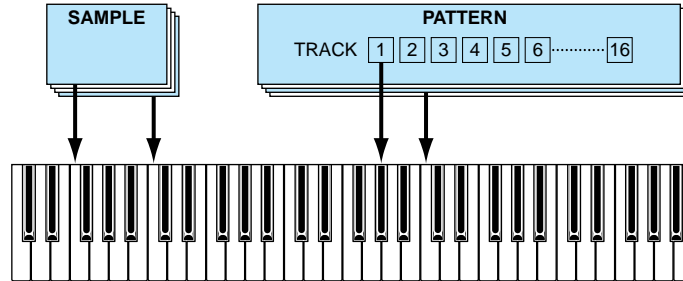
Suppose another case that you have a certain control set that combines MW1 and FC (Foot Controller) as Src and LFO1 PMD as Dst. This enables for a pitch modulation effect from both Modulation Wheel 1 and Foot Controller so that you may use a more convenient one depending on a performing situation. This is a typical example using multiple Srcs (sources) to control a single Dst, and it is available with a single controller set.



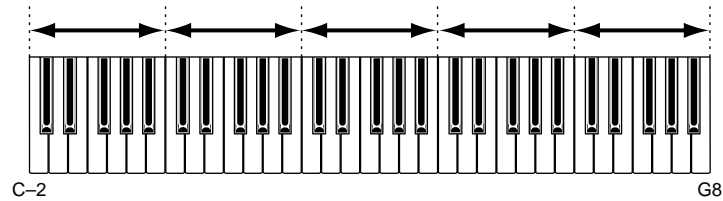
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## ■ The Key Map Mode

The EX Key Map mode allows you to assign individual samples, patterns, or pattern tracks to different keys of the keyboard, from C-2 to G8. The assigned samples and/or patterns can then be played via the EX5/EX7 keyboard, or via an external sequencer or other MIDI controller on all models. Key Mapping makes it possible, for example, to combine playback of looped rhythm samples with patterns to create new rhythmic textures that can be controlled “live”, in real time.



The Key Map mode can also be used for multi-sampling with wide-range instruments such as piano or guitar. Several samples from different ranges of the instrument can be assigned to corresponding ranges of the keyboard for natural-sounding pitch and timbral variation throughout the reproduced range.



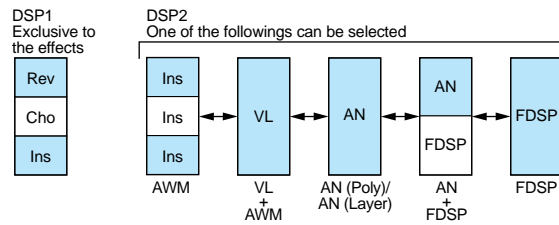
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## ■ DSP Limitations

The DSP (Digital Signal Processing) system used to create the EX effects is also used by the AN, FDSP, and VL (EX5/5R only) tone generators to create voices. This means that less DSP capacity is available to produce effects when the aforementioned voice types are used. This imposes limitations which are different for the EX5/5R and EX7. The Reverb and Chorus effect units function normally regardless of the type of voice used.

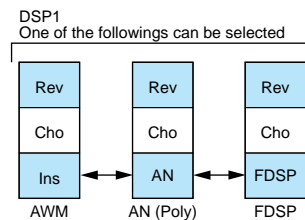
### EX5/5R

There are no limitations to using insertion effects in the EX5 or EX5R Voice mode. In the Performance mode, however, insertion effects can be used on a maximum of 4 parts (voices) if the performance setup consists entirely of AWM voices. If a VL, AN, or FDSP voice is used in the performance setup, however, an insertion effect can only be used on one part (voice).



### EX7

In the EX7 Voice mode, Insertion effects can be used in AWM voices, but not in any other voice type (AN or FDSP). In the Performance mode, if the performance setup consists of only AWM voices, then an insertion effect may be used on one voice. But if the performance setup includes an AN or FDSP voice, then no insertion effects can be used.



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