If you're reading this, you probably know that the Yamaha CS-80 is one of the most coveted polyphonic analog synthesizers ever created. When it was originally released in 1976, there was nothing like it on the market - with features like eight-voice voice assign polyphony, velocity and aftertouch sensitivity, and a massive sound, it truly was a flagship in sound quality, feature set, and build quality. The CS-80 became a legend for its use by Vangelis in the classic sci-fi flick *Blade Runner*, creating immense and dreamy warbling soundscapes that liberally made use of its very musical and controllable ring modulator. The CS-80 set a new standard in real-time control, and Vangelis took great advantage of the CS-80's bank of arced paddle-style performance controls, as well as the aforementioned keyboard velocity and aftertouch sensitivity.

With DSP code programmed by award-winning synthesizer designer Mark Barton, Cherry Audio's GX-80 emulates all of the sonic and control characteristics of the CS-80 with outstanding accuracy. Mark's extensive

research of the original CS-80 schematics and design led him back to the CS-80's predecessor, the mighty GX-1, aka "The Dream Machine" - truly one of the most impressive synthesizers ever conceived.

In the 70s and 80s, Yamaha often tested out new technology by creating a large and expensive flagship instrument. Released in 1974, the GX-1 represented the absolute cutting edge of organ and analog synthesizer technology. It was produced in extremely limited numbers (estimated around 20), and cost $50,000 (that's a comfortable house in the early 70s). This put it far out of reach for most musicians, but it was famously used by Stevie Wonder, Keith Emerson, Benny Andersson of ABBA, and a little later, by John Paul Jones of Led Zeppelin.

GX to CS

It's important to remember that like other Japanese manufacturers, Yamaha arrived in the synthesizer market via production of home organs. Korg, Roland, and Yamaha all produced small monophonic synthesizers intended as solo instruments to be placed atop a home organ. Seeing the expressive limitations of then-current "divide-down" organ technology, Yamaha used their basic SY-1 mono analog synth as the building block upon which to create the GX-1, which combined analog synthesizer voicing technology with a user interface and poly capabilities of a large multi-manual organ and pedalboard. Unlike the CS-80, the GX-1 by itself was strictly a preset instrument. Though it had no onboard synthesizer parameter controls, its analog synthesizer voicing *could* be programmed using an external hardware programmer box, and user sounds could then be saved as presets to cartridges through an almost comically elaborate procedure.

Though their outward appearances are radically different, both instruments are very similar under the hood. Both feature a voicing architecture based on "ranks," wherein each rank is a complete synthesizer voice consisting of an oscillator, highpass and lowpass filters, a noise generator, a sine wave oscillator, envelope generators for the filter and VCA respectively, and a VCA. The CS-80 includes two of these voice ranks, each capable of playing up to eight independent polyphonic notes - a total of 16 synth voices under the hood.

The GX-1 features four of these eight-note poly voice ranks, assignable across two keyboards, plus a single "lead synth" voice rank with its own mini three-octave keyboard, and finally, *another* voice synth voice rank for the pedalboard, for a grand total of 34 (!!!) full synth voices... essentially like having two complete CS-80's and then some. It should go without saying that

with all these layers of voice ranks, the GX-1 was capable of beautifully large animated tones. The nature of its synth voice, particularly the cascaded highpass/lowpass filter arrangement and their unique topology, resulted in a sound quite different than the familiar fat Moog ladder filter sound, resulting in a uniquely sophisticated midrange-forward tonality.

We should also mention that both instruments were highly innovative in their "voice-assign" polyphonic arrangement. We take the ability to play multiple individually articulated notes for granted, but this was all but unheard of in 1974. Besides a few custom rigs, there were no other instruments on the market that could assign keys to a finite number of synthesizer voices - the impact of this innovation cannot be overstated (otherwise we'd all still be playing Farfisa organs and string machines). By the time the CS-80 was released in 1976, the only other voice-assign poly synths on the market were the Oberheim Two- and Four-Voice instruments, and these were far more finicky to use.

That said, Yamaha's approach to preset sounds was downright archaic. The CS-80 included 22 permanent factory presets, divided between the two voice ranks, and allowed "storage" (to use of the term loosely) of four additional sounds (two per rank) via tiny slider pots under a hinged panel. These sliders were miniaturized versions of all voicing controls, and selecting the *Tone Selector Memory 1-4* buttons simply swapped out the main panel voice controls for the chosen mini slider set. For those of you with an electronics background, you can only imagine how many failure-prone 4000-series logic switching chips this feat entailed! The GX-1 used a conceptually similar system, but all of its sound presets were defined by external cartridges full of tiny trimpots. Unlike the CS-80, these were too tiny to edit sounds with in real-time, so Yamaha came up with a pair of impressively elaborate external programming boxes whose operation is so ridiculous as to be pure comedy.

To be fair, the GX-1 was really conceived as an organ on steroids moreso than a purely user-programmable synthesizer. Besides its beautifully layered sound, the GX-1 had a fantastically innovative array of performance controls, including velocity- and pressure-sensitive keyboards, a knee expression lever, swell pedals, and a pitch bend ribbon.

GX1+CS-80 = GX-80

As its name implies, the Cherry Audio GX-80 is *not* purely a CS-80 emulation. Though the Yamaha GX-1 and CS-80 are similar under the hood, the GX-1 is roughly equivalent to two complete CS-80's in one (real big) box. Additionally, the GX-1 oscillator section featured a pulse wave output with an

adjustable highpass resonator and a sawtooth wave output with its own dedicated bandpass resonator (these are *in addition to* and in parallel with the standard pulse and sawtooth wave outputs), allowing numerous additional sound colors. It's particularly useful for simulating the resonances of traditional string and wind instruments.

The Cherry Audio GX-80 incorporates all of the GX-1's extra features. *Single* and *Dual* buttons allow GX-80 to operate like the standard two-rank CS-80; the GX-1's additional two voice ranks are added when *Layer Mode* is set to *Dual*. We've also added a keyboard split mode, allowing splitting of the lower and upper ranks across the keyboard. The GX-1's additional filtered waveform outputs are also included, as well as its octave-up triangle wave and the ability to invert filter envelope control. GX-80 also includes CS-style filters as well as the GX-1's unique filter topology. **All GX-1-unique parameter controls are orange to distinguish them from standard CS-80 control parameters.**

GX-80 has been super fun to develop, and Mark Barton's work on its audio path has been exemplary. We hope you enjoy this monster synth as much as we do!

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/

… or you can communicate directly with one of our outgoing and friendly tech support staff at:

https://cherryaudio.kayako.com/

Top Toolbar and Preset Browser

The purple strip at the top of the GX-80 interface is where you'll load, save, and create sound presets. It also contains utility functions such as undo/redo, UI zoom and *Focus* controls, under-the-hood settings, and more. Let's go over them:

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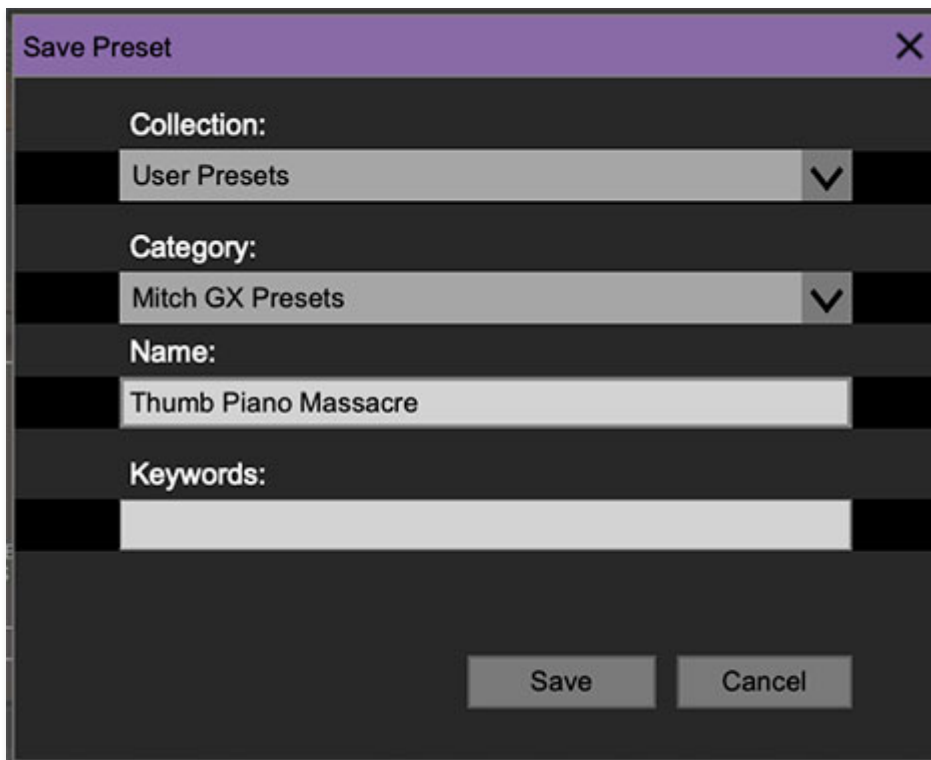
Save- Use this to save patches. There are a couple of levels of hierarchy:

- **Collection**- This is the top level of organization, and contains entire "sets" of presets. The *GX-80 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 separated 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 "bass," "lead," "replicant," etc., to patches to make them appear when terms are typed in the *Search* field. Use commas to separate multiple keyword entries.
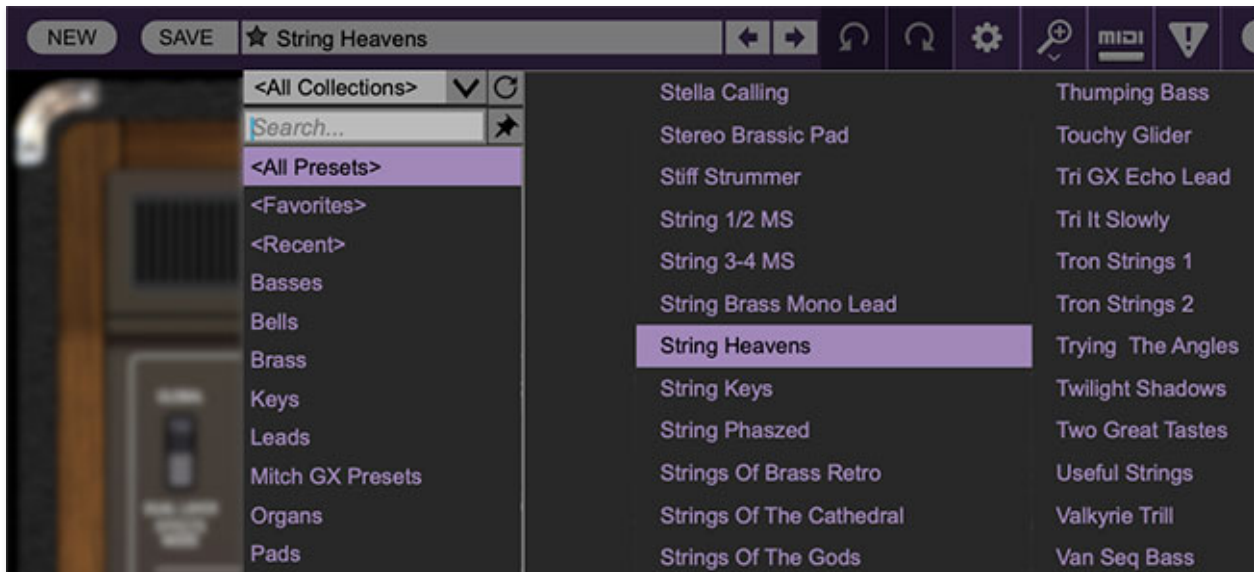
Browsing Patches- Patches can be browsed by clicking the preset name. To select a preset collection, click in the area below the current preset name (by default, it will say *<All Collections>*) or on the downward-facing arrow next to it.

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

- **<All Presets>** will show presets from all collections and categories.

- **<Favorites>** displays recently used preset

- **<Recent>** displays recently used presets.

- The remaining preset categories filter the displayed presets by sound type, such as *Bass*, *Percussion*, *Strings*, etc.

Refresh- This is the little circular arrow button to the right of the downward arrow; clicking this checks the Cherry Audio server for new or updated

presets.

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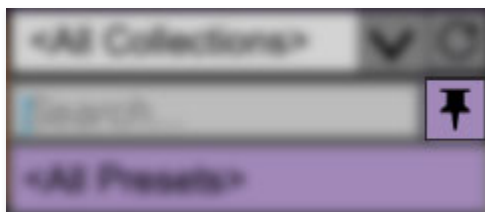
Pin- Clicking the push-pin icon locks the patch selection list open, allowing fast and easy browsing and auditioning of patches. Click the icon again to disable pin mode. when in pin mode, the up and down arrow keys can be used to select patches.

Preset Step Back/Forward horizontal arrows- These step to the previous or next preset.

Importing Preset Sounds with drag-and-drop

Presets can be imported singly or en masse simply by dragging and dropping from the desktop anywhere on GX-80's user interface.

If a single *.gx80preset* file is dragged and dropped, the sound is immediately loaded and the standard *Save Preset* dialog appears; this lets you save the sound to GX-80's preset browser. Note that you don't have to save the sound to GX-80's 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 GX-80 UI. This works the same as with single sounds, but instead of the *Save Preset* dialog , you'll see the *Import Preset Collection* dialog below:

(*top menu strip items continued*)

Undo/Redo circular arrows- These undo or redo the last action. It remembers many steps, so if you really mucked 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.
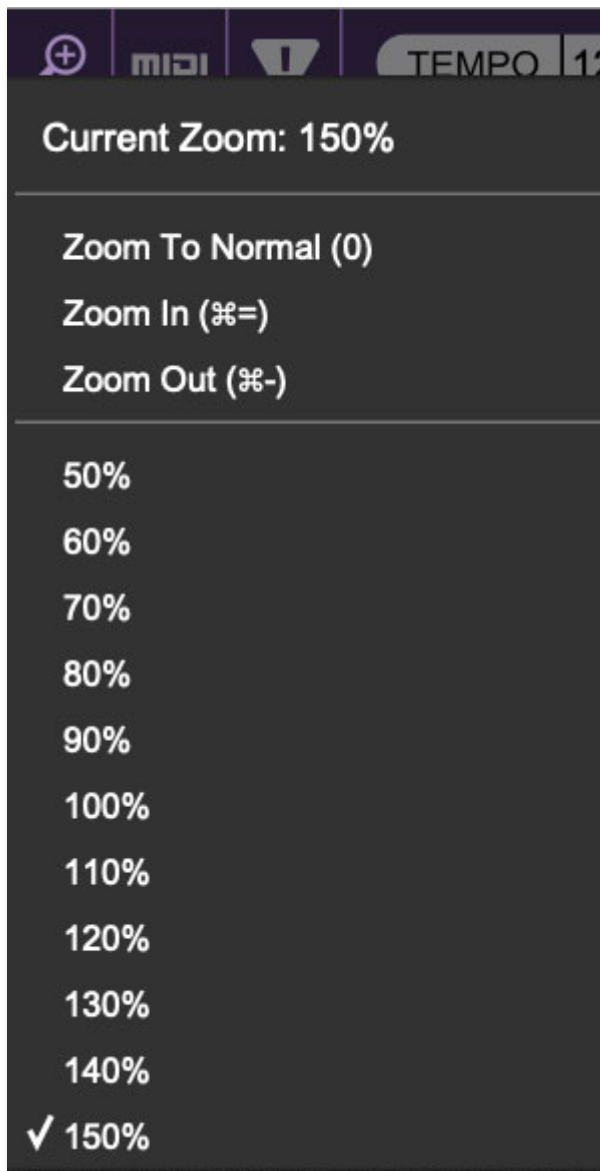
Zoom Magnifying Glass - Click to resize the GX-80 interface. Selecting *100%* returns the user interface to native size.

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, "why won't this thing stop making noise?!?" stuck-note incidents.
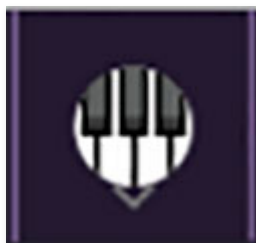
QWERTY Musical Typing Keyboard- Opens an onscreen keyboard allowing a standard QWERTY computer keyboard to be used for playing music notes. For more information, see **QWERTY Musical Typing Keyboard (MTK)** section.
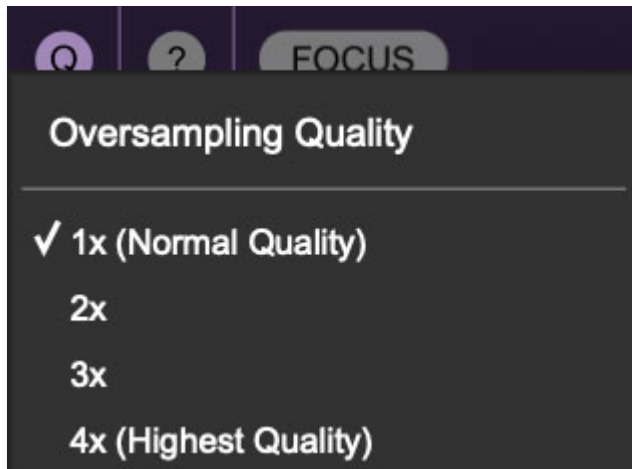

Q Oversampling Quality - The Q button sets GX-80's internal oversampling rate; the higher the setting, the better audio fidelity will be, with the caveat that more computer processing power will be required.

Internal processing can be set to *1x* (same rate as the current sample rate of the host DAW or in the *Settings>Audio/MIDI* window for the standalone version) or to *2x*, *3x*, or *4x* the current sample rate. The sample rate is downsampled at the instrument output stage to match the current host sample rate.

For example, if the current DAW/instrument sample rate setting is 48 kHz, and oversampling is set to 2x, GX-80's internal processing runs at 96 kHz, and is then reduced back to 48kHz at the output stage.

If the current DAW/instrument sample rate setting is 192 kHz and oversampling is set to 4x, GX-80's internal processing will run at 768 kHz, and you will very briefly hear the most ameeeezing synthesizer sound quality ever experienced by mankind before your computer instantaneously explodes in a fiery, white-hot supernova blaze. Ok, maybe not.
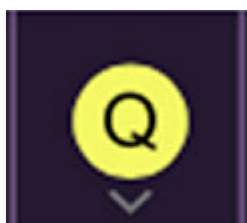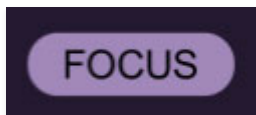
When oversampling is set to any multiple greater than *1x*, the *Q* button glows yellow.

Help- Clicking this launches your web browser and opens this very help document. (Confusing circular logic thing, right?)

Focus Button

If you're using a tiny laptop, the user interface can potentially be hard to see. With this in mind, the *Focus* button conveniently blows up GX-80's view 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*. **There's also a superfast key shortcut** - on Mac, hold the ⌘ [COMMAND] key and click the mouse; in Windows, hold the [OPTION] key and click the mouse. Focus can be reset with the same key shortcuts.

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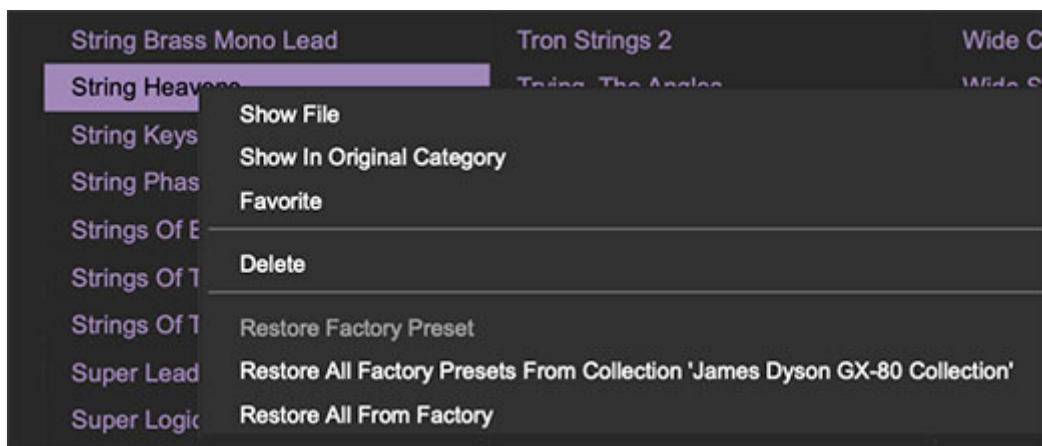
Show File - This displays the selected preset in the Mac or Windows folder containing it. This is useful for backing up or sending a preset file to another user.

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 the *<Favorites>* category menu when selected; a star will display next to the preset name. Right-click on the preset and reselect *Favorite* to un-favorite it. (Or just ghost it if you don't do the confrontation thing.)

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 'GX-80 Presets' - If any patches from the "factory" GX-80 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 GX-80 bank mentioned above is the only factory bank, so this function and the *Restore All Factory Presets From 'GX-80 Presets'* above have the same effect.

GX-80 Panel Layout

GX-80's front panel can be divided into five sections: Effects, Rank Voice Parameters, Performance Controls, Global Controls, and Left-Hand Controls. Below is a brief description; we'll thoroughly explain each section's controls in the user guide sections that follow.

Effects
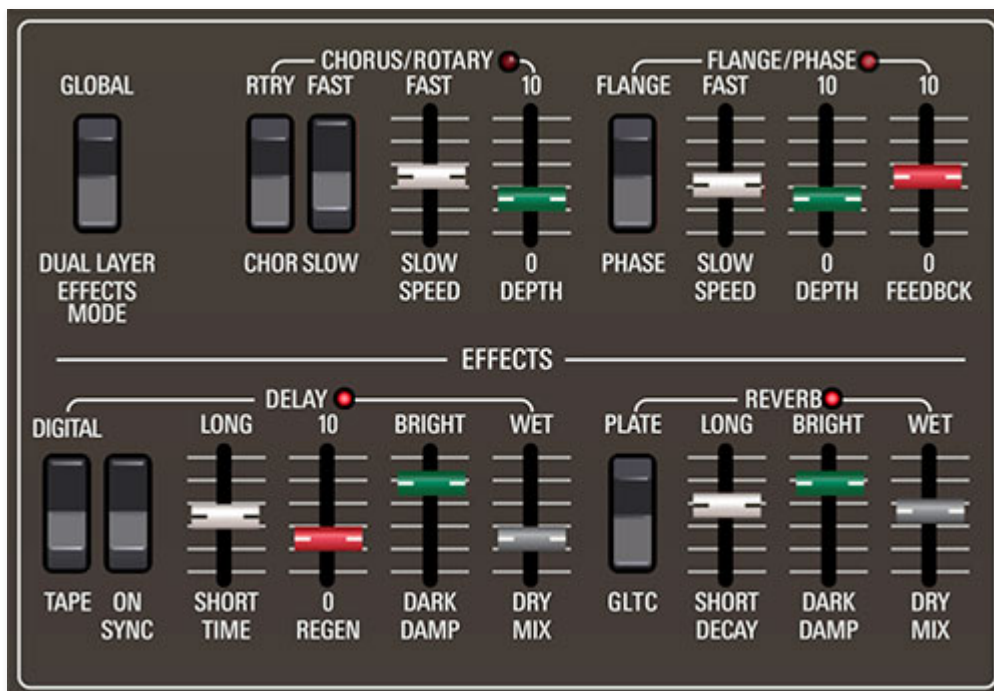
Four individual onboard effects sections, comprising Chorus/Rotary, Flange/Phase, Delay, and Reverb.

On the original CS-80, this area of the front panel contained a signal flow diagram and was actually a hinged door. Underneath the door were four sets of teensy sliders replicating the Rank Voice Parameter controls; these allowed four "user presets" (sort of). GX-80's modern preset browser makes this section completely unnecessary, so we repurposed this panel real estate for the Effects section.

Rank Voice Parameters
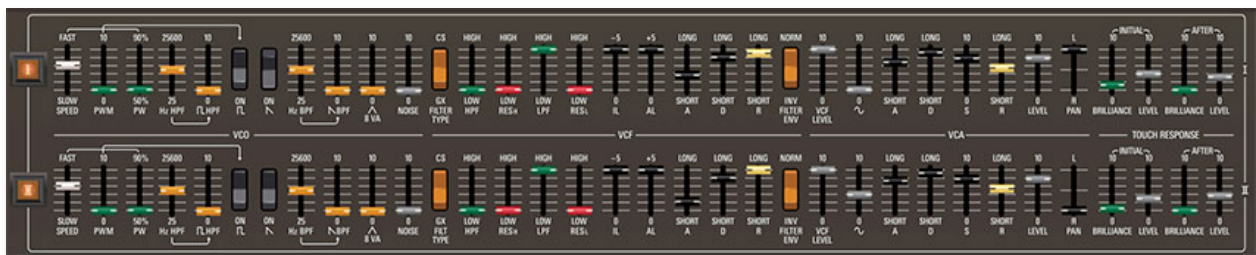
Contains two identical sets of controls related to synthesis parameters. These correspond to Rank I and II. These controls also edit Rank III and IV if *Layer Mode* is set to *Dual* or *Split* and *Panel Control* is set to *Lower*.

If you look at the center, you'll see that Rank Voice Parameters is subdivided from left to right into familiar analog synth components: *VCO*, *VCF*, *VCA*, and *Touch Response.* (Pretty sure "*Touch Response*" was also a 1981 Laura Branigan album of duets. One of those Toto dudes definitely would've played a CS-80 on this fictional release.)

Performance Controls
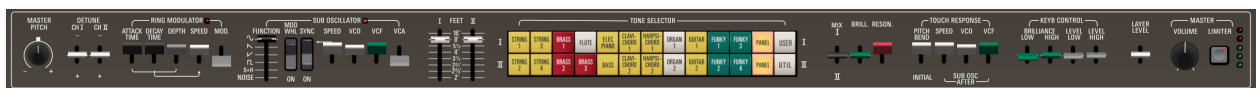
These controls are optimized for real-time use, and they're a large part of what made the CS-80 such a fantastically expressive instrument for live performance. The majority of these controls are what we refer to as "paddle" controls - i.e. sliders that rotate in an arc. These controls were appropriated from Yamaha's organ line, and like an organ, they operate backwards from a typical slider control - full up position is off, and their amount increases as they're pulled *back* toward the player.

Global Controls

These controls regulate voice assign modes (i.e. how GX-80 handles mono and poly) as well as the layer modes that allow stacking and splitting. The unique CS/GX pitch ribbon control also lives in this section.

Left-Hand Controls
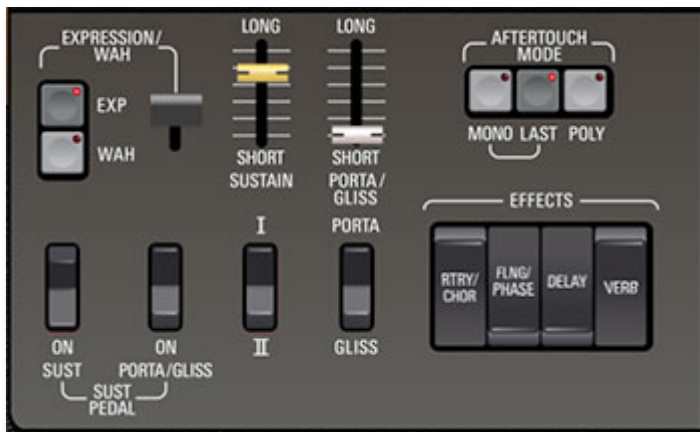
These controls regulate additional performance parameters, such as enabling and disabling effects, sustain and expression pedals, and aftertouch behavior.

Effects Section
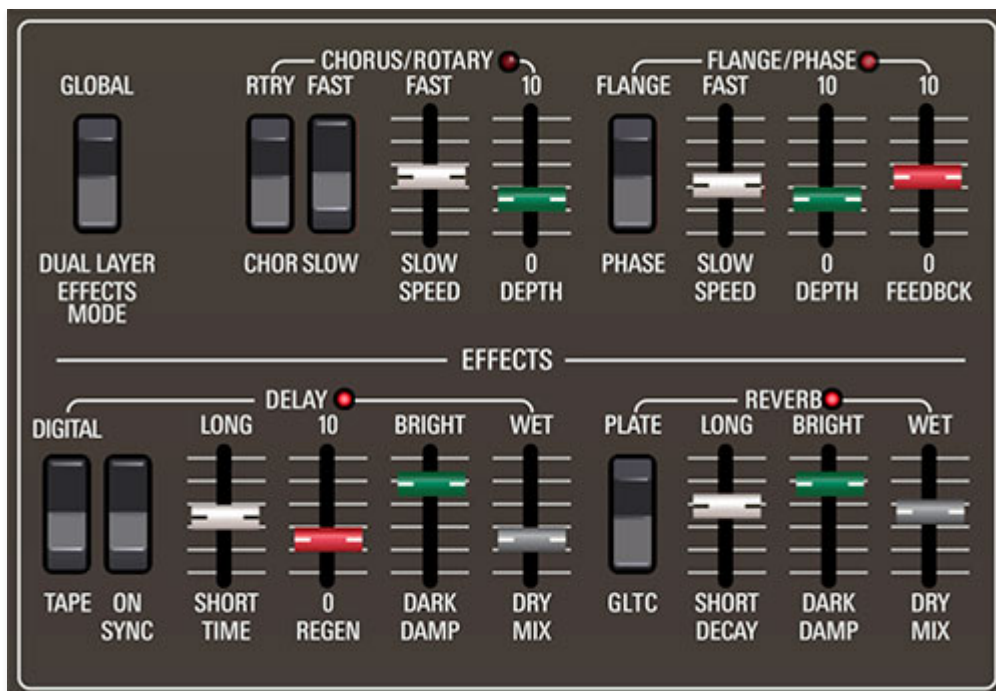
The GX-80 includes four individual effects: Chorus/Rotary, Flange/Phase, Delay, and Reverb. These can be used simultaneously in any desired combination. **If GX-80 is set to Dual or Split mode, each layer will have its own independent set of effects.**

Effects Enable/Disable Rocker Switches

On/off status is set for each effect using the rocker switches immediately to the left of the keyboard. Like other GX controls, the down position corresponds to on. LEDs next to each effect name also indicate on/off status.

Effects Mode

Effects Mode- When set to the *Dual Layer* position, an entirely independent effects section is available for the upper and lower layers. When set to the *Global* position, both layers (i.e., voice ranks I/II/III/IV) run through a single set of effects. This is useful when creating patches that combine all four voice ranks into one overall sound, or when creating a split sound and you'd like the same effects settings for both layers.

When set to *Global* effects mode, the rectangular frame remains white regardless of the current Panel *Upper/Lower* view setting.

The Effects Mode switch is only applicable when in *Dual* or *Split* Layer Mode. If Layer Mode is set to *Single*, the Effect Mode switch is "grayed out" and disabled.

Chorus/Rotary
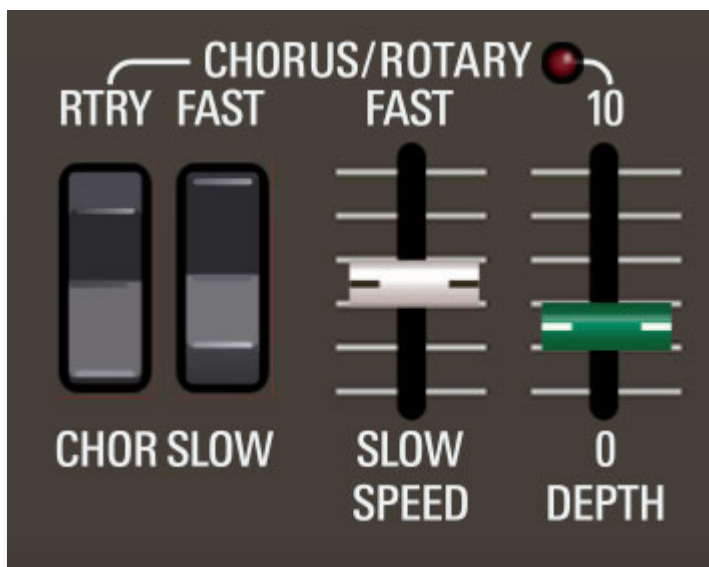
This can function as a rotary speaker effect or a chorus. Note that these are totally different effects - the rotary speaker is a true Leslie emulator, with all the inherent quirks of a real rotating speaker cab miked in stereo. Meanwhile, the chorus effect is not an emulation of the CS-80's onboard chorus, because frankly, the original chorus fidelity wasn't all that good, so we've improved it considerably. Both the chorus and rotary effects are full stereo.

Chorus/Rotary- Selects either chorus or rotary effect. When *Rotary* mode is selected, the *Speed* and *Depth* sliders are disabled, because a real rotary speaker only has two speeds (selected with the Fast/Slow switch), and it's inherently an "all-wet" effect due to the physics of a mechanically rotating speaker.

Fast/Slow- When in *Chorus* mode, this selects the range of speeds available via the Speed slider. When in *Rotary* mode, this switches between the two fixed rates of a classic rotating speaker enclosure.

Speed- Sets the rate in *Chorus* mode; disabled in *Rotary* mode.

Depth- Sets the overall modulation amount in *Chorus* mode; disabled in *Rotary* mode.

Flange/Phase
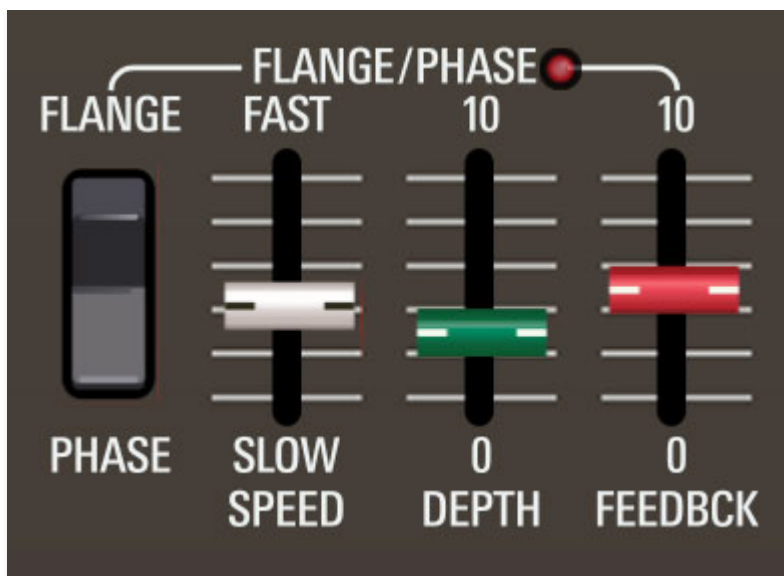
The familiar "jet-plane" flange or super swooshy phase modulation effects. Both effects are mono, but layer panning positions are properly maintained.

Phase/Flange- Selects either phaser or flanger effect.

Speed- Sets rate from 0.10 - 10 Hz.

Depth- Sets the overall modulation amount of effect.

Feedback- This sets the amount of internal feedback, increasing effect intensity.

Delay
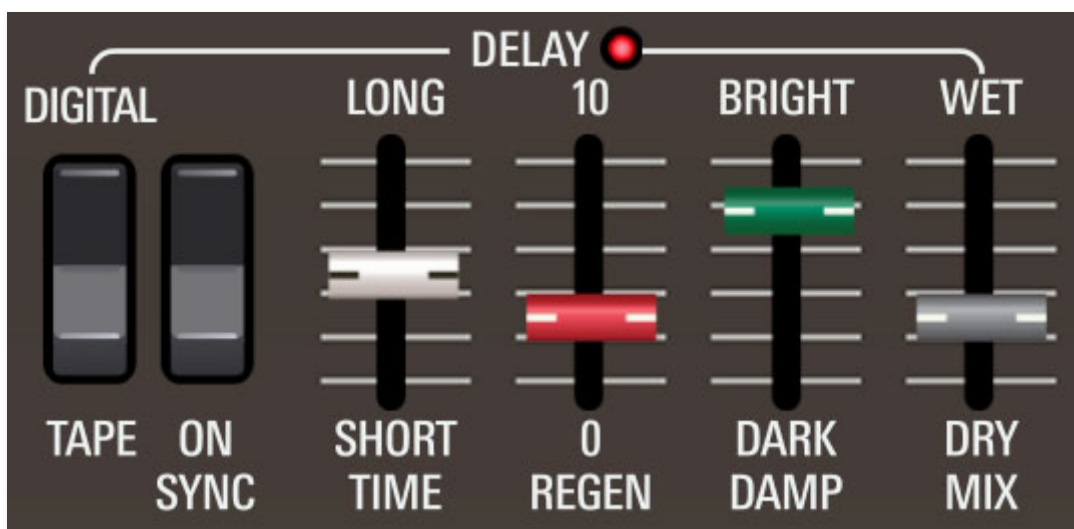
A sync-able delay with digital and tape modes.

Tape/Digital- Selects the overall character of the delay. Tape reproduces the effect of a vintage "space echo" tape delay. Digital is a cleaner sounding

delay with a bit of built-in stereo time offset for width.

Sync- Enabling the *Sync* switch locks the delay time to master tempo. When in the down position, the *Time* knob snaps to note values ranging from 1/64th note triplet to 8 beats. *Sync* mode 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.

Time - Sets delay time, from 1 to 2000 ms. If the *Sync* button is enabled, time settings snap to synchronized note values (see preceding *Sync* switch).

Regeneration- Routes the output to the input for additional repeats.

Damp- Attenuates high frequencies as the knob amount is reduced. 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. Center position is a 50/50 equal mix.

Reverb
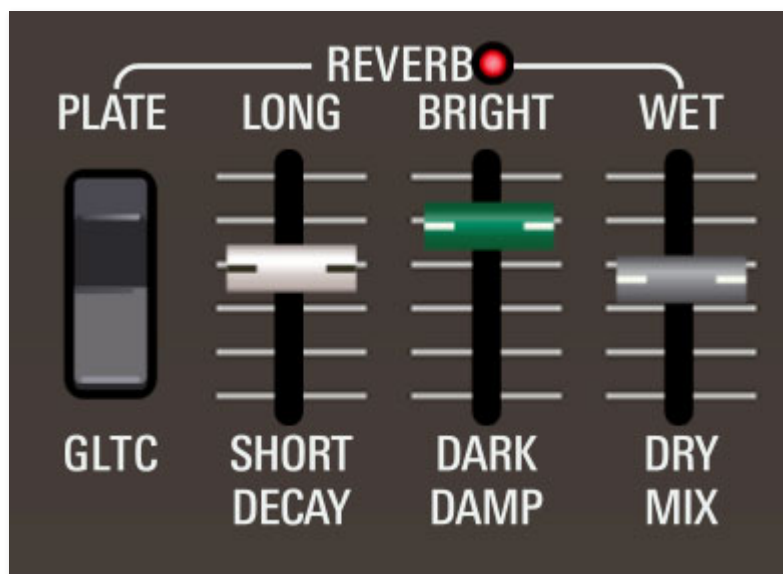
A smooth, studio-quality stereo reverb. The stereo implementation allows it to be used to stereoize mono (i.e. centered) sounds, but panning positions are retained.

Gltc (Galactic) / Plate- Allows selection of a classic plate reverb algorithm, or our exclusive Galactic algorithm, which is great for enormous, spacious soundscapes.

Decay- Sets the length of reverb release time/size.

Damp- Attenuates high frequencies as the knob amount is reduced.

Mix- Balances the level of dry and wet signal. Center position is a 50/50 equal mix.

Rank Voice Parameters

This is where the main synthesizer voicing controls are located. The architecture of the original CS-80 differs from typical analog synthesizers in that it contains two polyphonic "ranks," with each rank comprising a complete synthesizer voice consisting of a single oscillator, a highpass and lowpass filter, a noise generator, a sine wave oscillator, envelope generators for the filter and VCA respectively, and a VCA. These are referred to as rank I and II (these are Roman numerals). The Rank Voice Parameters section contains an identical sets of controls for each rank. A GX-80 sound consists of the two aforementioned I and II ranks when Global Controls *Layer Mode* is set to *Single*.

The Yamaha GX-1 featured four voice ranks instead of two, controlled either by one or two keyboards. The *Layer Mode* buttons let you select *Single* mode (two voice ranks - I/II, like a CS-80), *Dual*, or *Split* modes (four voice ranks - I/II/III/IV, like a GX-1). The *Panel* buttons select which voice parameters are currently displayed and controlled by the Rank Voice Parameter controls. The operation of the layer modes is fully explained in the **Global Controls** section.

GX-1 Controls

CS-80 and GX-1 voice architecture is very similar, but the GX-1 included some unique additional voicing controls, which we'll explain below. For the most part, GX-80's Rank Voice Parameter controls mimic the layout of the CS-80, but **slider and switch controls found only on the GX-1 are orange in color for easy visual distinction**.

VCO Section

I/II/III/IV rank enable buttons- These enable and disable the ranks. When a rank is disabled, the rank's audio is muted and all associated controls are dimmed. If Layer Mode *Dual* or *Split* mode is currently active and *Panel Lower* is selected, the I and II rank indicators on the buttons will change to III and IV (as will all other I and II panel labels). The rank enable buttons are useful for soloing and muting ranks when editing sounds.

Speed- Sets the speed of the low-frequency oscillator that modulates pulse width (see next two controls).

PWM (Pulse Width Modulation)- Pulse-width modulation refers to modulating the width of a pulse wave using a low-frequency oscillator (LFO) - it's essentially the same as moving the slider back and forth. Note that each rank includes its own independent and asynchronous PWM LFO.

PW (Pulse Width)- Sets the width or "duty cycle" of pulse waves, from a perfect square (50%) to a very narrow pulse (90%) The *PW* controls have no effect on the sawtooth wave.

Highpass Filtered Pulse Wave- This is a unique Yamaha GX-1 feature. The pulse wave is split off and routed through a highpass resonator, thus removing low frequencies and greatly accentuating the selected frequency. This filter functions independently of the filters in the HPF and LPF sections, and its output is summed with the standard unfiltered pulse wave.

- **Hz HPF**- Sets the pulse wave cutoff highpass filter cutoff frequency.

- **Pulse Wave HPF level**- Sets the highpassed pulse wave level. This slider functions independent of the unfiltered pulse wave, and the pulse wave rocker switch has no effect on highpassed pulse wave output.

Pulse Wave on/off- Enables and disables the oscillator pulse wave. Note that it works "backwards" of most rocker switches, that is, the down position is on.

Sawtooth Wave on/off- Enables and disables the oscillator sawtooth wave. Note that it works "backwards" of most rocker switches, that is, the down position is on.

Bandpass Filtered Saw Wave- Also a GX-1 feature, this is very similar to the highpassed square wave, but here the saw wave is split off and routed through a bandpass resonator, which removes low *and* high frequencies, while letting the center "band" through, creating midrangey, resonant tones. This filter functions independently of the filters in the HPF and LPF sections, and its output is summed with the standard unfiltered saw wave.

- **Hz BPF**- Sets the saw wave bandpass filter frequency.

- **Saw Wave BPF level**- Sets the bandpassed saw wave level. This slider functions independently of the unfiltered saw wave, and the saw wave rocker switch has no effect on bandpassed saw wave output.

Triangle 8 VA- Sets the volume of a triangle wave, pitched one octave higher than the main oscillator waves. This is also a GX-1 feature.

Noise- Sets the level of white noise. White noise is a random signal in which all frequencies across the frequency spectrum are represented equally.

VCF Section
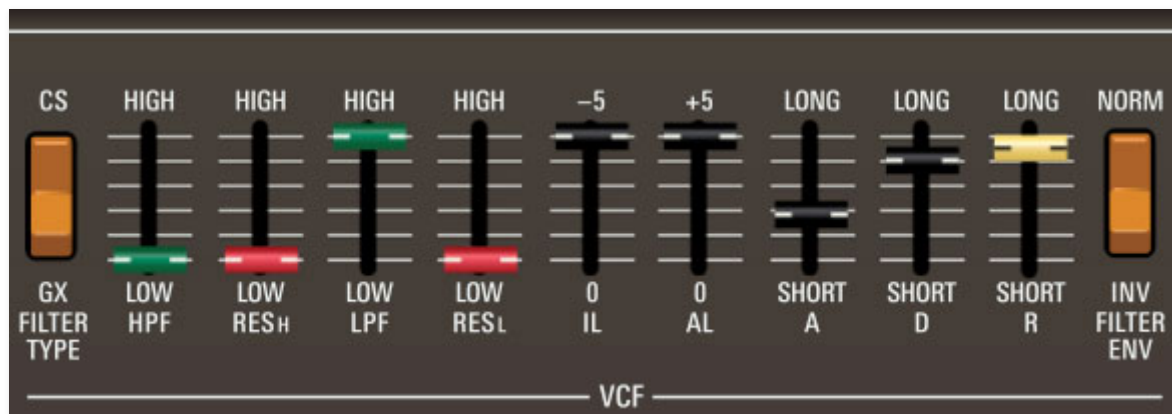
The CS-80 and GX-1 used completely different filter designs. The CS-80 uses a distortion-free 12 dB/oct filter topology while the GX-1 featured a unique 9 dB/oct design, which sounds buzzier and more open. Each voice rank includes cascaded independent highpass and lowpass filters. Combining both filters results in a bandpass response, which is excellent for brassy and stringy sounds, and at extreme settings, can create excessively thin and focused timbres.

Filter Type- Either filter style is independently selectable for each voice rank.

HPF frequency- Sets the cutoff frequency of the highpass filter - that is, all frequencies below the cutoff frequency are attenuated, reducing the overall amount of low frequency content.

Res H- Sets the amount of resonance for the highpass filter. Resonance emphasizes frequencies at or around the cutoff frequency. When combined with the filter envelope, it creates a typical synthesizer "wah" type sound.

LPF frequency- Sets the cutoff frequency of the lowpass filter - frequencies above the cutoff frequency are attenuated, reducing the overall amount of high frequency content.

Res L- Sets the amount of resonance of for the lowpass filter. Resonance emphasizes frequencies at or around the cutoff frequency. When combined with the filter envelope, it creates a typical synthesizer "wah" type sound.

VCF Envelope Controls
The GX-1 and CS-80 filter envelope control implementation is unusual; it's strongly advised that you read this section carefully.

First and foremost, the filter envelope does *not* include a sustain level control. Unlike other synth envelopes where the nominal envelope value is zero, **the nominal level of the CS/GX filter envelope is whatever the filter cutoff slider is currently set to**.

The envelope amount is affected by moving either or both *IL* and *AL* sliders from their zero settings. This moves the initial level (*IL*) down (more negative) and attack level (*AL*) up (more positive), thus making the overall envelope "bigger." *IL* defines the point at which the envelope starts and ends, ranging from 0 to -5V. *AL* defines the top of the envelope where attack switches to decay, ranging from 0 to +5V. Setting both *IL* and *AL* to 0 results in no filter envelope. The filter envelope "sustain level" is set using the *HPF* and *LPF* cutoff sliders.

The panel of the super-rare GX-1 programmer illustrates how the IL and AL sliders work together a little more clearly than the CS-80/GX-80, because the *IL* slider is positioned beneath the *AL* slider, and has a properly reversed travel. That is, its maximum setting of -5V is the slider's *lowest* position, and the *IL* and *AL* sliders "meet" in the middle at 0V, i.e. the current filter cutoff control setting. The diagram below is a recreation of the GX-1 programmer panel:
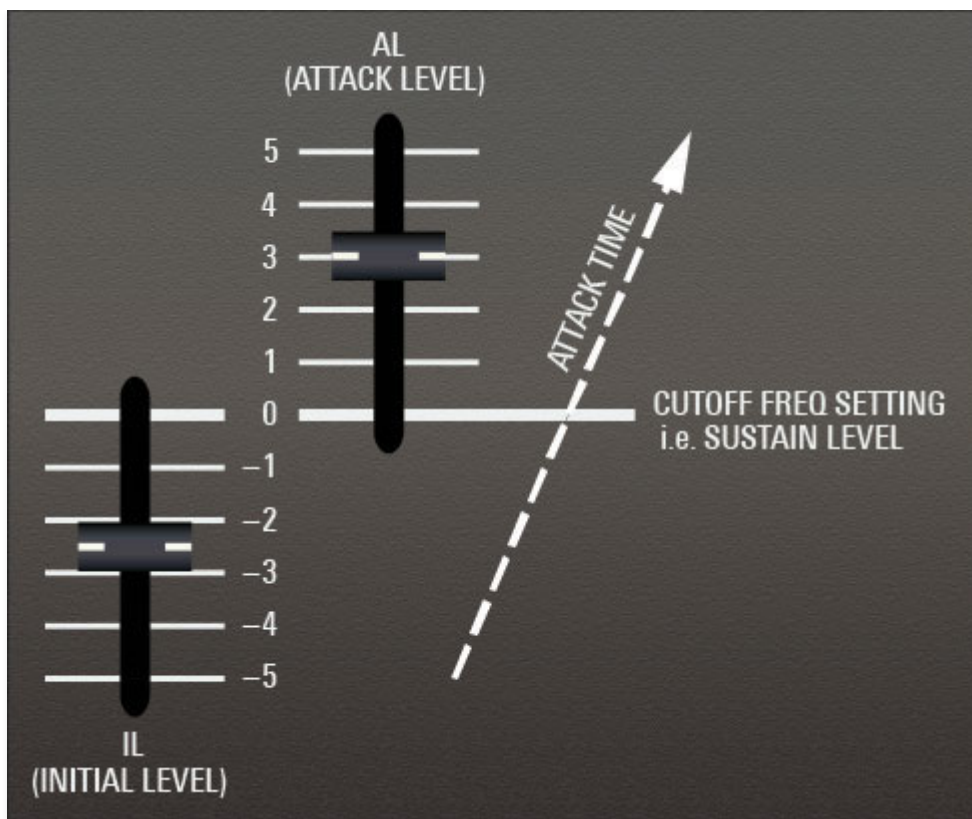
To achieve a typical attack/release envelope shape, where the envelope rises to the sustain level and then falls back when the key is released, raise the *IL* slider (more negative) and leave *AL* at zero. To get an attack/decay function, where the envelope rises and then falls back while the key is still down, raise the *AL* slider (more positive) and leave *IL* at zero. Other combinations of *IL* and AL settings will result in ADSR functions of different sizes.

It's important to remember that the filter envelope simultaneously modulates both highpass and lowpass cutoff frequencies. However, the envelope moves the HPF only half the amount (in octaves) compared to the LPF; this has two beneficial effects. First, it causes the bandpass to open up, and second, it prevents the HPF from completely removing all the beef from the sound. (If more low-frequency girth is desired, increase the sine wave slider in the VCA section - it's not affected by filter cutoff settings). The unique envelope movement of these filters is the trademark of these synths - don't be afraid of increasing HPF cutoff to achieve the "always bandpassing" signature tonality of the original instruments.

IL (Initial Level)- *IL* sets how far *below* the current cutoff frequency the envelope will begin when a key is played, and will end at when a key is released.

AL (Attack Level)- *AL* sets how far *above* the current cutoff frequency the envelope will climb when a key is played.

A (Attack)- Defines the length of time for cutoff frequency to rise from the *IL* setting to the *AL* setting when a key is played.

D (Decay)- Defines the length of time for cutoff frequency to fall from the attack stage peak (*AL*) to the current cutoff frequency setting.

R (Release)- Defines the length of time for cutoff frequency to fall back to the Initial Level when a key is released.

Invert Filter Envelope- When in the down *Inv* position, this reverses the effect the filter envelope has on cutoff frequencies. This is a GX-1 feature not found on the CS-80 (hence the orange switch).

"Always Be Bandpassing..."
An important thing to understand about the GX/CS voice architecture is that all filter modifiers, including the filter envelope generator, initial and after *Brilliance*, Sub Oscillator mod, built-in filter keyboard tracking, global *Brilliance*, and Keyboard Control *Brilliance* all affect the highpass filter AND lowpass filter cutoff frequencies simultaneously. This means that much of the time, the pulse and saw waves will be bandpass filtered to some degree, that is, high and low frequencies will be removed with "in-between" frequencies remaining intact. That said, the mod amount isn't the same - typically more mod signal is sent to the lowpass cutoff frequency than the highpass cutoff frequency.

This has two benefits. It allows the combined bandpass filter to open up and sound fuller, and it prevents the highpass filter from creeping up too high and destroying the low end. In fact, it's probably the defining characteristic of the CS sound, and certainly why these instruments are known for their punchy, brassy, midrange-y tone.

VCA Section
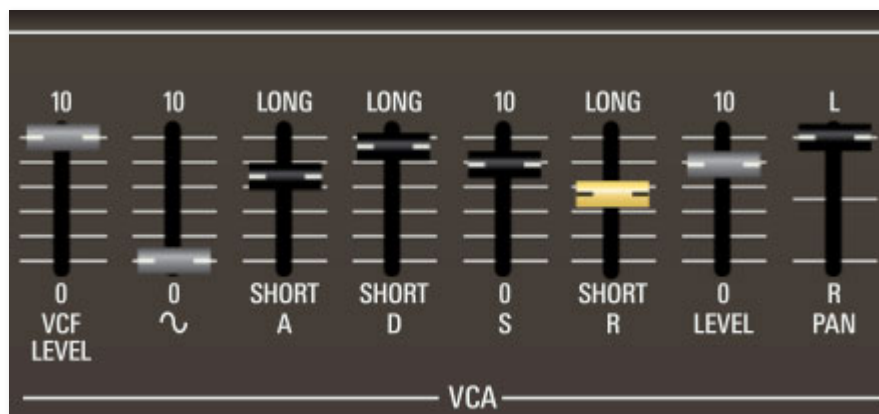
VCA stands for "voltage-controlled amplifier. Here you'll set incoming and outgoing volume, as well as amplitude envelope parameters.

VCF Level- Sets the input volume level from the preceding filter section.

Sine level- Sets the level of a sine wave oscillator at the same octave setting as the main oscillator. If you're wondering why this control isn't in the oscillator section, it's because a sine wave theoretically has no harmonics, so placing before the filter section would just reduce its volume. However, the original CS-80 sine wave isn't 100% pure - it has a few harmonics and has been reproduced accordingly.

The *VCF Level* and *Sine* level controls can be set to any balance; if you only want to hear the sine wave, simply set the *VCF Level* to zero.

A (Attack)- Defines the length of time for amplitude to rise from the *IL* setting to the *AL* setting when a key is played.

D (Decay)- Defines the length of time for amplitude to fall from the attack stage peak sustain level setting.

S (Sustain)- Sets the amplitude level following attack and decay phases while a note is held.

R (Release)- Defines the length of time for amplitude to fall to zero when a key is released.

Level- Sets the baseline level for volume dynamics (what you will hear with the lightest touch). If no dynamics are desired, set this control to full. If maximum dynamics are desired, set this control to zero and raise one or both of the other Level controls. See the Touch Response section below for more information.

Pan- Sets the rank position in the stereo field. The ability to pan the individual ranks was not available on the original hardware, and the results are spacious and wide, to say the least.

Touch Response
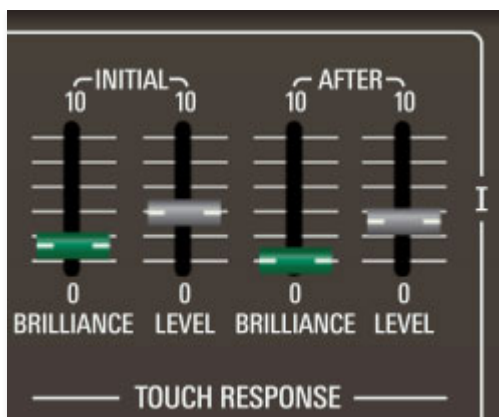
The Touch Response section allows polyphonic control of lowpass and highpass cutoff frequencies as well as amplitude via keyboard velocity and aftertouch.

There are 5 closely related controls on the right side of each rank that control keyboard dynamics. They are **Level**, **Initial Level**, **After Level**, **Initial Brilliance**, and **After Brilliance**. Although Level may at first glance appear to be a volume control for the rank, that is not really its purpose. Instead, volume should ideally be adjusted with VCF LEVEL and SINE LEVEL before the VCA ADSR Envelope.

The three Level controls adjust control voltages which go to a separate VCA which controls volume dynamics. The Level slider adjusts the VCA's starting level, Initial Level adjusts the velocity control voltage, and After Level adjusts the aftertouch control voltage. If no volume dynamics are desired, adjust Level all the way up. Bring in more dynamics by lowering Level while bringing up the Initial Level and/or After Level controls. To hear any output, at least one of the the Level controls needs to be turned up.

The Brilliance controls react similarly, though each filter's Cutoff control sets the filter's starting level.

The *After/Brilliance* and *Level* sliders work in conjunction with the *Aftertouch Mode* buttons to the left of the keyboard.

Initial- Sets how keyboard velocity (i.e. how hard a key is struck) affects filter frequency and VCA level.

- **Brilliance**- Highpass and lowpass filter cutoff frequencies rise as keys are played harder. The higher the slider setting, the greater the effect. A setting of zero means velocity has no effect.

- **Level**- VCA amplitude rises as keys are played harder. The higher the slider setting, the greater the effect. A setting of zero means velocity has no effect.

After- Sets how keyboard aftertouch (i.e. key pressure *after* the key is initially struck) affects filter frequency and VCA level.

- **Brilliance**- Highpass and lowpass filter cutoff frequencies increase as keys are played harder. The higher the slider setting, the greater the effect. A setting of zero means velocity has no effect.

- **Level**- VCA amplitude increases as keys are played harder. The higher the slider setting, the greater the effect. A setting of zero means velocity has no effect.

Performance Controls

These controls are (mostly) intended for live tweaking, and they're a huge part of what makes the original instruments (and GX-80) so beautifully expressive to play. The majority of these use "paddle" controls - i.e. sliders that rotate in an arc. These controls were appropriated from Yamaha's organ line, and like an organ, they operate backwards from a typical slider control - full up position is off, and their amount increases as they're pulled *toward* the player. Obviously it's a little tough to play a keyboard and fluidly move these with a mouse or trackpad - if you have a MIDI/USB controller with a bunch of sliders or knobs, we heartily recommend assigning many hardware slider or knob controllers (See the **MIDI Controllers Setup and the MIDI Tab section** for info on how).

**Performance Controls operate independently for each pair of ranks (I/II and III/IV).**

Tuning Controls

Master Pitch- Sets pitch globally for the entire instrument up or down a half-step.

Detune Ch I / Ch II /Ch III / Ch IV- Adjusts the tuning of the oscillators up or down a half-step. These are particularly useful for individual detuning when stacking ranks using the *Dual* Layer Mode.

Ring Modulator
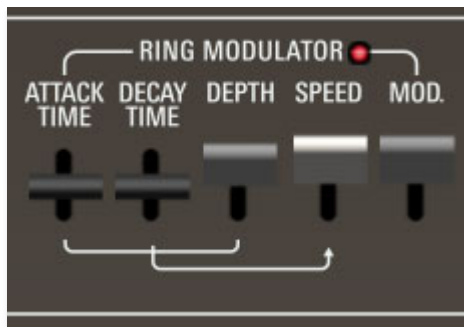
When two audio sources are combined, a ring modulator's output contains only the sum and difference frequencies of the two signals, while removing common frequencies. The audio result is a sound with inharmonic frequency content, which is useful for synthesizing bells, metallic clangs, and other special effects, and is also interesting and musical when applied sparingly. The CS ring mod combines the summed output of Rank I and II with its own independent oscillator or Rank III and IV, if *Dual* or *Split* mode is active.

Ring Mod Speed Envelope
The ring modulator includes a dedicated single AD envelope generator for controlling speed. Since there is only one ring modulator per layer, It behaves as a monophonic modulator. The attack and decay phases initiate upon note-down, and will only retrigger once all keys have been released. Note that you don't have to use the ring mod envelope - the attack/decay *Depth* paddle can be left at zero and a constant ring mod level can be set with the *Mod*. paddle.

- **Attack**- Sets the initial length of speed increase from the current *Speed* paddle setting.

- **Decay**- Sets the time for speed to fall from max at the end of attack phase to the current *Speed* paddle setting.

- **Depth**- Sets the maximum amount of attack/decay envelope speed increase.

Speed- Sets the basic ring mod speed.

Mod. (Modulation)- Sets the basic ring mod depth.

Sub Oscillator

The Sub Oscillator generates sub-audio range signals intended for modulation purposes. It affects both currently active ranks (I/II or III/IV) equally.

Function- We're not entirely sure how they arrived at this lofty title - it's usually referred to as "LFO waveform" on other synths. Available waveforms are sine, sawtooth, inverted sawtooth, square, sample and hold, and noise.

Mod Wheel- This is a really handy, but potentially confusing feature, so don't skim this section. If the switch is in the *Off* position, the LFO is always "on." Its effects will be immediately audible by moving the *VCO*, *VCF*, and *VCA* sliders. Setting to the *On* position enables control of LFO depth with an external keyboard controller mod wheel. If the mod wheel is all the way down, LFO depth is zero. This makes setting up a mod wheel to add vibrato or wah effects real easy. If it seems like the LFO isn't working, make sure the *Mod Wheel* switch is not on.

Sync- When the *Sync* switch is enabled, LFO speed will lock to host tempo when using GX-80 within DAW software, or to the current tempo in the top menu bar when using the standalone version. .

Speed- The *Rate* slider sets the speed of the Sub Oscillator. We've replicated the insanely fast speed of the original CS-80 (well into the audio range) enabling all manner of clangorous, raunchy sounds to be created. The LED beside the *Sub Oscillator* panel text flashes at the current modulation rate.

VCO- Sets oscillator pitch mod depth.

VCF- Sets highpass and lowpass cutoff frequency mod depth.

VCA- Sets amplitude mod depth.

Feet
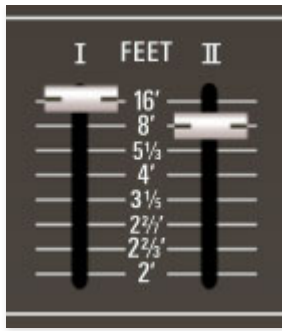
Feet I/II/III/IV- Sets the coarse pitch range for each oscillator in traditional organ footage settings of *16', 8', 5 1/3', 4', 3 1/5', 2 2/7', 2 2/3' and 2'*. The 3 *1/5' and 2 2/7'* footages are from GX-1; these are not available on the original CS-80.

Some of the range settings are not typically divisible-by-2 octave settings; instead, they're derived from various organ footages and match the settings of the original GX-1. Even though these are stepped controls, it's fun to set these up for control via a MIDI hardware knob or slider. For reference, these are the musical intervals associated with each footage:

• 16' : an octave below the note played
• 8' : unison
• 5 1/3' : a fifth above unison
• 4' : an octave above unison
• 3 1/5' : a major third above the octave
• 2 2/7' : an octave and minor 7th above the octave
• 2 2/3' : a fifth above the octave
• 2' : another octave higher (two octaves above the unison)

Tone Selector

The original CS-80 predated the use of modern computer memory to store patch settings. It included 22 non-editable single-rank factory presets divided between the two voice ranks. When one of these presets was selected, the Rank Voice Parameter controls were disabled. Four user memories were also included. These were programmed using four miniature versions of the Rank Voice Parameter controls, hidden beneath a hinged door at the left side of the instrument. The illuminated Tone Selector buttons were used to select either a factory preset, user memory preset, or live panel mode (the current Rank Voice Parameter control settings).

We chose *not* to exactly replicate the original CS-80's clunky preset memory scheme (and take our word, the GX-1's user sound creation and storage were even worse). However, we wanted to include the factory patches, and we

liked the idea of a rank-specific sound bank for user sounds. We replicated the CS-80 factory rank presets plus we added a *User* mode that allows storage of 22 non-volatile custom rank presets with the Tone Selector buttons. Here's how it works:

Tone Selector colored buttons- The top row recalls sounds for the upper rank in the currently visible layer; the bottom row recalls sounds for the lower rank in the currently visible layer.

When in normal (factory preset) mode, clicking any of the buttons recalls the factory patch for the appropriate rank, and the Rank Voice Parameter controls instantly change to the correct positions.

Panel buttons- When a *Panel* button is toggled on, the current rank sound uses the current Rank Voice Parameter controls. Selecting a factory preset button shuts off the *Panel* button; if a Rank Voice Parameter control is edited, the factory button shuts off and the *Panel* button illuminates. This "overwrites" the previous Rank Voice Parameter control settings; but you can always get back to the previous settings by clicking the circular undo arrow in the top purple menu strip.
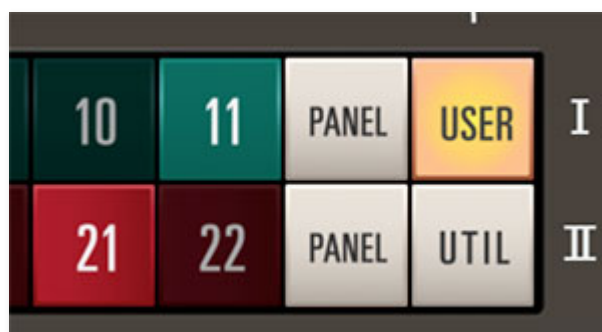
User bank button- The *User* presets allow saving or recall of the voice parameters *for that rank only*. This is useful for quickly creating and experimenting with composite sounds from multiple ranks. The 11 presets per bank (22 total) are intended for user favorites and will remain in GX-80's

memory when "powered-down" and will be the same even across multiple instances of GX-80 running in a DAW. If no sound has yet been saved to the user button, the button appears dark.

- **Saving a Rank sound to a Tone Selector User slot-** Make sure the Tone Selector is in User mode (*User* button lit); the buttons will be green and red with numbers on them. Right-click on a button and select S*ave Rank <I/II/III/IV> Sound* (the menu will show *I* and *II* or *III* and *IV* depending on the current *Lower* or *Upper* selection in the *Panel* section).

    Note that memory slots *1-11* store sounds for Rank *I* and *III*, and slots *12-22* store sounds for Rank *II* and *IV*. However, sounds can be saved from one bank to another. For example the current sound from rank I can be saved to button *12*, which applies to ranks *II* and *IV*. This makes it easy to move rank sounds back and forth between ranks.
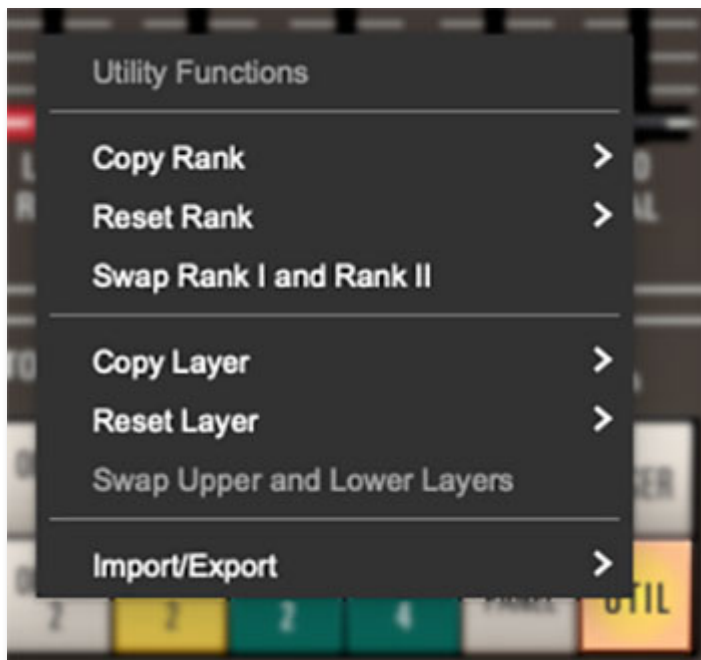
Utility button- Allows rank sounds and entire layers to be copied, swapped, and deleted.

The following three functions affect Rank Voice Parameters *only*, i.e. one of the single I/II/III/IV rank horizontal rows of voicing controls.

- **Copy Rank**- Duplicates one rank to the other. Unlike *Swap Rank*, the end result is that the same settings are applied to both ranks.

- **Reset Rank**- Initializes all settings of the selected rank.

- **Swap Rank I and II / Swap Rank III and IV-** Reverses the locations of the ranks on the currently viewed layer.

The remaining three commands are similar to the utility functions explained above, but *these affect an entire layer*, i.e. Effects, Rank Voice Parameters I and II or III and IV, and Performance controls. Because most of these commands affect both layers, most only work when in *Dual* or *Split* Layer Mode; if *Single* mode is selected, they will be grayed out.

- **Copy Layer-** Duplicates one layer to the other. Unlike *Swap Upper and Lower Layers*, the end result is that the same settings are applied to both layers.

- **Reset Layer**- Initializes all settings of the selected layer.

- **Swap Upper and Lower Layers-** Reverses the locations of the the upper and lower layer.

- **Import/Export**- The Import/Export command allows ranks (I, II, III, and IV) or layers to be moved between sound presets. Data from the source preset isn't affected.

  The process is simple - select the appropriate *Copy <rank or layer> to Memory* sub-menu to copy the data into GX-80's memory, then choose the destination preset, click the *Utility* button and select the appropriate *Paste to <rank or layer>* submenu.

Mix, Brilliance, Resonance
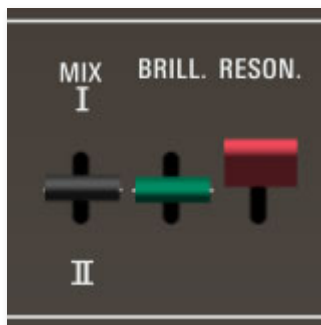
Besides making a fabulous title for a Sundance film about The Rolling Stones, these controls offer fast and powerful global control over both currently active ranks (I/II or III/IV). The original instrument refers to these as "overall" controls.

Mix- Adjusts the mix between the currently active ranks ranks (I/II or III/IV).

Brill. (Brilliance)- Adds or subtracts from the frequency of the highpass and lowpass filters for currently active ranks ranks (I/II or III/IV).

Reson. (Resonance)- Adds to the resonance setting of the highpass and lowpass filters for currently active ranks ranks (I/II or III/IV).

Touch Response
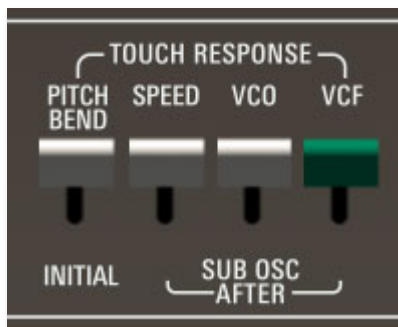
These controls relate to how GX-80 responds to keyboard velocity (how hard the key is played) and aftertouch (increasing key pressure after notes are played).

Pitch Bend- Pulling the paddle downward causes notes to swoop up to pitch from below. The harder the key is struck, the lower the initial pitch will be. The "swoop" speed remains constant regardless of velocity or the control setting.

Sub Osc After- These allow modulation of sub oscillator parameters via aftertouch.

- **Speed**- When the *Speed* paddle is pulled down, pressing harder after a key is played causes the sub oscillator to speed up. The further the paddle is pulled down, the more dramatic the speed increase when aftertouch pressure is applied.

- **VCO**- Allows modulation of sub oscillator pitch mod depth. If the Sub Oscillator *VCO* paddle is already on, the *Touch Response VCO Sub Osc After* slider adds additional mod depth.

- **VCF**- Allows modulation of sub oscillator highpass and lowpass frequency mod depth. If the Sub Oscillator *VCF* paddle is already on, the *Touch Response VCF Sub Osc After* slider adds additional mod depth.

Keyboard Control
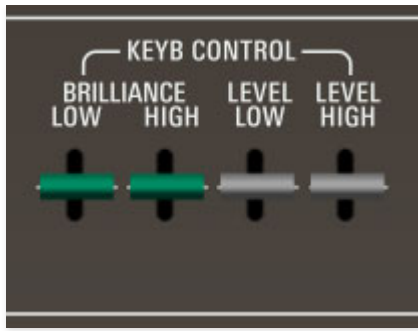
These allow scaling of the highpass and lowpass filter cutoff frequencies and amplitude based upon what range notes are played on the keyboard. Generally speaking, they work "out from the center" of the keyboard; that is, they have no effect on the center keyboard octave and become more noticeable toward the low and high extremes of the keyboard range. They can even out the tone across the keyboard resulting in a very enjoyable and intuitive playing experience. In Dual layer mode, by setting these controls in opposite ways on different layers, the layers can effectively crossfade from one to another as you play up the keyboard.

Brilliance Low- Pulling this paddle forward causes the highpass and lowpass filter cutoff settings to increase as notes are played lower on the keyboard. The further the paddle is pulled forward, the greater the amount of keyboard scaling that will occur. Pushing the paddle back results in the opposite effect.

Brilliance High- Pulling this paddle forward causes the highpass and lowpass filter cutoff settings to increase as notes are played higher on the keyboard. The further the paddle is pulled forward, the greater the amount of keyboard scaling that will occur. Pushing the paddle back results in the opposite effect.

Level Low- Pulling this paddle forward causes the overall amplitude to increase as notes are played lower on the keyboard. The further the paddle is pulled forward, the greater the amount of keyboard scaling that will occur. Pushing the paddle back results in the opposite effect.

Level High- Pulling this paddle forward causes the overall amplitude to increase as notes are played higher on the keyboard. The further the paddle is pulled forward, the greater the amount of keyboard scaling that will occur. Pushing the paddle back results in the opposite effect.

Layer
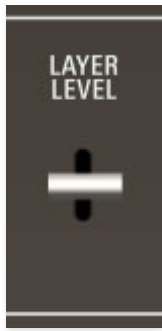
Layer Level- Sets the combined volume of the currently displayed voice ranks (I/II or III/IV). This is most useful for balancing the levels of multi layer *Dual* or *Split* mode sounds.

Master

Volume- Controls the overall instrument volume.

Limiter- This is a switch that applies a transparent limiting effect to help prevent overloading and clipping.

Output Level- Overall output level meters. You'll want to optimize the output to avoid clipping using the Layer *Level* knob and Master *Volume* knob as well as the *VCF Level* and *Sine Level* sliders in the Rank Voice Parameters. Green = good, red = bad.

Global Controls

Generally, these control "overall" instrument parameters - mostly how voices are assigned and the upper and lower layers, which we'll explain in gruesome detail!

Voice Assign
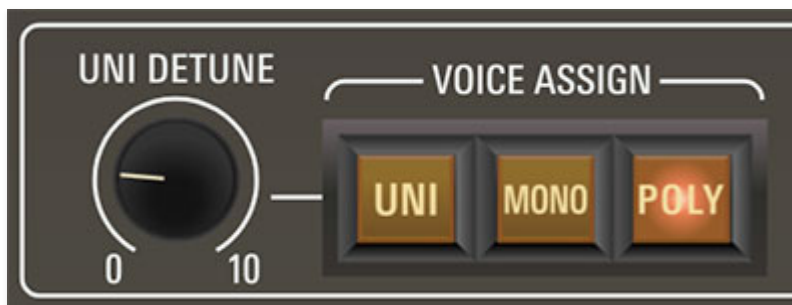
Uni (Unison) Detune knob- The *Uni Detune* knob is used in conjunction with the *Uni* Voice Assign mode to spread the tuning of the oscillators for fat sounds.

Voice Assign buttons- The Voice Assign section determines how incoming notes are assigned to synthesizer voices as follows:

- **Uni (Unison)**- One note sounds at a time. Multiple rank voices will stack according to the current *Number of Voices* setting. The *Uni* button should be used in conjunction with the *Unison Detune* knob explained above.

- **Mono**- One note sounds at a time with both ranks sounding.

- **Poly**- Multiple notes can sound simultaneously with the maximum polyphony determined by the *Number of Voices* setting.

Number of Voices
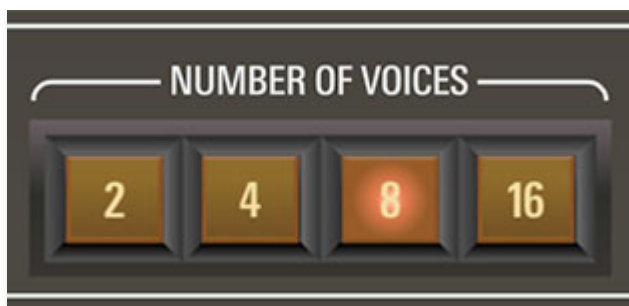
2/4/8/16- Sets the maximum number of notes that can simultaneously sound. Like the original instrument, there's no voice stealing. In other words, if the maximum number of voices are currently held down and new notes are struck, the new notes will *not* be audible until previously played keys are released.

Pitch Ribbon and Bend Range

Yamaha pitch ribbons are unique in that they don't have a set center location - the "zero" point is wherever you place your finger (which may be an 80s Paul Young hit), or in the case of GX-80, wherever you click the mouse.
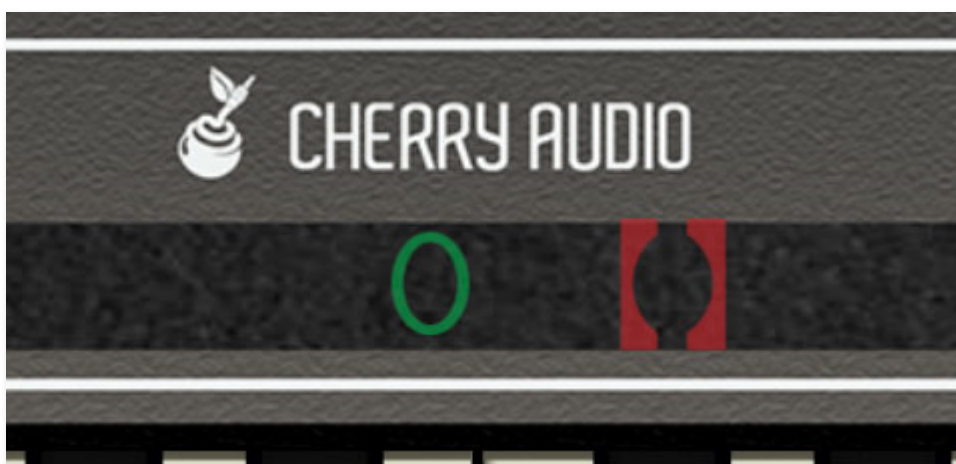
To use the ribbon, click and hold the mouse button or trackpad and move right or left. The green oval indicates the "home" nominal pitch position, and the red brackets will move left or right as the mouse is moved. The brackets turn green when aligned over the oval, indicating that pitch is "home." If the button is released at any time, pitch will instantly snap back to normal.

**Linear/Semi**- These define the response of the pitch ribbon.

- **Linear**- The pitch ribbon behaves exactly as the original. Upward bend range is maximum one octave (if you start at the very bottom), and

maximum downward range is essentially infinite (if you start at the very top), that is, low enough that audio becomes non-note clicks.

- **Semi**- Bend range behaves like a modern synth with max up and down range set in semitones. Maximum bend depth is an octave up/down.

Bend Range- This sets the maximum amount of bend via a USB/MIDI controller pitch bend wheel.

Layer Mode
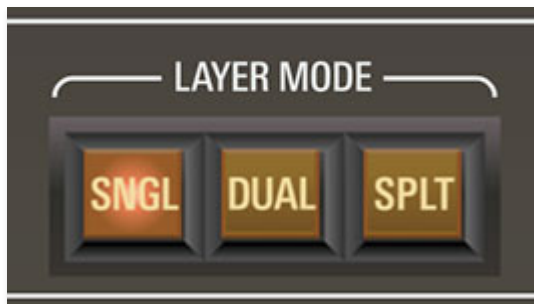
Understanding the Layer Mode and Panel sections is extremely important in order to take full advantage of GX-80's monster two-CS-80s = GX-1 architecture, so we strongly recommend studiously reading this section... in your studio!

Both the original CS-80 and the GX-1 featured a voicing architecture based on "ranks," wherein each rank is a complete synthesizer voice consisting of an oscillator, highpass and lowpass filters, a noise generator, a sine wave oscillator, envelope generators for the filter and VCA respectively, and a VCA. The CS-80 included *two* of these voice ranks, each capable of playing up to eight independent polyphonic notes - a total of 16 hardware synth voices under the hood, which is why it sounds huge. The GX-1 featured *four* of these eight-note poly voice ranks for its two main keyboards and sounded even huge-er, which is why it cost rock star $$$ in 1974 money, and thus, was only owned by rock stars.

When GX-80's *Layer Mode* is set to *Single*, it behaves like a CS-80, that is, two voice ranks (*I* and *II* on the panel, i.e. "upper"). When *Layer Mode* is set to *Dual* or *Split*, four voice ranks are active as with GX-1 (*I*, *II*, *III*, and *IV* on the panel).

Single- Voice architecture is like a CS-80, i.e. two voice ranks (*I* and *II* on the panel).

Dual- Voice architecture is like a GX-1, i.e. four stacked voice ranks (*I*, *II*, *III*, and *IV* on the panel) play at once.

Split- Like *Dual* mode, but instead of stacking the four ranks, the keyboard is split. The two Lower ranks (*III* and *IV*) play on the bottom half of the split, and the two Upper ranks (*I* and *II*) play on the top half of the keyboard split.

To set the keyboard split point, click the *Split* button, which will flash, and hit the key on the keyboard where you'd like the split to occur. You can use the onscreen keyboard, a USB or MIDI keyboard controller, or the **QWERTY Musical Typing Keyboard (MTK).**

Panel

Because displaying the controls for four sets of Rank Voice Parameters would have made the UI enormous, GX-80's panel displays two sets of Rank Voice Parameters like a CS-80. These are referred to as Upper (voice ranks *I* and *II*) and Lower (voice ranks *III* and *IV*).

Dual mode is essentially the same as stacking two almost entirely independent CS-80's, so it's capable of generating ponderously enormous sounds! **Almost every GX-80 parameter is completely independent when using the *Dual* and *Split* modes, including Rank Voice Parameters, the entire Performance Controls section, the Tone Selector preset buttons, all effects (two complete sets of effects under the hood), and most of the Left-Hand Control parameters. Effects can be made global for the entire instrument by setting the Effects Mode switch in the upper-left corner to *Global.***

Lower- GX-80's panel displays control settings for the Lower ranks (*III* and *IV*).

Upper- GX-80's panel displays control settings for the Upper ranks (*I* and *II*).

Besides the Lower/Upper button illumination there are a couple of ways to quickly tell which ranks are currently being displayed and

edited:

- All rectangle frames are white in Upper mode and Orange when in Lower mode.

- All panel roman numerals rank indicators will show as I/II in Upper mode and III/IV in Lower mode. (Except for the left-hand control section sustain mode, because those Roman numerals are associated with ranks. Hey, we didn't design the original, ok?)

The other exception is that the Effects section rectangle is always white when the Effects Mode switch is set to *Global*. This is to let you know that only one set of global effects is active for the entire instrument.

Layer Solo- The currently displayed panel layer is soloed for easier editing when in *Dual* or *Split* mode. The *Lyr Solo* button flashes when active in order to minimize, "why the heck isn't this making noise?" incidents.

Clicking the *Lwr* and *Uppr* buttons while *Lyr Solo* is active instantly switches which layer is audible - this is really handy when editing layered patches.
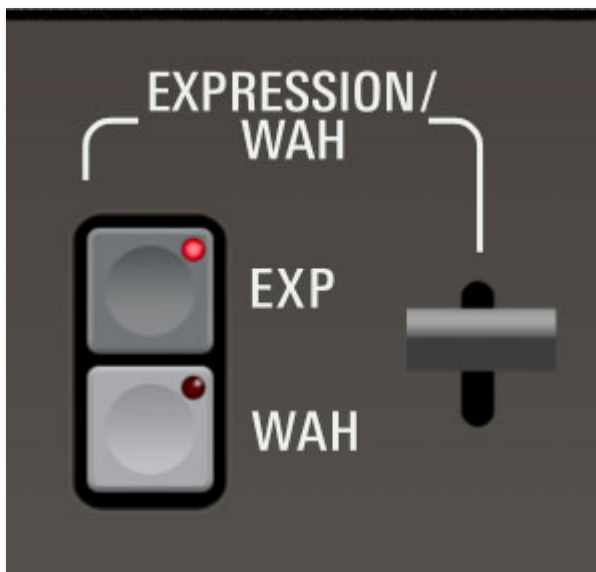
GX-80 logo- This one's actually *not* a joke - clicking on the big GX-80 logo displays "about" information, and shows the version number and current registered user ID.

Left-Hand Controls
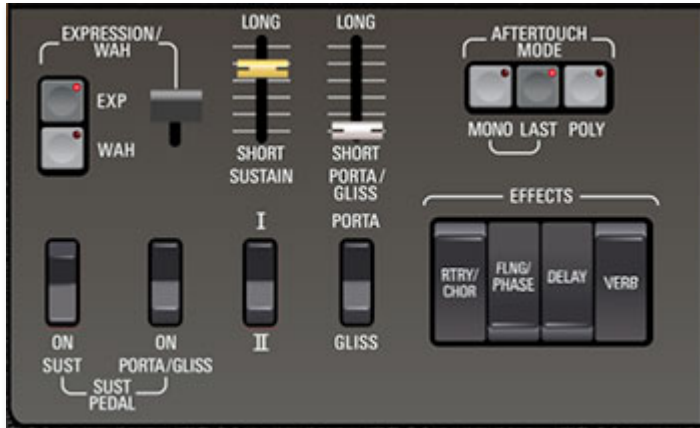
These are regulate additional performance parameters, such as enabling and disabling effects, sustain and expression pedals, and aftertouch behavior.

Expression/Wah

The CS-80 included an expression pedal input that could control overall volume and/or wah. The wah effect was completely independent of the highpass and lowpass filters - like having a guitar wah-wah pedal built into the synth, but by all accounts, it didn't sound so hot, so Mr. Barton dug up a vintage wah schematic and virtually created a sweet-sounding wah for GX-80.

The expression volume and wah effects are global, unlike most other layer-independent GX-80 controls.

Expression/Wah paddle- Controls the amount of volume or wah. The original CS-80 didn't have a panel control for this, but we added one because we wanted to allow users to assign a hardware controller of their choice (i.e. expression pedal, knob, slider, wii-enabled MIDI baseball bat, etc.).

Exp (Expression)- Enables global volume control via the *Expression* paddle.

Wah - Enables global wah via the *Expression* paddle.

Exp. and Wah may be used independently or simultaneously.

Sustain Pedal

Sustain switch- This one's a little unusual, but we included it for authenticity. The sustain pedal operates normally when the switch is in the *On* position - that's probably where you'll want it most of the time. When set

to the off (up) position, GX-80 behaves as if the sustain pedal is constantly pressed, so the *Sustain* slider is always active.

Porta/Gliss switch- When in the On position, portamento or glissando is enabled only when the sustain pedal is down. When set to the off (up) position, portamento or glissando are always on, with the amount set by the adjacent *Porta/Gliss* slider (set the slider to minimum for no portamento/glissando).

I/II switch- Sets the behavior of incoming sustain pedal control. In mode I, the sustain time is the same and each note fades independently when released; the same as most other synths.

In mode II, the last note or chord played carries the sustain; if multiple notes are released simultaneously all notes fade equally. If a new note is played, all fading notes will instantly silence as the new note takes over. This mode can be very useful when using portamento or glissando.

The *I/II* switch also affects pitch bend behavior. In Mode *I ,* notes that have been released but are held by the sustain pedal will not be affected by pitch bends. In Mode *II* all currently sounding notes are equally affected by pitch bend data.

This is the only part of the front panel where "I/II" Roman numerals do not refer to voice ranks - *they simply refer to the two different sustain types.*

Sustain time slider- This is essentially an additional envelope release time slider (notice that it's yellow, just like the Rank Voice VCA section *Release* sliders); it works additively with the VCA *Release* sliders. In other words, when the sustain pedal is depressed, the *Sustain* slider time setting is added to the VCA section *Release* slider times. If you're creating a piano-like sound, set the VCA section *Release* sliders to a low time, and the left-hand *Sustain* slider to a relatively high time.

Note: There is no way to get an infinite sustain when keys are released as may be possible on other synthesizers. Released notes always decay, similar to on a piano with the sustain pedal down. To keep a note sustaining indefinitely, its key must be held down.

Portamento/Glissando

Porta/Glissando switch- Portamento is a gliding effect where notes slide from one pitch to the next instead of discretely changing pitch - like sliding notes on a trombone. Glissando is similar but the pitch changes in discrete half-steps.

Long/Short slider- Sets the amount of time between notes when using portamento and glissando. The Long/Short slider also acts an on/off switch - portamento and glissando is disabled when the slider is at its lowest position.

The CS-80 employs a very sophisticated digital portamento system. It keeps track of what you're playing and always glides from the last note played to the next note played, just as if you were playing a monophonic instrument, only it does it polyphonically! This behavior is meticulously modeled on the GX-80.

Aftertouch Mode
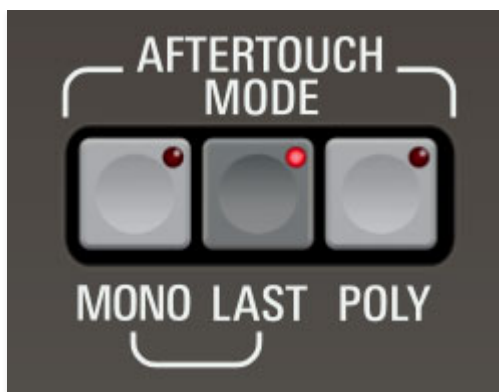
These regulate how aftertouch affects Touch Response-related parameters at the far right of the Rank Voice Parameters as well as the *Sub Osc* parameter in the Performance Controls Touch Response section.

As with the original instruments, GX-80 responds to polyphonic aftertouch, but you'll need a controller capable of transmitting it. To be clear, **very few synths and MIDI controllers are capable of transmitting poly aftertouch** (old Ensoniq keyboards, Kurzweil MIDIBoard, or MIDI MPE controllers from Roli, Keith McMillen, Roger Linn Linnstrument, etc.). Most synths and controllers only transmit what's known as "channel aftertouch"- essentially a single control signal summed or averaged from all keys.

With that said, GX-80 incorporates a unique *Last* mode, which lets you mimic true poly aftertouch pretty effectively using a MIDI controller that only transmits mono (channel) aftertouch data.

The aftertouch modes operate as follows:

- **Mono**- Increasing pressure to any held key varies mod amount equally *for all currently sounding notes*.

- **Last**- Increasing pressure to any held key varies mod amount *for the most recent note played only*.

- **Poly**- Increasing pressure to a held key sends aftertouch control data *independently for each key played*. As mentioned, **poly aftertouch requires a keyboard controller capable of transmitting poly aftertouch**, but *Last* mode is an effective substitute.

Effects Rocker Switches
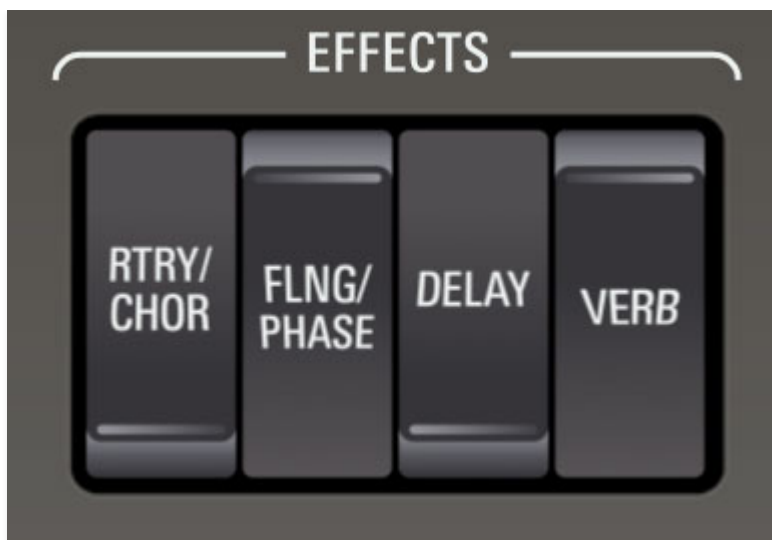
The *Chorus/Rotary*, *Flange/Phase*, *Delay*, and *Reverb* rocker switches independently enable the effects at the top left of the panel. Effects may be enabled in any combination. If you're using GX-80 in *Dual* or *Split* Layer Mode, effects are completely independent for the upper and lower layers. Please see the **Effects** section for full information.

MIDI Controllers Setup and the MIDI Tab

Assigning internal and external hardware controls to GX-80's performance paddles, sliders, knobs, and buttons 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 a GX-80 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 whole section to best take advantage of GX-80's swift MIDI control assignments.

In this example, we'll assign a hardware slider/knob control to Rank I's *LPF* slider (lowpass filter) cutoff frequency slider.
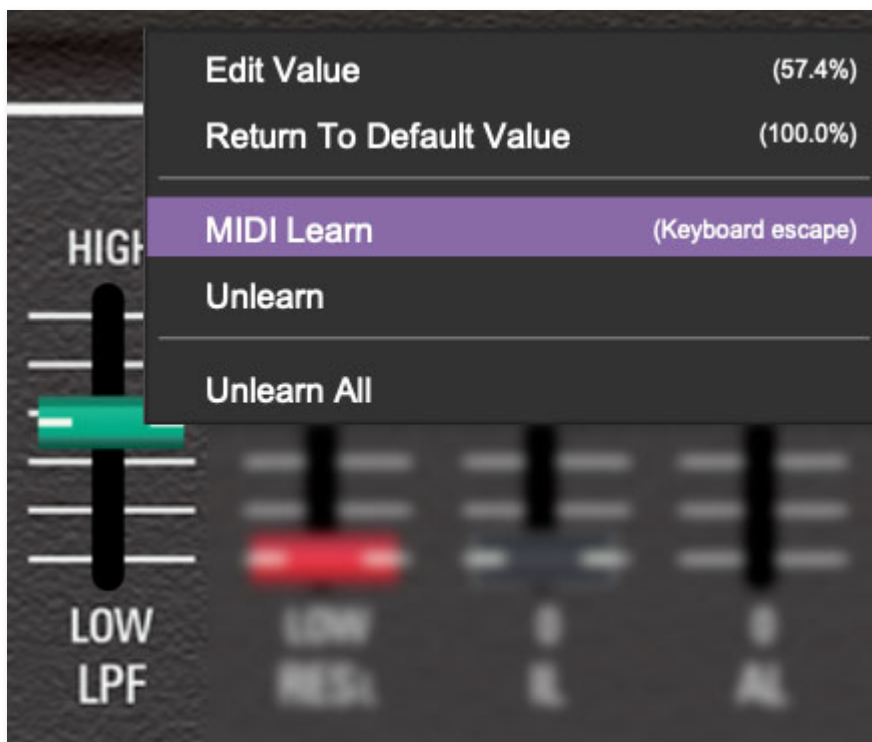
Begin by right-clicking on the green *LPF* slider in the Rank Voice Parameters *VCF* section and selecting *MIDI Learn.* A purple overlay appears over the slider indicating that it's in learn mode. Now move the desired hardware control device. The purple overlay disappears and the hardware control will move the onscreen slider. If you get cold feet (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 GX-80 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 GX-80 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.
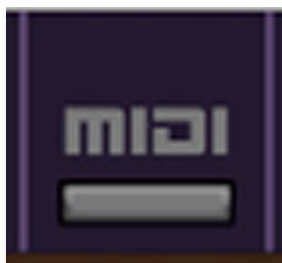
To view or hide the MIDI Tab, click the *MIDI* button in the top toolbar.

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 controls, where GX-80 automatically exits controller assignment mode, the *MIDI Learn* button "stays on" to enable assignment of multiple hardware controls. This is handy for quickly assigning a bunch of 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 control, continue clicking and assigning on-screen controllers until all desired controls are assigned, then click *Stop Learning* to exit learn mode.

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.

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 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 GX-80:

- **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.

- **Aftertouch**- Besides sounding like a 1979 Neil Diamond record, some keyboard controllers transmit controller data when keys are pressed and pressure is applied 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. More sophisticated controllers can transmit "polyphonic" aftertouch, allowing every key to have its own independent aftertouch value.

- **Key**- This allows keys of the computer QWERTY keyboard to act as button controls for GX-80'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- This slider works in conjunction with the *New Mapping Type* menu. In the left position (gray background), the MIDI mapping is global (affects all sounds and doesn't change when different presets are selected), in the right position (lavender background), the MIDI mapping is saved with, and only affects the current sound preset.

The *Preset* switch is super nifty, because it means MIDI mappings can easily be changed to global or per-preset status at any time. (A lot of folks asked us for 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.

- ***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. Along with the *Curve* control, the customization possibilities are super flexible.

Curve - These allow the customization of how incoming MIDI CC controls affect the movement of GX-80's onscreen controls, ranging from exponential to linear to logarithmic curves.

Using Hardware Controls with GX-80 Performance Paddles

You've probably noticed that the colored paddles in the Performance Controls section operate in reverse from a typical slider - up is off, with parameter amount increasing as the paddle is pulled down.

This is up to personal preference, but if you'd like hardware slider controls to operate "normally," i.e., minimum amount at the bottom, and max at the top, this can easily be accomplished by setting the MIDI Tab *Min* control to all the way up, and the *Max* control all the way down, thus reversing the hardware control's effect on a GX-80 onscreen paddle control.

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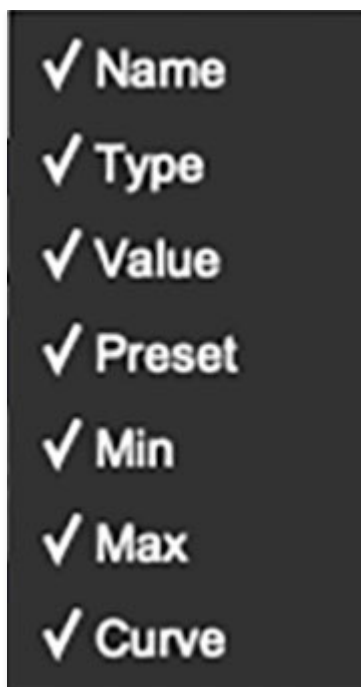
Right-clicking anywhere in the top row (*Name*, *Type*, *Value*, etc.) displays the column configuration menu. Checking/unchecking these allows hiding and display of each column. This has no effect on assignments.

MIDI Tab Parameters Right-Click
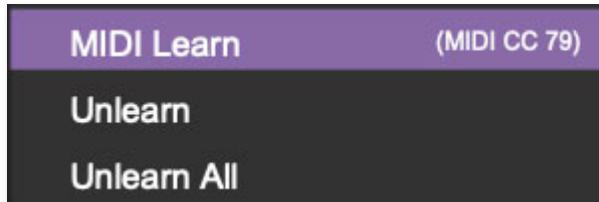
Right-clicking on an assigned parameter opens the menu above.

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. GX-80 will display a warning dialog prior to deletion in order to thwart potential unlearn-related disasters.
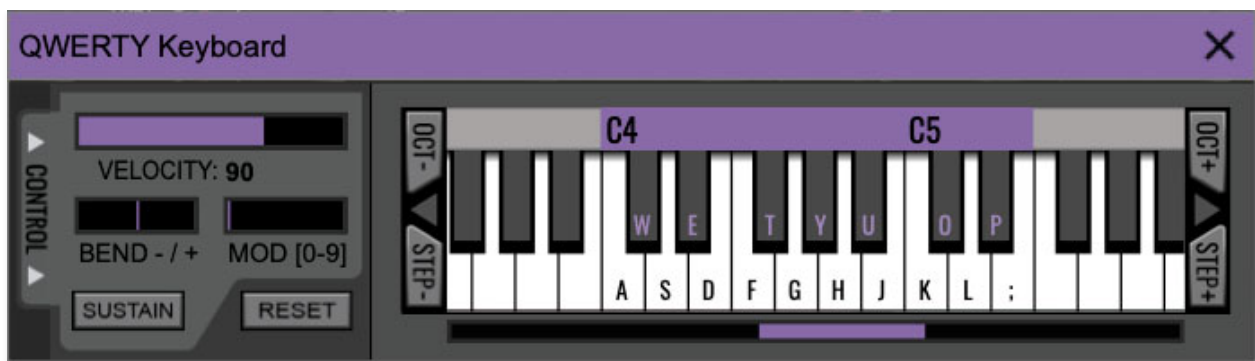
GX-80 can be played by clicking its onscreen keyboard with a mouse or trackpad, but if you don't have a MIDI keyboard attached to your computer, there's a better way - your computer's QWERTY computer keyboard can be used to play notes. We call this the "musical typing keyboard," or "MTK." Following is a list of MTK keyboard modifiers and functions:

Opening and Closing the MTK - click 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, 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 MTK 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 GX-80 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. Because the bend range is determined by the current pitch bend ribbon settings, we highly recommend setting the ribbon to *Semi* mode and using the *Bend Range* knob to determine bend depth (*Lin* won't work very well in this scenario unless you want to do super-low dive bombs). 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.

Settings

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 want to tweak is on the front panel, as it should be!

General
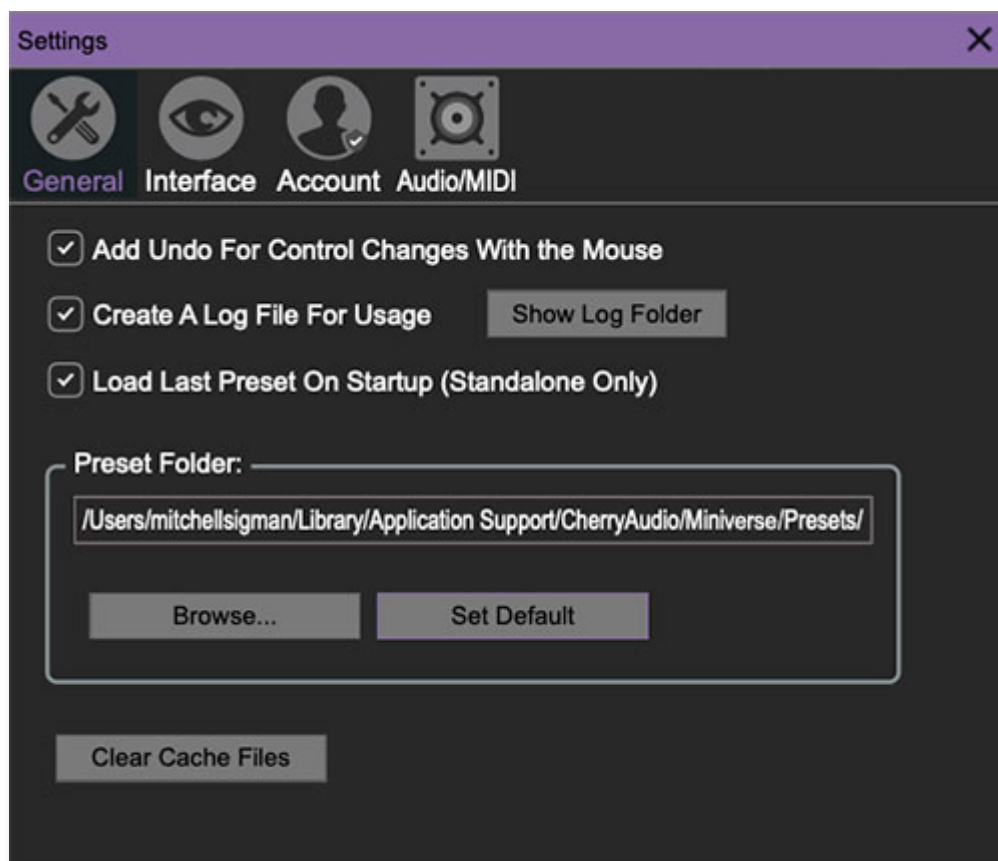
- **Add Undo For Control Changes With the Mouse**- Enabling this allows undo of knob/slider/button adjustments. You'll want this on if you want the ability to undo all aspects of patch editing and programming.

- **Create A Log File For Usage-** This creates a text doc of all of GX-80'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 GX-80 log file docs.

- **Load Last Preset On Startup (Standalone Only)**- Automatically loads the last preset used when GX-80 standalone version is started.

- **Preset Folder-** Displays the current location of GX-80'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
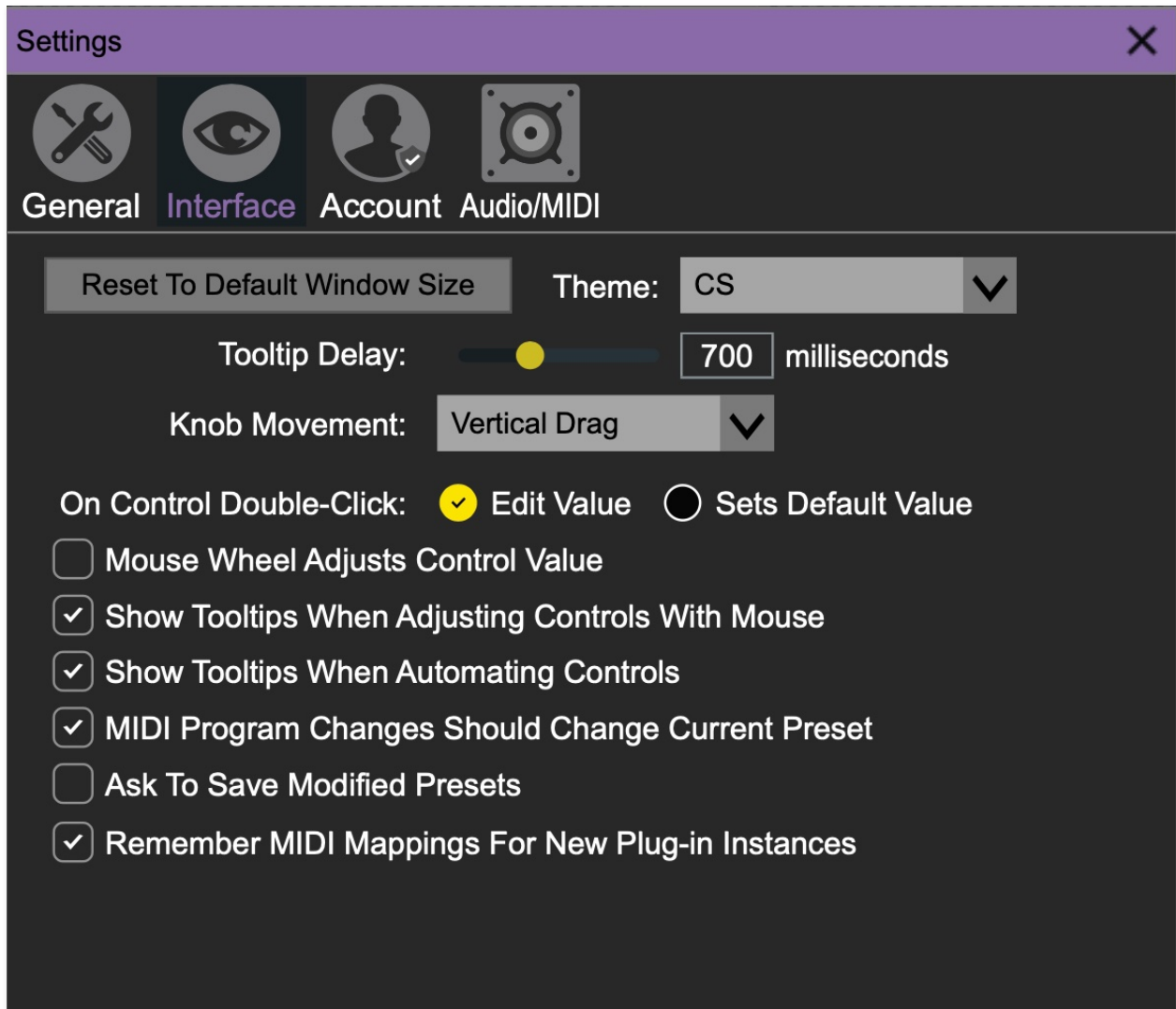
Allows customization of GX-80's user interface settings.

- **Reset To Default Window Size-** Resets the GX-80 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 (pretty sure we fixed that bug a while back though!).

- **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 how mouse movements relate to turning onscreen knobs. It defaults to *Vertical Drag*, but can be changed to *Horizontal Drag*, or *Rotary Drag* if you're one those folks that cut their teeth on the *Steinberg Model E* VST back in 2000.

- **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 Control 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 clicked.

- **Show Tooltips When Automating Controls-** Displays parameter tooltips/values next to controls any time a control is changed, i.e. if a control is moved via an assigned MIDI controller or a *Perform* panel knob, etc.

- **MIDI Program Changes Should Change Current Preset-** Allows MIDI program change messages to change GX-80 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, GX-80 remembers all global MIDI Tab controller settings.

Account
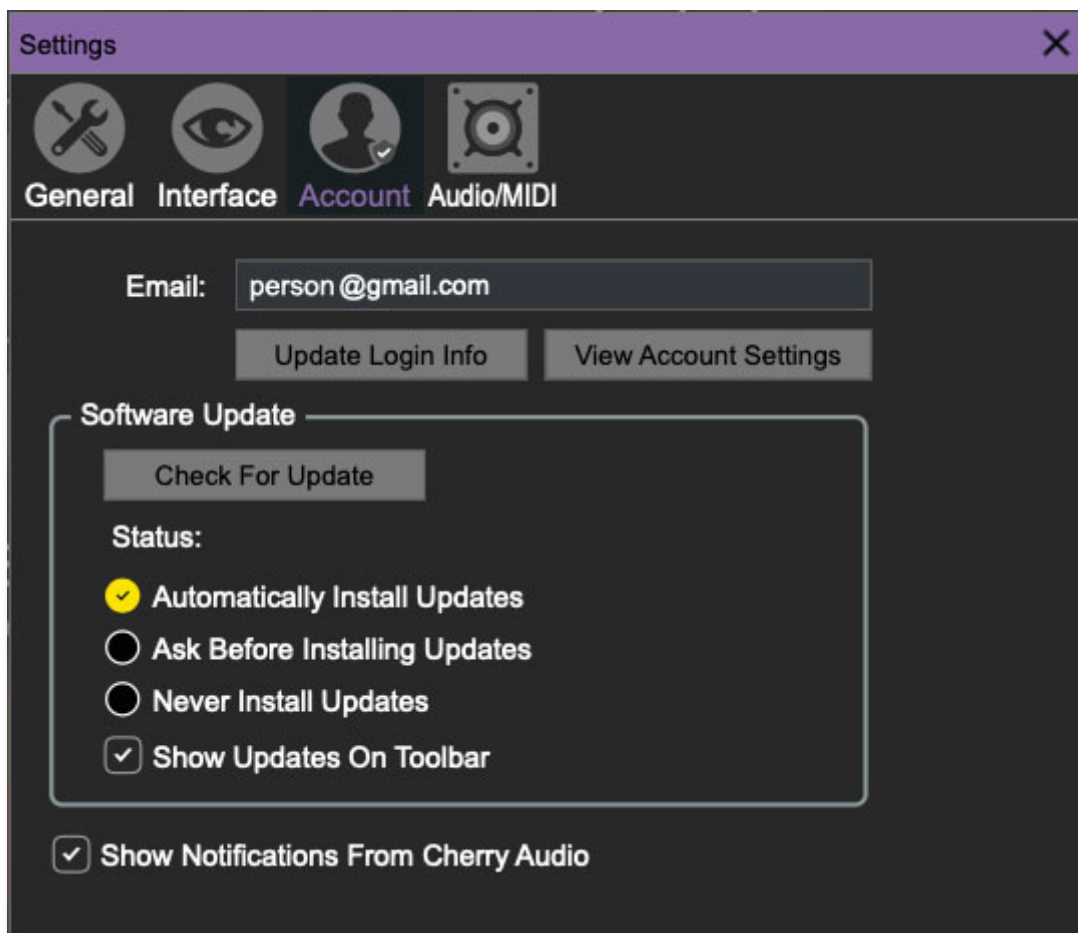
Settings for your personal login information and account.

- **Email**- Displays the email address of the current login.

- **Update Login Info**- No, this isn't a place for news and tour dates for yacht rock superstar, Kenny Loggins. Clicking this opens the same email and password login screen you'll see when initially launching GX-80.

- **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 GX-80 handles updates.

- **Check For Update-** Click this to see if an updated version of GX-80 available.

  Status-

- **Automatically Install Updates**- Updates are automatically downloaded and installed.

- **Ask Before Installing Updates**- By default, GX-80 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 GX-80 for live performances or other "mission critical" situations.

- **Never Install Updates**- GX-80 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 won't use this feature too often. When we do, it'll be for something super cool (like a killer sale), so we recommend leaving it on.

Audio/MIDI
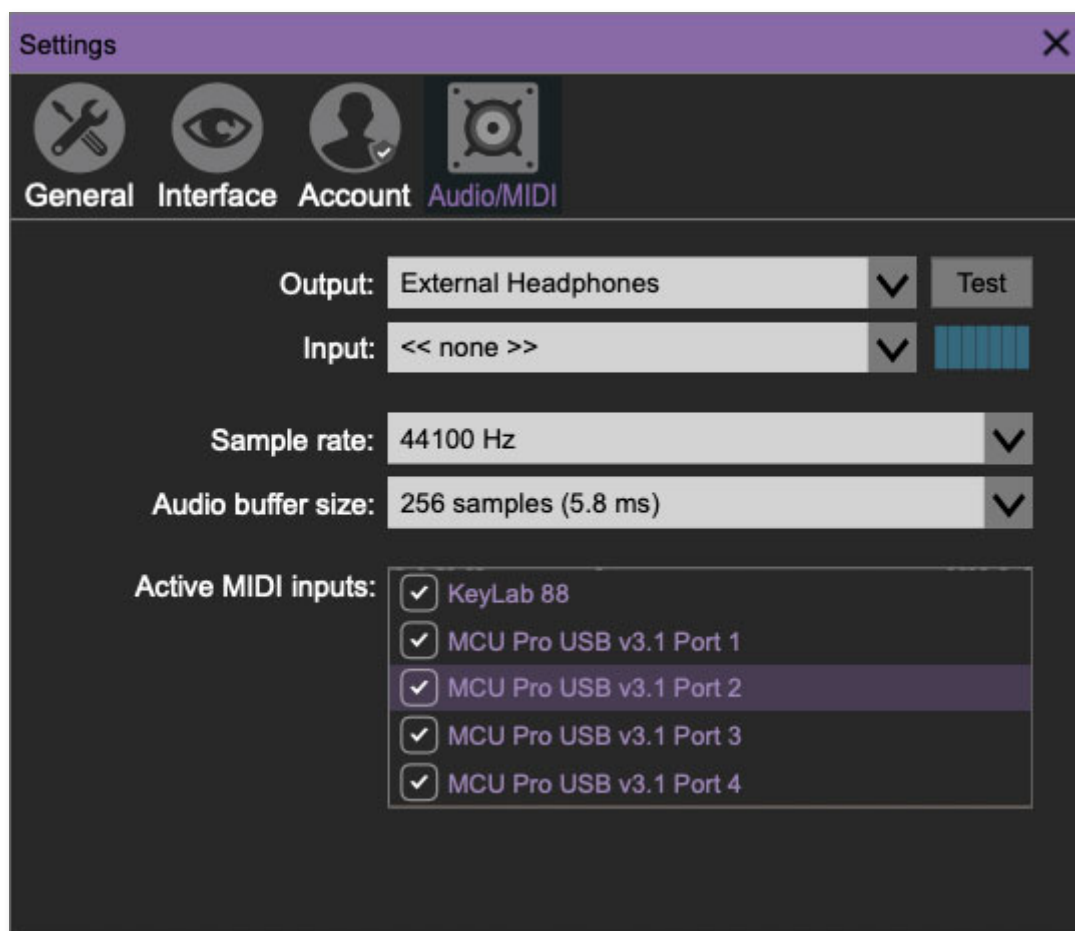
Not to be confused with my ex-employer audiomidi.com, these are settings for audio and MIDI hardware input and output.

This tab is only visible in the standalone version of GX-80.

- **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.

- **Sample Rate-** This sets GX-80'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.

- **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**- Enable MIDI input sources, i.e. MIDI/USB keyboards, pad controls, MIDI knob/fader control surfaces, etc. Check boxes to enable one or more devices. **If a MIDI/USB controller isn't working in standalone mode, make sure the appropriate box is checked here.** (We put this this piece of info *way* in the back of the manual, to make it extra challenging when things aren't working.)