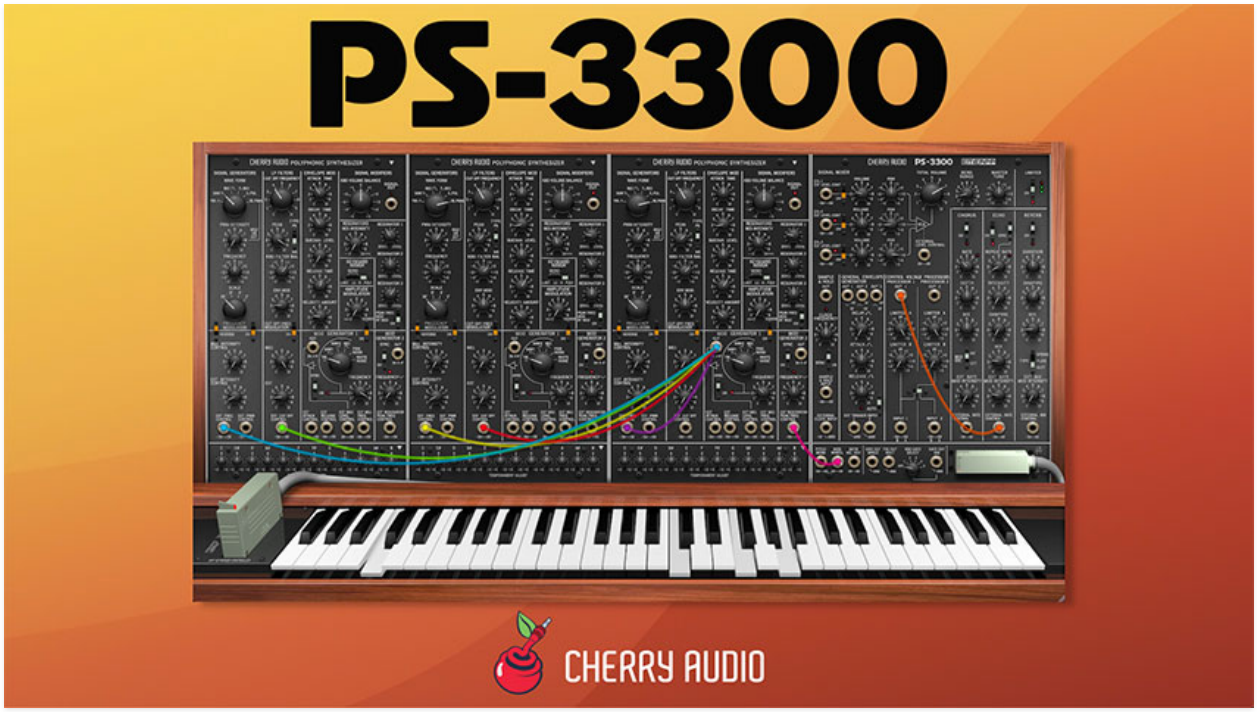


PS-3300 is an exactingly faithful virtual analog emulation of the colossal and ultra-rare semi-modular analog polyphonic synthesizer released by Korg in 1977. Cherry Audio has pulled out all the stops to accurately recreate and update this mythical monster synth, from its massive stacked sonic character and signature multiple-resonator sweeps to the considerable patching capabilities that distinguished the PS-3300 from all other polysynths of the era.

The PS-3300 had three independent "signal generator" panels, each essentially a complete polyphonic synthesizer. Each of these synth panels included 12 independently tunable divide-down oscillator banks as well as independent discrete VCFs, envelope generators, and VCAs for every note. This enabled all 48 keys of the external keyboard to be simultaneously played with independent articulation. Dual LFOs and triple voltage-controllable resonators for each generator further shaped its signature tone. A dedicated master panel featured a mixer with VCAs for

each of the three voice panels, a sample and hold, an additional envelope generator, and two control voltage processors. It also delivered extensive modulation possibilities through an astounding 67 front-panel input/output jacks.

Cherry Audio has faithfully preserved the soul of a classic instrument while cautiously updating its feature set for modern studio environments. The PS-3300 virtual instrument replicates the functionality, layout, and sonic characteristics of each of the three PSU-3301 signal generator panels, including the six-waveform oscillators; two modulation generators (LFOs); dynamic low-pass filters, envelopes, and amps; its distinguishing triple-peak resonators; independent per-note tuning knobs; and patchable jacks (with virtual cables) for signal routing. The voice panels have been expanded with additional faculties including PS- or MS-style filter selection, tempo sync, copy/paste between panels, and temperament tuning presets.

Similarly, the master signal mixer replicates the PSU-3302 sample and hold, a general envelope generator, and jacks for advanced sound shaping and control. Cherry Audio has elegantly expanded the panel with continuously variable CV control of level, per-channel panning, bend range, and studio-quality integrated effects for chorus, delay, and reverbs. With exceptional touches such as a lush interface with the Focus zoom-in feature, unlimited cables per jack, over 360 expertly designed presets, and versatile MIDI mapping, PS-3300 will satisfy both vintage synth aficionados and today's music producers.

Technical Assistance

Cherry Audio's unique online store and automatic updating should make operation a smooth experience, but if you run into any issues or have questions, you can discuss issues online at the Cherry Audio forums at:

https://forums.cherryaudio.com/viewforum.php?f=46

... or you can communicate directly with one of our ~~surly and grumpy~~ outgoing and friendly tech support staff at:

https://cherryaudio.kayako.com/



The Korg PS-3300 was an absolute beast of synthesizer. The largest and most complex of Korg's PS series (*P=polyphonic*, *S=synthesizer*), these incredibly rare instruments utilized a brute-force pre computer-chip approach to polyphonic analog synthesis. It's estimated that just 20-50 were produced during its 1977 - 1981 production run.

Like transistor organs and Moog's Polymoog, polyphony was implemented via a divide-down oscillator scheme. Prior to the advent of microcomputer chips, this was the only feasible approach to produce a polyphonic instrument. PS-3300's divide-down synthesis makes use of twelve high-frequency square-wave oscillators, each tuned to a high octave of each chromatic scale note. Their frequencies are iteratively halved by logic chips to produce consecutively lower-octave square waves at the correct frequencies for all keyboard notes. This allows full polyphony (i.e. no limit of how many notes may be played simultaneously), but these must be "waveshaped" to create saw or variable-pulse waves. Individual waveshaping circuitry is required for *each* of PS-3300's 48 keys. Similarly, *the original PS-3300 incorporated an individual voltage-controlled filter and envelope generator for every key*! Korg did their best to simplify these circuits, but as you might imagine, this required an insane amount of circuitry.

For increased flexibility, Korg implemented hardware patch points for signal routing. However, these were for mono audio and control signals only, as there was no provision for routing polyphonic control signals - this would have required cables like the massive multi-pin connector cable that attaches the keyboard to the main synthesizer cabinet.

Although the immense quantity of controls appears imposing, the PS-3300 can be thought of as three separate single-oscillator polyphonic synths (the three voice panels at the left of the cabinet) plus a master section (the right side panel) that includes a mixer, additional "mono" processing modules (sample & hold, an additional utility envelope generator, CV processors, and effects). The nifty part is that because the three voice panels are fully-independent, the programming possibilities for stacked sounds are immense.



Cherry Audio has been fortunate to forge a relationship with the Electronic Music Education and Preservation Project (EMEAPP) in Philadelphia, PA. By their own description, EMEAPP is, "A privately held world-class curated collection of rare vintage electronic instruments - a learning center, through research projects, creative endeavors, media programming and tours, enlightening many people along the way."

Translated for us synth-heads, EMEAPP is possibly the largest and most mind-blowing collection of incredible electronic instruments you'll ever witness. Please support them!



EMEAPP allowed us unfettered access to their mint, original PS-3300 which we carefully probed and recorded to create the most accurate emulation possible. (plus a few, "hey, can you check what it does when you do this???" follow up emails)

Technical Assistance

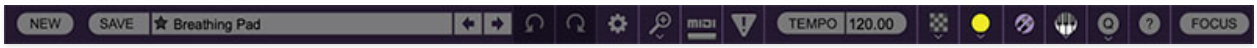
Cherry Audio's unique online store and automatic updating should make operation a smooth experience, but if you run into any issues or have questions, you can discuss issues online at the Cherry Audio forums at:

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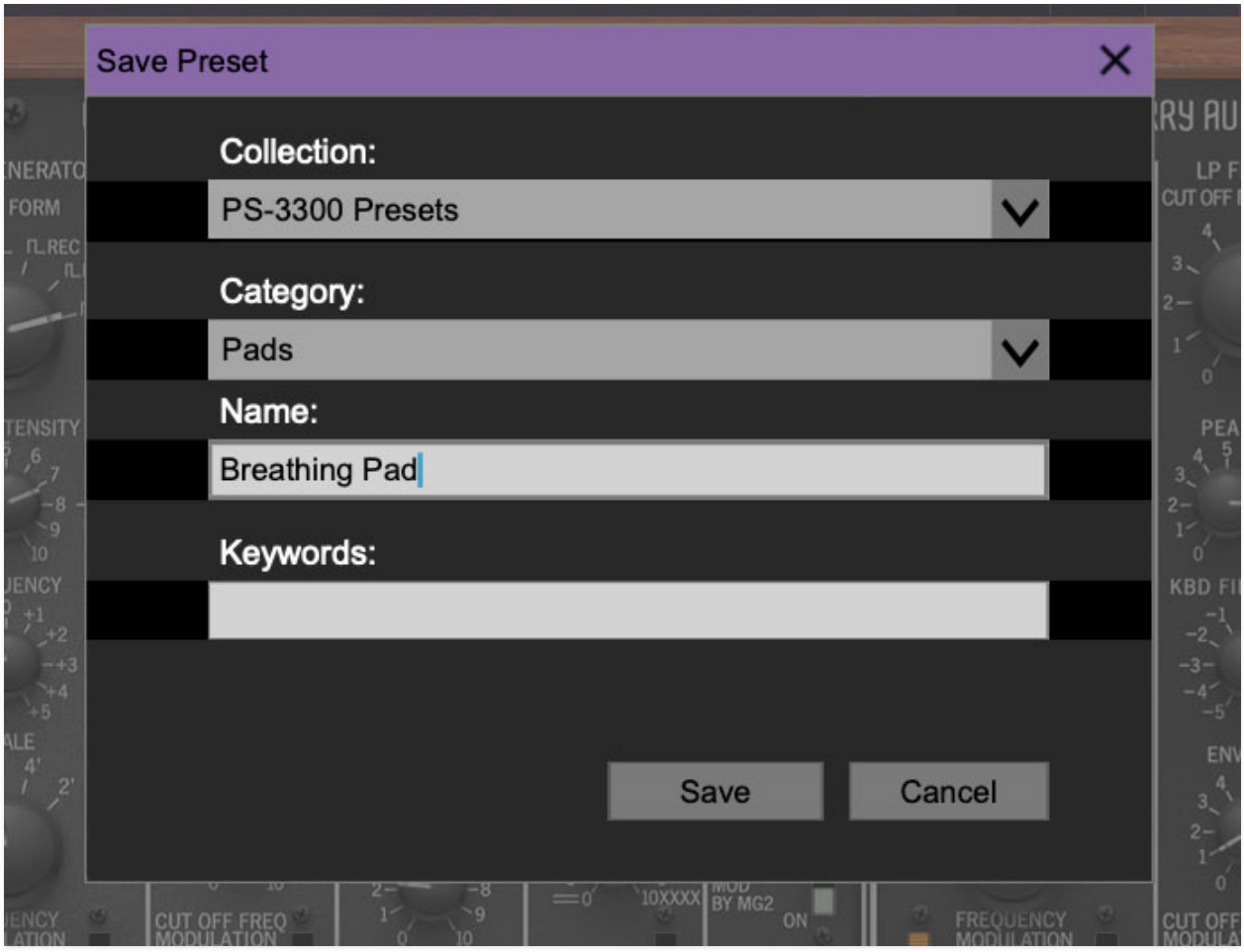
https://cherryaudio.kayako.com/

We really encourage you to reach out to our support staff before going to *<insert-angry-forum-here>*... our staff is really on top of their game and they'll take care of ya!



The purple strip at the top of the PS-3300 contains all of the preset loading and saving navigation, "under-the-hood" settings, zoom and focus control, and more.

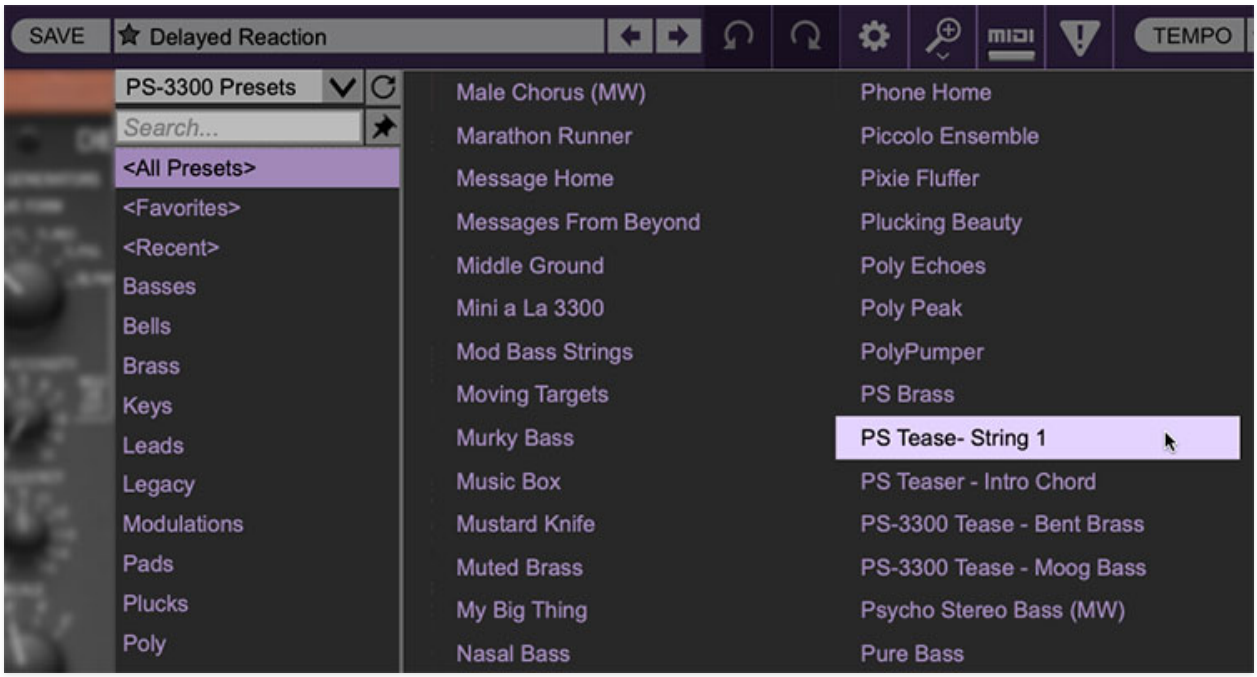
New- Opens a new blank patch preset. If an unsaved patch is currently open or you've modified an existing saved patch, a dialog asks if you'd like to save the patch in its current state. This greatly reduces the possibility of losing an edited unsaved patch.



Save- Use this to save patches. There are a couple of levels of hierarchy:

- **Collection**- This is the top level of organization, and contains entire "sets" of presets. The *PS-3300 Presets* are the main included collection. We also include a *User Presets Collection* for storing your own presets, but you're free to create your own collections. To create a new collections, click in the *Collection* text field (where it says *User Presets* above) and type a name. User-created sounds can be freely saved to any collection; we like to "keep 'em sepa-rated" for organizational purposes.

- **Categories**- Within each *Collection* are a number of sound categories. As with collections, you're free to create as many categories as you like. To create a category, click in the *Category* text field of the *Save* dialog window and type a new category name.
- **Patch**- A patch is an individual sound. To save a patch, simply type the name in the *Name* field and click *Save*.
- **Keywords**- You can add descriptive words such as "huge," "noisy," "poly," etc., to patches to make them appear when terms are typed in the *Search* field. Use commas to separate multiple keywords entries.



Browsing Patches- Patches can be browsed by clicking the *<Select Preset>* field. To select a preset collection, click in the area that says *<All Collections>* or on the downward-facing arrow next to it.

Clicking on the left-side categories narrows down which patches are displayed.

- **<All Presets>** will show presets from all collections and categories.
- **<Recent>** displays recently used presets.
- **Refresh**- This is the circular arrow button to the right of the downward arrow; clicking this checks the Cherry Audio server for new or updated presets.



Pin- Clicking the push-pin icon locks the patch selection list open, allowing fast and easy browsing and auditioning of patches. Click the icon again to disable pin mode. when in pin mode, the up and down arrow keys can be used to select patches.

Preset- *Step Back/Forward Arrows*- These step to the previous or next preset. macOS [⌘+left/right arrow key] or Windows [CTRL+left/right arrow key] will navigate through presets back and forth in the currently selected collection/category.

Undo/Redo- These circular arrows will undo or redo the last action. It remembers many steps, so if you really loused something up, keep on clickin'...

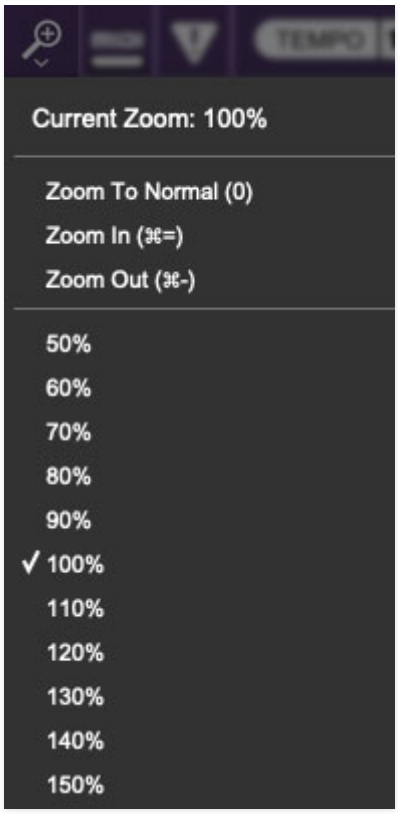
Settings- This is where user preferences for user interface, audio interfaces, user account, and more are configured. See the **Settings** section for full information.

Importing Presets with drag-and-drop

Presets can be imported singly or en masse (as a single compressed ZIP file) simply by dragging and dropping from the desktop anywhere on the user interface.

If a single .*preset file is dragged and dropped, the sound is immediately loaded and the standard Save Preset dialog appears; this lets you save the sound to the instrument's preset browser. Note that you don't have to save the sound to preset browser; if you just want to hear and play the sound, click the Cancel button in the Save Preset dialog - the sound will still be loaded.

Compressed zip files containing multiple sounds can also be drag and dropped onto the UI. This works the same as with single sounds, but instead of the Save Preset dialog, you'll see the Import Preset Collection dialog. The presets will be added as a new collection and available in the categories for which they were tagged.



Zoom Magnifying Glass- Click to resize the PS-3300 interface window. Selecting *100%* returns the user interface to native size.

MIDI tab- Opens the MIDI controllers tab for configuring internal and hardware MIDI controls. See the **MIDI Controllers Setup and MIDI Tab** section for full information.

! (MIDI Panic)- Click to send an all-notes-off message in case of, "make this freaking thing shut up?!?" stuck-note incidents.

Tempo (Standalone Version Only)- Displays PS-3300's current internal tempo setting. PS-3300's internal tempo affects the *Modulation Generator*, *Sequencer*, and the *Mod/Echo* sections when their corresponding *Sync* switches are in the up position. The tempo setting can be changed by moving the mouse up and down anywhere in the tempo section, or by double-clicking the number and entering the desired BPM value.

The tempo display only appears in the standalone version of PS-3300. VST, AU, and AAX plug-in versions receive tempo data from their host DAW app.

Cable Transparency- Clicking the checkerboard icon displays the cable transparency slider. Slide this to the left for more transparent cables, or to the right for more opaque cables.

Cable Color Select- Click this to select the global cable color, i.e. the color of any newly patched cable. Clicking *Random* randomly chooses a color for each new cable.

Show/Hide Cables- Clicking this hides or shows all cables. It has no effect on sounds, and its status does not save with patches. Cables can also be shown or hidden using the key shortcuts [CONT-D] (Windows) or [⌘-D] (Mac).

Special Cool Cable Color Select Feature- The color of any existing cable can be changed by right-clicking in jack area. Right-clicking on a jack that doesn't have a cable plugged in will change the global cable color (i.e. the same as changing the color with the toolbar button).



QWERTY Musical Typing Keyboard- Opens an onscreen keyboard allowing a standard QWERTY computer keyboard to be used for playing music notes. For more information, see **QWERTY Musical Typing Keyboard (MTK) s**ection.



Help (?) - Clicking this launches your web browser and opens the help document you're currently reading. (*Cheech and Chong voice*) So like, if you're already reading this, did you already find the *?* button and or was it the other way around, man...

Cherry Audio PS-3300 Synthesizer logo- Clicking this displays "about" information, and shows the version number and current registered user ID. We'll never tell what the Japanese writing says!

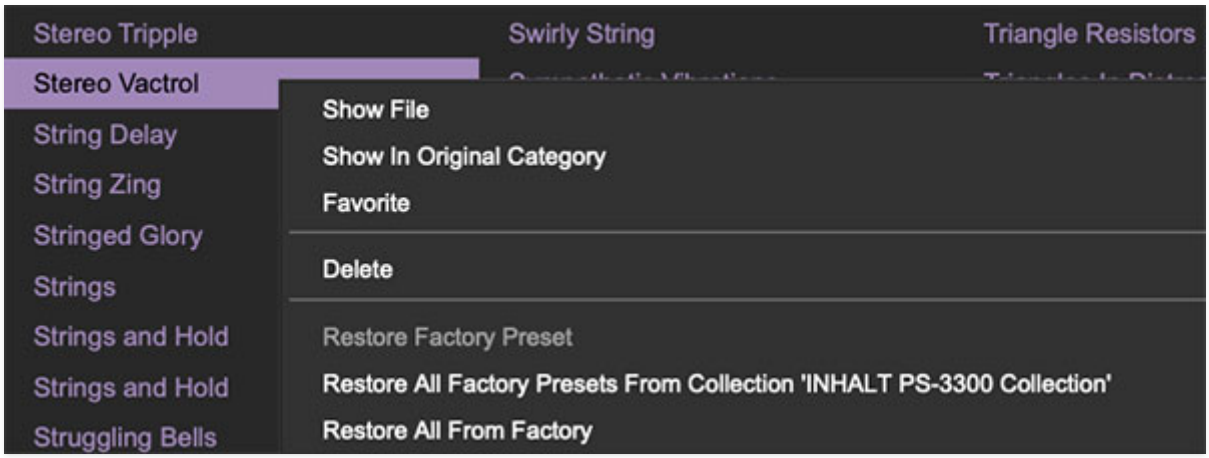
Focus



PS-3300 packs a fairly large number of controls and jacks into a limited space. If you have limited screen real estate, the *Focus* button conveniently blows up PS-3300's user interface to roughly twice its normal size within the current window size. Unlike the *Zoom* "magnifying glass" function, *Focus* doesn't affect the current window size. By default, the patch panel section fills the current window, but the view can be scrolled vertically and horizontally with a mouse wheel, track pad, or Apple Mighty Mouse finger-scrolling. Or if you're the last person on earth still using a single-button mouse, scroll bars will appear at the window edges when in *Focus* mode.

Using *Focus* mode couldn't be easier - just click the *Focus* button the top menu bar. To return to standard view, click *Reset*. *Focus* can also be directly accessed with [CTRL]+click (Windows) or [CMD]+click (Mac) by clicking anywhere in the user interface. [CTRL]+click / [CMD]+click again will resume normal view.

Preset List Right-Click Functions



Show File- This displays the selected preset in the Mac or Windows folder containing it. This is useful for backing up or sending a preset file to another user.

Show In Original Category- Selects the preset within its category, i.e. the category will highlight in the left preset menu. The *Show In Original Category*

command only displays if the preset was selected within the <*All Presets*>, <*Favorites*>, or <*Recent*> categories.

Favorites- Favorited presets will show in when the *<Favorites>* category is selected. A star will display next to the preset name. Right-click on the preset and reselect *Favorite* to un-favorite it.

Delete- Deletes the selected preset.

Restore Factory Preset- If one of the factory (i.e. not user) patches is edited and saved, selecting this command restores the patch to its unaltered "factory" setting. This menu will be grayed-out for user bank patches.

Restore All Factory Presets From 'PS-3300 Presets'- If any patches from the "factory" PS-3300 bank are edited and saved, selecting this command restores *all* of them to their unaltered factory setting.

Restore All From Factory- If any patches from the factory banks are edited and saved, selecting this command restores *all* of them to their unaltered factory setting. At the time of writing, the PS-3300 bank mentioned above is the only factory bank, so this function and the *Restore All Factory Presets From 'PS-3300 Presets'* above have the same effect.

Show File- This displays the selected preset in the Mac or Windows folder containing it. This is useful for backing up or sending a preset file to another user.

At first glance, PS-3300 appears to possess a heart-stopping quantity of controls. Fortunately, it's much simpler than it appears:

PS-3300 consists of three identical polyphonic synth Voice Panels (left side of cab), and a single master panel at the right. Though modular synth-style jacks are included, PS-3300 is a "semi-normalled" instrument; that is, **all signals are internally connected and no patching is required to create sounds**. Internal connections are only overridden when cables are plugged in (sometimes they don't disconnect anything and just act additively). The three Voice Panel outputs are internally routed to the Master Panel's upper-left hand Signal Mixer section. You'll hear sound from the three voices as long as the orange slide switches are in the down position and the *Volume* knobs are up. Clicking any of the Signal Mixer orange slide switches up disables the Voice Panel (handy for isolation when creating sounds). We've also added LED signal indicators to each of the three channels to make it easier to tell what's making noise.

Voice Panel



Each of the three Voice Panels can be thought of as a totally independent single-oscillator polyphonic synth. Each one consists of a signal generator (Korg's silly name for an oscillator), a lowpass filter, an ADSR envelope generator, two Mod Generators (Korg's also-silly name for an LFO), and a "Resonators" section. We'll discuss it more later on, but the PS-3300's Resonators section is really unique, and amongst other things, it makes super fabulous phaser-type sounds.

Because the divide-down synthesis scheme entails twelve individual oscillators (one for each chromatic note of the highest-octave), this allows the inclusion of individual tuning controls for *each note of the octave*, allowing some interesting alternate tuning abilities, which we'll fully explain later.

Master Panel



The Master Panel includes a mixer, additional "mono" processing modules (sample & hold, an additional utility envelope generator, CV processors, and

effects). We've also relocated controls and jacks originally in the left-hand section of the Korg PS-3010 keyboard controller to the master section, as they would've been at an awkward angle in our 3D keyboard art.

Keyboard and "Honda" Connector Cable

The keyboard has been accurately rendered because it looks super cool (that's how we roll). The keys can be played with a mouse and will animate when PS-3300 is controlled via MIDI notes. That massive Honda connector cable doesn't really do anything but it also looks really cool, and presents a swell opportunity for Mal to show off his formidable 3D modeling chops. We're pretty sure it's the same Honda responsible for the Elsinore 175 enduro bike I got pulled over on in Simi Valley in 1986 (and nailed for riding underage without a license...)

For the "that keyboard is taking up space on my display!" crowd, our apologies, but without the keyboard, this super awesome synth looks kinda blah, and we gotta sell tacos, okay?



The PS-3300 includes three identical polyphonic Voice Panels. Each of the three Voice Panels is essentially an independent single-oscillator polyphonic synth. Each one consists of a signal generator (Korg's silly name for an oscillator), a lowpass filter, an ADSR envelope generator, two Mod Generators (Korg's also-silly name for an LFO), and a "Resonators" section.

In the following pages, we'll go over all Voice Panel parameters.



"Signal Generator" is vintage Korg language for an oscillator. It includes the following standard analog synth oscillator controls:

Wave Form- Incorrectly bisected just like the real thing. This selects from the following oscillator waveforms: triangle, saw, rectangle (i.e. square), two preset pulse waves (with different widths), and PWM (variable-width pulse).

PWM Intensity (MG2 or Ext)- PWM is short for "pulse-width modulation". When *Wave Form* is set to the *PWM* position, the *PWM Intensity* knob sets the width or "duty-cycle" of the pulse wave. By default, Modulation Generator 2 (MG2 at the bottom-right of the panel) is normalled to PWM; the *PWM Intensity* knob sets the amount of modulation received from MG2. This adds timbral animation and a slight chorusing effect.

Other PS-3300 control signals, such as an alternate modulation generator, the Master Panel General Envelope Generator, Sample & Hold, etc. will override the default MG2 routing when a cable is plugged into the *Ext PWM Control* jack.



The MG2>PWM routing can be overridden to create a constant, non-modulated pulse width by using one of the Control Voltage Processors in the Master Panel. Route a cable from the Control Voltage Processor *Out 1* or *Out 2* jack to the *Ext PWM Control* jack at the bottom of the Signal Generators section. Set *PWM Intensity* and *Ext Intensity Control* knobs to max. The CV Processors *Limiter B* knob can now be used to vary pulse-width.

Frequency- Detunes the oscillator by slightly over a fifth, up or down. This can be used to fatten up multiple oscillator patches by detuning a small amount, or for "building-in" a set interval. The panel markings say -5 to +5; we’re not exactly sure what that’s supposed to correlate to (maybe they ran out of "7" Letrasets when they were laying out the panel), but the pop-up tooltip will accurately display detune amount.

Scale- Coarsely sets the signal generator pitch range in octaves. These are at standard organ footage settings of *32'*, *16'*, *8'*, and *4'*.

Frequency and Pulse Width Mod Controls and CV Jacks



Reverse switch- Enabling the *Reverse* slide switch inverts the polarity of both the hardwired *Mod Generator 1 and Ext Freq Control* signals.

On switch- The orange *On* slide switch enables frequency (pitch) mod when in the down position.

MG1 Intensity Control- Sets the amount of frequency mod from Mod Generator 1.

Ext Intensity Control- Sets the amount of frequency mod from the *Ext Freq Control* mod input jack when a source is patched.

Ext PWM Control- Allows an external control signal to modulate oscillator pulse width when the *Wave Form* selector is set to PWM. The amount of mod is set using the *PWM Intensity* knob beneath the *Wave Form* selector.



PS-3300's filters are very closely related to the Korg MS-10/20 filters. These are known for their super aggressive and squelchy tonality. The circuit design is almost identical in the PS-3300, but interestingly, Korg chose to implement it with far lower gain, resulting in a much cleaner tonality - perhaps they were concerned that the many notes of polyphony combined with raunchy distortion wouldn't go together. Since it was relatively easy to implement, we've given users the option of the clean PS-3300 or aggressive MS-20 filter tones (because we think that distorted MS filter mayhem sounds pretty neat with a poly synth).

If you're not familiar with how filters work, a lowpass filter allows frequencies *below* the cutoff frequency setting to pass through, but blocks frequencies *above* the cutoff frequency.

Cut Off Frequency- All frequencies *lower* than the current setting are allowed to pass through the filter, while frequencies higher than the cutoff setting will be attenuated at a rate of 12 dB per/octave.

Peak (resonance)- Emphasizes sound energy at and around the cutoff frequency by adding feedback from the filter’s output back to its input. Dialing up *Peak* is useful for thinning out sounds a bit, and sweeping the *Cut*

Off Frequency results in the familiar funky "weeoow" analog synthesizer sound. Resonance will be far more pronounced when the filter type is set to *MS* mode.

Type- The PS setting is a super-accurate emulation of the original PS-3300 sound and is generally very clean.

The PS setting also enables an under-the-hood preset highpass filter in order to accurately emulate the tone of the original, which generally didn't have a great deal of low-frequency response.

The MS setting cranks the gain up considerably in order to emulate the famous snarling MS-20 sound (these are gain compensated so MS and PS volume levels will be relatively consistent). If you haven't used an MS-20-type filter, they sound awesome with the *Peak* control cranked. **The *MS* setting also disables PS-3300's aforementioned built-in highpass filtering in case you desire a little more low-end oomph.**

Kbd Filter Bal- This allows the keyboard CV to modulate the cutoff frequency. When set to positive values the cutoff frequency rises as higher notes are played on the keyboard, in order to keep tonality consistent. When set to negative values, the cutoff frequency gets lower as higher notes are played.

At max resonance settings, it also allows the ringing resonant frequency to play in tune across the keyboard (this is more noticeable when *Type* is set to *MS*).

Env Mod- Turning this control up allows Envelope Mod to modulate the cutoff frequency. The higher the setting, the greater the filter cutoff frequency modulation will be.

Cutoff Frequency Modulation Controls/Jacks



On switch- The orange *On* slide switch enables cutoff frequency mod when in the down position.

MG1- Sets the amount of cutoff frequency mod from Mod Generator 1.

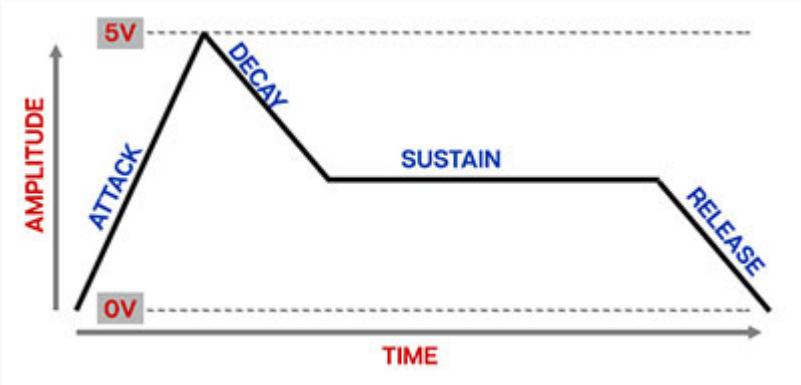
Ext- Sets the amount of cutoff frequency mod from the *Ext Cut Off Control* mod input jack when a source is patched.

Ext Cut Off Control- Allows CV control of the *Cut Off Frequency*. This is a bipolar input that accepts CV's from -5V to +5V; negative CV's will decrease cut off frequency and positive CV's will increase it.



The envelope generators accurately replicate the PS-3300's envelopes, with a couple of minor alterations, which we'll explain. The original PS-3300 attack and decay time constants are insanely long, and they're accurately recreated here.

If you're not familiar with the operation of envelope generators, here's an overview of a standard ADSR-style envelope generator:



When a gate voltage is sent to the envelope generator, it outputs a voltage that changes dynamically according to the settings of its four stages.

The *Attack* stage defines how long it takes for the output voltage to rise from 0 to 5 volts. Once the attack stage reaches 5V, it moves to the *Decay* phase, which defines how long it takes to fall from 5V to the setting of the *Sustain* phase. Unlike the *Attack*, *Decay*, and *Release* phases, each of which define a time, *Sustain* simply sets the held voltage level following the *Attack* and *Decay* phases - this usually equates to the envelope output level while holding down a key on a keyboard controller. Finally, the *Release* knob defines the the length of time it takes for the voltage to fall back to 0V when the gate input voltage is removed (typically when you let go of a key).

Controls

Attack Time - Defines the length of time for voltage to rise from 0V to 5V when the gate voltage is applied. The maximum *Attack* time is over 88 seconds (you read that right!).

Decay Time- Defines the length of time for voltage to fall from the attack stage 5V peak to sustain stage setting. The maximum *Decay* time is over 60 seconds.

Sustain Level- Following the decay stage, this sets the voltage level held until the key is released.

Release Time- Defines the length of time for voltage to fall from 5V to 0V when a key is released.

What We Changed and Why We Did It... get your geek on!

If you look at the panel of an original PS-3300, you'll notice that instead of a release knob, there are two slide switches, *Release* and *Kbd Hold*. Here's how they worked:



Release Switch

The *Release* switch has three positions, *Damped*, *Half D* (Damped), and *Release*. *Damped* instantly cuts off notes upon release like an organ; *Half Damped* releases notes at a preset time constant, and *Release* is the weirdest, with note release times (somewhat) proportional to the *Decay Time* setting. We originally implemented Cherry PS-3300 with the three-position switch just like the original, but honestly, we found it really hard to use in *Release* position, and in plain English, it didn't do anything that couldn't be done better with a conventional release knob. We suspect these quirky switched release modes were implemented as a cost-cutting measure in order to save parts count (remember there are 144 envelope generators in the original PS-3300!).

Keyboard Hold

The *Kbd Hold* switch is one of the oddest and most unique features we've seen on an analog synth. It allows the amplitude of certain notes to be held in a frozen state while playing other has no effect on the frozen notes. Unfortunately, it's almost comically un-inuitive to enable this function on the original - you turn the *Kbd Hold* switch on, dial the *Attack* knob up to a setting of *7* or more, play the notes you desire to hold, then dial the *Attack* knob down to somewhere around 3, and the notes will hold. Meanwhile, any *new* notes played will articulate normally (i.e. they won't be held).

We made the decision to jettison the hold feature for two reason; 1) it's finicky to set up on the real instrument, 2) it would be even more finicky to set up with a mouse on a screen, and 3) we needed the UI screen real estate to add a conventional *Release* knob.

Envelope Mod CV Jacks



These jacks are located at the bottom left of the Mod Generator 1 section.

Ext Attack Control jack- Allows a CV to control Envelope Mod *Attack* time. This is a bipolar input that accepts CV's from -5V to +5V. Negative CV's will lengthen attack duration; positive CV's will shorten attack duration (play harder = faster attack).

Ext Release Control jack- Allows a CV to control Envelope Mod *Release* time. This is a bipolar input that accepts CV's from -5V to +5V. Negative CV's will shorten release duration; positive CV's will lengthen release duration.



The Resonators section is set of three 12 dB/oct bandpass filters with a high amount of resonance (hence the clever name). The use of "vactrols" (aka, light-controlled resistors) in the original instrument gave these a pleasantly gooey, phaser-like tone. We've reproduced it super-accurately, if we say so ourselves.

There are three Resonator bands, all operating simultaneously. They can be set to a static settings or modulated via Mod Generator 2. These are similar to the famous Polymoog resonators, but unlike the Polymoog, they are easily modulatable, resulting in tons of awesome phaser-like tones.

Res Intensity- Simultaneously adjusts the overall depth of all three Resonators.

Resonator 1/2/3 frequency- Adjusts the frequency of each resonator from 10-20kHz. The front panel of the original PS-3300 says *10 kHz* at the top end of the knob scale, but in our measurements, the resonator frequencies actually go up to 20 kHz, so we kept the original panel markings for authenticity but programmed the actual frequency response to be correct. Note that the popup tooltip displays the actual correct frequency when the knobs are turned.

Peak Freq Mod by MG2- Switching this to the down position enables modulation of all three resonator frequencies simultaneously via Mod Generator 2.

Resonators CV Jack



This jack is located at the bottom of the Mod Generator 2 section.

Ext Resonator Peak Freq Control- Allows modulation of all three resonator frequencies simultaneously. This is a bipolar input that accepts CV's from -5V to +5V. Negative CV's will decrease resonator frequencies; positive CV's will increase resonator frequencies.

In this section, we'll talk about VCA-related voice panel functions. VCA is an acronym for "voltage-controlled amplifier." A good analogy of VCA functionality is a faucet that regulates signal volume, with the knob amount regulated by a control voltage. Most commonly, this voltage comes from an envelope generator in order to shape individual notes, but VCA's can be controlled by other sources such as LFO's, audio-frequency oscillators, and more.

Signal Modifiers



Keyboard Volume Balance- As its name implies, this control affects the balance of note volumes across the keyboard. At a setting of zero, note volumes will be the same across the entire keyboard range. If the knob is turned left, lower notes become louder and higher notes become softer. Conversely, turning knob up from center lowers the volume of low notes and increases the volume of high notes.

Signal Out jack- This a "direct out" of audio from the panel, and can be routed to any of PS-3300's audio or control input. Plugging a patch cord into the *Signal Out* jack does not affect the hardwired Master panel Signal Mixer routing, but you can turn down the appropriate Signal Mixer knob if you only want the *Signal Out* jack audio.

The LED above the Signal Out jack glows whenever the panel is producing audio. These were added for, "Is this thing making noise?," convenience.

Amplitude Modulation



Amplitude Modulation knob and routing switch- Moving a little further down the panel, Amplitude Modulation allows Mod Generator 1 to modulate audio level (make sure the orange switch between the sections is in the down position). At slower mod speeds, this is useful for conventional undulating-level tremolo effects. When the Mod Generator 1 is set to faster speeds, you'll hear ring modulator-type special effects (try experimenting with different Mod Generator waveforms as well).

PS-3300 includes two low-frequency oscillators (aka, LFOs) that generate signals intended for modulation purposes. Korg refers to these as "Modulation Generator 1" and "Mod Generator 2," and neither should not be confused with Generation X, which was the mediocre punk band Billy Idol fronted before he was, y'know, Billy Idol.

Mod Generator 1



This the more full-featured of the two mod generators, and though it looks pretty unique, it should be familiar if you've used LFO's on other analog synths.

Waveform- This actually isn't labeled, but obviously, it's the large knob in the center. Wave choices include triangle, Saw I (standard saw), Saw II (ramp), rectangle (square), pink noise, and white noise.

Frequency- The *Frequency* knob sets the speed of the LFO, from 0.07 to 4000 Hz (with *Sync* switch off) or from 8 beats up to 1/64th note triplets (*Sync* switch on). Unlike typical LFOs that operate in the sub-audio range (i.e. beneath the human hearing spectrum), Mod Gen 1 goes up to 4000 Hz, which is well into audible range. This enables all manner of clangorous modulation when applied to oscillator, filter, and amp signals. The LED beside it flashes at the current modulation frequency, and if you look close, you'll notice that it's pattern matches the currently selected waveform.

Pink Noise and *White Noise* waveforms are not affected by the *Frequency* control.

Sync- When the *Sync* switch is in the down posish, Mod Generator 1 speed will lock to host tempo when using PS-3300 within DAW software, or to the current tempo in the top menu bar when using the standalone version.

Mod Generator 1 CV Jacks

Out jack- This is the bipolar output of the Mod Generator 1, allowing routing to any of PS-3300's mod inputs - it can be routed to *any* of the panels. Plugging a cable in has no affect on any of the hardwired *MG1* knob routings; they'll all still work as normal.

The *Ext Attack Control* and *Ext Release Control* jacks affect the envelope generator, please see **Envelope Mod** section.

Ext MG1 Level Control jack- This allows a CV to control Mod Generator 1 depth. This is a unipolar input - it accepts CV's from 0-5V, with 0V being off, and 5V being full scale mod.

The most typical application would be to patch a cable from the master section keyboard Mod Wheel out jack for standard mod wheel vibrato (when *MG1 Intensity* control is dialed up). Here's what that would look like:



Ext MG1 Freq Control jack- Allows a CV to control Mod Generator 1's frequency. This is a bipolar input that accepts CV's from -5V to +5V; negative CV's will decrease mod rate and positive CV's will increase mod rate.

Mod Generator 2



Mod Generator 2 is more basic, with just a triangle wave. It's most useful for oscillator freq mod (vibrato), filter mod ("wah wah"), or mod of the Resonators section.

Frequency- The *Frequency* knob sets the speed of the LFO, from 0.2 to 12 Hz (with *Sync* switch off) or from 8 beats up to 1/64th note triplets (*Sync* switch on). The LED beside it flashes at the current modulation frequency.

Sync- When the *Sync* switch is in the down position, Mod Generator 2 speed will lock to host tempo when using PS-3300 within DAW software, or to the current tempo in the top menu bar when using the standalone version.

Mod Generator 2 CV Jacks

Out jack- This is the bipolar output of the Mod Generator 2, allowing routing to any of PS-3300's mod inputs - it can be routed to *any* of the panels.

The *Ext Resonator Peak Freq Control* jacks affects the Resonators section controls, please see Resonators section.



The original PS-3300 keyboard plays fully polyphonically at all times. Cherry PS-3300 lets you choose from a couple of mono or poly modes. *Remember that these are set independently for each voice panel.*

Keyboard Assign-

- **Last**- One note sounds at a time with the most recently played note taking priority.
- **Lo**- One note sounds at a time with the lowest note taking priority.
- **High**- One note sounds at a time with the highest note taking priority.
- **Poly**- Up to 24 notes sound at a time with most recently played notes taking priority.



Because the original PS-3300's voice panels each used twelve independent "divide-down" oscillators, Korg was able to implement fine-tuning controls for each chromatic scale note (repeating through the octaves). This allows unique custom and just-intonated scale tunings (we'll let Wiki **explain just intonation**, because they're smart and we're lazy).

In case you're not inclined to learn new ear-bending scales (or strangely super correct ones), we've found the temperament adjust feature is also real handy for minute amounts of detuning, and as such, we've provided some handy shortcuts for doing so.

Temperament Knobs- Each knob tunes the appropriate chromatic scale note up or down by 100 cents (i.e. a half-step). The panel says *-5* to *+5*; we're not sure how Korg arrived at that (that's what all the other bipolar knobs say?), but the popup tooltip will display the correct tuning offset.

- **Temperament Preset menu (white triangle)**- Like the ones at the top of the panel, these are easy to miss, but clicking these displays the a couple of useful temperament-related menus:

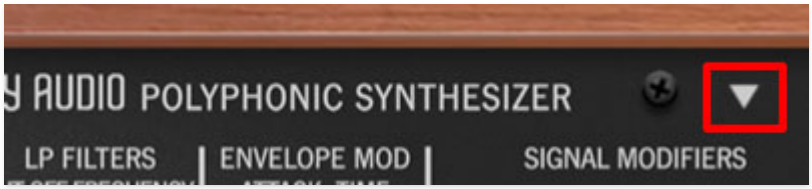
  Clicking the triangle displays the temperament presets menu, including *Equal Tempered*, *Mean Tone System*, *Hepatonal System* (which is extra hep), and *Just Intonation* with key signature submenus We regret that the Temperament Preset menu does not contain sharks with lasers in the heads, nor ill-tempered sea bass.

  Random and its *Subtle* and *Extreme* submenus applies random temperament tuning values. These can be useful for making patches sound more natural - particularly the large orchestral brass sounds PS-3300 excels at.

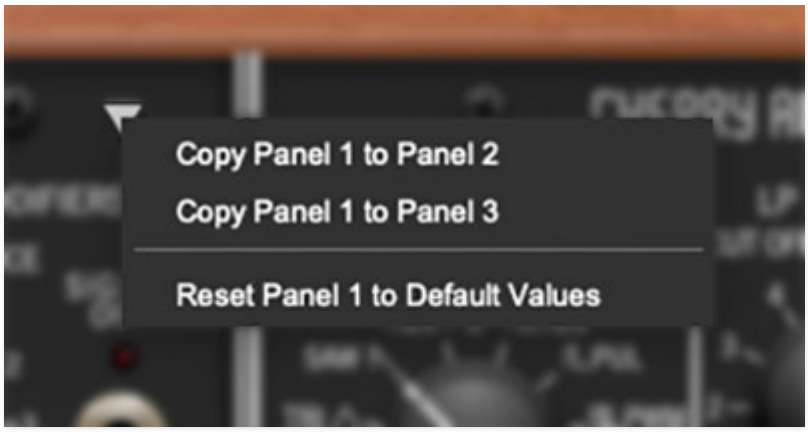
You can alway return to standard half-step tuning by selecting *Equal Tempered*.

This one is REAL easy to miss. It allows easy copying of parameters between the three Voice Panels as well as initialization - it's super useful if you create a sound on one of the Voice Panels, and you'd like to double it up on one of the others.

Each panel includes an upside-down triangle at the top-right.



Click on it to open the popup menu:



The menu commands are as follows:

Copy <*current voice panel*> to <*one of the the other voice panels*>- Select which panel you'd like to copy settings to. Patch cords are not copied (because there isn't good way to handle cables routed between voice panels), so if something doesn't round right, check the destination Voice Panel patch cables mod routings.

If you accidentally copy "over" settings on the wrong panel or change your mind, remember that you can always undo with the standard [CTRL-Z] (Windows) or [⌘-Z] (Mac) commands or by clicking the counterclockwise undo arrow in the purple menu strip.

Reset Panel <*panel # here*> to Default Values- This resets the current Voice Panel (but not the others) to initial parameter values. It's like clicking the New button at top-left, but only for the current Voice Panel

"Default Values" also may have been a short-lived 1987 NBC TV series starring Justine Bateman and Lisa Bonet... but probably not.



The Master Panel on the right side includes a mixer for all three Voice Panels, the Sample & Hold generator, the General Envelope Generator, two Control Voltage Processors, keyboard-related CV outs and controls, and audio effects including Chorus, Echo, Reverb, a Master Limiter, and master controls for volume, tuning, and bend range. Oh yes, and an enormous plug that doesn't do anything, but it looks super cool.

In the following pages, we'll go over the Master Panel parameters.



The Signal Mixer is where volume and panning is set for the three Voice Panels "channels."

Channel 1/2/3 Common Controls

Channel External Level Control jacks- These are bipolar CV inputs for controlling the volume for each channel.

Channel On switches- The channel is enabled when the corresponding switch is in the down position. These are particularly useful for disabling Voice Panels when editing sounds.

Volume- Sets the volume of the corresponding Voice Panel (that's five seconds of my life I just wasted).

Pan- Sets the left/right pan position of the corresponding Voice Panel. (there's five more!)

Total Volume- Master volume setting for the entire instrument.

External Level Control jack (master)- The single jack beneath the VCA symbol is a master CV input for simultaneously controlling the volume of all three channels.



Bend Range- Globally sets the pitch bending range of the entire instrument from 0 to 12 half-steps. It may seem silly that there's a 0 setting, but it's useful if you'd like to use a MIDI controller pitch bender and the *Pitch Bend* CV out jack to control a parameter *other* than pitch. In this way, the pitch of notes is unaffected.

Master Tune- Tunes the entire instrument down or up by 100 cents. Useful for jamming with the tuning-impaired (or a piano).



How A Sample & Hold Works

Sample & Hold is a synthesis tool that repetitively “samples” an input signal and outputs a held voltage until triggered again. In the image below, the smooth gray line shows a continuous input signal. Each time the module is triggered the current voltage is “sampled” and “held” until the next trigger. The red line shows the stepped output signal:



White noise is typically used as an input source to generate a randomly stepped-CV signal. Random sample & hold pitch mod is often heard in sci-fi movies, most recognizably as the voice of R2-D2 (or for you prog-types,

modulating filter cutoff in the intro of the ELP tune, "Karn Evil 9" or the Rush tune, "The Camera Eye")

Sample & Hold Controls

Sample & Hold Out jack- The Sample & Hold control signal output (the Master Panel sections tend to have a backwards-ish bottom-to-top signal flow).

Clock Frequency and LED- The *Clock Frequency* knob sets the rate of the Sample & Hold, from 0.1 to 40 Hz (with *Sync* switch off) or from 8 beats up to 1/64th note triplets (*Sync* switch on). The LED above it flashes at the current clock frequency. The LED flashes at the current clock rate.

Sync- When the *Sync* switch is in the up position, Mod Generator 2 speed will lock to host tempo when using PS-3300 within DAW software, or to the current tempo in the top menu bar when using the standalone version.

Sample & Hold Input jack- If nothing is plugged into this jack, white noise is used as the sample source - in other words, you don't need to plug a cable in to use the Sample & Hold. If a cable is plugged in, the white noise sample signal will be overridden.

External Clock Input jack- Patching a cable into this jack overrides the Sample & Hold internal clock and disables the *Clock Frequency* knob.

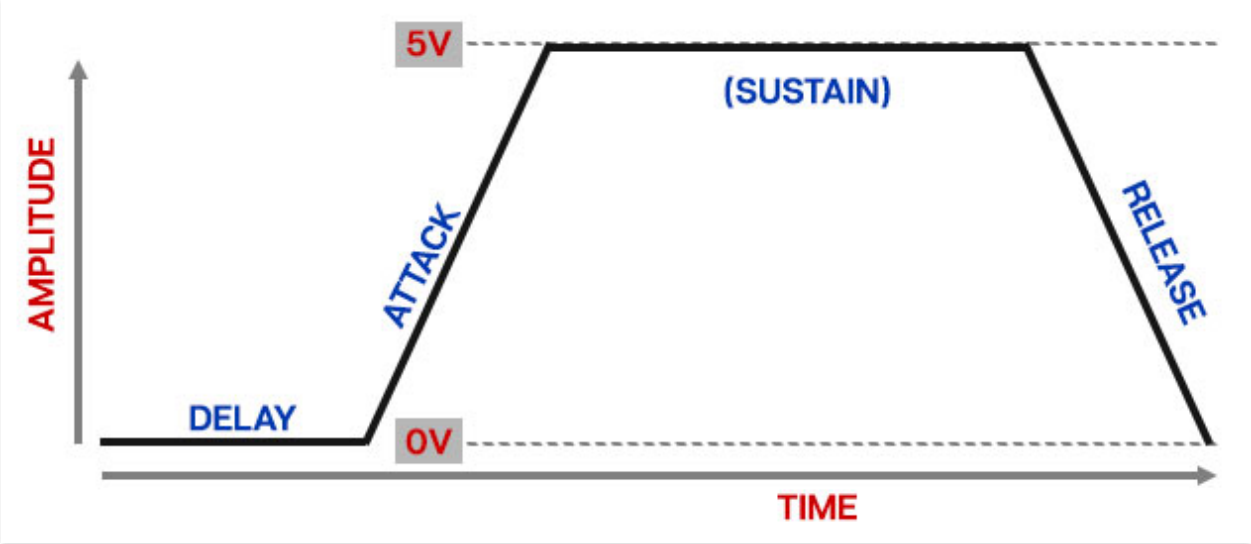
One nice way to use the *Sample & Hold Input* jack is to patch in a slow-moving mod generator triangle, ramp, or saw wave, and use the output to modulate oscillator pitch. This creates interesting pseudo-sequencer patches.



As its name implies, the General Envelope Generator is a "general-purpose" Delay-Attack-Release envelope (or DAR, like the badass 70s stuntman, Dar Robinson). Unlike the Voice Panel Envelope Mod envelope generators, it's not hard wired to anything, so it's necessary to patch cables to gate or trigger it and route its output to appropriate CV inputs.

It's important to understand that the General Envelope Generator is monophonic. Unlike the Voice Panel envelopes, which are independent for each note played, the General Envelope Generator affects all mod destinations equally, at the same time (this is what the kids what the kids usually refer to as "paraphonic").

How a DAR Envelope Generator works:



When the envelope is triggered, the Delay knob setting defines how long the envelope "waits" at 0 volts before the attack stage begins, then the attack stage defines how long it takes for the output voltage to rise from 0 to 5 volts. Once the attack stage reaches 5V, it remains there until the key is released (unless *Auto* mode is engaged, we'll explain below). The release control defines the length of time it takes for the voltage to fall back to 0V when the gate input voltage is removed, i.e. when the key is released.

General Envelope Generator Controls

Out 1/2/3 jacks- These are the General Envelope Generator signal output jacks; each of these outputs a slightly different version of the envelope with respect to polarity as follows:

- **Out 1**- +5V at rest. Attack/release stages move from +5V to 0V and return to +5V upon release.
- **Out 2**- -5V at rest. Attack/release stages move from -5V to 0V and return to -5V upon release.
- **Out 3**- 0V at rest. Attack/release stages move from 0V to +5V and return to -0V upon release (start with this one if you're not 100% sure how this stuff works).

Delay- Defines the length of time before the attack phase begins.

Attack- Defines the length of time for voltage to rise from 0V to 5V when the gate voltage is applied.

Release- Defines the length of time for voltage to fall to 0V when a key is released.

Signal Out LED- Lights up when any of the General Envelope Generator's stages are currently active.

Auto- This is Korg's terminology for what's commonly known as "one-shot mode." It can be used with any of the keyboard gate/trigger out jacks at the bottom of the Master Panel, but it's especially useful when using the *Trig Out Multi* jack (because a trigger signal is a very short blip of voltage).



Like the many analog synthesizers, PS-3300 makes use of control voltages ranging from -5V ~ +5V. These voltages are used to control oscillator pitch and vibrato, filter cutoff, amp modulation and more. The Control Voltage Processors primary purpose is to control voltage ranges or "swing." (not the kind of swing heard in Bobby Brown songs in the late 80s).

PS-3300 includes two independent and identical CV processors.

Out 1/2 jacks- The output voltage of the Control Voltage Processor. If nothing is plugged in to the corresponding input jack below, the *Out 1*/ *Out 2* jacks will produce a static voltage, adjustable between -5V to +5V. This has a number of uses, for example, it can be used to set oscillator pulse width to an exact amount by patching it to the *Ext PWM Control* jack and varying the *PWM Intensity* knob (make sure the *PWM* oscillator wave is selected).

Limiter A- Sets the uppermost voltage value. If the incoming voltage is positive, and Limiter A is set to a negative value, the voltage will be inverted (output will be a negative voltage).

Limiter B- Sets the lowest voltage value. If the incoming voltage is negative, and Limiter B is set to a positive value, the voltage will be inverted (output will be a positive voltage).

Routing switch- When switched to the left position, this mults Control Voltage Processor 1's input to Control Voltage Processor 2's input. If the

switch is in the right position, both inputs and outputs are fully independent. Since PS-3300 allows unlimited multiple cables from any output jack, this switch is somewhat superfluous, but we included it for accuracy.

Input 1/2 jacks- Patch incoming control voltages here.

How the Control Voltage Processors Work

Since the Control Voltage Processors can initially be confusing, we're going to explain their functionality with an example - this will make them easy to grasp, we promise! Create the patch below as follows:



- Click the *New* button at top left.
- In the Signal Mixer section at the top of the Master Panel, set *Ch-1 Volume* to 0, and *Ch-3 Volume* to around 8.

  (*We're using Voice Panel 3 so our screen shots aren't crazy wide, but it doesn't matter which Voice Panel is used*).
- Set Voice Panel 3 / Mod Generator 1 waveform to *Rec*. This gives us a perfect square modulation wave.
- Patch a cable from Voice Panel 3 / Mod Generator 1 *Out* jack to Control Voltage Processor 1's *Input 1* jack.
- Patch another cable from Control Voltage Processor 1's *Out 1* jack to Voice Panel 3 *Ext Freq Control*.

- Turn the *Ext Intensity Control* knob all the way up. When a key is played, you should hear a six-octave wide trill. The LFO wave is alternating between -5V ~ +5V. Because PS-3300 uses the 1V/oct standard, this would correspond to ten octaves of pitch modulation (five octaves each direction). However, if you look closely at the panel beneath the *Ext Freq Control* jack, you'll see it's labeled -3V ~ +3V (the range is limited, because a 10-octave pitch mod range isn't musically that useful). **The important point is that the LFO wave is alternating at its full range.**

Try reducing the setting of Control Voltage Processor 1's *Limiter A* knob. The high pitch decreases as *Limiter A*'s setting is reduced, because the high voltage is reduced.

Now reset the Limiter A knob to its max setting (+5V), and increase the setting of Control Voltage Processor 1's *Limiter B* knob. The low pitch *increases* as *Limiter A*'s setting is reduced, because the low voltage is increased.

Setting both the *Limiter A* and *Limiter B* knobs to 0V "closes down" both sides of the swing to nothing - in fact, the same "cancellation" occurs when both knobs are in the same position, regardless of the the setting.

Up to this point, the *Limiter A* knob has always been at a higher setting than *Limiter B*. But what happens if *Limiter B*'s setting is higher than *Limiter A*? The output becomes inverted - using our same square wave example, the "valley" (negative voltage) becomes high, and the peak (positive voltage) becomes low. This waveform inversion can be useful if you'd like the same modulation to affect sources conversely (pitch of one oscillator rises while the pitch of another oscillator falls, for example).

It should be clear that Limiter A and Limiter B's settings can be combined to limit voltages to any range. Note that the limiters will work on any kind of voltage input - including constantly changing sources, i.e. triangle and saw waves or even an envelope generator.

Here's one final Control Voltage Processor trick. If nothing is plugged into one an input jack, the output jack will output a static voltage from -5 ~ +5V, depending on the knob settings. This is useful for transposition, or for setting the Signal Generator PWM wave to an exact static (non-modulated) setting.

The original PS-3300 included a separate pre-MIDI keyboard controller - in fact, the enormous multi-pin connector cable carried individual control signals for each of the 48 keys! The controller keyboard also included additional CV outs for keyboard trigger and gate, a couple of momentary switches, and a joystick.

In adapting PS-3300 for your computer screen, we jettisoned a few things that didn't make sense (like the joystick), and relocated the keyboard CV outs to the bottom of the Master Panel (otherwise the 3D art would've been an awkwardly angled mess).

We also replaced the joystick CV outputs with *Pitch Bend* and *Mod Wheel* CV outs, which make far more sense with 99% of MIDI/USB keyboard controllers out there.

Control signals from the keyboard (i.e., a MIDI/USB keyboard controller) are hardwired to the appropriate pitch and envelope destinations, so it's not necessary to patch any cables to play PS-3300. However, the included keyboard CV outs can be really useful and add flexibility.



Pitch Bend- This outputs a voltage between -5V ~ +5V when the pitch wheel or joystick on a MIDI/USB controller is moved. Its output nominally sits at 0V.

Mod Wheel- This outputs a voltage between 0V ~ +5V when the mod wheel or joystick on a MIDI/USB controller is moved.

Keyb Vel Out- This outputs a voltage between 0V ~ +5V corresponding to keyboard velocity (how hard a note is played). Since it's mono only, it is "last-note"priority; that is, the velocity CV is derived from the most recently played note.

Keyboard Gate/Trigger Out Jacks



The gate and trigger out jacks can be potentially confusing, so please read the following paragraphs closely.

The first important thing is unlike most analog synths, PS-3300 uses "shorting" triggers and gates. Keypresses are just like flipping a switch and completing an otherwise open circuit (as opposed to most other synths where trigger and gate circuits are nominally are at 0 volts, and pressing a key sends +5V).

In either type of circuit, a "trigger" is an instantaneous blip, whereas a "gate" stays on (typically, when a key is held down). A trigger is usually used to initiate something that's going to continue on its own. Conversely, a gate keeps something turned on as long as it's "on" - usually an envelope generator as it runs through its attack, decay, and sustain phases. This is important, because patching a trigger to a destination intended for a gate usually results in, "why the ^&* isn't this working?"

In the case of the vintage Korg PS keyboard controller, its three CV outs and *Kbd Trigger Select* switch **all** say "trigger," but they are, in fact, mislabeled. The *Trig Out Single* and *Kbd Trigger Select* knob/jack are actually gates, but the *Trig Out Multiple* jack IS a trigger CV. We'll explain why below, but **what you need to know is that we changed the panel labels to correctly represent the control signal types**. We did not change the nature of the controls signals themselves.

Gate Out Single- Sends a shorting switch signal when a key is held. The signal remains switched "on" until all keys are released and remains on as long as *any* number of keys are held.

Trig Out Multi- Sends a very brief shorting switch signal every time a key is played, regardless of currently held notes. The intended use of this output is for repeatedly triggering the General Envelope Generator when it's set to *Auto* (aka, one-shot) mode. In this way, the envelope cycles through all phases every time a note is played.

Keyboard Gate Select and Gate Out jack- This one is very unique - it sends a shorting switch signal *dependent upon the setting of the Kbd Gate*

Select switch and the number of keys currently held.

- *Keyboard Gate Select* setting 0- Switch signals are never sent.
- *Keyboard Gate Select* setting 1- Shorting switch signal sent when a key is held. The signal remains switched "on" until all keys are released and remains on as long as *any* number of keys are held - same behavior as the *Gate Out Single* jack.

- *Keyboard Gate Select* settings 2-5- Shorting switch signal is sent only when the corresponding number of keys is currently held.

  For example, if the *Keyboard Gate Select* is set to 3, three notes are simultaneously played, a shorting switch signal is sent as long as three or more notes are currently held. If only one or two notes are currently held, no shorting switch signal is sent.

If you're like us, you're probably wondering, "what the heck would I use that for?" We believe the intention of this "numeric" shorting switch was to connect it to Signal Mixer *External Level Control* CV inputs in order to control the number of synth layers directly from the keyboard - sort of a 1977 version of bringing in additional layers with velocity.

How to use the Keyboard Gate Select and Gate Out jack

Since that bit above might be a little hard to get your head around, we've built a basic patch to demonstrate how the Keyboard Gate Select sections works:



- Click the *New* button at top left.
- In the Signal Mixer section at the top of the Master Panel, set *Ch-2 Volume* to 8.
- On Voice Panel 2, set *Scale* to *4'* and *MG1 Intensity* to around 1% (we're changing up these parameters in order to make Voice Panel 2 sound noticeably different from Voice Panel 1 - the settings are not critical).
- On the Master Panel, set *Kbd Gate Select* to 3 (next to the big plug), and patch a cable from the *Gate Out* jack to General Envelope Generator *Ext Trigger Input 1*.

- Patch a cable from the General Envelope Generator *Out 2* to the Signal Mixer *Ch-2 External Level Control* jack.

Try playing single-note lines on the keyboard - only Voice Panel 1 is heard. Now hold down three or more notes on the keyboard, and Voice Panel 2 sounds, one octave higher. If less than three notes are played, Voice Panel 2 isn't heard, but any time three or more notes are played, Voice Panel 2 is audible.

Also notice that every time Voice Panel 2 enters, its level is affected by the General Envelope Generator settings. Increasing the *Attack* time slows Voice Panel 2's entrance; increasing the *Release* time causes it to fade out slowly when fewer than three notes are played.

PS-3300 includes Chorus, Echo, and Reverb effects as well as master Limiter.

Limiter and Audio Output meter



PS-3300's onboard limiter gently controls overall output level to prevent ugly clipping in case you're playing 24 notes at once with your elbows. It's super transparent, so you can leave it on all the time without detrimentally affecting audio.

On switch- Enables the Limiter.

Meter- The three-LED audio output meter isn't really part of the Limiter per se, but this was a good spot for it. Keep on eye on this guy, if it goes in the red, reduce the *Total Volume control*. Of course, engaging the Limiter will help keep levels under control.

Chorus

We've included a thick and warm Chorus effect for fattening and stereo-izing patches.



On switch- Enables Chorus mode.

Rate- Sets the internal low-frequency oscillator speed from 0.01 to 8 Hz.

Depth- Sets effect depth, i.e. the amount of modulation.

Mix- Sets the ratio of clean to effected sound. Chorusing is usually optimal at a 50/50 setting (a setting of *5*), but we've added the *Mix* control by popular demand to allow more subtle (or warble-riffic) tones.

Mod Source- Selects mod via the internal LFO (which is independent of PS-3300's other "mod generators") or a mod source patched into the *External Freq Control* jack at the bottom.

External Rate Mod Intensity- Sets the amount of rate mod when a mod source is patched to the jack below.

External Rate Control jack- Patching a mod source in here allows any of PS-3300's CV sources to be used for chorus mod and overrides the internal LFO.

Echo



On switch- Enables and disables Echo effect.

Sync- Setting the *Sync* switch to the down position locks echo time to master tempo. When engaged, the *Repeat Rate* knob snaps to note values ranging from 1/64th note triplet to 8 beats. Enabling *Sync* locks to the tempo in the top toolbar when using the standalone version or the current project tempo when using the plug-in version in a DAW.

Repeat Rate and LED- Sets delay time, from 1 to 2000 ms. If the *Sync* switch is enabled, time settings snap to synchronized note values (see *Sync* switch above). The LED beside it blinky-blinks at the current repeat rate.

Intensity- Routes the output to the input to set the number of echo repeats. High Intensity settings lead to runaway feedback, so watch out for that!

Damping- Attenuates high frequencies as the knob amount is increased. Not only does this create more natural sounding decays, it also reduces the "stacking" effect that occurs with high feedback levels.

Mix- Balances the level of dry and wet signal. Setting the knob to center *5* position gives an equal 50/50 balance of wet and dry signal.

External Rate Mod Intensity- Sets the amount of Repeat Rate mod when a mod source is patched to the jack below.

External Rate Control jack- Patching a mod source in here allows any of PS-3300's CV sources to be used to mod *Repeat Rate*. This is useful for chorus-y modulated delay effects.

Reverb



On switch- Enables the reverb effect.

Duration- Sets the overall length of reverb; the actual time varies for each type.

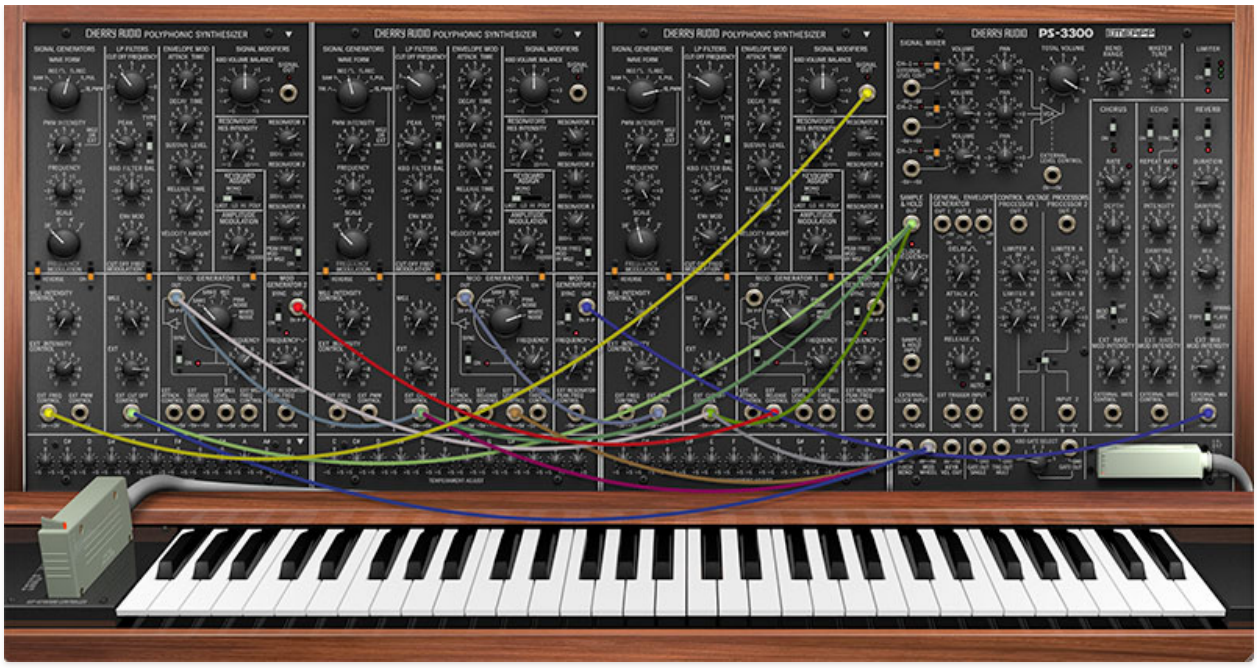
Damping- Attenuates high frequencies as the knob amount is increased for more natural reverb sounds.

MIx- Balances the level of dry and wet signal. A setting of *5* results in a 50/50 mix.

Reverb Type- Allows selection of spring, plate, or Cherry Audio's fabulously huge Galactic reverb algorithms.

External Mix Mod Intensity- Sets the amount of effects mix mod when a mod source is patched to the jack below.

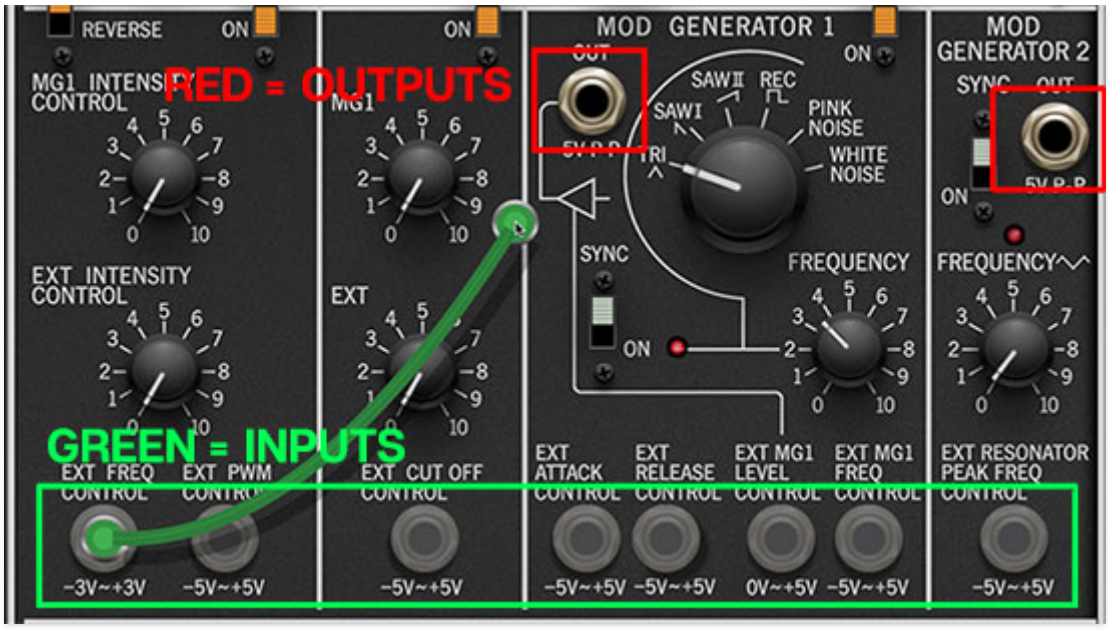
External Rate Control jack- Patching a mod source in here allows any of PS-3300's CV sources to be used to mod the *Mix* control.



The patch panel makes use of the exact same highly refined cabling system used in our Voltage Modular instrument. We believe it's the slickest, most refined virtual synthesis cabling system on the planet, so patching cables is super easy and intuitive. It also has some great not-immediately-obvious features, so read on...

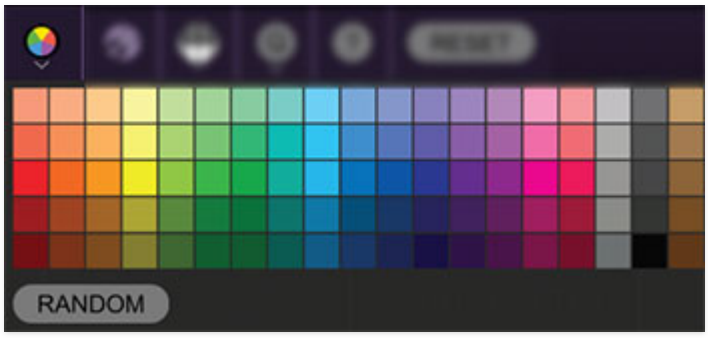
Basic Cable Operations

Patching A Cable- Simply click on a jack, drag the cable to the desired destination jack and release the mouse button, **but be aware of that unlike a hardware synth**, **all jacks are exclusively an input or an output.** To help make this clear in use, when a jack is clicked and held to patch a cable, jacks *not* available as destinations are grayed out. For example, if you’re patching a cable from an output jack, all other *output* jacks are temporarily grayed out. The same applies if you’re patching a cable from an input jack- all other *input* jacks are grayed out.



In the screenshot above, the *Ext Freq Control* input is being patched, causing all other input jacks to become grayed out, while all output jacks are potential destinations, thus their appearance remains normal.

Disconnecting A Cable- Cables can be disconnected by grabbing one end of a jack and dragging it to any "not-a-jack" panel location, or by right-clicking on a jack and selecting *Disconnect Cables*.



Selecting Cable Colors- There are a couple of ways to select cable colors. The most obvious way is to click the color circle in the top menu bar to reveal the color picker palette and select a global color. By "global," this means all newly patched cables will be the chosen color (or a random color, if *Random* is selected). Existing cables are not affected.

To change the color of an existing patched cable, right-click on one of the jacks it’s connected to, then click a new color. This changes *only* that cable, and won’t affect the global cable color in the top menu bar.

- **Super Handy "Pre-Patching" Cable Color Selection**- Right-clicking a jack that doesn’t have a cable plugged in opens the color palette and changes the global color; the same as clicking the color selector in the top menu bar. This is convenient for specifying a cable color right before patching a new cable.



Adjust Cable Transparency- Clicking the checkerboard icon in the top toolbar displays the cable transparency horizontal slider. Slide this to the left for more transparent cables, or to the right for more opaque cables.



Show/Hide Cables- Click the "dual plugs" icon in the top menu bar to hide or show all cables. This has no effect on sounds, and its status does not save with patches. When cables are hidden, colored dots will still show in the jacks. Cable visibility can also be toggled with the key shortcuts [CTRL-D] (Windows) or [⌘-D] (Mac).

Advanced Cable Shortcuts and Tricks

Following are some not-so-obvious shortcuts that seriously speed up patching operations.

The Unlimited Mult Hiding Beneath Every Jack



Single-clicking on any input or output jack reveals a six-way multiple jack (aka, a "mult"), which is super convenient for routing (or mixing) multiple sources. The mult stays visible until a cable is routed, at which point it disappears.

The jack mult art animates when it opens or closes, but if you're one of those impatient, overcaffeinated types (i.e., me), the animation can be disabled by clicking the *Settings* gear icon in the top menu strip, clicking the *Cables* tab, and unchecking *Enable Animations For Jacks*.

Mults initially display six jacks, but if more than six connections are added, the "ring" grows and additional jacks appear. There's no limit to the number

of mult jacks that can be added to a connection. We designed this with Voltage Modular in mind, where the number of modules and cables can get huge, but just know it's there if you need it.

Move or Unplug Multiple Cables Plugged Into A Single Jack



Multiple cables plugged into a single jack can be moved at the same time by holding the [SHIFT] key and clicking and dragging to a new destination. This is also a super fast way to unplug multiple cables from a single jack if the mouse button is released in an "empty" area (i.e., not on a jack).

Rapidly Routing a Cable to Multiple Destinations

This one’s not obvious, but it’s super handy. To patch cables from a single jack to multiple destinations, press and hold the [CTRL] key in Windows or the [⌘] key on Mac , click the source jack, then click as many destination jacks as desired and release the modifier key when you’re done. This works with input or output jacks.



If you're not experienced with modular synthesis, the patch points may look a little intimidating, but we promise, they're not too hard to understand. And unlike a fully modular synth, PS-3300's semi-normalled connection scheme makes it easy to use only patching that you need, while leaving the rest of the instrument operating like a standard hard-wired synth.

Korg's PS-series instruments are quite possibly the only polyphonic synthesizers ever made incorporating modular synth-style patching. In some ways, this offered unheard of sonic flexibility for a polyphonic synthesis architecture. With that said, it's important to keep in mind that all of the patch cable modulation paths are strictly monophonic. That is, control signals are applied globally to all note pitches, filter cutoff frequency, etc. - there are no separate mod paths for individual note articulation. This naturally limits mod source and destination possibilities. If you're wondering why there isn't a particular mod routing, most likely, this is the reason. We didn't want to radically alter the design of the PS-3300, so we (mostly) stuck with the original design and intention.

(If you get into PS-3300's patching and find yourself wishing for full patching of all polyphonic control signals, let us recommend Cherry Audio's fabulous **Voltage Modular** platform, which includes a unique "poly cables" implementation.)

Semi-Normalled Connections

A self-contained, non-modular synthesizer, such as a Minimoog, is internally hard-wired. That is, the oscillators are permanently connected to the mixer

inputs, the mixer outputs are connected to the filter inputs, and so on. A semi-normalled synth is similar, but there are jacks added to these connections throughout the instrument. With that in mind, semi-normalled is a short way of saying, "all sections are connected inside the synth, but plugging cables into the input jacks will interrupt internal connections and replace them with whatever is plugged into the jack." In the case of patch panel output jacks, plugging a cable in won't affect internal hard-wired connections, it just tacks on an additional output connection - this is known as "multing" from it.

CV Ins With Attenuators



Many of PS-3300's CV input jacks are routed through attenuator knobs beneath the lower half of the voice panels prior to their destinations.

If you've patched a CV source to a CV input and nothing appears to be happening, check that the appropriate attenuator is turned up.

CV Ins Without Attenuators

Some of PS-3300's CV inputs have direct connections to their mod destinations, for example the *External Attack Control* and *External Release Controls*. Without an attenuator, the mod amount is always at "full blast." Depending on the situation, this usually isn't a problem - for example, if

you're using a MIDI/USB controller's mod wheel to control a CV input, the mod wheel itself effectively becomes the attenuator.

CV Outs

Depending upon their function, CV outs can transmit various types of control signals. In most cases, they'll transmit a voltage ranging from either 0V ~ 5V (useful for oscillator pitch and amplitude control) or a range of -5V ~ 5V (useful for cyclical mod, such as vibrato or filter wahwah).

The tables below describe all patch panel ins and outs:

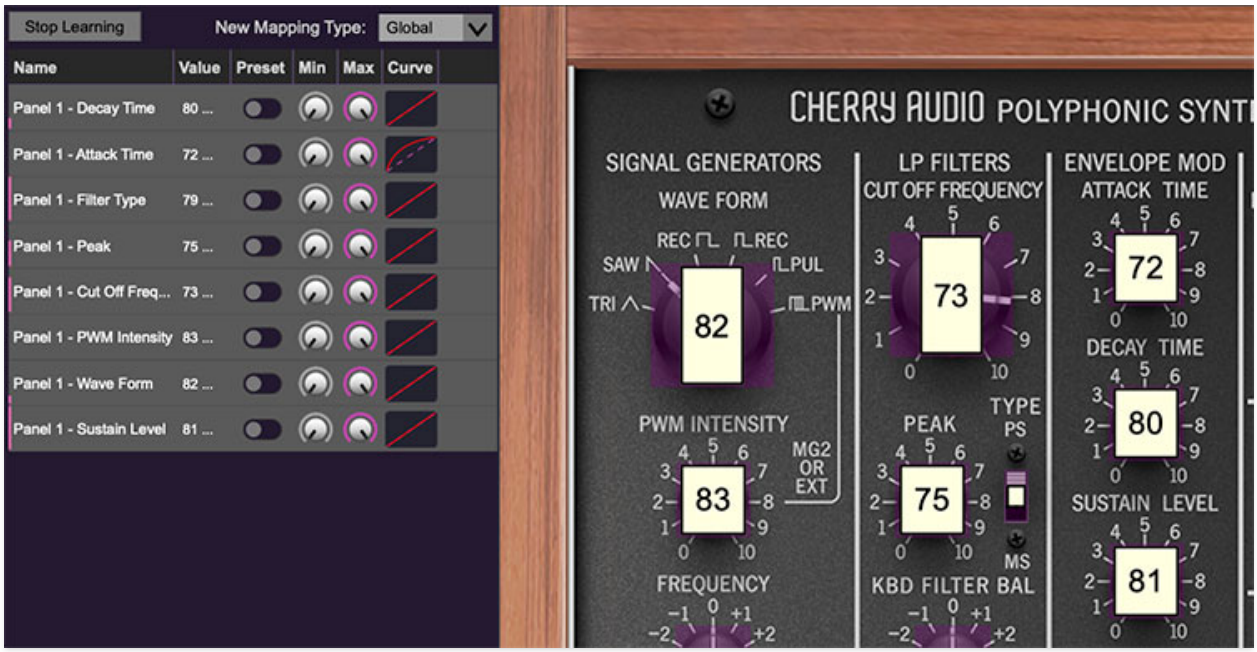
VOICE PANELS 1, 2, 3

Name	*Input or Output**	**Function**
EXT FREQ CONTROL	INPUT	pitch freq CV
EXT PWM CONTROL	INPUT	pulse width mod CV
EXT CUT OFF CONTROL	INPUT	LP filter freq mod CV
EXT ATTACK CONTROL	INPUT	attack time CV
EXT RELEASE CONTROL	INPUT	release time CV
EXT MG1 LEVEL CONTROL	INPUT	LFO 1 amount CV
EXT MG1 FREQ CONTROL	INPUT	LFO 1 rate CV
EXT RESONATOR FREQ CONTROL	INPUT	resonator 1, 2 ,3 freq C
MOD GENERATOR 1 OUT	OUTPUT	Mod Gen 1 CV output
MOD GENERATOR 2 OUT	OUTPUT	Mod Gen 2 CV output
SIGNAL MODIFIERS SIGNAL OUT	OUTPUT	Voice Panel audio outp

Name	*Input or Output**	Function
SIGNAL MIXER EXT LEVEL CONTROL 1, 2, 3	INPUT	indiv mixe
SIGNAL MIXER EXT LEVEL CONTROL (master)	INPUT	master mi
SAMPLE & HOLD INPUT	INPUT	input to Sa
SAMPLE & HOLD OUTPUT	OUTPUT	output of S
GEN ENV GEN EXT TRIG INPUT 1	INPUT	Gen Env G
GEN ENV GEN EXT TRIG INPUT 2	INPUT	Gen Env G
GEN ENV GEN OUT 1	OUTPUT	+5V ~ 0 e
GEN ENV GEN OUT 2	OUTPUT	-5 ~ +0V e
GEN ENV GEN OUT 3	OUTPUT	0 ~ +5V e
CONTROL VOLTAGE PROCESSOR 1 OUT 1	OUTPUT	CV Process
CONTROL VOLTAGE PROCESSOR 2 OUT 2	OUTPUT	CV Process
CONTROL VOLTAGE PROCESSOR 1 INPUT 1	INPUT	CV Process
CONTROL VOLTAGE PROCESSOR 2 INPUT 2	INPUT	CV Process
PITCH BEND	OUTPUT	MIDI/USB p
MOD WHEEL	OUTPUT	MIDI/USB m
KEYB VEL OUT	OUTPUT	MIDI/US ke
GATE OUT SINGLE	OUTPUT	MIDI/USB k

MASTER PANEL

TRIG OUT MULTI	OUTPUT	MIDI/USB I
KBD GATE SELECT GATE OUT	OUTPUT	MIDI/USB I
CHORUS EXT RATE CONTROL	INPUT	Chorus rat
ECHO EXT RATE CONTROL	INPUT	Echo rate
REVERB EXT MIX CONTROL	INPUT	Reverb Mi

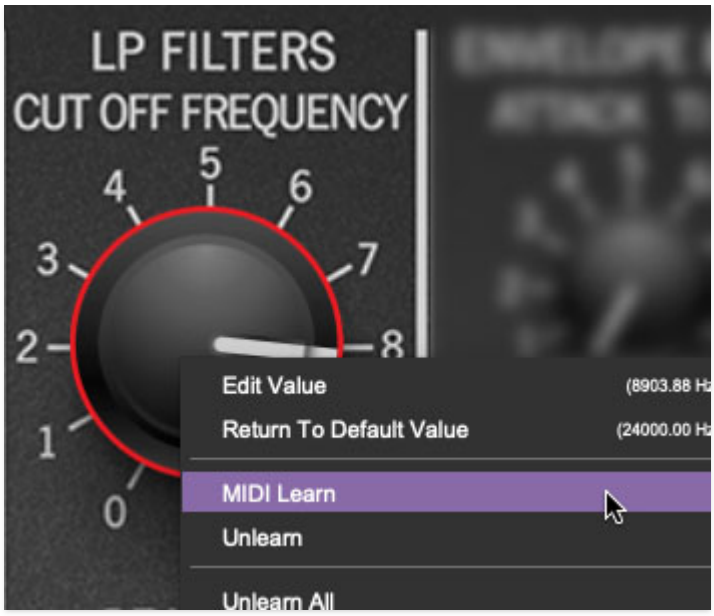


Assigning internal and external hardware controls adds a whole new dimension of control and musicality to patches, and it's really easy to do. The MIDI Tab is where all controller assignments can be viewed and tweaked. First we'll show how to assign an external hardware controller to an PS-3300 control, then we'll go over all parameters in the MIDI Tab.

Basic External Hardware Control Assignment

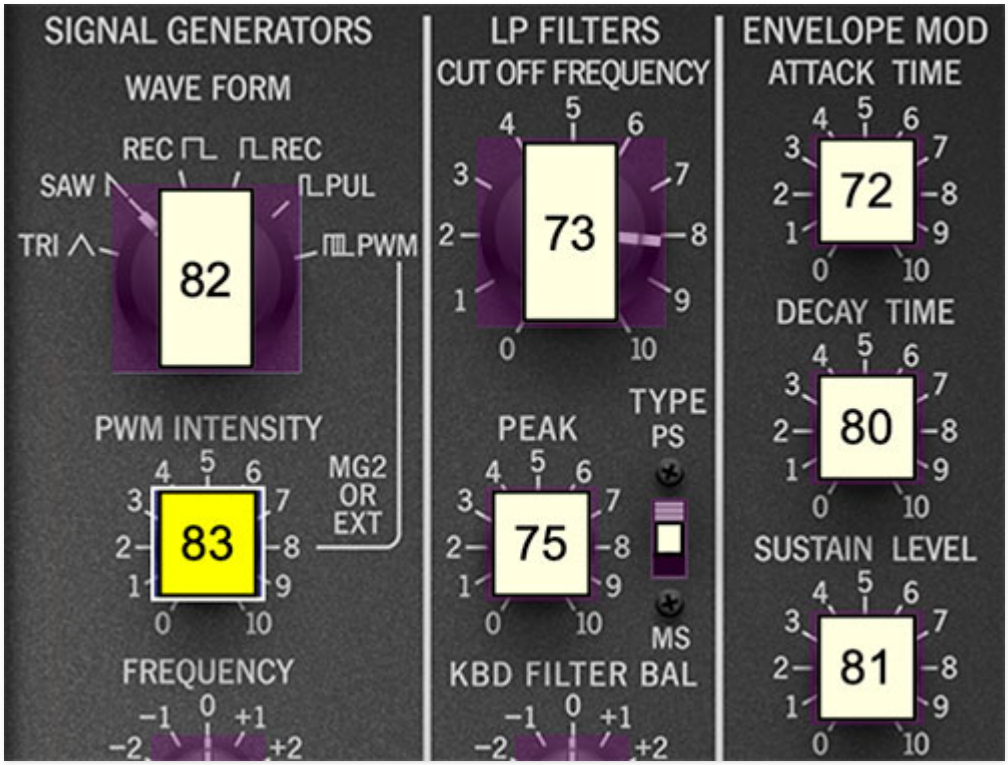
This is the quick, "I just want to assign a hardware control right now!," section. We recommend reading this entire section to best take advantage of PS-3300's swell MIDI control assignments.

In this example, we'll assign a hardware slider control to Voice Panel 1's LP Filter *Cut Off Frequency* knob.



Begin by right-clicking on the *Cutoff Frequency* knob in the Voltage Controlled Lowpass Filter section and selecting *MIDI Learn.* A transparent purple overlay appears over the knob indicating that it's in learn mode. Now move the desired hardware control device. The purple overlay disappears and the hardware control will move the onscreen knob. If you change your mind (or accidentally put the wrong control into learn mode), learn mode can be aborted by right-clicking and selecting *Stop Learning*.

This is the basic procedure for assigning hardware controllers to almost any PS-3300 control.



When in MIDI learn mode, any previously assigned controller numbers will show in squares. These indicate the MIDI continuous controller number of the assigned hardware control (these are also displayed in the *MIDI* library tab at left).

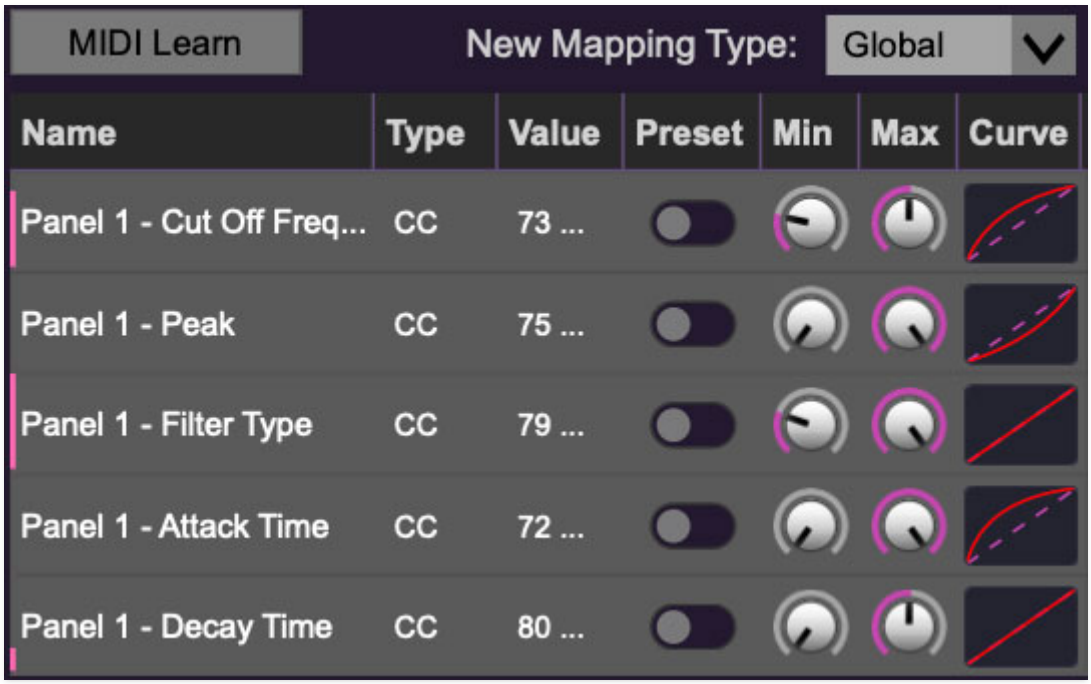
Once a MIDI controller has been assigned, in addition to real-time control of a PS-3300 parameter, you'll also be able to record and play back controller data from a DAW.

The MIDI Tab

This is command central for all MIDI controller assignments. Here you'll be able to see information about all currently assigned controllers and adjust control ranges.



To view or hide the MIDI Tab, click the *MIDI* button in the top toolbar.



MIDI Learn button- This is almost exactly the same as enabling MIDI learn mode by right-clicking a control. Click the *MIDI Learn* button to enter learn

mode (all controls turn purple). Unlike right-clicking on specific knobs, where PS-3300 automatically exits controller assignment mode, clicking the *MIDI Learn* knob "stays on" to enable assignment of multiple hardware controls. This is handy for quickly assigning a bunch of knobs, sliders, or the buttons of a grid-style controller.

To assign multiple controls, click *MIDI Learn*, click an on-screen control, move the desired hardware knob or slider, continue clicking and assigning on-screen controllers until all desired controls are assigned, then click *Stop Learning* to exit learn mode. (Do we ever REALLY stop learning... oh, forget it.)

Remember that a single hardware knob/slider/button isn't limited to controlling just one parameter - a single hardware controller can simultaneously operate as many controls as you'd like. Combined with the MIDI Tab's controller range and inversion controls explained below, this can be a very powerful and customizable way to control parameters.

New Mapping Type- This popup menu selects whether newly assigned MIDI mappings will be *Global* (affects all sounds and doesn't change when different presets are selected) or *Preset*, where mappings are saved with individual presets.

MIDI Tab Columns
Name- Displays the name of the parameter being controlled.

Type- There are five possible types of controller automation in PS-3300:

- **Note**- Notes played on a MIDI keyboard controller, expressed as C-1 to G9
- **CC (MIDI Continuous Controller)**- The standard 128 MIDI controller numbers as defined in the MIDI spec. More specifically, these are the controllers transmitted by hardware knob and slider controls. MIDI CC’s can be used to control parameters in real-time or recorded and played back within DAW software.
- **MMC (MIDI Machine Control)**- The MIDI control protocol for tape machine-style transport controls. Back in the dark ages, this was used to control wonky old Tascam and Fostex reel-to-reel monsters, but it's useful if your MIDI controller has tape-style transport control buttons.
- **Pressure**- Most modern keyboard controllers transmit controller data when keys are pressed and released as they're held down. The vast majority of keyboard controllers with aftertouch transmit "mono" aftertouch only; in other words, aftertouch data is the sum of all keys to

one single data stream. Note that PS-3300 only responds to mono aftertouch.

- **Key**- This allows keys of the computer QWERTY keyboard to at as button controls for PS-3300's onscreen controls.

Value- Displays the specific automation controller. In the case of a *Note* this would show a MIDI note number (C-1 to G9, for a MIDI CC, this would be the MIDI CC controller number, etc. Clicking on the value opens a pop-up menu where all values are displayed and can be selected.

Preset- In the left position, the mapping will be global for all Harmonia patches; in the right position, the mapping applies only to the current patch, and will be saved as a parameter specific to that patch.

The *Preset* switch is super nifty, because it means MIDI mappings can easily be set to global or per-preset status at any time. (A lot of folks requested this feature.)

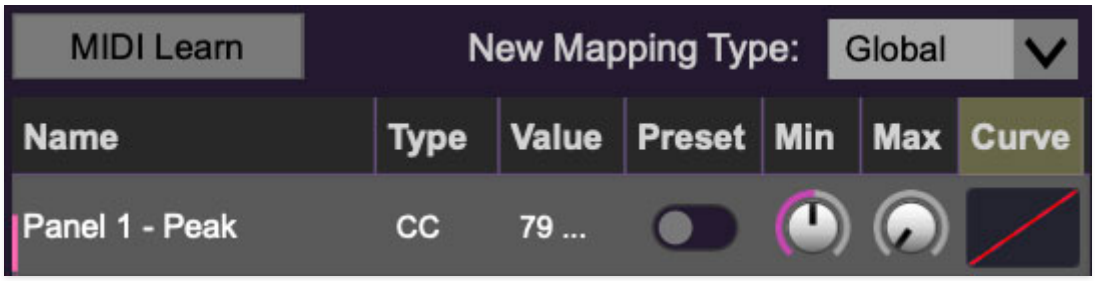
Min- Sets a limit on the lowest value any automation control can set a mapped controller to. This actually recalibrates the range of the automation controller to the remaining parameter range.

Max- Sets a limit on the highest value any automation control can set a mapped controller to. This actually recalibrates the range of the automation controller to the remaining parameter range.

Curve- These allow the customization of how incoming MIDI CC controls affect the movement of PS-3300's onscreen controls, ranging from exponential to linear to logarithmic curves.

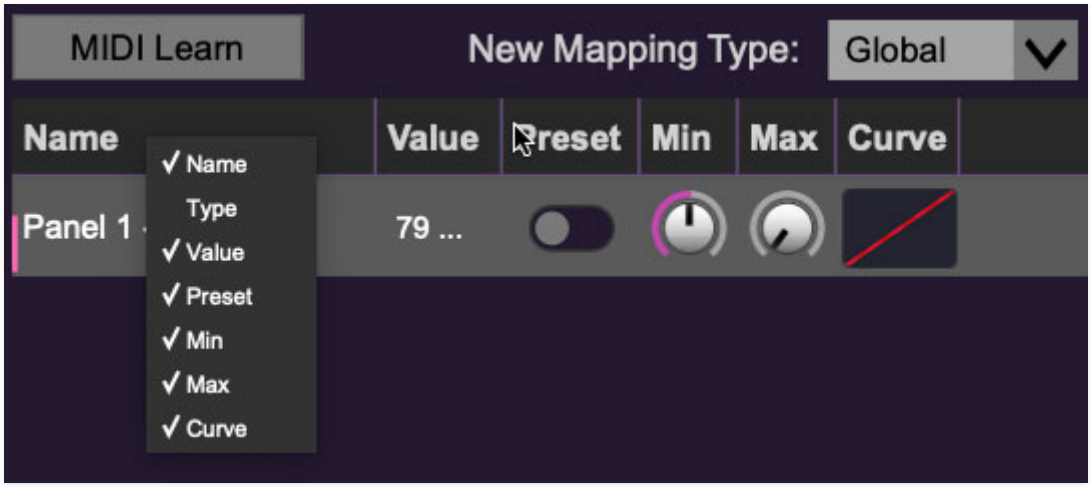
Super Tricky Min-Max Tricks- Not only can parameter ranges be limited via the *Min* and *Max* knobs, mapped control destinations can be completely inverted by setting the *Min* knob all the way up and the *Max* knob all the way down (or anywhere in between).

Limiting and inverting parameter ranges with the *Min/Max* controls is particularly useful when multiplexing a single hardware control to operate multiple parameters. Because *Min/Max*, range inversion, and *Curve* settings can be separately set for each onscreen control, the customization options are super flexible.



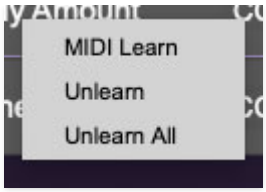
Example / Assign Voice Panel 1 LP Filters *Peak* to adjust from *5* to *0*- Assign the desired hardware knob or slider by right-clicking the Voice Panel 1 LP Filters *Peak* knob, selecting *Learn* and moving the hardware knob or slider. Now click the *MIDI* button in the top purple menu strip to open the left-hand MIDI tab. In the *Panel 1 - Peak* column, set the *Min* value knob to 50%, and the Max knob to 0.0%. Minimum setting on the hardware control will set the onscreen *Peak* knob to halfway, and increasing it will move the control toward zero.

MIDI Tab Column Configuration Right-Click Menu



Right-clicking anywhere in the top row (*Name*, *Type*, *Value*, etc.) displays the column configuration menu. Checking/unchecking these allows hiding and display of each column. This has no effect on assignments.

MIDI Tab Parameters Right-Click

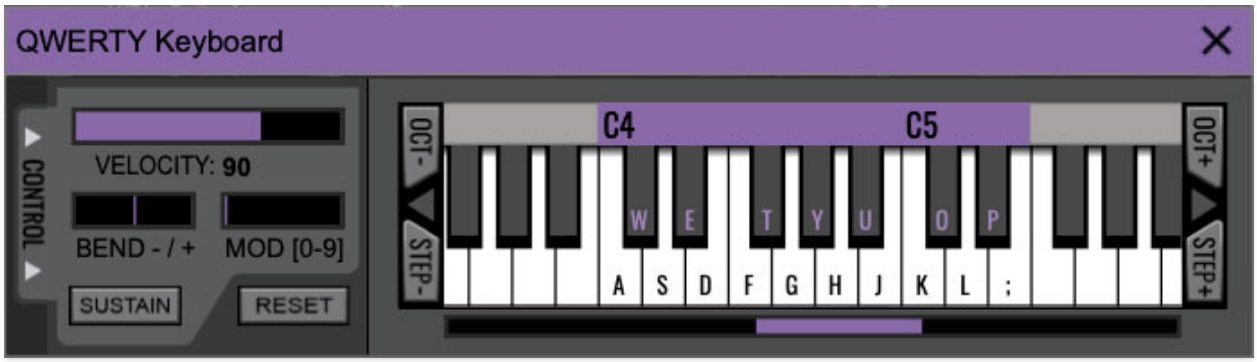


Right-clicking on an assigned parameter opens the menu above.

MIDI Learn- This is used to change the controller assigned to a particular parameter.

Unlearn- Deletes the selected automation parameter.

Unlearn All- Deletes all controller assignments for the patch. PS-3300 will display a warning dialog prior to deletion in order to thwart potential unlearn-related disasters.



The onscreen 3D keyboard can be used to play notes with a mouse or trackpad, but that's a pretty clunky interface. If you don't have a MIDI/USB keyboard controller attached to your computer, the standard QWERTY computer keyboard can be used to play notes. We'll refer to this as the "MTK" because acronyms sound cool and I'm a lazy typist... following is a list of MTK keyboard modifiers and functions:



Opening and Closing the MTK - click the the circular keyboard icon in the top toolbar. To close the MTK, click the keyboard icon in the top toolbar, or click the *X* in the top right corner.

Play Notes- To trigger notes, simply press the corresponding computer keyboard key or mouse click the onscreen keys.

Adjust Currently Visible MTK Range- Slide the purple scroll bar horizontally to adjust the currently visible keyboard range.

Adjust Overall Visible Keyboard Range- Clicking and dragging the right edge of the MTL window allows the overall size of the window to be adjusted. This lets you view more or less of the onscreen keyboard. Note that the MTK window's borders cannot exceed the overall outside dimensions of the Eight Voice window.

Shift Range Up/Down Octave- Click the *Oct-* and *Oct+* buttons at the top left and right of the onscreen MTK. The current range is displayed above the keyboard.

Shift Range Up/Down Semitone- Click the *Step-* and *Step+* buttons at the bottom left and right of the onscreen MTK. The current range is displayed above the keyboard.

Hide/View Controllers- Clicking *Control* at the far left hides and displays velocity, bender, mod, and sustain control parameters. Hiding the control view makes more space available for the keyboard.

Set Note Velocity- Move the purple *Velocity* bar to adjust the output velocity of notes.

Pitch Bend- To pitch a note or notes, press the + or - computer keyboard keys while playing a note. Notes will bend up to an octave. Notes can also be pitchbent by clicking the mouse in the *Bend* area.

Mod Wheel- To add mod wheel modulation, press the number keys from *0-9* (above the character keys) while playing a note. The modulation amount will vary from none (*0*) to full modulation (*9*). Note that modulation will "stick" at the selected number; to disable modulation, click the *0* key. Mod can also be engaged by clicking the mouse in the mod bar area.

Sustain- The *Sustain* button mimics the functionality of a standard sustain pedal. Click the [TAB] key to engage sustain, or [SHIFT]+[TAB] to lock it. The *Sustain* button can also be engaged by mouse clicking it.

Reset- Initializes all MTK parameters including keyboard range and control parameters.

Clicking the settings gear opens a window with multiple tabs for configuring various "under-the-hood" settings. These are mostly set-and-forget kind of parameters - all the stuff you'll use most is on the front panel, where it should be!

General



- **Add Undo For Control Changes With The Mouse**- Enabling this allows undo of control adjustments. You'll want this on if you want the ability to undo all aspects of patch editing and programming.
- **Create A Log File For Usage-** This creates a text doc of all of PS-3300's internal and routines during use. It is mainly intended for our tech staff should you experience any issues. Clicking *Show Log Folder* opens the folder containing Harmonia log file docs.
- **Load Last Preset On Startup (Standalone Only)**- Automatically loads the last preset used when PS-3300 standalone version is started.
- **Preset Folder-** Displays the current location of Harmonia's sound presets. This can be changed by clicking and typing in the field.
  - **Browse...** - Displays the current location of preset folder in the file manager.
  - **Set Default-** Sets the current displayed *Preset Folder* path as the default location
- **Clear Cache Files-** Deletes all log files, temporary sounds, and the image cache.

Interface



Allows customization of PS-3300's user interface settings.

- **Reset To Default Window Size-** Resets the PS-3300 workspace to default size. Use this to reset the window size if the window somehow becomes too large for your display and can't be resized.
- **Tooltip Delay-** Tooltips are those informative bits of text that pop up when hovering over a control (go ahead and try it, we'll wait...). The *Tooltip Delay* setting defines how long you must hover before the tooltip pops up.
- **Knob Movement-** Defines which how mouse movements related to turning onscreen knobs. It defaults to *Vertical Drag*, but can be changed to *Horizontal Drag*, or *Rotary Drag (*if you're having trouble with your vintage Mazda).
- **On Control Double-Click**- Defines what happens when the mouse is double-clicked on a control. If *Edit Value* is selected, an exact number can be entered by typing the number and hitting [ENTER] or [RETURN]. If *Sets Default Value* is selected, double-clicking a control resets it to its default value.
- **Mouse Wheel Adjusts Control Value-** Enabling this lets you adjust knob, slider, and switch values by moving the mouse wheel. This works great with a standard mouse wheel, but you'll want to disable it if you're using an Apple Magic Mouse (which will move the control AND scroll the window).
- **Show Tooltips When Adjusting Controls With Mouse-** Displays parameter tooltips/values when the mouse is hovered over a control or as a control is moved with mouse button down.
- **Show Tooltips When Automating Controls**- Enabling this causes control tooltip flags to show when automation data is being received.
- **MIDI Program Changes Should Change Current Preset-** Allows MIDI program change messages to change PS-3300 patches.
- **Ask To Save Modified Presets-** This opens a dialog window asking if you'd like to save changes if a patch has been edited and a new patch is selected. If you're the type that likes to click through presets and tweak a control here and there, it can be annoying to have a window pop-up asking if you'd like to save every time you switch presets - if you're that person, keep this off.
- **Remember MIDI Mappings For New Plug-in Instances**- When enabled, PS-3300 remembers all MIDI Tab controller settings.

Account



Settings for your personal login information and account.

- **Email**- Displays the email address of the current login.
- **Update Login Info**- Clicking this opens the same email and password login screen you'll see when initially launching PS-3300 and allows changes to be made.
- **View Account Settings**- This opens your personal account page on the Cherry Audio Store website containing information about modules purchased and more.

Software Update

- We often fix bugs and make improvements; below are options defining how PS-3300 handles updates.

- **Check For Update-** Click this to see if an updated version of PS-3300 is available.

Status:

- **Automatically Install Updates**- Updates are automatically downloaded and installed.
- **Ask Before Installing Updates**- By default, PS-3300 automatically downloads new versions of modules when available. Checking this box defeats automatic updates and will ask if you'd like to install updates when they become available.

  We'll never make changes that can potentially "break" existing patches but we recommend enabling *Ask Before Installing Updates* if you're using PS-3300 for live performances or other "mission critical" situations.
- **Never Install Updates**- PS-3300 never automatically installs updates.
- **Show Updates On Toolbar**- Checking this will display an icon in the toolbar next to the logo letting you know there's an update available.

Show Notifications From Cherry Audio- We occasionally will fire off in-app advertisements; disabling this checkbox will hide them. We hate repetitive, annoying ads as much as you, so we on't use this feature too often.

Cables



These preferences define how PS3300’s virtual patch cables behave.

- *Animate Cables*- When checked, PS-3300's cables will bend and dangle like real cables. This makes everything sound better (not really, but it looks cool).
- *Move Cables Away*- When checked, hovering over a cable (or multiple cable spaghetti) will temporarily shift them out of the way to make it easier to see modules beneath.
- *3D Cables*- Checking this shades cables to appear more three-dimensional, no silly red and green glasses required.
- *Draw Shadow*- Causes cables to cast a shadow upon modules.
- *Cable Thickness*- Adjusts the thickness of all cables.
- *Transparent Cables*- This works in conjunction with the *Cable Transparency* button discussed previously.

  All Cables- Cable Transparency slider affects all cables.

  All But Current Jack - Hovering over a jack will make its cables opaque. If the *Cable Transparency* control is set to its maximum setting, *Transparent Cables* will have no effect.
- *Show Signal Animation*- Enabling this superimposes a stream of “marching ants” over cables displaying signal flow and direction. (They’re easier to see at wider cable width settings.) The *Speed* slider adjusts the speed of display, but has no effect on signals.
- *Enable Animations For Jacks*- Selecting this shows a nifty little animation when a jack is clicked to use its built-in mult. If you’re a high-strung

weirdo (like me), unchecking this box disables the animation, which makes the mult pop up more quickly.

Audio/MIDI



Settings for audio and MIDI hardware input and output. **This tab is only visible in the standalone version of PS-3300.**

- **Output**- Use this drop-down menu to choose a physical audio output source. This defaults to *Built-In Line Output*, i.e. your computer's onboard system audio, but you'll get better fidelity with an external professional audio interface. The biggest audible difference is usually reduced background noise or hum, but external audio hardware also offers greater flexibility in terms of number of inputs and outputs and built-in mic or low-level instruments pres (i.e. electric guitars). The *Test* button will produce a sine wave when clicked; this will help with troubleshooting, aka, "WHY THE HECK ISN'T THIS MAKING ANY NOISE?!?"
- **Sample Rate-** This sets PS-3300's global sample rate. Lower sample rates offer better performance, but if you have a fast computer, high sample rates may offer slightly improved fidelity. Best of all, using super high sample rates will give you fantastic bragging rights that are sure to make you the life of any party!
- **Audio Buffer Size**- As with any digital audio app, this defines performance vs. note latency, and will largely depend upon computer CPU speed. A professional external audio interface will almost always exhibit better performance than "built-in" system audio. Lower settings will result in less latency (in the form of faster response to notes played), but will increase the chances of audio gapping or crackling noise.
- **Active MIDI Inputs**- Displays all available MIDI input sources, i.e. keyboards, pad controls, MIDI knob/fader control surfaces, etc. Check boxes to enable one or more devices. If you're using a fader controller with touch-sensitive sliders (like a Mackie Control, for example) and PS-

3300 plays weirdo notes when you touch the faders, you can uncheck it here to stop that.