



S90 ES

Power User: Working with and Understanding Physical Controllers

How to use this document:

This is a tutorial and assumes you are making the button pushes as it advances. By following the example setup, you will gain an insight into how the controllers work and how they can be assigned to your advantage. All possibilities could never be covered in a short guide but this should get you on your way. After going through this article feel free to experiment with other assignments.

Background:

Get your S90 ES DATA LIST booklet and refer to the CONTROL LIST on page 42: "VOICE CONTROL SET DESTINATIONS" and "ASSIGN A/B DESTINATIONS". You will also want to refer to the EFFECT PARAMETER LIST (pages 27-35).

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Assigning Controllers in Voice Mode

Within the architecture of each internal AWM2 (sampled-based) Voice is a set of 6 controller assignment setups, called Control Sets. You can program how the physical controllers will be assigned to affect a specific part of the sound. The assignable physical controllers available in the Control Sets are:

- MW – Modulation wheel
- PB – Pitch bend wheel
- AT - Aftertouch
- FC1 – Foot Controller 1 (optional FC7 pedal)
- FC2 – Foot Controller 2 (optional FC7 pedal)
- FS – Foot Switch (optional FC4 or FC5 pedal)
- Assign 1 – Slider
- Assign 2 – Slider
- BC – Breath Controller (optional BC3a)
- RB – Ribbon Controller (*)

* The S90 ES does not have a Ribbon Controller. However, keep in mind that if the same MIDI Control Change messages as set here are received from an external device, the internal tone generator also responds to those messages as if the Ribbon Controller of the instrument was used. Voices that were programmed for the Motif ES, for example, might have RB (cc22) assigned – the S90 ES Voice can still respond to these in sequence data or via MIDI.

What about the Assign A and B Control Sliders?

ASSIGN A and ASSIGN B Control Sliders do not appear in the individual Voice mode Control Sets. Both are each assignable for the entire S90 ES (global) and will behave the same in **all** Programs. This is different from Assign 1 and Assign 2, where the “destination parameter” is programmable, per Voice.

What about the Sustain pedal and the new Half-damper and the Damper Resonance functions?

This will be the subject of a separate article. But, in general, the **Half-Damper** function is part of the VOICE mode Amplitude Envelope Generator on a per Element basis and is tied to the FC3 (optional) sustain pedal; while the **Damper Resonance**, which simulates the soundboard resonance inside a piano when the sustain pedal is pressed, is a special Insertion Effect controllable via the sustain pedal.

Control Set Conventions:

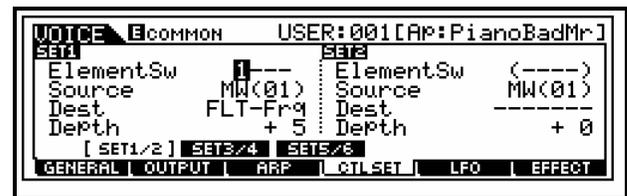
Certain Control Set assignments are *common* to all elements and others can be specific to a particular *element* of the sound. There are 6 Control Sets, each allows the user to pick a physical controller and assign it a parameter destination (the target parameter you will be changing). It is possible with this system to assign more than one controller to the same destination

by using more than one CONTROL SET. And it is also possible to have a single destination under the control of more than one physical controller. The degree or *depth* of the control of each physical controller can be programmed, as well. In fact, the Depth parameter is very important – because without a Depth amount the assignment is meaningless. Think about the Depth setting as controlling *how far* the controller will be moved to get the response you wish. This is your performing gesture and should be set to *your* particular taste and playing style. It is okay to have an opinion about ‘how much’ you move a controller to get the response you need.

You can view and set the parameters for the Controller Setups in the S90 ES itself or via the “Voice Editor for S90 ES” in your computer.

To navigate to the Controller Sets in the S90 ES from **Voice mode**:

- Press [EDIT]
- Press [COMMON] (a/k/a Drum Kits/Favorites)
- Press [F4] CTL Set



- There are 6 sets (3 pair) selectable via the [SF1]-[SF3] buttons
- **Setting the SOURCE/DEST:** select a Source controller and assign a target Destination (Dest) parameter.
- **Destination Elements or Common:** The ‘ElementSw’ (or Element Switch) activates control for each element. If the destination is ‘common’ to all elements you will see parenthesis (----) around the four dashes that represent the individual elements. Parenthesis around a parameter means you cannot get at it (This is the equivalent of being ‘grayed-out’). In this case because all Elements will be treated together. The Common parameter destinations are Volume, Reverb Send or Chorus Send. If, however, the destination can be assigned to a specific Element(s) you will see the destination parameter name as **ELM-Lvl** = Element level, **ELM-Dly** = Element delay, or **ELM-Pan**, etc. You can select which elements are to respond to this control setting. An “ElementSw” Element Switch setting of “-2-”, represents a setting where

element 2 will be affected, and the others are unaffected. (See example assignment below).

- **Real-time Control over Insertion Effects:** Other possible destinations include real-time control over the powerful DUAL INSERTION EFFECTS that can be applied to a VOICE. Refer to the Effect Parameter List (page 27-35) for an idea of potential here. When targeting a control destination if an effect parameter can be real-time controlled you will see an abbreviation of the parameter name appear in the Control Set. If not controllable in real-time, the parameter will be designated with a "P" number, as in "INS2P10". For example, call up the B3 Organ sound PRE1:118 [Or:16+8+5&1/3]; This Voice uses the Dual Rotor Speaker 2 algorithm for INSERTION B. You will find data about this effect on the bottom right of page 30 of the DATA LIST booklet. Navigate to its Control Set1/2;

- Press [EDIT]
- Press [COMMON]
- Press [F4] CTL SET
- Press [SF1] Set1/2;



This Voice has the destination set to "INSB:EfSpCt1" which translates to "Insertion Effect B: Effect Speed Control". It has two speeds (like a Leslie) Slow and Fast. This Control Set is using the Mod wheel to switch between Slow/Fast speeds. Most of the parameters of the Dual Rotor Speaker 2 algorithm are assignable for real-time control. There are 16 possible parameters in the processor. "Speed Control" is listed as MIDI Parameter Number 16. MIDI Parameters 10 and 15 are unavailable for real-time control assignment. If you attempt to select them you will see "INSB:INS2P10" and "INSB:INS2P15" instead of a parameter abbreviation - meaning they are unavailable. (MIDI Parameter Number 10: (typically Wet/Dry Balance) is totally unavailable because of phase cancellation possibilities - it is not even listed; and Number 15 "Microphone L-R angle" is the angle of the modeled stereo microphone on the Leslie cabinet...simply not a parameter you would move in real-time. Mic angle is a "set and forget" parameter. Parameters that are unavailable typically have no **musical** or

practical use. If you want to see and tweak this effect algorithm press [F6]: EFFECT/[SF3]:INSB

- **DEPTH** The setting here must be set with care and some thought. The range here is from -64 ~ 0 ~ +63. How the S90 ES responds to a setting will depend on *which parameter* and *which controller* is selected. (See below some example assignments). A Depth setting of 0 defeats all other settings in the Controller Set and renders them meaningless. In general, the higher the number the more it increases the range of control. Negative value settings reverse the effective *direction* of the controller. You will have to be logical here when making assignments. ...More on this in a minute.

How the assignment of controls works

Example Assignment: In this example we deal with controlling VOLUME via controllers within a S90 ES sample-based Voice. This can be tricky, but this example should make clear how it works.

--Let's say you want to control the **total** Volume of the Voice with the Modulation Wheel. MIDI control change message #001 is the Modulation Wheel. The modulation wheel can be assigned to control all manner of parameters within a synthesizer, *not just* vibrato (Pitch Modulation Depth). But for our example let's see what happens when you attempt to assign the MW to control overall volume. For our experiment let's initialize a voice. This way we are not inheriting values from a preprogrammed Controller Set. From **Voice mode:**

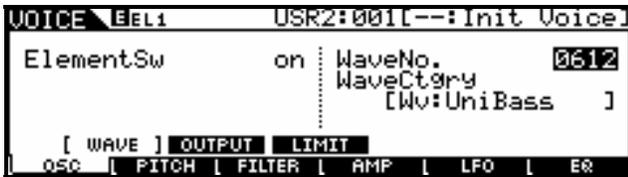
- Press the following buttons:
- Press [JOB]
- Press [F1] INIT
- Press [ENTER]
- Press [INC/YES] to execute.

This will create an INIT VOICE with just a piano wave in it.

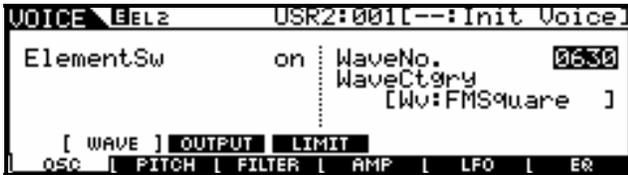
- Press [EDIT]

Let's select a synth wave. Navigate to the OSCILLATOR WAVE page:

- Press Program button [1] to drop to the Element level of editing. (Notice the Inverse video  and the 'EL1' on the top line - denoting the Voice has been edited but not yet stored and we are editing Element 1.)
- Press [F1] OSC
- Press [SF1] WAVE
- Select sample wave #0612 [Wv:UniBass]



- Now, for fun, let's activate a second Element in this Voice. Press the Program [2] button that represents Element 2. You can now turn the Element Switch ON.
- Set Element 2 to waveform #0630 [Wv:FMSquare]



- You can use Program buttons [1], [2], [3], and [4] to **select** Elements, and buttons [9], [10], [11], and [12] to turn them **on/off**. Try it! Currently we can use [1] and [2] to select and [9] and [10] to mute and un-mute our two Element Voice. This will allow you to isolate each element when you want to concentrate on just one at a time. Practice this basic skill.
- Navigate to the CTL Set 1/2 (Control Set 1) page. (Press the [COMMON] button to return to Common edit. [F4]:CTL SET
- Set the CTL SET 1 as follows:



In the above example, the Volume parameter is 'common' to **all Elements**. We know this because the Element Switches are grayed out (parenthesis). If you were to activate additional Elements they would also share the same setting when you select a 'common' destination. The modulation wheel will effect all the Elements. The +63 Depth setting sets the maximum range of the controller. Try it...move the mod wheel...

Hey! What gives...I thought we would now be controlling the volume completely with the modulation wheel! But **no**, it **doesn't** work. Is the unit broken? Should I call someone? - Not at all. Here's why it is not working: This is not the place that the overall volume of the sound is set, only where you **assign control to it**. We need to go to the overall Voice volume parameter and reduce it to zero. In other words something else is

controlling how loud this sound is as well - of course, it's the main Volume assignment that responds to note-on. Here is how to change it.

Navigate to the Common OUTPUT page [F2]. Here you will see a parameter for the total volume of the Voice = 127. Program it to 0. That's right, 0.



Now when you move the modulation wheel you have **total** control over the volume of the Voice. The position of the modulation wheel is now an **absolute** representation of the current common volume, 0-127. We call this process 'biasing' the parameter (in this case, volume) to the controller. In other words, it will now look to this controller (mod wheel) for volume instructions.

Okay, return the Common Voice Volume to 127 before continuing.



Similarly, a volume assignment can be made on the Element level. This would allow the player/programmer to have control over specific parts of the sound (Elements) within a Voice. In our Control Set instead of making the Destination = Volume (common overall volume) like before, this time assign it to **ELM-Lvl** or Element Level. When ELM-Lvl is selected you can individually assign which elements will respond to this Control Set's Depth setting when the physical controller is moved.

Return to Control Sets press [F4]:CtlSet/[SF1]:Set 1/2. Select 'ELM-Lvl' as the DEST (destination). Set only Element 2's level to be controlled via the MW (Element Switch). This is accomplished by moving the cursor to the Element Switch line and setting it so it reads: "-2-"



And in a similar fashion to before, you would need to set the initial level of the Element(s) that you are controlling to zero (bias its level to the MW). Instead of "Total Voice Volume" we are looking for the level of this particular Element. This is found on the Element Amplitude page: Return to Element Level editing by pressing program button [2] (Element 2 Select)

Then press [F4]:Amp/ [SF1]:Lvl/Pan
Set EL2 Level to 0



When you set Element 2's Level to 0, it is biased to the MW. This is a very flexible arrangement. You can expand upon it and dream up your own configurations. For example, you could take Control Set 2 and program it to control just Element 1 with the same Mod Wheel but set the ELM-Lvl DEPTH to -64. Now when you move the wheel it will fade out one sound and fade in the other.



Notice you did not have to set the Element Level for Element 1 to 0. This is because if you did and then applied a minus value to it...this would be illogical...because levels below 0 are still inaudible. Experiment.

A similar scenario occurs when you assign a Voice to Breath Control. You want the Voice to only pay attention to (be biased to) input from the Breath Controller (cc #002). In such a case you may want to reduce the overall volume of the Voice to 0 or the element level to 0. Which one you use will depend on what it is you are trying to accomplish. This way the volume will be entirely determined by the amount of breath pressure applied to the BC3. Note-ons **do not** turn the sound on alone. They must be accompanied by a burst of breath (air) pressure (cc #002) applied to the mouthpiece.

Note: It must be stated here that Breath Control works best of all on VL physical modeled voices (optional PLG150-VL board). The Virtual Acoustic technology is meant to respond perfectly with breath control input. In

the technology there is an acoustically accurate change in timbre, pitch and amplitude in response to BC 'pressure' control. The sound of VL will mimic the 'behavior' of acoustic instruments. When controlling non-VL type voices you might try assigning breath control (BC) to vary the cutoff frequency of the filter. In such a case you may want to program the initial value of the filter to something other than zero - set to taste. This would require you to go into the Voice element level and set the cutoff frequency of the filter for each element you want to control. Each element can have a different filter type and cutoff/resonance. Each element that you add can have its own filter and filter settings.

Note 2: When using Breath Control on sampled-based Voices you may find it easier to just reassign the BC to Expression. Here's how: from Voice mode press [UTILITY]/ [F3]:VOICE/ [SF3]:CtlAsn and set BC = 11 Expression. This will allow you to immediately control any internal sound with BC - without any further programming.

FOOT PEDALS

The same scenario holds true for controlling volume with an optional Yamaha FC7 (sweep control pedal) plugged into the **Foot Control** jack (FC2). Foot Control (cc #004) can be assigned to control many different parameters within a synth voice. (Not to be confused with Foot Volume (cc #007) which always controls MIDI Channel Volume). There is always some confusion here because they both use the same FC7 pedal - however, the function can be quite different. One key difference is that if you use cc007 every thing connected to that MIDI channel will be controlled the same. If you use the assignable Foot Control cc004 you can choose the destination parameter for the foot pedal and it will only affect the S90 ES and only the Elements of the S90 ES sound that you designate.

Foot Control (cc004) can be assigned to control the internal volume of the S90 ES in a similar fashion to how we did the MW experiment. Simply follow the same steps we did with the MW, above, to assign the Foot Controller (FC04) to be the Source and set volume as the (DEST) destination. When you set the Volume to 0 you will have biased total volume to the Foot Controller.

Note: If the parameter to be controlled is set at any value other than 0, you are, in affect, setting a *minimum value*. In the case of our volume example, this would be the minimum volume when the controller was in the heel down position. In some instances you may wish to set the minimum to a value other than zero as the stored condition (especially for Live players this is invaluable). The example above is useful in a scenario where you want to control the internal S90 ES sound with a separate foot pedal from what is sent via MIDI.

After any and all Voice edit procedures you should STORE and then SAVE data (if it is worthy of

keeping). If you started editing a Preset or you started editing an Internal Voice, simply point the Store procedure towards a desirable Internal location. Press [STORE]; Select a location; press [ENTER]; then [YES].

Note: At the end of any editing session you should make a backup copy of all your new Voice edits. Save sounds either to an optional USB Drive, in an ALL or ALL-VOICE files or backup the current set via a S90 ES Voice Editor

What other things can be assigned?

To answer this question we must recognize that there are answers for internal Voices/Performances and answers for external communication via MIDI Master Keyboard setups. Let's first gain an understanding of how the controllers work. MIDI provides for standard physical controllers. Some are **fixed** as to what control change message they send, while others are **assignable**. We must consider what these controllers are doing to the internal S90 ES sounds and what they are doing out via MIDI. These two things can be quite different, by design.

First, here is how it works with Voices. S90 ES Voice banks hold the factory programmer's best work. These are your fundamental, playable sound Library. A Voice can have as many as four completely independent multi-sampled waveform sets within it – Yamaha calls these components *Elements*. Each Element can be individually controlled by S90 ES parameters such as filters, envelopes, LFOs, etc. You can assign the various physical controllers to control specific areas within the sound. The physical controls available are:

- PB** – Pitch bend wheel
- MW** – Modulation wheel
- Assign 1** – Slider 3
- Assign 2** – Slider 4
- AT** – Aftertouch
- FC1** – Foot Volume (Expression)
- FC2** – Foot Control
- FS** – Foot Switch
- BC** – Breath Controller
- SUS** – Sustain
- Assign A** – Slider 1
- Assign B** – Slider 2
- Control Sliders 1 / 2 / 3 / 4**
- RB** – Ribbon Controller

PB (fixed) – Pitch Bend wheel will always send information that is Pitch Bend data (its own category of message) both internally and out via MIDI. Exactly how the data is interpreted by the tone generator (receiving device); **is** programmable. For example, it is possible to use the wheel for something other than just pitch

bend by programming the sound to have a pitch bend **depth** of 0 and then assigning the PB wheel to a different parameter. For example, in physical modeling VL technology (PLG150-VL) the PB wheel is often used for embouchure (mouth position/tightness of the lips) – most horns don't pitch bend like a synth. It makes a good control for embouchure because embouchure can be tightened (wheel up) or loosened (wheel down) or returned to normal (centered). These VL Voices are often programmed such that the PB range = +0. Typically, however, on the internal AWM2 sample-based Voices PB range is set to up/down 2 steps (a whole step; see below).

Pitch Bend range is a COMMON parameter and can be set per Voice on the following screen:

- Press [COMMON]
- Press [F1]: GENERAL
- Press [F5]: OTHER



The Pitch Bend wheel actually sends out 16,384 different units, how far this bends the pitch is always determined in the receiving device. While raising the pitch bend wheel in the screen shot above will raise the pitch two half steps, out via MIDI a receiving module might see this as an octave or a fifth (how far the PB changes is always determined in the receiving device).

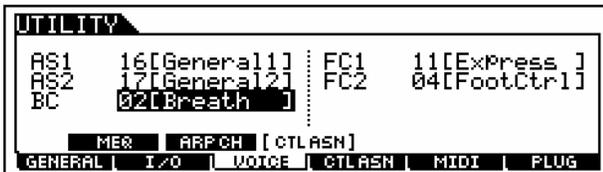
MW (fixed) – Modulation wheel will always send control change message 001 and this data is typically used for vibrato depth both internally and out via MIDI. Exactly how the data (control change message 001 – written cc001) is interpreted by the tone generator (receiving device); **is** programmable. For example, it is possible to use the modulation wheel for something other than just vibrato depth by programming the sound's PMD (pitch modulation depth to 0) and assigning it another parameter. (PMD is another name for vibrato.)

For example, the mod wheel makes a good mix control. You can use it to fade one layer *in* (+ depth/level at 0) while a second layer is programmed to fade *out* (- depth/level at 127). The assignment to vibrato (Pitch Modulation Depth) is not automatic. Each Voice that uses the MW as vibrato has it assigned in a Control Set:



Above you see a typical synth lead Voice PRE4:064 [Ld:Bright Saw]. A two Element Voice that has the Mod Wheel as the ELFO-PM depth control – this translates to Element Low Frequency Oscillator- Pitch Modulation control. Depth = +27. As you move the wheel up you will add vibrato (pitch modulation) to the Voice

AS 1 – ASSIGN 1 does not have a fixed MIDI message (while all decent MIDI keyboards have Modulation Wheels and Pitch Bend wheels, they do not necessarily have an assignable controller). It can be assigned as an internal control device. You can use Assign 1 to change Element level, filter cutoff/resonance, effect send, etc., etc. (see Control Set Destination list). It can be assigned to any control change message, (cc1-cc95), for transmitting out via MIDI. The default assignment is cc #016 called: “General Purpose control 1”. If you reassign the default control change assignment (a global setting found in UTILITY) to cc #001 Modulation, for example, you will in effect have a modulation wheel on a Slider.



However, leave it set at cc016 as this is as good as any for its purpose.

AS 2 – ASSIGN 2 does not have a fixed message. It can be assigned as an internal control device. You can use it to change Element level, filter, effects, etc., etc. (see Control Set Destination list). It can **independently** be assigned any control change message for transmitting out via MIDI. The default assignment is cc #017: “General Purpose control 2”. If you reassign the default assignment (global setting found in UTILITY) to cc #002, for example, you will in effect have a breath control on a Slider.

AFTERTOUCH (fixed) – will always be sent when extra pressure is applied to the key. How this controller data is interpreted, if at all, is a function of the voice parameters in the tone generator/receiving device. Some players use

aftertouch to vary PMD (pitch modulation depth), vibrato. Others like it to brighten the sound and assign it to filter cutoff, still others assign it to control an effect, like the rotating speaker speed. Try substituting AT for MW in the OR:16+8+5&1/3 Voice... as long as you apply pressure to the keys, the speed of the rotary speaker will be fast. Aftertouch cannot be turned off, per se. It is always sent when pressure is applied to the keyboard. Whether or not anything happens when this pressure is applied is determined completely in the receiving device.

FOOT CONTROL 1 (FC1) – An FC7 pedal plugged into the Foot Control 1 jack is available as an assignable controller. You select what it will send globally for the S90 ES from VOICE mode UTILITY:

- Press [UTILITY]
- Press [F3] VOICE
- Press [SF3] CTL ASN.

The default is cc011 (expression) which is *similar* but not the same as control 007 (Main volume). Many people mistake these two as being the same thing. While they both control ‘how loud’, they have different functions. For example, in a Song you plan to play a B3 Voice on top of a sequenced rhythm section. You set the organ Part’s mix volume to a level of 96. (Because 96 is the perfect setting for as “loud” as you will ever need to be compared to the rhythm section). You are setting how loud the organ sound will play on a scale from 0-127 - relative to the other sounds. If your FC1 pedal is set to control 011 (expression) – toe down will never exceed the ‘96’ Main volume setting of the Part. If, on the other hand, you have the FC1 assigned to cc007 (Main volume) the volume will be set by the absolute position of the pedal – toe down will reset the volume to 127 – and you will be too loud. Expression (cc11) is **relative** volume within the maximum set by the individual parts Level. Volume (cc07) is **absolute** volume for the current MIDI channel.

FOOT CONTROL 2 – defaults to sending control change message 004, but can be reassigned to any control change number 1-95 (global setting found in UTILITY). How this data is interpreted by the tone generator/receiving device; is programmable. For example, it is possible to use the foot control for filter cutoff (wah-wah) on an internal sound and have an external sound set to interpret cc #004 as something entirely different.

FOOT SWITCH – Use an optional Yamaha FC4 or FC5 (momentary switch). It can be assigned any cc number between 1-101. It will always send a control change value of 127 when activated;

otherwise the value is 0. The nature of the switch makes it ideal for OFF/ON operations. This message can be used to turn something from off to on or vice versa. The default assignment is cc #088 an unassigned number. Assigned to cc #099 or 100 you can advance or move backward through Voices or Performances. You could even use it to start/stop the arpeggiator (cc96*), hold the arpeggiator (97*) or the sequencer (cc98). *The S90 ES default for Arp Sw and Arp Hold. Use cc090 when you want to Stop an arpeggio during sequence playback. This cc message can be placed on a track to automate the arpeggio ON/OFF. Set FS to cc66 it will become a sostenuto pedal. Set to 101 it will reset the OCTAVE transpose.

BREATH CONTROL – defaults to sending control change message 002, but can be assigned to any cc number from 1-95 (global setting found in UTILITY). How this data is interpreted by the tone generator; is programmable. For example, in VL Voices (PLG150-VL) breath control often applies a virtual ‘Pressure’ to the virtual mouthpiece (or driver), and can be responsible for parameters like Scream and Throat Formant. Setting BC to 11 Expression is a quick way to assign sample-based Voices to BC. This is accomplished for Voice mode by press [UTILITY]/[F3]:VOICE/ [SF3]:CTL ASN

SUSTAIN (fixed) – will always send a control change message 064. This control number is HOLD 1 and will latch the current sound. (Other controllers can be assigned to send cc064 sustain but a pedal plugged into the sustain jack will always send sustain). When activated how long the sound sustains will be a function determined by the Voice’s own programming. The Amplitude Envelope Generator determines what happens to a sound over time. The sustain parameter will not hold a sound indefinitely if the AEG has a DECAY 2 LEVEL that ultimately reaches 0. Typically an organ envelope is an example of a sound that **will** sustain indefinitely – because an organ envelope’s DECAY 2 LEVEL remains at maximum (127). If the DECAY 2 LEVEL of the AEG is 0 the sound will eventually die out completely. If the DECAY 2 LEVEL is set to any value other than 0, then the sustain parameter will HOLD it at that level.

SUSTAIN (half-damper) – the S90 ES represents the first of the Yamaha professional synthesizers to implement the very “pianistic” half-damper function. This requires that a special parameter be activated in the Voice’s Element AEG and that an optional FC3 pedal be used. In general, the FC3 is continuous sustain pedal that is capable of sending message form 0 through 127, unlike the regular sustain pedal which is a simple ON or OFF proposition. But the magic of

the half-damper function is in the S90 ES itself. What it means is you can get the subtle nuance of how a piano responds when the pedal is not fully pressed. This allows for greater expressive playing on piano pieces. Until now this feature was only found on the dedicated Yamaha electronic pianos (and, of course, on all the Yamaha acoustics ☺.) Plugging an FC3 into a keyboard that does not have the AEG to take advantage of the half-damper will get you nothing – the magic is as much in the S90 ES as it is in the pedal.

Sustain pedal and the Damper Resonance Effect – new to the S90 ES as well, is the Damper Resonance Effect. This is an additional Insertion Effect developed with the acoustic piano in mind and allows the sustain pedal to control the amount of soundboard simulation you hear when the sustain pedal is pressed. The Damper Resonance is a subtlety that adds to the significant realism and playability of the S90 ES piano sound.

Assign A / B – default to cc18 and cc19 but are assignable to any control change number. Additionally, and independently they can be assigned to System Controller Destination parameters (Master EQ, Arpeggio, and other global parameters). See page 42 of the DATA LIST booklet for more details. These are assigned globally in UTILITY mode. The default assignments have these 2 Sliders controlling Amplitude Envelope Sustain and Decay parameters internally.

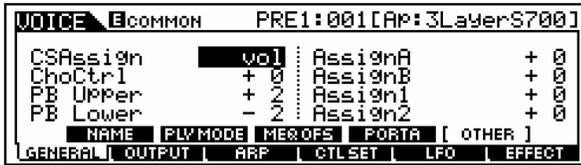


CONTROL SLIDERS 1 / 2 / 3 / 4 – These can be used for a variety of functions as defined by the [CONTROL FUNCTION] section. Options are:

- Pan/FX Send/Tempo;
- Filter/EG;
- Assign
- Master EQ
- Volume
- Zone

When the LED is set to the Volume row, they default to controlling levels via Sysex messages in both Voice and Performance modes. They are assignable per zone in a 4-zone Master Keyboard setup to Control Change message. (See separate section below). In a Master Keyboard setup they are individually programmable – CS 1 will be for zone 1, CS 2 for zone 2 and so on. But you select the parameter they each control. The row that is

active when you initially call up a Voice is a function of the [CONTROL FUNCTION] section and is programmable per Voice. When set to VOL, as below, the Sliders will send System Exclusive messages to control the Element levels within the Voice. (When selected in a Performance the Sliders control Voice levels with the Performance). When in a MASTER Setup you will most likely select ZONE as the active row making the Sliders then programmable per Master setup.



Control Sets Summary: Each AWM2 (sample-based) S90 ES Voice has six Control Setups where a physical controller, called the Source, is assigned a specific controllable parameter, called the Destination (DEST) and a Depth value that determines how much effect the controller will have. This flexible system will enable the user to tailor the sensitivity of each controller's movement. Sensitivity or Depth refers to how far you move the controller to get a desired result. This is an important setting because you want to be comfortable working the controller while you perform.

The destinations are listed in detail on page 36 of the Data List booklet that comes with your S90 ES. They include Voice volume, reverb send, chorus send, and some 26 Insertion Effect parameters (not all Insertion Effect parameters are real time controllable). And if you are dealing with the internal sample-based Voices, an array of Common and individual Element parameters like filter cutoff, resonance, LFO speed and depth, tuning, key on delay, Pan position, Pitch, Filter and Amplitude envelopes, etc., etc., can be programmed. PLG1, PLG2 and PLG3 Voices will be able to be assigned to volume, reverb send, chorus send and the 26 possible Insertion Effect parameters, **only**.

Each PLG-series board may have controller sets of their own, depending on the technology involved – these will be programmed in the PLG Voice Editor software. For example, if you program (using the provided AN Expert Editor) a PLG150-AN Voice to respond to cc16 for filter cutoff and cc17 for filter resonance, it will have its 'virtual analog' filter controlled by the S90 ES Assign 1 / 2.

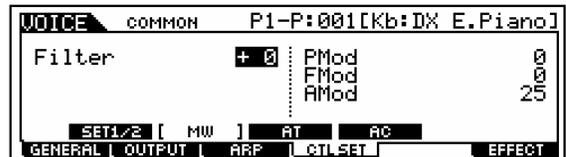
Note: PLG150-series Plug-in Voices will have a different set of Controller Set screens in the S90

ES (explained below). Also, look in the Voice Editors for additional assignable controller routings. For example, the PLG150-AN has some 8 AC (assignable control devices) and 15 Control Sets available. The PLG150-AN is based on the AN1x keyboard synth, which had 8 front panel assignable knobs AC1-AC8. You can reassign as many as you wish to your available S90 ES physical controllers. Each board will have a different controller setup arrangement depending on the technology involved.

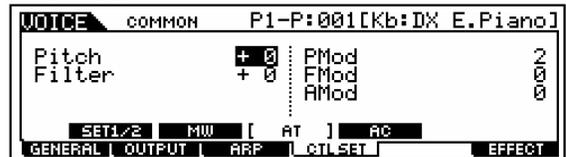
PLG150 Series boards are single PART boards and have two kinds of Voices: PLUG-IN and BOARD. PLUG-IN Voices are those that have been integrated with S90 ES Effects and Controller routings (discussed below). BOARD Voices are resident on the Board itself and have not yet been integrated with the host parameters (hopefully you will customize them to your liking). Each board comes with a different amount of Board Voices for you to build PLUG-IN Voice and the S90 ES gives you 64 blank USER locations for you to place them.

The PLG150 Voices will have the following additional Controller (CTL) screens that will let you route controllers to the following areas:

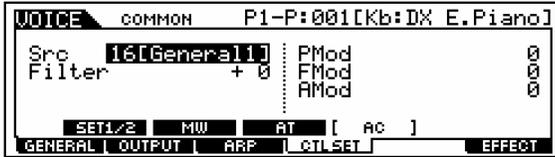
Modulation Wheel Assignment: In each S90 ES PLG150 Voice you can assign MW to directly control the Filter (cutoff/resonance); Pitch Modulation (PMod) – vibrato; Filter Modulation (FMod) – wah-wah; and Amplitude Modulation (AMod) - tremolo.



Aftertouch Assignment: Aftertouch can be assigned to Filter, Pitch Mod, Filter Mod, Amplitude Mod and the direct control of Pitch with (AT) key pressure



Assignable Controller: For each PLG150 Voice you will find a screen for an Assignable Control – AC Control. Here you can pick a device (physical controller) or control change number to do various tasks: Control the Filter, Pitch Modulation, Filter Modulation, and Amplitude Modulation. These will enable the user to customize routing for the PLG150 Voices.



Depending on the PLG board you may have access, via the S90 ES front panel, to selecting a specific parameter to control with the AC selected here. Look in the PLG boards NATIVE parameter area.

Understanding how the Controller and the Parameter ranges work:

Put on your thinking caps...this is tricky. Remember I mentioned *logic* – well here we go. Minimum-to-Maximum controls versus Negative-to-Positive controls: Consider the Mod wheel versus the Pitch Bend wheel as an S90 ES physical control device. One has its zero position in the middle, while the other is at zero in the down position. One changes values from minimum towards maximum, the other above and below a 0 center value. These factors must be considered when you make an assignment of a parameter to a physical control. Think about all physical controllers in these two groups:

Minimum to Maximum Controllers

- Modulation Wheel
- Foot Controllers: FC1/FC2
- Breath Controller
- Aftertouch
- Foot Switch/Sus *min. or max. only

Negative ~ 0 ~ Positive Controllers

- Pitch Bend Wheel (self centering)
- Assign 1/2 (center détente)
- Assign A/B (center détente)
- Control Slider 1/2/3/4 (center détente)

Now think about the parameters and the range of possible values. Some parameters go from minimum to maximum (like volume and effect sends: 0-127) while others move above and below a center zero point (pan position: L-C-R), and filter cutoff: -64 more closed, 0 normal, +63 more open).

This can be an issue if, for example, you assign a **minimum to maximum** parameter, like Common volume 0-127, to a **negative to positive** controller like Assign 1.

Here's what happens:

The center position will be 0 volume, while +63, at the top, will be maximum volume. For all settings below the center position, 0 through -64, the minimum volume is sent out, 0. The control

seemingly only works half the time. You can't hear less than 0.

Conversely, if you assign a parameter that is **negative to positive** to a controller that does not have a center détente (a **minimum to maximum** controller like MW), you may find it difficult to place it back to neutral.

It is **not** an issue when you assign a negative/positive parameter, like pan position, to a negative/positive controller like a S90 ES Slider. In such a case, negative values pan left, positive values pan right and the center position is center.

Conclusion: Consider the above when selecting a controller for a specific parameter.

The Control Sliders

There are 4 Control Sliders, CS1-CS4. We need to talk about their function in Voice, Performance and Master Keyboard modes.

Why don't the Control Sliders send cc007 in Voice Mode?

The sliders send Element Level via system exclusive messages. In Voices that combine up to four (sampled) elements you have a slider for each Element. Of course, they **do not** send cc007 (Main Volume) in Voice mode – cc007 is main **channel** Volume and would affect all components together (common) because they are all on the same MIDI channel. You would lose individual control. It would set all Elements to the same Volume no matter which slider you moved.

Why don't the Control Sliders send cc007 in Performance Mode?

The sliders send Voice Level again via system exclusive messages – which will affect only the S90 ES. In a Performance that has up to 4 Voices each slider controls the volume of one of the Voices. Performances can combine Voices and PLG150* Voices. *One Voice contributed per PLG150 series board. Of course, the sliders **do not** send cc007 in Performance mode. Again you would lose individual control because a channel message would set all Voices to the same Volume no matter which slider you moved. All Voices in a Performance are on the same MIDI channel.

What about the Control Sliders in Master Keyboard Mode?

The sliders are assignable to any control change number from 1-95, when you are setting up a **4-zone** setup. You determine what each slider sends to each corresponding zone. You determine the MIDI channel and destination (internal TG or MIDI or both) for each zone. The default is cc #007 (volume) for each zone and this is sent out via MIDI (if you want).

Controllers can be activated or deactivated per Zone. Of course, they **can** send cc007 in Master mode because each Voice can be on a separate MIDI channel!

What happens when I want to control Voices in a Performance, independently?

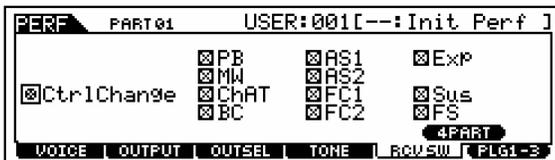
A Performance is literally, up to 4 Voices addressed together on the same Basic MIDI Channel. If you want to control one Voice a certain way and another a different way within the same Performance you may need to program each individually back in Voice mode. That is what you learned about in this article – assignment of controllers in Voice mode. You now can assign parameters in a Voice and when you place that Voice in a Performance all of your controller routings will apply. This can be very interesting because a single slider can be doing different things to different Voices in your Performance... ..which is actually very, very cool. For example, say you want to control a Performance with three sounds: STRING/PIANO/FLUTE. And you want to control the string sound independently with a FOOT CONTROL pedal. You may need to program the individual Voice, however, you do have the option of activating or deactivating a controller for an individual PART within a Performance. So you will have to determine if you need to make adjustments to individual Voices or can you simply activate or deactivate certain controllers to accomplish your goal. In a Performance you can see which Controllers are active per Part:

- Press [EDIT]

Touch program button [1] to select PART edit level/

- Press [F5] RCV SW or Receive Switch.

Here you can set each Part as necessary. An 'x' means the Controller is active on this PART.



In general, each Performance is pretty much autonomous when it comes to control assignments. In other words BC, Assign1, Assign2, FC1, and FC2 can be assigned differently per Performance, as necessary, whereas in Voice mode the assignment for these was global.



One last tip concerning your controller assignments: There is a default condition for each when a Voice or Performance is recalled. This is affected by the CONTROLLER RESET parameter which can be set globally:

- Press [UTILITY]
- Press [F1] GENERAL
- Press [SF4] OTHER

This parameter can be set to either RESET or HOLD. "Hold" will allow each Voice to inherit the current condition of a controller. For example, if you have a BC plugged in and the Controller Reset is set to HOLD, you will not have to blow air into the BC3 to initialize it each time. Therefore if you are using a BC3 you want the value to HOLD.

If you use a Foot Controller as your master Volume level, setting Controller Reset to HOLD will mean that the next setup you call up will hold at the current volume of your pedal. This makes your pedal's position "live" rather than having it RESET to a pre-set value. You can choose which way works best for you.

Cool...enjoy!

Phil Clendeninn
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Technology Products
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