



S90 Synthesis Glossary

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YAMAHA S90 Glossary

A/D: Analog to Digital – this describes the input jack on the back panel and lets you bring signal from a microphone or line input and use the onboard effects and routing to process the signal. The input jack is a single stereo jack that sums the input to mono (L+R=mono) @ 24-bit A/D converter. This input can be applied to the PLG100-VH board for Vocal Harmony processing when in Performance or SeqPlay Mix modes.

AEG: Amplitude Envelope Generator. Controls the change in volume (amplitude) over time. Traditionally, referred to as 'ADSR' – attack-decay-sustain-release, when it concerns amplitude (volume). The envelopes in S90 are time and level - based. See [EG](#), [FEG](#), [PEG](#)

Algorithm: An Algorithm is a formula or recipe that yields a result. A special method of solving a certain kind of problem. Algorithm is used when talking about different effect processor setups. Each effect *algorithm* delivers a unique result. The word *Algorithm* is most frequently associated with the FM synthesis technology found in the Yamaha DX7, now available on the PLG150DX plug-in synthesis module. Algorithm refers to one of 32 different arrangements of operators in the PLG150DX. See [Carrier](#) and [Modulator](#).

AN: Yamaha's proprietary analog synthesis technology utilizing physical modeling. The synth engine is based on Yamaha's powerful and award-winning AN physical modeling synthesis. The synth features a filthy, fat and punchy 5 note polyphonic synthesizer with 6 fully resonant [filter](#) types, 2 [VCOs](#), 2 [LFOs](#), a [VCA](#), [EG](#) for pitch, amplitude and filter and an effects processor capable of producing delay, flanger, phaser and distortion effects. You can sync the VCOs to create that classic oscillator sync sound and apply noise via the separate noise generator. A unique FM parameter allows you to create a carrier/modulator arrangement of the VCOs in a way that was simply not possible in analog synthesizers of the past. Originally introduced in the AN1x synthesizer, it is now available on the

PLG150-AN plug-in synthesis module. See [MSPS \(Modular Synthesis Plug-in System\)](#).

Arpeggiator: A set of prerecorded note and/or controller information that, when engaged, triggers a musical phrase without requiring that the player actually perform the phrase in real time. Arpeggios can be up and down note flourishes, finger picked guitar gestures, drum grooves, flute trills, Cuban Montuno piano grooves, synth bass lines with filter sweeps, etc. In the S90, the arpeggiator is not just a simple note flourish: It can be a complete musical gesture. This is one of the compelling aspects of the Motif, S90, EX, S80, S30, CS6x, and CS2x to name a few. Data generated in conjunction with the Arpeggiator can be divided into the note data that is input and the note data that is output. These can be sent on different MIDI channels to the MIDI out.

Assignable 1 and 2: A user configurable set of parameters can be assigned per VOICE via the Voice mode Control Sets. They can be assigned to specific parameters internally and separately assigned a Control Change message for transmission out via MIDI.

Assignable A and B: A user configurable set of parameters that can be accessed when the Control Function LED is illuminated on the ASSIGN row of functions. Assignable A and B are settings that are 'global' for the S90 (they will always affect the assigned parameters). The parameters are set in UTILITY mode. They can be assigned to specific parameters internally and separately assigned a Control Change message for transmission out via MIDI.

Assignable L and R: User configurable outputs. These can be used as a second stereo pair or as individual L-mono or R-mono outputs. Signal routed to the assignable outputs bypasses the onboard effects. The Assignable L and R can be used in Performance and SeqPlay Mix modes. Output assignments made to individual DRUMS in a USER Drum Voice will be recalled when that user kit is used in a Performance or Mix **and** the PART is set to OUTPUT SELECT = "drum".

Attack: The first segment of an envelope (ADSR). How an envelope begins. See [EG](#)

AWM2: AWM is Advanced Wave Memory and is Yamaha's proprietary method of storing PCM sampled data. The latest version is AWM2 – all references to AWM are AWM2.

Bank Select MSB/LSB: Control Change messages that are used in combination to select various Voice banks. MSB is Control #000, and LSB is Control #032. MSB will select S90 Normal or Drum Voice type, and LSB will select Voice Memory banks (Pre1, Pre2, etc.). The messages when followed by a Program Change event will select the corresponding Voice in the selected Memory bank.

Board Voices: This is a sound that is resident on a PLG150 series board in one of several possible banks. It is treated as raw data from which you can create a completed S90 Plug-in Voice (see Plug-in Voice). You can use on-board parameters or use the provided Voice Editor for the PLG150 series board to customize the sound data.

BreakPoint: A point in the scale where you apply a change in the effectiveness of a parameter. With Break Points you can set the exact point of change where the effectiveness of amplitude take place. For example, you may want to have an element get louder as you approach the mid-range and soften again as it ascends up the keyboard. Break points are defined by note designation, C3 = middle C.

Carrier: PLG150-DX. In the FM (Frequency Modulation) synthesis process, the carrier is the audible operator. In the original DX7, sine waves modulated sine waves. The output of the carrier, alone, was a pure sine wave. When acted upon by a modulator(s) the result is a harmonically rich sound. See [Algorithm](#) and [Modulator](#). When viewing an FM algorithm, the carrier will be on the bottom row.

Chorus: The Chorus effect processor uses modulation to create a rich ensemble sound — as if several instruments were playing one part simultaneously. A total of 25 different Chorus effect types are available in S90, and some of the effect algorithms are not simply chorus effects: Several types of Delay, Flange, and Phase effects are available as well. The Chorus

processor is responsible for short time delay effects.

Controller Set: A Controller Set is a Voice edit parameter group that allows **each** Voice to respond to the various physical controllers. These controls are PB wheel, FC1/FC2 Foot Controllers, FS (Foot Switch), Sus (Sustain), MW (modulation wheel), AT (Channel Aftertouch), BC (Breath Controller), Assign A/B, Assign 1/2 Slider devices. Each PLG150 Series board may have its own addition Controller Sets (depending on the technology) that can be accessed when the board is placed in an [MSPS \(Modular Synthesis Plug-in System\)](#) compatible synthesizer.

Control Sliders: The Control Sliders (CS) will send control change parameters according to the illuminated LED for that row of functions.

Cutoff Frequency: This is a parameter of the [Filter](#). The cutoff frequency is the point in the frequency range at which the filter becomes active. A LPF (Low Pass Filter) with a cutoff frequency of 1kHz will pass all frequencies below 1,000 cycles per second and begin attenuating frequencies above that point by the amount of the filter's rating. That is, a 12dB per octave filter will attenuate the sound 12 dB for each octave above 1,000 cycles per second. Therefore, at 2kHz the sound is 12 dB down, by 4kHz the sound is 24 dB down and so on.

Decay: The second segment of an envelope (ADSR). After the attack which generally has a transient peak (a moment when it is at maximum loudness) comes a steep drop in volume before the sustain portion. This is sometimes called the initial decay. See EG.

E: This inverse video "E" signifies "Edit" and appears in the upper left corner when a sounds has been altered.

Edge: A unique parameter within the **AN** model (PLG150-AN) that allows the programmer to control the harmonic content within a chosen wave type. In your classic analog synth you chose a sawtooth or pulse wave and had to use a filter to alter the harmonic content. The Edge parameter is a variable control that can remove all the harmonics from a waveform or add additional "edge".

Edit: "Edit" mode is defined as a condition where specific parameters are changed. Each of the main modes (i.e., Voice / Performance / SeqPlay Mix and the Master mode) all have their own specific Edit modes that can change different things.

- [Voice](#) Mode Edit: *Common* parameters (specific to the overall voice) Name, Effects etc. *Element* parameters (specific to the individual element) Filter, EG, LFO, Elements, Waves, etc.
- [Performance](#) Mode Edit: *Common* parameters, *Part* parameters (Voice selection, Split and Layer, PLG board status, effect send levels, etc. are addressed in Performance edit Mode. Multi-timbral – single MIDI channel
- [Mix](#) Mode Edit (inside SeqPlay mode): Voice Selection, Volume, Panning, Effects Sends and Effects Routing, and Synth parameter offsets can be edited and stored in Mix Edit mode. You store a MIX by placing it in a TEMPLATE. MIX mode is Multi-timbral – multi-MIDI channels.
- [Master](#) Mode Edit: Master settings are edited here such as linking them to an internal function (Voice, Performance, SeqPlay MIX), common edit, zone edit, controller edit, etc.

EG: Short for Envelope Generator. Simply put, an envelope generator is responsible for the change in a parameter over time. How a sound changes during its duration. This change can be influenced further by the velocity of the note. Typical Envelope Generators are the AEG, FEG and PEG – amplitude EG, filter EG and pitch EG, respectively. The AEG is responsible for changes in loudness over time. How a sound comes in at key-on, how it sustains and how it disappears after key-off in terms of its amplitude. The Filter EG is responsible for changes in timbre or tone color over time. Adds harmonic movement to sounds. And the PEG is, of course, changes in pitch over time. This is great for "scoops" and "drop-offs" in brass voices, for example. The S90's EGs allow for precise control over Attack, Decay, Sustain and Release portions of the envelope. You can set the TIME between segments and

control the LEVEL at each point. On many of the envelope generators you have additional parameters for Initial Levels and Release Levels (after key-off).

Element (ELM): An Element is a single component of a Voice. An element can stand on its own as a complete synthesized sound – they can be stereo, multi-layered, multi-samples of a complete instrument. For example, waveform #1347 is a stereo, triple-strike piano element. It can be combined with three other elements to create a [Voice](#). An [AWM](#) element is based on digitally sampled data. In a Yamaha sampler (where Elements can be created from scratch) the user would have extensive mapping possibilities with AWM samples. [Keybanks](#) contain the information for mapping the sample and can be stacked on a note for velocity crossfading, they can be mapped horizontally for complex splits/layers. At maximum, theoretically, an AWM element could contain 127 samples deep – a different sample for each velocity.

Embouchure: PLG150-VL. This refers to the tightness of the lips against the reed or against each other or the downward force of the bow against the string. A change in the musicians embouchure will have a characteristic change in timbre **and** pitch of the instrument in question. In the VL modeling engine this parameter is assignable to a physical controller whose position will determine the tightness of the virtual lips or the downward force of the bow resting on the string. The Physical Model creates all the physical components so that embouchure is a real time control available to the player. When you tighten the lips of the "virtual" VL trumpet player the horn characteristically jumps modes like a trumpet in a similar physical situation. This is a key point in understanding acoustic behavior modeling: to accomplish what the VL is doing here you would have to have a single control that adjusts pitch and timbre in the precise way that it occurs in nature – a filter and pitch bend are the devices available to convention synthesizers but they do not (cannot) mimic the conditions that occur in nature with a real acoustic instrument. The VL physical model can do this – this is why we talk about *acoustic behavior*.

FEG: Filter Envelope Generator. Controls the change in timbre (tone) over time. See [EG](#).

Filter: A filter in a synthesizer is responsible for the timbre or tone quality. As with most Yamaha synthesizers, S90 has extensive filtering. In general, you have LPF or Low Pass Filter, which allows the low frequencies to pass while blocking the highs. You have HPF or High Pass Filter, which allows the high frequencies to pass while blocking the lows. You have BPF which allow a band of frequencies in the middle to pass while blocking both highs and lows. You have the BEF or Band Eliminate Filter (old school call it a "notch") eliminates a band of frequencies in the middle and accentuates the low and high.

1. LPF24D (Low Pass Filter 24dB/oct Digital): A 4-pole (-24db/oct) dynamic LPF with a strong resonance.
2. LPF24A (Low Pass Filter 24dB/oct Analog): A 4-pole (-24db/oct) dynamic LPF with a character similar to those found on analog synthesizers
3. LPF18 (Low Pass Filter 18dB/oct): A 3-pole (-18db/oct) dynamic LPF.
4. LPF18s (Low Pass Filter [18dB/oct Staggered): Also a 3-pole (-18db/oct) dynamic LPF, but with a shallower frequency curve.
5. LPF12 (Low Pass Filter 12dB/oct) A 2-pole (-12db/oct): dynamic LPF, designed to be used in combination with an HPF (High Pass Filter).
6. LPF6 (Low Pass Filter 6dB/oct): A 1-pole (-6db/oct) dynamic LPF with no resonance, designed to be used in combination with an HPF (High Pass Filter).
7. HPF24D (High Pass Filter 24dB/oct Digital): A 4-pole (-24db/oct) dynamic HPF with a strong resonance.
8. HPF12 (High Pass Filter 12dB/oct): A 2-pole (-12db/oct) dynamic HPF.
9. BPF12D (Band Pass Filter 12dB/oct Digital): The combination of a -12dB/oct HPF and LPF.
10. BPF12s (Band Pass Filter 12dB/oct Staggered): Also the combination of a -12dB/oct HPF and LPF, but with a shallower frequency curve.
11. BPF6 (Band Pass Filter 6dB/oct)

12. BPFw (Band Pass Filter Wide): Also the combination of -12dB/oct HPF and LPF, but allows a wider frequency band than the BPF12D filter.
13. BEF12 (Band Elimination Filter 12dB/oct)
14. BEF6 (Band Elimination Filter 6dB/oct)
15. Dual LPF: A combination of two sets of -12dB/oct LPF in parallel.
16. Dual HPF: A combination of two sets of -12dB/oct HPF in parallel.
17. Dual BPF: A combination of two sets of -6dB/oct BPF in parallel.
18. Dual BEF: A combination of two sets of -6dB/oct BEF in parallel.
19. LPF12 (Low Pass Filter 12dB/oct)+ HPF12 (High Pass Filter): A combination of a LPF and HPF.
20. LPF12 (Low Pass Filter 12dB/oct)+ BPF6 (Band Pass Filter): A combination of a LPF and BPF.
21. HPF12 (High Pass Filter 12dB/oct)+ BPF6 (Band Pass Filter): A combination of a HPF and BPF.
22. THRU – The filters are bypassed

FM Frequency Modulation: A real form of synthesis developed by Dr. John Chowning at CCRMA at Stanford University. FM synthesis put the "D" in Digital when the Yamaha DX7 made only synthesis popular, and signaled the end of the analog era. FM synthesis creates sound by using interacting components called Operators. The Operators could create more complex wave shapes than the geometric oscillators in the analog palette. Harmonic content change with velocity and over time was now possible. Although some people will tell you that you need a degree in order to program FM, you can get a degree that includes the study of FM as a legitimate form of synthesis. Like all things it has a learning curve...a few weeks to learn and a lifetime to master.

GEN General

Key Follow: This is a parameter that deals with the responsiveness from left to right on a keyboard. Scaling is another word for 'key follow'. A positive (+) value generally means lower and slower to the left, higher and faster as you move up to the right. As in attack rate of acoustic instruments: the lower the instrument the slower the attack, the higher the instrument the faster the

attack. A negative value generally means the opposite of what occurs in nature – it is a synthesizer, after all.

Insertion Effect: S90 has a Dual Insertion effect. These are programmed in Voice mode. The Insert 1 processor has 25 effect types (the same effect algorithms as the [Variation](#) processor). The Insert 2 processor has 104 effect types. The relationship between a Dual Insertion Effect and the Elements of a Voice can be very intricate. Each Element of a Voice can have a separate connection within the effect routing. Routing can be from INS1→2, INS2→1, or parallel. Additionally, certain Insert Effect parameters can be assigned to real time controllers via the Control Sets. In Performance mode and in a Mix, one Part can recall its Dual Insertion effect routing and controller setup.

Job: Job Functions in Yamaha synthesizers are functions that carry out a task and are always associated with a Mode. In the S90, the main modes (Voice, Performance, Master, SeqPlay/Mix), and the sub-modes (Card and Utility) all have their own specific Job functions. For example, if you wished to create a new user voice and wanted to delete an existing voice first, you would enter the Job function from the VOICE mode and select the "Initialize Voice" JOB. If you wanted to restore the S90 to factory setup, this would be a UTILITY JOB.

KeyBank: A keybank is the note range and velocity range to which a wave (Sample data) is assigned. A maximum of 2 samples can share the same keybank – this accommodates "stereo" waveforms. A group of keybanks (up to a maximum of 128) make up a [Waveform](#).

LFO: Low Frequency Oscillator. A source that provides oscillations typically at or below the audible frequency range. These "rates" can be used to control various synthesizer processes. Typically, you have a selection of source waves for the LFO. A triangle wave would yield a cyclical change. A triangle wave LFO applied to a pitched oscillator gives us the musical effect *vibrato*. An LFO applied to a filter gives us the musical effect *wah-wah*. An LFO applied to an amplifier gives us the musical effect *tremolo*. LFOs can be applied

to a wide variety of parameters as automated controllers.

M.EQ Master Equalizer

Master Mode: Master Mode is a special mode within the S90. This mode allows you to access all the different main modes (Voice, Performance, or SeqPlay/Mix) from one convenient location. You can set up Master MIDI Keyboard Controller functions such as 4-zone settings. You can use the MASTER "Zone" setups to control internal and/or external Voice selection on up to 4 MIDI channels simultaneously.

Mix: Mix is the multi-timbral, multi-MIDI channel mode. The SeqPlay mode allows the S90 to playback sequence files from SmartMedia card in real time. It also lets you use an external sequencer and recall Voices via multiple PARTS. You reach the MIX mode by pressing [SeqPlay] followed by [F6] Mix. Each File can be recalled by a special CHAIN function that acts as an updateable set list (100 locations). The instruments and setting for each song are stored in a MIX TEMPLATE. A Mix Template will contain all the settings used for the song – you can name and keep 50 TEMPLATES in memory even after power down. It is your multi-timbral setup. Mix mode is where voices are selected, volume levels are set, pan positioning is determined, effect send levels are set, etc. One of the cool things about a S90 Mix is that you can also change and store synth parameter offsets to things like the [filter cutoff](#), resonance, and [AEG](#) and [FEG](#) envelopes. Any changes that you make to a Voice in a MIX are local to that MIX. All sequences can have an associated Mix Template. When you are using an external sequencer to record, you still want to be in Mix Mode to operate S90 as a multi-timbral module and should create and backup a Mix for your song. You can then use the Bulk Dump Mix feature to send all the Mix information to your sequencer.

mLAN: Short for Music Local Area Network. MLAN is a new digital network designed for musical applications using the industry standard IEEE1394 "firewire" serial bus. It has a very fast data transfer rate (approx. 400 megabytes a second). Both MIDI data and digital audio data can be transmitted via mLAN (video too). The mLAN protocol was designed by Yamaha

but is open to other manufacturers for utilization. mLAN is the future of connectivity.

mLAN8E: Optional mLAN expansion board for the S90. See mLAN.

MSPS (Modular Synthesis Plug-in System): Modular Synthesis Plug-in System. A proprietary expansion architecture that allows a user to not only expand the voice palette of a synthesizer, but the actual synthesis technology. The Plug-in board can be a tone generator or effect processor. The tone generator boards don't simply add more wave ROM, it increases the polyphony of the keyboard. Since each PLG-series board features different synthesis technology, each board adds a different amount of polyphony to the "mothership" synthesizer except in the case of the PLG-100VH, which adds powerful vocal harmonization effects. There are currently 8 PLG-series boards available in the Modular Synthesis Plug-in System:

1. PLG150-DX: The classic DX7 [FM](#) synth on a Plug-in card. 16 voice polyphony.
2. PLG150-VL: Yamaha's [VL](#) synthesizer based on Virtual Acoustic Physical Modeling technology. Monophonic, but one of the most breathtaking (pun intended) monophonic synthesizers ever created.
3. PLG150-AN: Yamaha's proprietary [AN](#) Analog Physical Modeling synthesizer. 5 voice polyphony.
4. PLG150-PF: [AWM2](#) Piano Plug in card featuring 16 megabytes of wave data, stellar piano and electric piano programming, 64 voice polyphony.
5. PLG-150-DR: 22MB of [AWM2](#) Drum Kits. Organized into KIT Elements; 32-note poly;
6. PLG150-PC: 18MB of [AWM2](#) Latin Percussion Kits. Organized into KIT Elements; 32-note poly;
7. PLG-100VH: Effect processor board – works as an Insertion Effect. A vocal harmony/pitch shifter with formant correcting capabilities (i.e. "gender bender": A male voice can sound like a female voice and vice versa) allowing up to 3 additional voices to harmonize a vocal track

or live microphone input. Voices can be compelled to follow MIDI notes input on the keyboard or by the sequencer.

8. PLG-100XG: [AWM2](#) GM and XG compatible tone generator with 32-voice polyphony, 16-part multi-timbral capability.

Modulation: Any change. Used in the common synth language to refer to vibrato (Control Change message 001) or Pitch Modulation Depth. Actually, modulation is any change affected on a waveform.

Modulator: PLG150-DX. In the FM synthesis process, a modulator is an operator whose output is not heard directly, you hear the result of it on the carrier or modulator it is assigned to. If the modulator is velocity sensitive, then as you increase velocity you affect a change in timbre (harmonic content). Modulators are always on top in the FM diagram – they can never be on the bottom row. They are not heard directly, you only hear their influence.

Operator: PLG150-DX. In the FM synthesis process, an operator is a complex tone source that includes the envelope generator, and sensitivity parameters built in. Each operator is like a little mini-synth unto itself. In the original DX7 there were 6 operators, each capable of contributing a sine wave of a specific frequency. The operators interact to create greater tonal qualities and harmonic complexity.

OSC: Oscillator. Basic tone source

P1-B, P2-B or P3-B This refers to a Plug-in Board Voice bank on a PLG150 series Board. Each board (depending on the technology involved) will have a different number of Voice banks. When one of these is in the upper left corner of the screen you are in one of the resident banks on the PLG board – these sounds have yet to be integrated with S90 controller and effect routing. You can access these sounds using the S90 program buttons A01-H16. A "B" or Board bank Voice can be edited and the result stored to PLG1USR, PLG2USR or PLG3USR location.

Part: A Part exists in a [Performance](#) or [Mix](#). There are 4 Parts in Performance and

16 Parts in a Mix (even more Parts are available, if you add PLG boards). A Part is basically a [Voice](#) plus the parameters to make it work in a multi-timbral context. The significance of a PART is that you can edit a Voice without changing the original data – PARTS are offsets applied to the Voice data. This means your edits are local to the Performance or Mix and you do not have to pay the consequence of changing a sound permanently when you edit. Parameters include effects routing (which Part gets its Insert effect), effects sends, synth offsets like filter cutoff, resonance, [FEG](#) and [AEG](#) envelopes and output routing.

PCH Pitch

PEG: Pitch Envelope Generator. Controls the change in pitch over time. See [EG](#).

Performance: A Performance is a program in which multiple Voices are assigned to [Parts](#) and combined — in a layer, split or combination of those two. Each Performance can contain up to four different [Parts](#). All Parts of a Performance are on a single MIDI channel. See diagram at the end of this article.

PLG: Plug-in. This refers to the optional PLG series synth/processor boards that add synthesis technology and/or effect processing to the S90 as part of the Modular Synthesis Plug-in System (MSPS).

PLG1 / PLG2 / PLG3 This refer to the physical banks that have Voice locations for the PLG150 Series Plug-in Boards.

Plug-in Voice: An S90 Voice that is made from data that originates on a PLG150 Series board. A Plug-in Voice refers to a PLG150 Board sound that has been integrated with the S90's controller functions and onboard effects processors.

Pressure: This PLG150-VL engine parameter refers to the amount of breath pressure applied to the reed or mouthpiece of the 'pipe' or to the velocity of the bow across the 'string'. The subtle variance in breath pressure applied to wind instruments is recreated by the BC3 Breath Controller. Pressure can, however, be applied via TouchEG (Aftertouch) or via Velocity. It is the subtle variance in pressure that the human ear detects

during a musical performance as timbre/pitch/behavioral changes and is one of the reasons VL modeled Voices can be so hyper-realistic. Both BC and TouchEG can be varied as a note is held. Velocity sends just one note-on value at key on and, therefore, is the least expressive control for VL pipe or bowed-string type Voices.

RCV Receive

RAM: Random Access Memory = Memory that is rewrite-able and erasable. Often data stored in RAM memory is lost when the power is turned off. It must be saved and reloaded each time the unit is powered on. The USER Voices, Performances, Mix Templates and Master setups are stored in RAM in the S90 but it is a battery-backed type of RAM. But for long term storage you should back it up to SmartMedia card.

Release: The final segment of an envelope (ADSR). The portion of the envelope that occurs at note-off. How long the sound lasts after you take your hands off the keyboard is influenced by the Release parameter.

Resonance: This parameter, sometimes called "Q" or "Emphasis" is technically described as a boost at the cutoff frequency. At the point at which the filter becomes active the resonance parameter is responsible for boosting that frequency. When the cutoff frequency is in motion (filter opening or closing) the resonant frequency peak can be heard to move. See Cutoff Frequency, Filter

Reverb: Reverb effects add ambience to the sound, simulating the complex reflections of actual performance spaces, such as a concert hall or a small club. The decay in the sound after the sound source has ceased making sound – the response of the environment the sound takes place in.

Ring Modulation: Ring Modulation occurs when 2 audio oscillator signals are combined and the sum and difference frequencies are output. The PLG150-AN can generate Ring Modulation in its physical model DSP processor. The AN engine uses two VCOs in combination to create ring mod effects. The larger the

Ring Mod Level value the more dissonant the interval. Great for clangorous metallic sounds.

ROM: Read Only Memory = Memory that is pre-stored at the factory and not erasable or rewrite-able by the end user. The preset Voice data in S90 is stored in ROM, it can be edited but the edits must be stored in USER RAM memory.

Scaling Refers to up and down the keyboard. When you set the scaling of the filter you are determining the effectiveness of that filter to low notes as opposed to high notes. There are several Break Points to offset the level. In general, positive values mimic nature, negative values are contrary to nature. Sounds in nature tend to trigger faster as you ascend the scale. For example, a tuba has a slower attack time than a trumpet. And the sound of a tuba is less bright than a trumpet. So positive scaling settings for amplitude and filter would mimic what occurs in nature.

SCF: Static Control Filter. These filters allow certain frequencies through while blocking others. Each Element can have its own settings within a filter. The SCF types are: Low/High Shelving, 2-Low Shelving, 2-High Shelving, Low Pass, High Pass, Band Pass, Inverted Low Pass, Parametric EQ, Thru, and a straight Boost 6dB/12dB/18dB.

Scream: This PLG150-VL parameter drives the model into chaotic oscillation, creating effects that a sax player can get by overblowing in such a manner.

Sensitivity: This parameter determines the responsiveness of a device to a controller. For example, when you set the *sensitivity* of the filter to velocity you are controlling how the filters dynamics will change to incoming velocity values.

SeqPlay Mode: When you press this button you have access to the S90 as a multi-timbral, multi-MIDI-channeled unit. You will find the MIX mode and access to the different PART parameters. You will also be able to point the unit to a SmartMedia card 'folder' containing your sequences (stored as TYPE 0 SMF Standard MIDI Files). You can then CHAIN play the songs – recalling a [Mix](#): prior to playback.

Sustain: The third segment of a synthesizer envelope (ADSR). It controls the level at which the envelope will hold during key-on (as long as a key is held). Sustain also refers to the sustain pedal function - the level at which the amplitude envelope will *hold* as long as the pedal is held down. Control Change message 064.

System: System settings are those that apply to the S90 as a whole. These include your particular MIDI settings (Receive Channel, Transmit Channel, MIDI IN/OUT settings, Sync settings, Local Control, etc.), parameter settings for the assignable controllers and control devices, 50 MIX TEMPLATES, Master Tuning and Transpose, etc. Systems settings are saved in the ALL data CARD File type. System settings are retained even after power down but are reset when a Factory Reset is performed.

TCH: Short for Transmit Channel as in MIDI transmit channel.

Throat Formant: This PLG150-VL parameter creates a characteristic edge in the sound. This occurs when a sax player uses the size of their throat cavity to influence their tone. In a string model it adds a "roughness" to the note.

Ton: Tone

TouchEG: PLG150-VL. This is a new application of the Channel Aftertouch parameter. It was developed by Yamaha engineers during the development of the original VL1. It interpolates between key-on velocity and the aftertouch controller, improving on the ability of the player to control subtle changes in Voice character via downward key pressure. (See Pressure). A necessity for those adverse to using the BC3 Breath Controller on VL sounds.

Utility: In this mode, you can set parameters that apply to the entire system of the S90. These include global MIDI settings like Local On/Off, Internal and External Sync, as well as system settings like Autoload.

Variation: The Variation effect processor algorithms provide a wide variety of sound transformations and enhancements. A total of 25 different Variation types are available. The Variation effect exists in

Performance and a SeqPlay Mix. Each Part can have its own Variation effect send amount. The Variation effects are the same algorithms as Insertion 1 so it's like having an extra Insert except you can use it on as many different Parts as you want. You can manipulate the DRY LEVEL on a particular part to re-route signal exclusively through the Variation effect making it behave like an INSERT.

VA: Virtual Acoustic – Yamaha's proprietary physical modeling process. (See VL). Visit www.sondius-xg.com for more information on this technology.

VCA: Voltage Controlled Amplifier. In an analog synthesizer this component is responsible for the loudness or audio output of the sound.

VCF: Voltage Controlled Filter. In an analog synthesizer this component is responsible for the tone or timbre of the sound.

Vce: Voice

VCO: Voltage Controlled Oscillator. In an analog synthesizer this component is responsible for the geometric wave shape of the oscillator that is audible: sine, sawtooth, square, pulse etc (perceived as pitch). Sine wave giving the flute family; sawtooth giving the string and brass families; square wave woodwinds; etc.

Velocity Sensitivity Translates the speed with which the key goes down into the volume of the sound.

VeISens: Velocity Sensitivity.

VL: Short for **Virtual Acoustic Lead**. This engine is based on technology developed by Yamaha with CCRMA (Stanford University). The first application of Physical Modeling of acoustic instruments, the VL is a Virtual Acoustic™ Self-oscillating (VA/S) model. It models the kind of instrument where the player is responsible for applying 'pressure' to the instrument's driver (mouthpiece or bow) in order to cause the oscillation. In addition to the mathematics occurring in the driver the

technology also models the pipe or string (response chamber) and the virtual player's physical input. The hyper-realistic sound of VL is due to the accurate 'behavior' of the model under similar physical conditions. There are no samples in this technology. All sound is generated via the calculations in real-time!

Voice: A Voice is the main sound of the S90, made up of a variety of parameter settings. Internally, there are several different Voice Types:

-User Voices are voices that are stored in RAM and can be modified.

-Preset Voices are stored in ROM and can be modified by offsets in Performance and Mix Mode. If you edit a Preset Voice you must store the changes to a USER memory location (RAM).

-Preset/User Normal Voices: *Normal Voices* are mainly pitched musical instrument-type sounds that can be played over the range of the keyboard. Each Voice can consist of up to four separate Elements, each of which is a high-quality multi-sampled wave, or basic sound. You can access Normal Voices in Voice, Performance, and SeqPlay Mix modes.

-Preset/User Drum Voices: *Drum Voices* are mainly percussion/drum sounds that are assigned to individual notes on the keyboard. A collection of assigned percussion/drum waves is known as a Drum Kit. Drum Voices are very complex entities. Each Note in a Drum Voice has its own Filter, EQ, Amp EG and Pitch settings.

- **Waveform** – A waveform is the basic component of an element. In S90, there are 1347 high-quality Preset Waveforms (Waveforms created by Yamaha and stored in ROM) available covering the many instrument categories.

The basic S90 hierarchy goes like this: Waveforms are assigned to Elements. There are up to 4 Elements within Voices, and Voices are assigned to Parts within Performances and Mixes. In the S90 you are given a list of 1347 Waveforms from which you build your own sounds.

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Structure of an S90 Performance

As you can see, a Performance can be 16 elements deep. Each element uses a note of polyphony when it sounds (two, if the element is a stereo element).

