

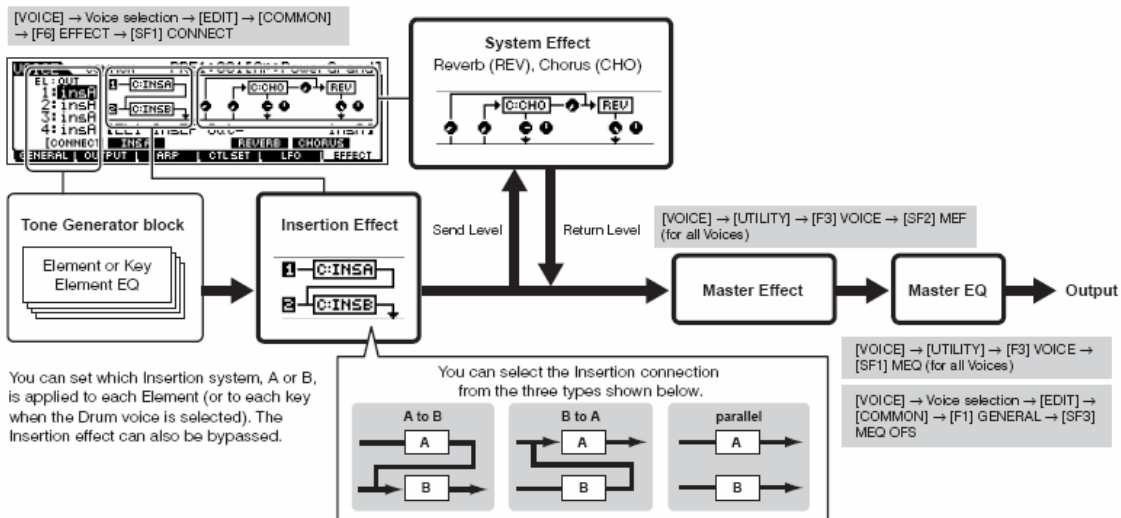


POWER USER

MUSIC PRODUCTION and PERFORMANCE With the MO

Introducing MO EFFECTS

Phil Clendeninn
Senior Product Specialist
Technology Products
©Yamaha Corporation of America



Understanding MO Effects

The focus of this article will be to introduce you to the MO effects. "A picture is worth a thousand words", some great mind said. Please refer to the MO Owner's Manual pages 142-144 for the full graphic story on the Effects routing in the MO for VOICE mode, PERFORMANCE mode and for SONG/PATTERN modes. This makes it very clear where the Effects blocks are and when they are available via a left-to-right flow chart. We will try and make clear how this impacts you using the MO to its fullest.

In VOICE mode (see diagram page 142):

There are up to 4 Elements (multi-sampled instruments) in an internal MO Voice. They can be individually assigned (starting at the left side of the diagram) to the INSERTION EFFECT block, which is a dual block (INS A and INS B) that can be routed in series or in parallel (see the routing as A to B, B to A or parallel). Each Element has a signal path to the Insertion block – they can be routed to INS A, to INS B or to neither (THRU). The two System Effects (reverb and chorus) each have their own send levels for the *entire* Voice (that is, all Elements together). And there is an independent return level for each System effect – mixing the signal back into the main flow. Then the entire signal goes through the Master EFFECT, the Master EQ (a 5-band EQ) then on to the stereo output. An important thing to understand about the VOICE mode effects is that the Insertion Effect assignment are part of the VOICE programming and can be recalled for up to 3 of the 16 Parts when used in a multi-timbral setup in SONG/PATTERN mode and 3 Parts of a PERFORMANCE can recall their Insertions...more on this point in a minute. The System Effects are always shared by all the Elements in a Voice and are shared by all the PARTS of a Performance and Song/Pattern MIXING setup, as well.

In PERFORM mode (see diagram page 143):

There are up to 4 Voices in a Performance. The DUAL INSERTION EFFECTS are available for three Parts of the Performance. That is, 3 Voices in a Performance can recall their original Dual Insertion Effect routing and control while in a Performance. What actually happens is you are *activating* the Dual Insertion effects that are programmed in at Voice level.

Each Voice in a Performance is called a 'PART'. And each Part has an individual send level to the System Effects so that you can control how much is applied individually. There is a return level from each System effects. The total signal is delivered

to the Master EFFECT, then to the Master EQ and then on to the stereo outputs.

In SONG/PATTERN MIXING mode (see page

144): The Tone Generator block can have up to 16 parts total. The DUAL INSERTION EFFECT can be activated on any three Parts from the internal MO (1-16). Each Part will have an individual send to the System effects. And finally, all signal goes through the Master EFFECT, the Master EQ and then on to the stereo outputs.

Background

The algorithms (or Effect TYPES) in the MO Effects are deep. Please refer to the DATA LIST booklet to see the individual parameters and effect types. On page 26-27 of the DATA LIST you will see a list of the different Effect Categories and Effect Names. Page 28-35 will list the parameters available in a convenient form to see them all and the ranges of control. This is worth a look. The TABLE Number heading is for those that need to know the exact value of each setting – refer to the charts on pages 36-41 for exact values for each parameter setting. Basically settings are made to taste (by ear). However, knowing what is subjective and what is objective is what separates a bogus mix from a brilliant mix.

So much of working with sound is subjective (meaning it is up to you) but some of it is very objective (meaning there is a right and wrong). Sorry, it's true. Knowing the difference between these two concepts is the key to greatness in the audio business. For example, when routing signal to an effect do you return more than you send or send more than you return? Gain staging is the objective part of audio. Make sure that you work on the side of 'SIGNAL' when dealing with the SIGNAL-to-NOISE ratio. The rule of thumb: Send up to the limit of clean audio and return just enough to taste. If you are sending signal to an effect processor that you have configured as an EQ, how much signal do you send? Again this is not subjective; there is a right and wrong. Send all of the signal through the EQ. If you were to return dry signal from certain routing scenarios you can cause phase cancellation – a situation where you will be adversely affecting the signals integrity. Knowing what you are doing with effects can mean confident utilization with stunning results. Just experimenting willy-nilly can lead to bogus results. Of course, you could eventually wind up with something useable but knowledge is power. In most instances the MO will not let you get in too much trouble – sometimes you are prevented from controlling certain things because it would be illogical or lead to bogus results...those

decisions are made by the designers. For example, you will see where a subjective return is allowable a DRY/WET balance so that you can mix your amount of effect return, but from a device like an EQ there is no balance control.

The Processors

The **REVERB** processor has 20 algorithms available. When working with a reverb algorithm you can select it by size environment: HALL, ROOM, STAGE, PLATE, WHITE ROOM, TUNNEL, BASEMENT and CANYON. Yamaha was the first company to introduce digital DSP based effects that were based on the actual dimensions of the great concert HALLS of the world. ROOMS have a definite size factor to the space. A STAGE is usually a loud reverberant environment. A PLATE is a brilliant emulation of the old 10-foot boxes that used to contain these reverb chambers that used a transducer (driver) at one end and second transducer (microphone) at the other...in between was a large aluminum plate 1/64th of an inch thick. You sent signal from the mixing board's aux sends and returned up to a maximum of 5 seconds of cool reverb. This was the standard for drums and percussion "back in the day". The WHITE ROOM will help you design your own environment and can teach you about how the other presets were made. The WHITE ROOM lets you set width-height-depth of the walls and the 'wall vary' lets you set the reflective texture of the surface from rug to steel. Also important in working with reverb is an understanding of how it works in the real world. In most listening situations you are hearing a certain amount of signal, directly from the source, while the rest of the signal bounces off the environment you are standing in. If, for example, you are 30 feet from the stage you will hear a portion of the sound direct from the stage but most of it will bounce off of the walls, floor and ceiling to arrive at your position. Because we often record and/or amplify musical signal with a technique called "close-miking", reverb became a necessary evil (if you will). Close-miking allows us to *isolate* a particular sound from others in the environment but there is a trade off...we lose that sense of distance and environment. To regain some of the distancing we use artificial reverb to do the trick. Recognize that when you put a different amount of reverb on the snare than you do on the flute this does not occur in nature. All the musicians in the same room would naturally have the same reverberant environment with very subtle differences due to positioning in the room. This gets back to the subjective part of the audio business. SO WHAT? You can use effects to taste. There is no rule that says everyone has good taste. An important parameter in all the reverbs is the INITIAL DELAY this is the time before the reverb receives the signal and can help position the listener near-far

from the instrument source. The HPF and LPF are there to help you shape the reverb signal itself. There is a rule of thumb here: low frequencies reverberate less than high frequencies. Low frequencies tend to hit a surface like a wall and spread out while high frequencies hit a wall and bounce back into the room. This is why when you are sitting next door to the party you only hear the bass through the wall - all the high frequency content 'reverberates' and stays in the source room. So use the HPF (high pass filter) to allow the highs to pass through to the reverb and block the lows from reverberating. Reverb on bass just adds MUD. MUD is not a subjective term but if it is what you want go for it (but yuck, it is mud). Low frequencies don't bounce back they tend to hug the walls and spread out. If you want cutting, punchy bass leave the bass "dry" (without reverb).

The MO Reverb processor features a brand new effect algorithm set based on the heralded Yamaha "Rev-X" technology. "REV-X" is a whole new generation of Yamaha Reverb with the richest reverberation tone and smoothest decay. There are "Hall", "Room" and "Plate" algorithms. Newly introduced parameters like ROOM SIZE and DECAY envelope also bring much higher definition and finer nuances. Check out the LARGE HALL, MEDIUM HALL, WARM ROOM, WOODY ROOM and RICH PLATE algorithms to hear these new reverbs.

The **CHORUS** processor has 49 algorithms available. These are short time period delays from flanging, to chorusing/phasing and on out to multiple repeats and echoes. There are also tempo control delays that can be synchronized to the BPM of the music. Flanging is a very short time delay. If two identical signals arrive at your ear-brain, you will not be able to perceive them as two separate signals until one is delayed slightly. Imagine 2 turntables in perfect synchronization playing the same record. You would perceive the second one as just making the first signal louder until you delayed one of them a bit. If one slips 1ms behind the other you will perceive what we call flanging. The actual name comes from two reel-to-reel tape decks playing the same 2-track material. This was used as a real time effect, "back in the day". You would have 2 identical 2-track decks running in sync (no, there were no protocols to sync them - you pressed the buttons at the same time!!!) The engineer would slow one down by placing his thumb momentarily on the *flange* (reel holder). The resulting swirling sound is called flanging. Any delay between exact sync and 4ms is considered flanging. Delays of 4ms-20ms are considered chorusing and somewhere beyond 20ms the ear-brain starts to perceive two separate events, called doubling or echo. Among

the 'time-delay' algorithms in the Chorus processor you will find: Chorus, Celeste, Symphonic, Ensemble Detune, Flanger, Tempo Flanger, Phaser, Tempo Phaser, Delay L/R, Echo, Cross Delay, Cross Delay Mono, Cross Delay Stereo, Tempo Delay Mono, Tempo Delay Stereo, and Tempo Cross Delay.

The **DUAL INSERTION EFFECT** is made up of two identical units (INS A and INS B), and each has 116 innovative effects. The effect types can be the subjects of intense study. We will try and introduce you to some of the more unusual and unique ones in this article. In addition to all the reverbs, delays, echoes, cross delays, tempo delays, etc., you get some that are available nowhere else. The V-Flangers, for example, are a simulation of the classic vintage flanger devices. The Vintage Mono and Vintage Stereo Phasers faithfully reproduce the response of the old guitar stomp box of the '70's. The Early Reflections and Gate Reverb/Reverse Gate are great to recreate classic drum sounds. The Karaoke delays (basically cheesy repeats for that sing-along sound) should not be overlooked. The Auto Pan has settings for front-rear as well as left-right to give a circular "feel" to a stereo panorama. There are many combination and multiple effect algorithms.

Distortion + Rotary Speaker
Overdrive + Rotary Speaker
Amp Simulator + Rotary Speaker
Distortion + 2-way Rotary Speaker
Overdrive + 2-way Rotary Speaker
Amp Simulator + 2-way Rotary Speaker
Distortion + Delay
Overdrive + Delay
Compressor + Distortion + Delay
Compressor + Overdrive + Delay
Auto wah + Distortion
Auto wah + Overdrive
Touch wah + Distortion
Touch wah + Overdrive
Wah + Distortion + Delay
Wah + Overdrive + Delay
2-way Rotary Speaker
Dual Rotary Speaker

Among the innovative effects from the Yamaha Samplers A4000/5000 are the Lo-Fi, Low Resolution, Noisy Delay, Attack Lo-Fi, Digital Turntable, Digital Scratch, Auto Synth, Tech Modulation, Jump, Isolator, Slice, Voice Cancel, Ambience, Talking Modulator, Beat Change, Ring Modulator, Dynamic Ring Modulator and Dynamic Filter.

There are two different Multi-band Compressor algorithms that are great for fixing and punching up specific frequency ranges. Multi-band

compressors are used to finalize mixes and bring out (punching up) specific frequency bands without raising overall gain. The Digital Turntable algorithm adds "record surface noise" to your mix. You can program the tone of the noise, the frequency and randomness of the clicks and pops, and you can even program how much dust on the stylus. Digital Scratch creates ripping scribbles and wild panning effects. Jump takes wild panning effects to the **n**th degree. Voice Cancel is a vocal eliminator that can remove center information from a stereo input - you set the frequency range. Does it really work? Well, yes, but it must be applied to a stereo signal. It works by canceling data between 300-3,000Hz in the center of the signal. So the lead vocal is greatly reduced but so is the snare drum. Your mileage will vary. Slice is also the name of one of the effect algorithms in addition to being a sample edit process. This Slice effect can divide the audio into musical timed packets that it can pan left and right in tempo. You can select a quarter note, eighth note or sixteenth note slice and there are 5 different pan envelopes and some 10 different pan types.

The innovative CONTROL DELAY effect is a digital version of the old style tape delay where you can create wild repeating effects. When using the Control Type = Scratch you can assign a controller to the delay time to create insane echo effects.

Why is it called "Insertion Effect" and what is the difference between it and a "System Effect"?

On an audio console you have a series of channels. Channels carry **input** or **returns** from a multi-track (we refer to them as Input Channels or Track Channels depending on their role). Each channel has an on/off button, EQ, a fader, and a set of auxiliary sends. These 'aux' sends allow each channel to send a **portion** of the signal on what is called a bus (a group of wires carrying like signal). That bus can then be connected to an offsite effect processor in a rack. The return comes back to the board and is mixed to the stereo signal. That scenario is an example of what happens in MO with the SYSTEM EFFECTS. That is, when you are in a Song or Pattern and on the MIXING screens, the REVERB, and the CHORUS Effects are arranged so that access is just like the auxiliary sends of a console - each channel (Part) has an individual send amount to the system effects. There is a composite return signal that is mixed to the stereo output.

An Insertion Effect on an audio console is usually accessed via 'patch points' (interruption points in the channel's signal flow) that allow you to reroute **all** of the channel's signal via a patch bay through the desired effect or device. You are, literally, inserting a processor on that specific

channel alone. This is how the INSERTION EFFECT block works on the MO.

Examples: Typically, when a reverb effect is setup, just a portion of each sound is sent to it. This is the perfect example of what a System effect is about. However, things like rotary speaker (organ) or amp simulator (guitar) are effects that you might want to isolate on a specific channel. Therefore these type effects are usually accessed as an Insertion Effect. One **key** advantage of the Insertion Effect is that it can be controlled in real time, during the playing performance. Since the Insertion Effects are programmed at the VOICE level you can use the Control Sets (there are 6) to route your physical controllers to manipulate the parameters of the Insertion effect in real time. You can change the speed of the rotary speaker, or you can manipulate the Guitar Amp simulation setting while performing the guitar sound. This type of control is beyond just the send level (you are given access to System Effect send level only from the Voice mode Controller assignment). In the real world, the size of the room does not change (hopefully) so System effects like reverb are pretty much "set it/forget it". However, changing the speed of the rotary speaker effect is something that you may want to perform during the song.

Just how are you able to control certain parameters in an Insertion Effect? ...via MIDI commands, of course. In the hierarchy of modes in the MO VOICE mode is the most important when it comes to programming. This is where Yamaha spent hours and hours developing the sounds you play. The programmer's, with great care assembled the multi-samples into waveforms, and combined the waveforms into the Voice and worked with the envelopes, the response to velocity, the pitch, the tuning, the filters and so on. Each sample in the MO has its own EQ; the meticulous programming goes on for months at a time. Of course, parts of the arsenal available to the programmers were the Effect processors. Take a close look at a Voice and its effect structure (again the graphic on the top of page 142 makes the routing clear)... notice the Insertion Effect block, the System Effect block, the Master Effect block and the Master EQ block. Contrast this to the graphic on page 144, which shows the blocks during a MIX in Song/Pattern mode. The Dual Insertion Effect is available for any three MO (PART 1-16).

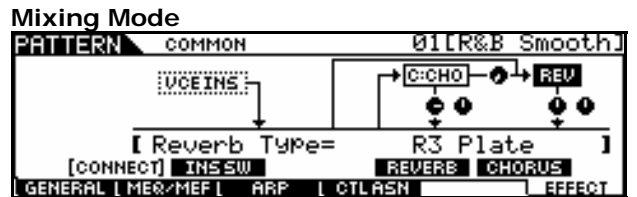
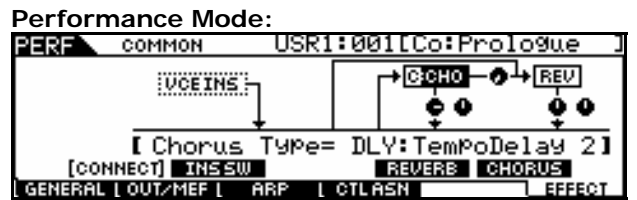
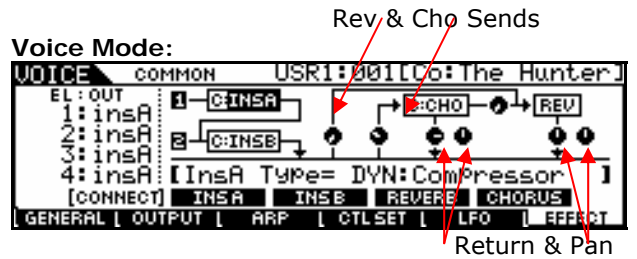
How do the diagrams on page 142-144 relate to the EFFECT/CONNECT screen?

Navigate to the MO Effect connection screen.

- Press [MIXING]
- Press [EDIT]

- Press [COMMON]
- Press [F6] EFFECT
- Press [SF1] CONNECT

This screen shows you an overview of the connections.



Notice also that both the Performance and Mixing screens do not have send level controls *to* the Reverb and Chorus. This is because the send level is not a 'common' parameter but is on a per PART basis. Each Part will have its own control for the amount of signal sent to the System Effect on the Part Edit level. While in Edit, you can select the PART to edit by touching the Track buttons 1-16 – corresponding to Parts 01-16.

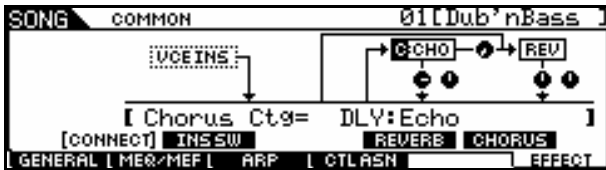
Notice that between the Chorus processor and the Reverb processor you have a level Send control knob: Chorus-to-Reverb Send. This can be used to create a situation where the System effects are used in series (one after the other) rather than in parallel (side by side). An example of how this can make a difference is when you select a DELAY as the effect for the Chorus and a HALL for the Reverb...when parallel routing is selected, you could send a signal independently to the delay and to the reverb. Only the initial note will have reverb, each repeat would be dry. By routing "0" send to the Reverb, but send the signal through the Chorus first, then through the Chorus-to-Reverb send, on to the reverb, you will now have a signal where *each* repeat of the Delay will have reverb.

- Press [SF2] INS SW

The screen below shows which Parts of a MIX are recalling their Dual Insertion Effect setups from Voice mode. It initially defaults to the first three Parts of a MIX and the first three Parts of a Performance.



As you move your cursor to the right in the CONNECT screen (shown below) you can highlight the CHO or REV effect and select from among the different algorithms. The letter "C" can be highlighted and denotes "category" allowing you to search the effects by category.



You can drop into edit any of these via the associated SF (Sub Function) button. For example, in the screen above SF4 is Reverb and SF5 is Chorus. So where do you edit the Insertion Effects? Notice the VCE INS box is a dotted line - denoted it is "grayed out" or unavailable from this screen. The Dual Insertion Effects are simply activated from Voice mode. When you go to this same CONNECT screen in VOICE mode you will see SF buttons available to access the INSERTION EFFECT parameters. The Insertion Effects do not appear in the MIXING CONNECT screen because the Insertion Effects are part of the VOICE mode edit parameters. If you need to radically change an Insertion Effect from the original programming then you will need to create a USER Voice with your new Insertion Effect edits and STORE it.



New to the MO is the ability to edit a Voice directly while still in a Song Mix or Pattern Mix. Press EXIT to leave EDIT mode but press MIXING to view the MIX screen shown above. The MO allows you to drop into full Voice Edit for any Normal (non-drum) Voice while still in the MIXING mode. While in MIXING Quick Access view, press the [F5] VCE ED (Voice Edit) button to drop into edit (shown above circled in red).

This allows you to edit a Voice and its Dual Insertion Effects while you are using the sequencer so that edits can be done in the context of the music sequence. When you STORE this edited Voice it will automatically replace the Voice in your MIX in a special "MIX VOICE" bank (63/60) which is "local" to the current Pattern or Song. What this means is the Mix Voice will automatically load when you load the Pattern or Song, even if you load just the individual Pattern or Song. Each Pattern Mix and Song Mix has 16 Mix Voice locations total. Due to complexity, Drum Voices cannot be stored in Mix Voice location.

In Voice edit you have 6 Control Sets that allow you to customize how the available effect parameters (and others) are controlled. Choose your assigned MIDI controls wisely, they will be available when you go to Song or Pattern Mixing.

Master Effects

The Master Effects are "post" everything but the Master EQ. So they are applied to the overall System signal (stereo). These are 8 effect algorithms that you will also find in the Dual Insertion Effects. If you want to apply them to a single sound, you can create a Voice and find the algorithm within the 116 Dual Insertion Effects.

These are:

- Control Delay2 (stereo)
- LO-FI
- V-Distortion
- Isolator
- Dynamic Filter
- Slice
- Ring Modulator
- Multi-Band Compressor1

These are typically called "DJ"-type effects, for lack of a better term, because like a DJ would, they are applied to the entire recording. DJ's are either playing back a record or CD that is a finished mix. So the effects that they add are always *post*, they cannot put a Dynamic Filter on just the snare drum, if you get my meaning, so "DJ-style effects". These Effects are applied to the entire SYSTEM signal. Don't be afraid to use your imagination with these Master Effects - they are radical. Things like putting a Control Delay on the final hit of the song so that it repeats and fades...or using a frequency Isolator to roll out all the bass for a section of a song, then bringing it back in for dynamic impact...or wacky panning effects with the Slice algorithm where you can pan signal left and right in tempo with the groove. Also on the normal side, you are given a powerful Multi-band Compressor for pumping up the frequency bands of the final mix. Awesome tools...experiment!!!

Master EQ

Although not technically an effect (EQ is an essential utility for any mixer), the Master EQ is the last process the signal goes through prior to the outputs.

In Voice mode, the Master EQ is setup and is global for the mode (applies to all Voices). While in Voice mode:

- Press [UTILITY]
- Press [F3] VOICE
- Press [SF1] MEQ

Here you find the full 5-band parametric EQ. Parametric means you can select the Frequency, the Gain and the Q (or width of the bands). Within each VOICE you will find the MEQ OFS or Master EQ Offset. This allows you to add to or subtract from the overall global setting made in Utility on a per Voice basis. The MEQ OFS (offset) is available via the KNOB CONTROL FUNCTIONS for the two lowest and two highest bands for quick tweaks.

In PERFORMANCE mode or in Song/Pattern MIXING modes you can setup the Master EQ on a per program basis

- Press [EDIT]
- Press [COMMON]
- Press [F2] OUT/MEF
- Press [SF2] MEQ

There is also an MEQ OFS (offset) available via the KNOB CONTROL FUNCTIONS for the two lowest and two highest bands for quick tweaks.

Phil Clendeninn
Senior Product Specialist
Product Support Group
Pro Audio & Combo Division
©Yamaha Corporation of America