y

S90 and the Modular Synthesis Plug-in System

PLG150-VL
Virtual Acoustic Physical Modeling Plug-in Board

A Getting Started Guide

The **PLG150-VL** is a single part plug-in board. It is part of the Modular Synthesis Plug-in System (MSPS) an expansion system that adds synth or signal processing engines to a compatible synthesizer.

The mothership, or host, is your synthesizer or module that the plug-in board is placed in. The Professional Series PLG150 boards are intended for use in the Motif, S90, S80, S30, CS6x, and CS6R. Unlike some competing plug-in boards, which are simply ROM expanders, the Yamaha PLG series boards are complete synthesizers or signal processors in themselves.

When placed in a MSPS host, the PLG boards can be edited with parameters that *offset* values from the originally stored board data. Full editing can be accomplished with computer editors.

The VL technology is not based on sampled data – there are **no samples** in VL technology. It is based on *physical modeling*. Therefore many of the conventions concerning it will be new to some users. Physical modeling is a technique that uses real time computer calculations to simulate a real world situation. Each voice is actually a mathematical *equation* into which you input data. The board's CPU calculates a sonic result in real time, as you input data via the various MIDI controllers. There are no pre-recorded sounds or traditional tone generators. The sound is a result of the current input to the model.

Physical Modeling - Virtual Reality
It should be stated here that performing on VL technology is going to be a totally new musical experience for many players. This technology actually responds in ways that sampled data, or even analog data, cannot. Physical modeling can best be explained as a "virtual" experience. This proprietary physical modeling technology is designed to accurately represent an acoustic pipe/string instrument. It is called, S/VA, or Self-oscillating **Virtual Acoustic** synthesis. This includes several families of instruments - single reeds, jet reeds (flutes), lip reeds (brass), and bowed string instruments. The model has some extensions that allow it also to mimic plucked and struck attacks, double reeds, synth leads and sound effects that are possible no where else on the planet. In fact, the mathematics can be used to create new instruments that it would be physically impossible to construct in the real world. This Virtual Acoustic[tm] technology was first available in a keyboard called the VL1. VL is short for *Virtual Lead* synth – indicating its monophonic nature, after all it is a detailed model of the physics involved in a single pipe or single string in musical motion.

Like a flight simulator is 'virtually' flying, playing a VL trumpet or sax is virtually playing a trumpet or sax. In an Air Force flight simulator you are in a room (designed as a cockpit) that can be moved on hydraulic lifts to simulate the attitude of the plane at any moment. When you bank the simulator, the room will tilt appropriately. The controls are all the levers and switches you would find in the jet being modeled. Everything is accurate to the last detail. They can even thin your air supply so that you experience high altitudes! In front of the pilot, where the windshields would be, are computer screens that show a 3-D model representation of the terrain you are to fly over or the airport you are to land at – accurate to the finest detail. They can even simulate a landing on a moving aircraft carrier. As you move the controls you are controlling a unique flight experience. You practice you get better.

The VL technology can precisely model the influence of the reed, the lips, the throat, the air flow, the mouthpiece, the shape of the horn, the condition of the horn from note to note in a scenario where the model is of a human blowing a saxophone or a trumpet. The sound is generated, **not** by recalling a sampled recording like in AWM2 sounds. The sound is **not** generated by filtering a geometric wave into a new harmonic shape like in analog synthesizers, but by mathematically recreating the precise shape of horn, the materials that the horn are constructed from and the complex interactions that occur in the acoustic situation. The speed of air flow within the pipe, the diameter of the pipe, and the texture and character of the vibrating element (driver) are all interactive components involved in the calculation of the resulting sound. It involves real time number crunching – which takes place on the DSP chip on the PLF150-VL board. When you apply a virtual "pressure" (via a MIDI controller) to the equation, the CPU on the VL chip calculates how that would influence the sonic result. This represents when a musician applies a pressure to the mouthpiece of a saxophone. You effect the sound of the instrument through an interactive system where one parameter is depends on the condition of another which is dependant on another. You control things like: pressure (air flow), embouchure (mouth position), breath noise, growl, scream, throat formant (influence of the players lungs and trachea), tonguing (the momentary deadening of the reed), absorption (the complex physics at the end of the pipe) and damping (shape/flare or the pipe). You can control not only the playing of the horn but, at times, the shape of the horn itself. This is why you can get VL trumpets to jump modes with characteristic trumpet rips, and you can get the

VL saxophone to squeak, squawk, scream, honk and growl like the real thing. It is also why you can play with all the 'mistakes' and 'clams' of the real instrument. You can even create and perform on instruments and sounds that never existed before. Your controls to the model are standard MIDI controls: Breath Control, velocity, aftertouch, mod wheel, pitch bend wheel, foot controls, etc. Breath Control is a unique MIDI controller that allows the performer to use breath pressure to control parameters within a synth sound. The VL technology lends itself particularly well to Breath Control. In fact, no other technology will reward your breath input like the Yamaha VL physical modeling technology. It is a technology, where as you practice, you get better. You begin to develop a *sound*. You certainly can develop playing techniques. It is a life altering experience for many, because you can totally develop a personal sound with this technology. Spend some time experimenting with the controller settings of VL Voices. You will experience how "alive" the sound is as the technology responds to controller changes.

A saxophone player will control (with great dexterity) the slit between the reed and the mouthpiece as they blow air into the horn. As they blow harder the timbre, pitch and behavior of the instrument changes. They also can control things like tone and vibrato by how they position their mouth on the mouthpiece. These same elements are in play with VL technology but there is an important difference. The mouthpiece of the BC3 is **not** a direct substitute for the sax mouthpiece. What the sax player can do with just their mouth the keyboard VL player must farm out to various controllers. Typically, you control the virtual reed/mouthpiece slit and position of the mouth with the Pitch Bend wheel. This parameter is called *embouchure*. You can tighten or loosen the virtual player's embouchure by moving the wheel up and down, respectively. There will be a realistic change in the pitch and the timbre. You control the airflow through the virtual horn, however in a very similar fashion to the real sax player – by how much air you put into the system. There will be a realistic response in the behavior of the sound. You will want to match your 'horn's' response to your preferred controller gestures.
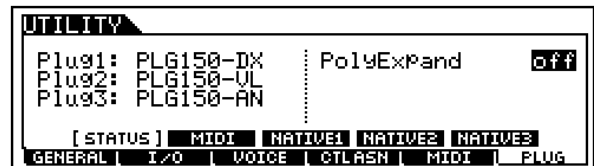
Checking Installation
Check to make sure your board or boards are properly installed. The connector with the single Orange wire is slot 1, the single yellow wire connector is slot 2 and the single Green wire connector is slot 3. A PLG150-series board can occupy any slot.[1] The boards should always be

---

[1] **HINT:** Find a consistent slot layout for your boards and stick with it. When making bulk files that reload

installed with the S90's power off – the boot up routine will check the plug in slots and automatically load 64 Preset sounds for the detected board. The VL board is the exception. It has actually 3 Preset banks of 64 – one for Aftertouch, one for velocity play and one for breath control. Here's how to verify your board:

On the S90: Press [UTILITY]/[F6] PLG/ SF1 Status to check the status screen:

```
UTILITY
  Plug1: PLG150-DX    PolyExpand      off
  Plug2: PLG150-VL
  Plug3: PLG150-AN
  [STATUS]  MIDI  NATIVE1 NATIVE2 NATIVE3
GENERAL |  I/O  | VOICE | CTLASN | MIDI | PLUG
```
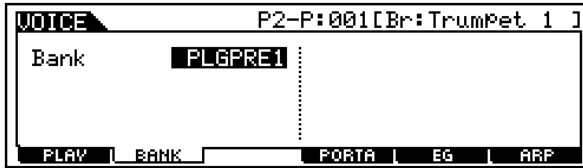
The "PolyExpand" parameter will be active only when you have 2 or more PLG150 series boards of the *same* type installed and polyphony expansion is possible. With the VL technology (which is purposefully monophonic) 3 VL boards would likely be used as three separate horns rather than a 3 note polyphonic horn! Because the System is **modular**, this polyphony **does not** take away from the 64-note polyphony of the mothership host (S30 / S80 / S90 / CS6x / CS6R / Motif6-7-8)- Nor does it contribute to a pool of notes – they are completely separate. You, of course, can use multiple boards as individuals, thus increasing how many Parts you for which you will have analog sounds available. If you have 2 VL boards you can play with 2 notes of polyphony (Poly Expand mode) or you can play 2 monophonic horns. The phrasing is way different. *When you begin to appreciate this difference, you begin to really understand the beauty of the VL technology*.

To select between the 192 provided preset sounds. Three sets of 64: Press [F2] Bank from the main Voice screen. The PLG150-VL presets are as follows:
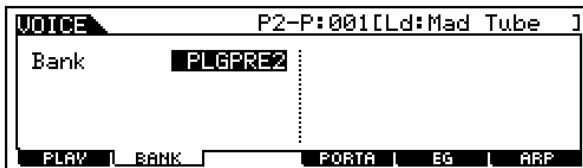
PLGPRE1 Wind instruments for play with Touch EG; lets you use a specialized aftertouch (called Touch EG) to vary the wind pressure. Use this bank if you do not have the optional BC3 Breath Controller ($119.00 MSRP) or would rather play without the BC.

```
VOICE                            TCH= 1
  P2-P:001(A01)                  OCT:+0

          Br:Trumpet 1

 ASA AEG-Dcy ASB AEG-Sus AS1 RevSend AS2 ChoSend
  PLAY | BANK |        PORTA |  EG  |  ARP
```
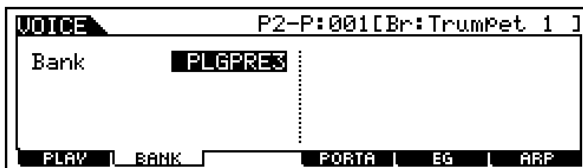
---

your custom sounds, it matters which slot the board is found in.

```
VOICE          P2-P:001[Br:Trumpet 1 ]
Bank      PLGPRE1
   PLAY   BANK            PORTA   EG    ARP
```

PLGPRE2 Keyboard sounds setup for play via Velocity; Plays like a regular keyboard sound.

```
VOICE                        TCH= 1
P2-P:001(A01)                OCT:+0
   Ld:Mad Tube
ASAAEG-DcyASBAEG-SusAS1RevSendAS2ChoSend
   PLAY   BANK            PORTA   EG    ARP
```

```
VOICE          P2-P:001[Ld:Mad Tube  ]
Bank      PLGPRE2
   PLAY   BANK            PORTA   EG    ARP
```

PLGPRE3 Wind instruments setup for BC; obviously this is the best way to control wind instrument - by blowing. Do not play these without a BC3.

```
VOICE                        TCH= 1
P2-P:001(A01)                OCT:+0
   Br:Trumpet 1
ASAAEG-DcyASBAEG-SusAS1RevSendAS2ChoSend
   PLAY   BANK            PORTA   EG    ARP
```

```
VOICE          P2-P:001[Br:Trumpet 1 ]
Bank      PLGPRE3
   PLAY   BANK            PORTA   EG    ARP
```

Play the provided Plug-In Voices
These Plug-in Voices are made from *preset* Board Voice data. Play through the [PLG] bank experimenting with the wheels and controllers. The first voice should be one called, **"Br: Trumpet 1"**.

Experience how the sound animates as you vary the 'pressure' applied – either via aftertouch or Breath Control. Pressure is a parameter of the acoustic model and refers to the amount of breath pressure applied to the reed or mouthpiece, or the bow velocity applied to the string. There is an appropriate response in amplitude, pitch and harmonic content. Attack notes while varying control and hear how the sound responds.

If you do not have a BC3, it is suggested you play PLGPRE1 sound bank – because they are setup for expressive play via aftertouch. Let's

look under the hood and see where these 64 Plug-in Voices sounds come from:

The PLG150-VL has several banks of native sounds, called **board voices**. Think of them as the 'raw data' from which you will build your instrument.

There are a total of 256 unique Voices on the PLG150-VL board located in preset 1 and 2.

Bank = 033/000 128 preset1 **Board Voices**
Bank = 033/001 128 preset2 **Board Voices**
Bank = 033/002 6 user Custom **Board Voices**
Bank = 033/003 64 RAM **Board Voices**
Banks = 081/112~081/119, 097/112~097/119 VL extension for XG*
*These are basically the preset 1 and 2 board Voices arranged into various XG banks for use with XG modules. (You can ignore these banks when using the PLG150-VL board in the S90, S30/80 or CS6x/R products).

The numbers represent MSB/LSB for bank select – (MSB and LSB Bank Select commands can be used to remotely select sounds from a device like a sequencer).

There are just 4 banks of **board voices** you need to initially concern yourself with on the PLG150-VL. These are 033/00**0**, 033/00**1** and 033/00**2** (Custom) and 033/00**3** (INT VL70-m).

Banks 033/000 and 033/001 each contain 128 VL sounds that are preset on the board. Bank 033/002 has 6 custom locations for importing new model configurations created in the VL Voice Editors. The 033/003 bank is 64 locations that bring the PLG150-VL to full compatibility with the VL70-m Internal bank. It can store your own customized VL instrument setups.

In an AWM2 sampled Voice, the oscillator page will point to a set of samples (digital recordings) that serve as source material for the Voice. With the PLG150-VL, however, the oscillator page is **not** pointing to 'sampled' data but is accessing a 'virtual' PIPE/STRING instrument model located on the plug-in board. The Voice is pointing to a 'physical model' located on the PLG board – called a board voice.

Exploring the preset Board Voices
To audition the 256 provided preset VL sounds return to [VOICE] mode:
- Press [VOICE]
- Press [F2] Bank to select the Board Voice bank you wish to explore: 033/000, or 033/001.
- Press [F1] Play
- Notice that the bank prefix now reads **P1-B**, **P2-B** or **P3-B**. The 'B' denotes a **b**oard voice not yet integrated with S90 parameters.

These voices have not yet been set up for play. They will have no effect processing nor will they be set for **mono mode**. Next in this tutorial we will learn how to set these up for performing. And learn a shortcut for programming your own sounds by creating a template voice.
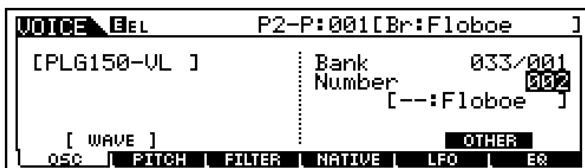
- You can now select the Board Voices in a normal manor – via the Bank and Program buttons. Now lets learn how to turn one of these "raw data" Board Voices into a fully integrated Plug-in Voice.

Plug-In Voices are Board Voices that have been integrated into the S90's controller and effect processing and are stored in either bank [PLG1], [PLG2] or [PLG3]

Step- by-Step: How to create a Plug-in Voice from a PLG150-VL Board Voice
Let's use the Floboe configuration of the model - a hybrid instrument combining the mathematics of a flute and an oboe - to learn about how the voicing works using S90 parameters.

- From [VOICE] mode select the [PLG] bank that contains your PLG150-VL
- Press [JOB] and select the Initialize function [F1]. Initialize the current Voice position. Press [ENTER], [INC/YES] to execute
- Press [EDIT]
- **Select the OSC page – Touch track button [1] to select element level edits.**
- Press [F1] OSC / [SF1] Wave
- Using the data wheel select Bank 033/001; Select Program Number = 002[Floboe].

```
VOICE EL          P2-P:001[Br:Floboe    ]

[PLG150-VL ]          Bank          033/001
                      Number            002
                               [--:Floboe  ]

[ WAVE ]                           OTHER
OSC   PITCH   FILTER   NATIVE   LFO    EQ
```

- Explore the Element parameter pages; Use the [F] and [SF] keys to navigate the different screens.
- Use button [F4] to select the 'Native' (parameters) page. Native Parameters refers to parameters that address the data on the PLG150-VL board. You are *offsetting* data that originates on the board. Use the cursor arrows to navigate the pages. The concept of OFFSET is simple. If the originally programmed data for a parameter was set to 100, for example, and you set that Native Parameter to a value of –25, then the parameter will be set to 75. You are simply adding or subtracting value from the preset data.

- Native Parameters (those accessible via the front panel of the S90). Learning to 'master' a VL instrument is very much about controller assignment and how you set the performance depth.
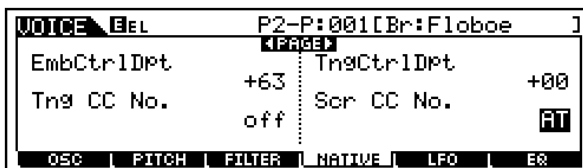
Filter Envelope Generator Depth
Pressure Control Change Number
Press Control Depth
Embouchure Control Change Number
Embouchure Control Depth
Tonguing Control Change Number
Tonguing Control Depth
Scream Control Change Number
Scream Control Depth
Breath Noise Control Change Number
Breath Noise Control Depth
Growl Control Change Number
Growl Control Depth
Throat Formant Control Change Number
Throat Formant Control Depth
Harmonic Enhancer Control Change Number
Harmonic Enhancer Control Depth
Damping Control Change Number
Damping Control Depth
Absorption Control Change Number
Absorption Control Depth
Breath Mode

- Experiment with making edits – both on the Element level and the Common level. On the Element level check the [F] keys for parameters. You have a dedicated modeled Distortion and EQ. You can add S90 level parameters on the COMMON level. **Push the [COMMON] button to edit Common (S90) level parameters.** Practice navigating the edit area. Try adding some S90 EFFECTS. Press [F6] Effects/ [SF1] Connect.[2]
- There are the Dual Insertion Effects available on the Common level. INS1 has 25 effect algorithms and the INS2 has 104.
- Also available are the KNOB CONTROL FUNCTION parameters. You have the 4 knobs that can be selected:
  - Top row: knobs for Pan, Reverb, Chorus, Tempo (when appropriate)
  - Second row: Cutoff, Resonance, Attack and Release.
  - Third row: ASA (assignable knob A) is set to control envelope initial Decay and ASB (assignable knob B) is set to control envelope Sustain. AS1 and AS2 are assignable per Voice in the Voice Edit - Common level CONTROL SETS, [F4] CtlSet.
  - The bottom row: gain controls for 4-bands of EQ (storable per Voice)!

- Try a half-step trill – hold down one note while fingering the adjacent note. Notice that
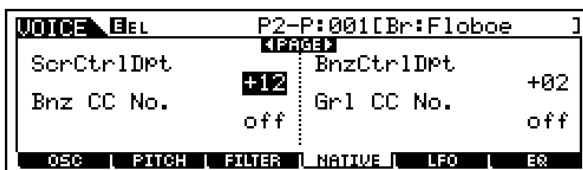
---

[2] Element level (Program button [1]) and Common level ([COMMON] button) – are available. S90 effects are Common level.

the held note cuts off. This is what happens when a **monophonic tone generator** is set to **poly** mode. Navigate to the Common parameters. Press [COMMON]/ [F1] General/ [SF2] PlyMode. Set the Poly/Mono to MONO.

- Try the trill again. Now you will have a much more natural response. The note-to-note connections feel better, more horn like, and less keyboard like.
- Find the reverb and chorus effect sends; COMMON F6. Add effects to your taste.
- Now let's experiment a bit with the model itself on the Element level. Find the Native VL parameter that is **Scr CC No** (Scream Control Change number). This selects a controller to apply 'scream' – an actual VL parameter that controls the chaotic, harmonic condition that approximates what happens when a musician aggressively attacks and overblows on the instrument. Set this parameter to **AT** (aftertouch – near the very end of the list of controllers).

```
VOICE  EL          P2-P:001[Br:Floboe   ]
                      ◀PAGE▶
EmbCtrlDpt                   TngCtrlDpt
                   +63                    +00
Tng CC No.                   Scr CC No.
                   off                    AT
   OSC  |  PITCH  |  FILTER  |  NATIVE  |  LFO  |  EQ
```

- Now PAGE right with the cursor arrow and select the **ScrCtrDpt** (Scream Controller Depth) parameter and set it to **+12**. When AT is applied you will hear a roughness grow within the sound. Without a Depth value the controller will not be applied. Experiment with different amounts and even different controller numbers and find something you like, something that suits your playing style. For example, setting the Scr CC No. to 001 will assign it to the modulation wheel, or setting it to 004 will assign it to the Foot Controller.

```
VOICE  EL          P2-P:001[Br:Floboe   ]
                      ◀PAGE▶
ScrCtrlDpt                   BnzCtrlDpt
                   +12                    +02
Bnz CC No.                   Grl CC No.
                   off                    off
   OSC  |  PITCH  |  FILTER  |  NATIVE  |  LFO  |  EQ
```

- When you press [STORE] your work will be saved to one of the 64 **PLGUSR** locations reserved for this board. Now it becomes a proper Plug-In Voice. They will go to the "**Px—U**" PLGUSR bank- 'Px' for your Plug-in slot, 'U' is User. You have made a complete PLUG IN VOICE from Board Voice data.
- When you save your first data to the PLGUSR Bank your Voice will be there alone. Don't panic if you press a program button and all the other places in that bank say "---:------".

Simply press [F2] Bank and select a bank. When you attempt to store you are automatically taken to the USER bank, of course.

When you save an ALL DATA file type the PLG bank Voice data will be saved. However, as we will see, if you have made any custom user Board Voices (those voices made from scratch via the editor in bank 033/002) will need to be saved separately in a bulk type file (.w2b). As long as your S90 Plug-in Voices point to preset Board Voices your Voices will be backed up in a regular ALL data file. It is when you have used the 033/002 User bank to create brand new VL sounds that you must also save a bulk file.

If you find that some of the parameters have little or no effect on a particular sound it is because the parameters you are adjusting are offsets to the original board voice data. For example, if a parameter is at maximum in the original data you will not be able to increase it any further with the offset. You may find that the HPF or High Pass Filter has no effect on our Floboe sound – this is because in the original configuration of this model the HPF was not used. Therefore it is not available to be controlled. To really get at the original data you must access it via the computer editing software. With some sounds a particular parameter may not be available because it does not apply to the current voice or family of instrument. Because VL technology is interactive some parameters cannot be changed in real time – those that would cause the horn to no longer mathematically support sound. We call this 'breaking the model'. You will **not** be allowed to break the model. For those of you that are **un**afraid of complex technology and systems may want to download the VL70-m Expert Editor from the www.yamahasynth.com download section (it's free). It really let's you get in and create physical modeling instruments from scratch – **WARNING:** not for the meek, or easily frustrated programmer. In other words, it is very deep and requires a fundamental understanding of musical acoustics. For mere mortals you will want to try the VL Visual Editor – a much easier version of the modeling software.

- When you attempt to store your work, it will be saved to one of the 64 PLG locations of the host and become a proper **Plug-In Voice**. You have not really changed the preset board Voice called Floboe, but you have stored a new set of parameters that point to and will control the preset Floboe Board Voice equation.

- Press [STORE] – you will be able to direct this P1-B, P2-B or P3-B Voice to one of the 64 PLG bank locations.

- **TIP:** When working with VL board voices you may find it convenient to set up a template voice. For example, the Floboe voice we just worked with can act as a template. When you want to work with a different Board Voice rather than start from scratch each time, just simply insert a new VL board voice on the OSC Assign page. This way it will inherit the mono setting, the effects and scream control that you have set up. When you are ready to store the new voice just point it to a new PLG bank location. For example, after storing Floboe to location 001(A01) press [EDIT] and then Program button [1] - this will take you back to the Oscillator page. Select Jazz Sax, bank 033/001, number 81.

The Jazz Tenor sax – it will inherit all the edits of the Floboe experiment. When you go to [STORE] simply aim the results to another PLG bank location, PLG :002(A02). You may find that a bigger horn, like the Tenor will require more Scream Depth to get the same throaty response!
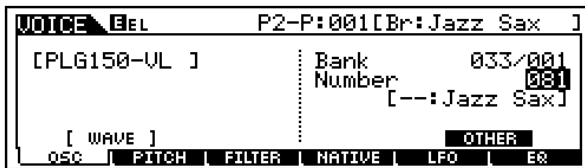
The CUSTOM Bank and the INTERNAL Bank

The bank **033/002** is a bank of 6 **Custom** user locations to which you can import new configurations of the model. Here you can load in your own totally *original* models created in the provided Visual Voice Editor software. (You can also use the VL Expert Editor software - downloadable from the Yamaha website). You can create your own hybrid acoustic instrument models. The memory of the custom bank is **volatile**. The data in a volatile bank is lost when you power down. Each time you power up these locations revert to 6 VL sound effect Voices. When you load in new Voices you will be writing over these default Voices (do not worry they appear elsewhere with the Preset banks and are only acting as placeholders. Any custom Voices must be stored and reloaded **each** time you want to use them. Fortunately, with an optional SmartMedia card you can create an auto load file that will reload your data automatically on power up. (More on this later).

The bank **033/003** is an **Internal** board RAM bank that will hold 64 of your favorite VL sounds (made from the preset VL elements and any of your 6 custom board elements). You can load in bulks created in the VL70-m tone generator (an equivalent tone engine). This bank also is **volatile**. These must be loaded in via MIDI bulk from the VL Editor, from a SmartMedia card file or from a sequence. When you power up these locations default to a collection of Voices made from preset 1 and preset 2 - set up for breath control play. As you start to experiment you will determine how you want to setup each voice - whether you want to use BC or velocity or TouchEG and how you want all the other controllers to be assigned. These 64 Internal locations are for your favorite setups. As you find a preset that you enjoy playing you will want to refine the controller setups that help you 'perform' the sound – store your controller tweaks to voice locations in the 033/003 bank. As you master an instrument (and it can take you months of practice to really fully explore a single VL 'axe') add it to your arsenal of elements. In a future tutorial we will learn to bulk new VL models into the Custom bank.

Mastering a VL sound is very much about finding your own personalized controller setups and ranges, then working out your performance gestures.

Summary: When you create a Voice for your PLG150-VL using a VL element from the either the Custom or Board Internal set, you must make sure the correct VL bank is loaded into the machine each time you wish to use them. The Custom (033/002) and Board Internal (033/003) banks are in **volatile** memory and will revert back to the default sounds on power up. Like working with any computer word processor, you must save your work or document before exiting the program. You can save your work via the editor or to SmartMedia card via the S90. With a SmartMedia card you can automate any Voice setups that you wish to have available so that when you boot up it loads all your custom configurations. That's why they call it a 'Smart' card. Later we will learn how to make such automatic files.

Using Board Voices and Plug-In Voices in Performances

The architecture of the Performance mode is very flexible and will allow you to create unique layer/split combinations using multiple technologies. Because each board has its own CPU, polyphony and DSP resources, you are not limited by having to pre-allocate resources for mathematical calculations.

The S90 series of synthesizers have 2 kinds of storable/playable entities: Voices and Performances. In general, a **Voice** can use a

REVERB processor, a CHORUS processor, and a dual INSERT Effect processor. A **Performance** on the other hand can combine pre-made Voices together. A Performance has the same system Reverb and Chorus effects and *one* of the parts of the Performance can call up its dual Insert effects. You will discover that there is an **additional** Variation Effect in a Performance.

Performances can be used as a complex split/layer that is played from the keyboard. Alternatively, you can use a Performance location to address PLG Plug-in and Board Voices directly. In other words, nothing says you have to use a Performance to setup more than one sound. You can dedicate the entire Performance to just one sound, if you wish. This gives you additional places to store your own custom sounds made from the board voices. The PLG150-VL is a single part board. This means that you can only select a single sound from it, at a time.

In order to use a PLG sound in a Performance you simply activate the PART SWITCH = ON for Part**P1**, Part**P2** or Part**P3**, depending on the slot you have the PLG150-VL board. The PLG Voice works just like any other PART of the Performance. Any 4 Parts can have their PART SWITCH set to ON in a Performance.

In the Performance EDIT - Common parameters you will find the Effects Connect page [F6]. **EFF Part Parameter**. Here you can assign the effect processor to the PLG. Select either PartP1, PartP2 or PartP3 as the INS EFF source.

MULTI-TIMBRAL: PARTS and MIDI channels

Don't get confused by the way the Multi capability of the S90s works. The S90 is a **16 MIDI channel** system. You have access to your sounds in a multi-timbral setup via what are called PARTS. The PLG150 series boards add a PART to the Modular Synthesis System. A Part is assigned a MIDI channel and you can place as many Parts on a single MIDI channel as you require. A Part can be key limited, velocity limited, and edited as you deem necessary. When a PLG Voice is played from **Voice mode** it is a single PART and will be addressed by the software as PART1. However, when a PLG Voice is used in a **Performance**, it becomes Part **P1** or Part **P2** or Part **P3** depending on the slot it occupies. This means that you can **layer** a PLG sound with internal sounds or you can key zone them to create splits. Of course, you can change the MIDI channel as required. As you add Plug-in boards each will have its own Part but *share* a MIDI channel with one of the other sounds. You can then choose to layer (play together) or split (limit the key range) the Parts on a single MIDI channel. You also can turn each one ON or OFF as suits your needs.

A Performance can access Voices from any of the host banks: PRE1, PRE2, PRE3, GM, USER, PLG1, PLG2, and PLG3. Additionally it can use the A/D input.

Working with the SmartMedia Card

Knowing about saving and loading different file types will be important. There are several file options open to you when it comes to organizing your data. Because of the modular or component nature of the system the organization of the data is a bit complex, but learning to deal with it will give you a heads up on archiving our data efficiently. We have discussed 2 kinds of Voice data concerning the PLG150-VL: Plug-in Voices and Board Voices. Plug-in Voices are sounds that have been integrated into the host product, while Board Voices are elements (raw data) that are housed on the PLG150-VL itself. There are separate file protocols to backup and restore these data types.

The optional SmartMedia works just like a floppy disk. If you are familiar with computers you will have no trouble finding your way around. If, however, you are unfamiliar with file structures of computer disks, it may be a bit confusing at first, but it will be well worth the hassle to learn how to protect your data. SmartMedia cards operate at approximately 4 times the speed of the typical floppy drive and comes in various sizes - 4, 8, 16, 32, 64 and 128MB sizes. It is also possible to create folders in the file structure of a SmartMedia card (for file management and organizational purposes).

The most versatile file type that can be saved on the SmartMedia card is the 'ALL' file (extension **.w4a**). This is because when you want to reload data, you have the most options. You do not just have to reload everything – you can be selective and choose which data you want to recall. From an 'ALL' file it is possible to load entire Voice banks or individual Voices, entire Performance banks or individual Performances or entire Plug-in Voice banks or individual Plug-in Voices.

To SAVE an ALL file to SmartMedia card

- Press [FILE] and select Card mode
- Select the SAVE Card function
- If necessary set the TYPE to **"all"**
- Name your file (8 characters).
- Press [ENTER]; and [YES] to execute
- If you name your file in the root directory (literally): AUTOLOAD.w4a the synthesizer will automatically load this file when you switch it ON. (Obviously, there can only be one such file in a folder).

It is important to note that an "ALL" file will save the S90 Voice and Performance Banks including:
128 [USER] Voices + 16 [USER] Drum Voices
128 [INT] Performances
64 [PLG1] Plug-in Voices
64 [PLG2] Plug-in Voices
64 [PLG3] Plug-in Voices

It does **not** save custom Board Voice data, however. That is stored in a separate bulk.

To Load individual Voices from an ALL file:
* Press [FILE] and select Card mode
* Select the LOAD Card function
* Select the ALL data file you which to extract data from (.w4a extension)
* Choose the data type to extract – Voice
* Press [Enter]
* Use the front panel bank buttons to choose the source file and destination location, either USER, USER DRUM, PLG1, PLG2 or PLG3.
* Press [ENTER]; and [YES] to execute

You can **only** load PLG data to the proper bank that physically contains the PLG150-VL board (TYPE MISMATCH will occur). Likewise you can only save PLG data from the bank containing the board. If at some later time you switch the location of the board you only need to point the data toward the board – the system will figure it out.
We mentioned that "ALL" files do **not** save custom Board Voice data. Data that is created and in the RAM of the PLG150 series board must be stored in a separate file (extension **.w2b**). The file type is called **PluginAllBulkX,** where 'x' denotes the slot. It is only necessary to save this "pluginBulk" type when you have created or imported <u>new</u> **Board Voices** into either the 033/002 Custom board or 033/003 Internal board locations. Remember that these banks are volatile and revert to sounds pulled from the preset 1 and preset 2 board banks when the unit is powered down.
To understand this better use this analogy - think of the Board Voice data like a user sample in a sample playback synthesizer. If you do not restore the wave data to the proper location, the Voice data will not see the sample. In the VL technology – if you do not restore the correct mathematical formula (user board voice data) to the proper location the S90 Voice data will not find the model.

To SAVE a "PluginAllBulkX" file
* Press [FILE]
* Select the SAVE function
* Set the TYPE to **"PluginAllBulkx"** where x is your slot

* Name your file (8 characters).
* Press [ENTER]; and [YES] to execute
* If you name your file in the root directory (literally): AUTOLD1.W2B for PLG1, AUTOLD2.S2B for PLG2, or AUTOLD3.S2B for PLG3 the synthesizer will automatically load this file when you switch it ON.
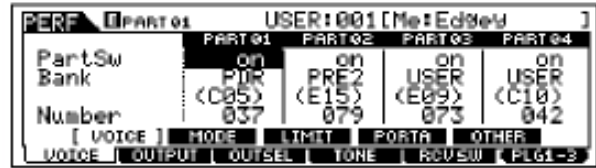
Push [F6] to see PLG.

Performances: When setting up Performance, you can activate up to 4 Voices – In Performance Part edit you have a "PART Switch". This includes selecting one sound from your PLG150 series board (AN, DX, PF, and VL). Each 150 series slot, PLG1/PLG2/PLG3, can contribute **one** sound at a time. Alternatively, you can use the Performance mode Initialize JOB to create any combination of AWM2 Internal and PLG Voice slots. **Please note**: When you have multiple PLG150 Series (single part synthesizer) boards, each board must 'see' its own data through the proper slot. P1, P2 or P3 – attempting to recall voice data in a slot not containing the right board will cause a TYPE MISMATCH error or you will simply not hear your sound (even with the name showing). The board for the voice data must be in the S90 in order to play.

Setting up your optional BC3 Breath Controller
Connect the BC3 to the Breath input on the back panel of the S90. Select the BC set of PLG Voices **PLGPRE3.** Press [F2] Bank and use INC to select PLGPRE3.

Blow a puff of air into the BC3 mouthpiece to initialize it. Now, **without blowing into the mouthpiece** (very important) hold a note down on the keyboard. Adjust the OFFSET control on the side of the BC3 up and down. Notice how the sound can be made to disappear (remember you are **not** blowing). This is a critical setting – you want to turn this back and forth so that you are resting at a point where the sound has **just** reached the OFF point. Stop! You should now here absolutely no sound when you play on the keyboard. (The sound is said to be "biased" to breath control). It will now take blowing into the mouthpiece of the BC3 **and** playing a key to turn on a note.

Now, what about that GAIN control? This is set to your playing style and taste. If you are just starting with breath control and have no background with blowing an instrument, then you will want to set this sensitivity control for lighter response. With GAIN you are changing how much effort it takes to reach a maximum of 127. As you acquire more and more confidence in your ability to 'blow' notes, you will find yourself actually increasing the amount of air it takes to reach 127. *Please take your time*. In about 3 weeks re-evaluate your playing and make adjustments. Remember that the BC3 mouthpiece has an air/moisture release valve (drain cap) that also changes how the BC feels as you play. You can let air escape or close it tight – it is a matter of taste. The VL Visual Editor will make VL voice creation easy. It has prearranged "drivers" (mouthpieces / bows) and prearranged pipes/stings so that combining the complex mathematics is as easy as selecting icons. Without a degree in acoustics you can quickly put together custom horns. If you want to delve deeper into the technology download the VL Expert Editor but be forewarned the potential for creating a "tacit horn" – one that will not support sound - is very great. There is very little luck involved in creating new instruments via the Expert Editor. You can find the Mac and PC versions of the VL Expert Editors at: www.yamahasynth.com in the Downloads section Be sure to visit: www.sondius-xg.com for more information on the development of this technology – a joint project of Stanford University and Yamaha Corporation.

We'll close this article on the PLG150-VL with an excerpt from the Programming Guide written for the VL Expert Editor – it gives you a good insight into why this Physical Modeling system is different from any synth engine you have encountered to data. Visit the VA (Virtual Acoustic) Tutorial online:

http://www.digitalmusicworld.com/html/hardware/SynthsTutorial.asp

Excerpt taken from VL Programming Guide by Dr. Manny Fernandez:

"Virtual Acoustic synthesis is unlike traditional types of synthesis because you are programming the physics of instrument behavior and construction (not the sound!). This reproduces in the holistic interaction of pitch, timbre and behavior, which occurs in acoustic instruments. Indeed, it is the skillful control of pitch, timbre and behavior which allows acoustic instrument-alists to create nuances and expression in their playing that traditional synthesis cannot reproduce.
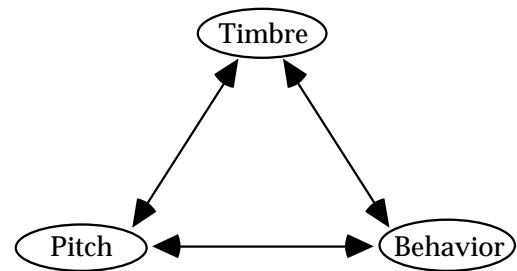
This is because traditional synthesis is based on the reduction of sounds into *discrete* pitch, timbre and behavior components i.e. Assign a tuning (pitch), choose a waveform or sample (timbre), then alter with filter and amplifier envelopes (behavior). There is the ability to modify behavior with real-time controllers like Mod Wheel for vibrato, Foot Controller for filter sweeps and the Pitch Wheel for bend articulations, but each of the effects is discrete and does not recreate the *interdependent interactions* that happen in a acoustic instrument.

Programming the VA system will put you in the role of instrument designer, and you will need a new paradigm in your approach to creating and editing sounds. Namely, you are no longer directly dealing with the 'sound' itself, but instead are dealing directly with the **instrument**. Thus you change the construction of the instrument to indirectly affect the desired change in the 'sound.' For example, you are no longer making the 'sound' brighter by opening a filter. You are now making the 'sound' brighter by increasing the airflow speed through the instrument, widening the flare of the bell and changing the dampening characteristics of the wood, metal or plastic body. The essence of VA synthesis dictates that now the 'sound' is brighter, but it now also has a slightly different harmonic structure, the pitch and scale temperament is altered, and the attack/decay and legato/staccato articulation behavior is different as well. The fact that VA synthesis always responds with this interaction between pitch, timbre and behavior gives it the ability to recreate the nuances and expression of acoustic instruments.

By it's design, VA synthesis emulates the real physics, so you can easily create instruments that don't, won't or can barely play. Traditional acoustic instrument designs were created and refined over generations, and reflect refinements in design to maximize specific physical behaviors. The first time Adolphus Sax tried to create a metal woodwind, it was a far cry from a Selmer Mark VI!"

Prepared by: Phil Clendeninn
Product Specialist
Technology Group
©Yamaha Corporation America