



Wavelore Instruments Pedal Steel Guitar

v.2.5

Kontakt Edition

User Guide



Welcome!

This help file contains an overview of the Kontakt Edition of the Wavelore Pedal Steel Guitar, version 2.5. Reading it carefully and practicing the playing methods it describes will enable you to use this powerful virtual instrument in as many musical applications as possible. Please be aware that the pedal steel guitar is a very complex and expressive instrument. In order to capture as much of it's essence as possible in this library, we had to give the Wavelore Pedal Steel Guitar a degree of complexity that is comparable to the real instrument. This means, basically, that you'll get out what you put in. So dust off your theory books and read up on as many aspects of pedal steel playing as possible - *especially this document!!!*

Enjoy!

Table of Contents

<u>Before you Start: The Concept and Design of the Wavelore Pedal Steel Guitar.....</u>	<u>3</u>
<u>I) What is a Pedal Steel Guitar, and How Does it Work?.....</u>	<u>3</u>
<u>II) How Does All of That Translate to MIDI and the Keyboard?.....</u>	<u>5</u>
<u>III) OK, So Sum All This Gibberish Up For Me.....</u>	<u>7</u>
<u>1) What's New in version 2.5.....</u>	<u>8</u>
<u>2) Really Quick Start.....</u>	<u>9</u>
<u>3) Quick Start.....</u>	<u>11</u>
<u>3.1) Controllers and the Keyboard Layout.....</u>	<u>11</u>
<u>4) More About Expression.....</u>	<u>13</u>
<u>4.1) Position Playing.....</u>	<u>13</u>
<u>4.2) Harmonic Vocabulary Tutorials.....</u>	<u>14</u>
<u>4.3) About the Voice Guide.....</u>	<u>17</u>
<u>4.4) Position Playing, Continued.....</u>	<u>18</u>
<u>4.4.1) New Position Controls in Version 2.5.....</u>	<u>19</u>
<u>4.4.2) Auto-Position Mode.....</u>	<u>20</u>
<u>4.5) Important Expressive Controls.....</u>	<u>22</u>
<u>4.5.1) The Mod-Wheel.....</u>	<u>22</u>
<u>4.5.2) The Expression Pedal.....</u>	<u>22</u>
<u>4.5.3) The Pitch-Wheel.....</u>	<u>23</u>
<u>4.5.4) Portamento Time (CC#5).....</u>	<u>23</u>
<u>5) Editing the Instrument's Setup.....</u>	<u>25</u>
<u>5.1) About the Pitch/Volume Page.....</u>	<u>25</u>
<u>5.2) About the Pitch-Wheel Page.....</u>	<u>28</u>
<u>5.3) About the Keyswitches Page.....</u>	<u>31</u>
<u>5.4) About the Vibrato/Damping Page.....</u>	<u>33</u>
<u>5.5) About the Amplifier Page.....</u>	<u>34</u>
<u>5.6) About the Temperament Page.....</u>	<u>36</u>
<u>5.7) Saving your Changes.....</u>	<u>36</u>
<u>6) Where to Get More Help.....</u>	<u>37</u>
<u>Appendix A: The Pedal Steel Guitar Neck.....</u>	<u>38</u>
<u>A1) Pedal Steel Guitar Neck Diagram.....</u>	<u>38</u>
<u>A2) Written Pitches Per String.....</u>	<u>39</u>
<u>A3) Keyboard Diagrams by Neck Position – Primary Strings.....</u>	<u>40</u>
<u>A4) Keyboard Diagrams by Neck Position – Secondary Strings.....</u>	<u>48</u>
<u>A5) Keyboard Diagrams by Neck Position – Primary + Secondary Strings Comparison.....</u>	<u>57</u>
<u>Appendix B: Credits.....</u>	<u>70</u>

Before you Start: The Concept and Design of the Wavelore Pedal Steel Guitar

When we set about sampling and programming a virtual counterpart to the Pedal Steel Guitar, we were taking on a challenge that no other sample library developer had taken on to date: To design a virtual instrument that was capable of emulating the capabilities of a highly expressive instrument; one with such complex abilities that it seems to defy any sort of conventional adaptation into a MIDI counterpart. Our challenge was to create something that put the power of the real thing into the hands of the user, such that he or she would be able to sequence or perform any passage they liked – not just be able to use a finite number of prerecorded licks.

In order to accomplish this goal, it was necessary to design the library in such a way that it possessed many of the variables and subtleties of the real thing. Since learning a virtual instrument of this kind of depth is naturally a daunting task, it's best if we start right at the beginning, with an explanation of just what a pedal steel guitar is, what it does, and how, in a nutshell, we've adapted its abilities to the realm of the MIDI keyboard and sequencer. The specifics of the MIDI implementation are covered in detail in the main help document.

I) What is a Pedal Steel Guitar, and How Does it Work?

The best place to start is with a picture or two:



In the above picture, notice the pedals suspended on the connecting bar between the two rear legs of the instrument, as well as the levers hanging down from the instrument's underbelly. Each pedal and lever performs a specific function when operated by the player – namely, to tighten or loosen particular strings, resulting in notes that “bend”. These mechanisms make the pedal steel guitar a very unique instrument because they allow the player to play multiple notes simultaneously while changing the pitch of only those notes that they select. A pedal steel player has so much control over the individual notes they are playing that they can actually bend two pitches in *opposite directions* at the same time!

The image below shows an overhead view of the necks (yes, there are two of them, but we sampled just the E9th, or rear neck, since most models have just one neck. It just happens that the particular model we sampled was built for players who want to rapidly switch between tunings). Notice that each neck's headstock has five tuning keys on either side, totaling ten strings per neck.



So, from the above images, we know that a pedal steel guitar is a ten-stringed, freestanding instrument (rather similar looking in profile to a keyboard), with pedals and levers that affect tuning changes to particular strings. Here are some other defining features:

- “Electric” sound: Like a typical electric (6-string) guitar, the sound of the strings' vibrations is sensed by electromagnetic pickups, which transmit the signal over an instrument cable to an amplifier which produces the sound heard by the player and listener.
- Played with finger picks on the right hand.
- The left hand operates a steel bar, commonly referred to as the “steel”, which slides over the strings, both stopping them at certain lengths to produce particular notes, and often connecting one note or chord to another. The steel is also rolled or slid back and forth over a small distance around the notes played to produce varying widths and speeds of vibrato (pitch fluctuation). Used on most instruments, vibrato imparts an emotive, voice-like quality upon the sound. Playing a string without stopping it using the steel is referred to as playing an “open” string.
- To accommodate the left hand technique of using a steel, the strings are raised high off the fretboard. In fact there are no “frets”, *per se* – just markers representing the points at which the slide should be placed in order to produce an in-tune sound. Steel players often play “between the cracks”, meaning that they embellish notes and chords by striking them at slightly out-of-tune locations, and then slide into the correct position. Many variations on this technique exist.

- A volume pedal is often used to create swelling and fading effects, and/or to soften the attack of notes and chords. Constantly changing volume is a very common identifying trait of steel playing, and, together with the instrument's control over all aspects of pitch, is one of the reasons that the steel guitar's sound is often described using the term "liquid".
- Tuning: Pedal steel guitars are usually based on "open" tunings, where each string is tuned to a note of the same chord. Our pedal steel uses E9th tuning, which is, from low to high, as follows:

B2 (String 10), D3, E3, F#3, G#3, B3, E4, G#4, D#4, F#4 (String 1).

The last two notes, highlighted in red, are notable, because they do not follow the typical low-to-high pattern of most guitar tunings. They are in fact, lower than the two preceding strings, or more accurately, string two (D#4) is lower than string four (E4), and string one (F#4) is lower than string three (G#4). Regardless of this curiosity, when all the pitches are examined, it can be seen that the distances between the available notes are fairly small, at least when compared to a typical guitar tuning. To compound the already complex issue of string spacing, the pedals and levers allow some strings to be bent to the same pitch as others, or even past those pitches.

- Position Playing: Using just the "open" strings of the pedal steel guitar together with the pedals and levers, it is possible to play all the diatonic notes and chords of both the E-Major scale and the A-Major scale. When the steel is placed on all ten strings at a given location along their lengths, the entire tuning arrangement (and its harmonic possibilities) outlined above is transposed by a number of semitones equal to the number of the position marker targeted. For example, placing the steel at position marker seven places the instrument in "seventh position", and results in the following tuning arrangement, seven semitones (or a perfect fifth) higher:

F#3 (String 10), A3, B3, C#4, D#4, F#4, B4, D#5, A#4, C#5 (String 1).

When the wide array of harmonic and melodic possibilities of a single position are considered against the pedal steel's expressive powers and its ability to change positions on the fly using the steel, it becomes easy to see why the pedal steel player has become a valued asset to almost any kind of musical ensemble imaginable. - His instrument represents an almost infinite palette of sonic possibilities!

II) How Does All of That Translate to MIDI and the Keyboard?

We started by treating the capability of independently bendable pitches as paramount. To emulate this ability, we came up with two solutions, equally useful in different circumstances, and quite powerful when used together:

1. Independent pitch-wheel operation for each string: Some strings of the Wavelore Pedal Steel Guitar library bend a whole tone with the wheel at maximum, others a semi-tone, and still others not at all. This kind of programming makes some of the more common techniques of pedal steel playing easy to emulate on the keyboard. For example, it is possible to play any major chord, and to bend two of the three notes such that the chord transforms into another triad with it's root a fourth higher. The reverse is also possible. Whether or not you understand any music theory at all, you'll recognize the sound. Click one of the links below for an example:

[Audio](#)
[Video](#)

The pitch-wheel behavior can be set to taste separately for each string in both the upward and downward directions. [See Section 5.2 for directions and applications.](#)

2. "Portamento", literally translated as the "carrying" of one note to another: In performance practice, the sound of portamento depends upon the instrument it is used on; The classical guitar player slides his finger over a number of frets in one smooth motion, but the note only changes at the passing of each fret. What we hear in effect is a fast chromatic scale that still gives the impression of two connected notes. The pedal steel player's portamenti are smoothly connected notes that play all the pitches between the semitones. This is a similar sound to a trombone, slide guitar, slide whistle, or voice.

In synthesis, portamento is a feature of many vintage synthesizers and some samplers, and is commonly referred to as "monophonic", meaning that only one note will sound at a time. Kontakt's scripting processor (KSP) allowed

us to emulate this type of keyboard behavior, in which a note played while another is held will cause the pitch of the original note to bend to the pitch of the new note rather than to sound both pitches simultaneously.

The problem with this feature was that it prohibited chordal playing. Our workaround was to program a new mode of playing which allows polyphonic (chordal) playing while treating each note as its own monophonic voice. This was accomplished by dividing the keyboard up into zones, each of which represents one monophonic “string”. Playing in two or more different zones at once allows polyphonic playing, but each zone can still be treated monophonically without affecting the pitch of notes played in the other zones. This aspect – the ability to play chords and to choose which notes bend, how fast, and in what direction – is the essence of the pedal steel translated to the keyboard.

The next problem that needed consideration was that of position playing: Once the keyboard is divided up into zones representing the tuning of the pedal steel guitar’s strings and their unique bending ranges, it must be possible to transpose this entire arrangement, since a large part of the pedal steel guitar’s versatility comes from its ability to change position on the fly. We recorded each string’s entire length just so that we could implement position changes in the virtual pedal steel. Here’s how it was done:

Since all of the available pitches on the instrument transpose one semitone for each position that the steel is advanced, we ended up providing an assignable MIDI continuous controller (default: CC#4) to set the neck position of the instrument. Keyswitches (keyboard notes that do not produce sound, but implement a setting) are also available for position switching. This setting of position effectively advances the points along the keyboard where one monophonic zone ends and another begins, and automatically plays a sample taken from the correct string in the correct position as selected. The net result is that anything possible in open position can be transposed to new keys as long as the neck position is advanced by the same number as the number of semitones transposed.

Another way of stating this rule is: *Transpose by X, Advance by X*. What works in the key of E-Major in open position will work in the Key of D-Major in tenth position. (Transpose by ten semitones, Advance by ten semitones).

The ability to perform vibrato and volume swells were comparatively easy to translate to MIDI, since those expressive factors are common enough to most instruments to basically have been included in the traditional MIDI “bag of tricks” already:

The modulation wheel (CC#1) traditionally performs vibrato-related functions. We’ve assigned CC#1 as both the vibrato depth and the vibrato speed controller, though you have the option of reassigning either or both functions to any CC# you like.

The expression pedal (CC#11) is the typical controller for volume (independent of channel volume, CC#7, which should be reserved for mixing purposes), and, conveniently, is most commonly found in MIDI hardware configurations as a pedal that rocks (or “sweeps”) through the controller’s range of values. It is convenient both for its hands-free operation, and for its similarity to the device used by real pedal steel players.

We also needed a way to “glue” all of these factors together – For that, we turned to Kontakt’s convolution processing. Impulse responses of several amplifiers were recorded at various reverb settings, and through several microphones. When the keyboard triggers two notes and bends one of them, the sum of the sounds is processed through whichever impulse response you’ve selected as active, and the resulting sound is that of the “signal” of the steel guitar, being processed through the amplifier, room, and mics. Using this process and recording the guitar direct (rather than recording the samples through an amp/room/mic combination) allowed us to make the cabinet, amp reverb, and room reverb constant. If these elements had been recorded in the samples themselves, they would “stretch” every time a pitch was bent, and this would sound very unnatural.

III) OK, So Sum All This Gibberish Up For Me

Basically what we've got here is a virtual instrument that is composed of ten sub-instruments (strings). Each string is assigned to a particular range on the keyboard, within which that string can be used in any way desired, as long as it's monophonic. Since you can play polyphonically by using multiple ranges at once, and still use portamento for pitch bending independently within each range, it follows that you can play chords with the ability to bend individual notes. Using a MIDI continuous controller or keyswitches, you can change where the boundaries of those ranges lie, allowing many, many possibilities.

Beyond that, use your mod-wheel for vibrato, your pitch wheel for some common chordal bends (outlined in greater detail below), and your expression pedal as a volume pedal. The sum of all these elements is fed through the amp simulation, and voila – a whole world of pedal steel licks at your fingertips!

The instrument's behavior and sound are highly customizable, and the how-to of doing so is covered in [Section 5](#).

1) What's New in Version 2.5

Bugfixes:

- 1) **A major fix for a problem involving stuck notes;** Previously, sequencing a repetition of a note before the first instance of that note had been released would cause that note to stick even after both notes were released. The effect was that all notes on the string played would become unavailable, since the instrument would try to bend the pitch of the stuck note, even after it had completely died away. There was no workaround save for reloading Kontakt, or restarting the Kontakt engine. In v.2.5, not only does this problem not occur, but a repeated note prior to release of the first instance will actually *silence* the first instance, in keeping with the principle that it is only possible to play one note on any given string at a time.
- 2) **Release samples now play at a pitch matching in-progress slides/bends;** Previously, if a note was released during a bend, the release sample of that note would always play at pitch, sometimes not matching well with the pitch of the actual note while the bend was in progress. Now it is possible, for example, to play a long, slow slide from G#4 to G#5, but to release both notes while the pitch is actually about midway, where the actual release sample played will be that of the pitch at the time of release (say, D5), offset by a fine tune value which corresponds to the distance from the nearest semi-tone.

Enhancements:

A few useful new features have been incorporated into the v.2.5 update:

- 1) **Traditional sustain pedal (CC#64) functionality;** Since the instrument's portamento behavior depends so heavily upon note-off events as triggers for pitch bends, and since the sustain pedal's default role is to perform string-group switching, traditional sustain pedal functionality was omitted from the original Kontakt version. A button on the main page of the instrument's performance view now allows optional activation of the sustain pedal for the traditional use of holding notes. The default string group switch is still the sustain pedal, and the two functions can be used simultaneously with great results, but for independent operation of these features, one can still re-assign the string switch CC# as desired. [See Section 5.1](#) for more information.
- 2) **Optional re-routing of the voice guide to a dedicated output;** Originally only possible through tedious navigation of Kontakt's instrument editor, it is now possible to re-route the sound of the voice guide to alternate outputs of your sound card. This may be useful if one is using the instrument in a live performance setting and wishes to hear the voice guide in a pair of headphones or an on-stage monitor mix without sending it over the mains! [See Section 5.1](#) for more information.
- 3) **Fully definable pitch-wheel behavior;** Where the original Kontakt version had pitch-wheel behavior modeled upon the discontinued GVI version, version 2.5 offers much more user control over how the pitch-wheel acts on each string. The pitch-wheel range (in semitones) can now be defined independently for each string, and, within each string, can be set to differing amounts for the upward and downward directions. Reverse behavior is possible, where, for example one may set a given string to bend upward on a downward movement of the wheel, and downward on an upward movement of the wheel. Presets are included for the original settings and a new enhanced setting, as well as several "lock" functions for quick batch editing of the values. [See Section 5.2](#)
- 4) **Keyswitchable neck positions;** Previously, it was only possible to change position using the assigned MIDI continuous controller. Version 2.5 allows the user to define a range of available positions and the keyswitches that will set them. Voice guide for keyswitched positions is optional. See Sections [4.4.1](#) and [5.3](#) for more information.
- 5) **Auto-Position;** It is now possible to define a starting string from each of the primary and secondary string groups, and to have the instrument automatically set the neck position to place the first note of a passage on the given string. For example, if the starting string is set to string ten, and, with no other notes held, a B3 is played, the instrument will automatically place itself in twelfth position, since that is the position in which B3 will reside on the tenth string. If an F#3 is played, the instrument will set itself to seventh position. This is useful for playing phrases that repeat at different pitch levels without having to manually change position between repetitions. Detailed applications are explained in Section [4.4.2](#). This behavior can be keyswitched on and off.
- 6) **Amp Tremolo;** Tremolo, a useful swelling and fading effect for producing interesting guitar parts, has been added to the amplifier section. It features user definable speed and depth controls, as well as the choice of de/activation method (Keyswitch, MIDI CC, Always On, or Always Off). [See Section 5.5](#) for more information.
- 7) **Temperament;** It is now possible to re-tune each string of the pedal steel guitar in order to make it sit better harmonically in arrangements that feature instruments played in unequal temperaments. This feature can also be used to emulate an out-of-tune guitar. [See Section 5.6](#) for more information.

2) Really Quick Start

1) Load the instrument into Kontakt: Kontakt 2 users will want to use the file "Wavelore_Pedal_Steel_Guitar_2_5_K2.nki", whereas Kontakt 3 users will want to use the file "Wavelore_Pedal_Steel_Guitar_2_5_K3.nki".

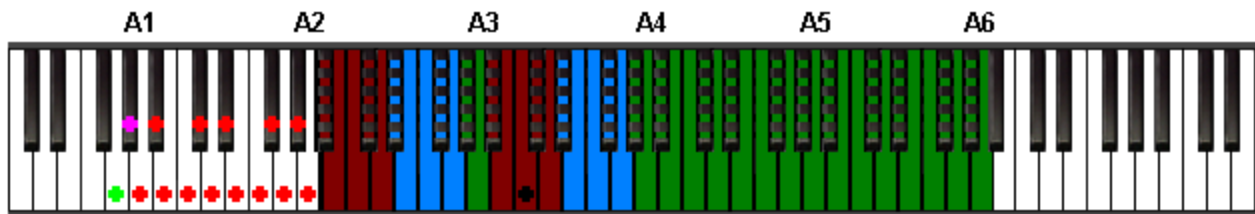
2) Assign the following MIDI control sources on your MIDI controller:

- CC#1** (mod wheel) - vibrato, release sample control.
- CC#4** (must be continuous) - neck position.
- CC#5** (must be continuous) - portamento speed.
- CC#11** (expression pedal) - real-time volume control
- CC#64** (sustain pedal) – Sustain and string switching

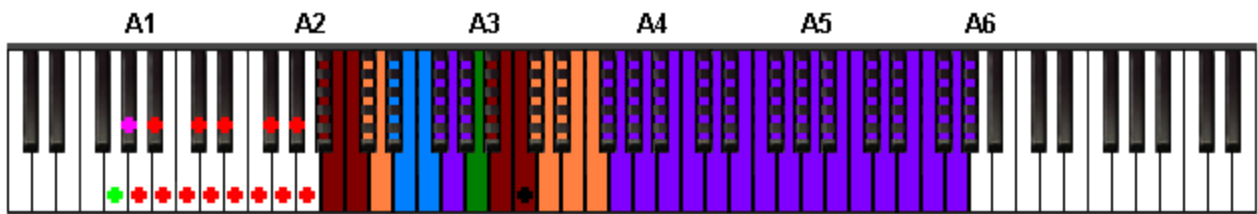
3) Play the keyboard. You'll quickly get a sense that playing legato between certain pitches will produce sliding notes, where other notes do not slide at all. To find the exact points where one "bendable" area ends and another begins, play a connected chromatic scale all the way from Bb2 to G#4. From G#4 to A6 are all one area.

Here is a color-coded diagram of what is going on:

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

◆ = Middle C

● = Position Keyswitch

◆ = Auto-Position Keyswitch

● = Tremolo Keyswitch

Notice in the legend that each colored range represents one string. Just like a real guitar, you can only play one note on a given string at a time. Any notes played together within the same colored range of keys will slide from one note to the next. Any notes played in different colored key ranges will sound together. This keyboard arrangement is influenced strongly by the pitches of the open strings and the pitches that those notes can be bent up or down to on a real pedal steel.

Notice also that there is a different diagram for the keyboard behavior when the sustain pedal is down. Having the pedal

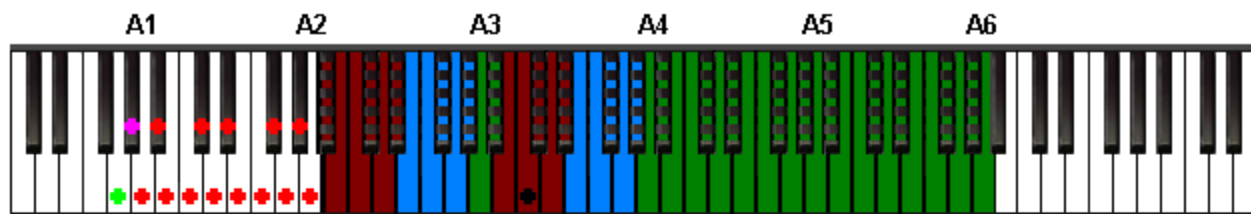
act as a switch allows more real-time access to all ten strings worth of samples without having to omit or substitute samples.

Don't play any keyswitches (marked "+"), or move CC#4 yet!!! Read the Quick Start (and everything after it) first!!

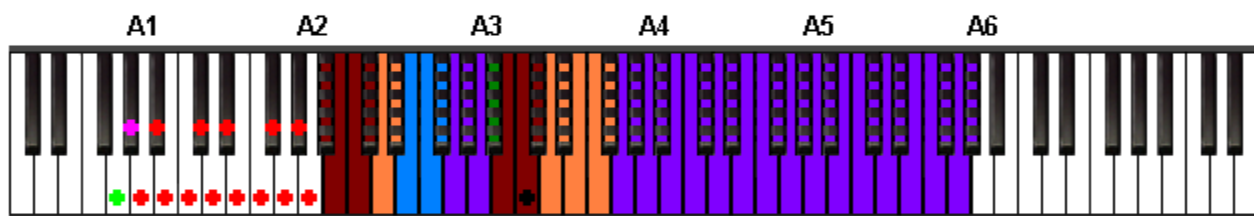
Moving CC#4 will do two things:

- 1) Sound a voice, which tells you what neck position you're in. You can silence the voice by deactivating the button labeled "Voice Guide On". We recommend leaving it on for now, however.
- 2) Change the current position to the one called by the voice. With each advancing position, the colors in the diagram above will advance to the right by one semitone, allowing transposition of phrases from any key to any other. For example, when CC#4 is moved until the voice calls, "one", each string of the instrument will then occupy an area whose highest and lowest notes are one semitone higher than in the diagram above, as illustrated in this diagram:

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

It's best to learn the open position (the default behavior, shown in the diagram) first, and learn the other positions by transposing what you know from that. [Appendix A](#) contains a comprehensive set of keyboard diagrams for all positions with the pedal up and with the pedal down, and a large part of the rest of this help document concerns the "how and why" of using the different positions. Click one of these links for a video demonstration: [Video 1 - Fast](#) [Video 2 - Slow](#)

Finally, use your mod-wheel for vibrato, your expression pedal as a volume pedal, and the pitch wheel to bend between the following pairs of chords (in open position):

Pedal UP:	Pedal DOWN
E-Major → (up) → A-Major	B-Major → (up) → C#-Minor
A-Major → (down) → E-Major	C#-Minor → (down) → B-Major

3) Quick Start

3.1) Controllers and the Keyboard Layout

1) Load the instrument into Kontakt: Kontakt 2 users will want to use the file "Wavelore_Pedal_Steel_Guitar_2_5_K2.nki", whereas Kontakt 3 users will want to use the file "Wavelore_Pedal_Steel_Guitar_2_5_K3.nki".

2) Assign the following controllers on your MIDI controller. They are organized by importance, but you'll want them all eventually. Suggestions are included in brackets for whether the designated control should be a button (for toggling) or continuous:

-**CC#11** (Expression Pedal) Acts as a volume pedal.

-**CC#4** (Slider) Controls neck position. A controller-activated voice will call the position numbers as you move it.

Important Note: Throughout this document, we will make reference to "open position". It is the default state of the Wavelore Pedal Steel Guitar library. To proceed as smoothly as possible through this guide, it will be good practice to avoid changing the value of this controller from the default value until instructed to do so. If the controller is moved out of position, the instrument will not function as explained. That is because each "position" has a unique set of behavioral characteristics relating to chords and string bends. If the explanations and diagrams below do not match the instrument's behavior, please move CC#4 until the voice counter says, "open". A more detailed explanation of the other positions and their operation is part of the main help document.

-**CC#5** (Slider) Portamento speed control (also significantly affected by velocity).

You'll also need a mod-wheel and sustain pedal. These are the features they control:

Mod-wheel:

1) Vibrato depth. Vibrato is subtle, and can be made more subtle by moving the mod-wheel in cycles (sort of like if you used the pitch wheel for simulating vibrato, which is also possible), giving the pitch variation some inconsistency. Its behavior (depth and speed, control source) can also be edited.

2) Kind of release sample played. Mod-wheel at 0-60=strings muted with the palm, mod wheel at 70-127=strings muted with the pick, for a more noticeable "click". This is useful for adding some grit to the performance. Placement of the mod-wheel at note-off also attenuates the release samples so that you can influence how audible they are in performances or sequences. The palm damps will play at full volume with the wheel at zero, and fully attenuated with the wheel at 60. The pick damps will play at full volume with the wheel at 127, and fully attenuated with the wheel at 70. If the wheel is set between 60 and 70 at the time of a note off message, no release sample is played.

Sustain Pedal:

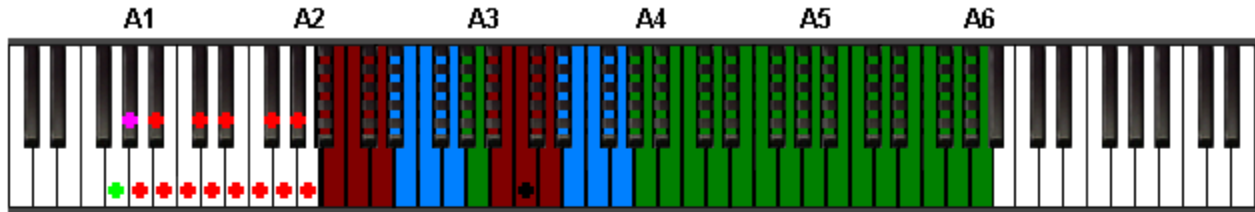
Active/inactive strings. The pedal steel guitar has ten strings, several pairs of which overlap in ways that make programming their real-time availability difficult. To help organize the chaos, we started by dividing the strings into two groups, "primary" and "secondary":

-**Primary** strings are those which make up an E Major chord when played open (without the slide or pedals/levers engaged). In order from lowest pitched to highest pitch, they are strings 10, 8, 6, 5, 4 and 3 (B2, E3, G#3, B3, E4, and G#4). By default these strings are available simultaneously with the pedal up.

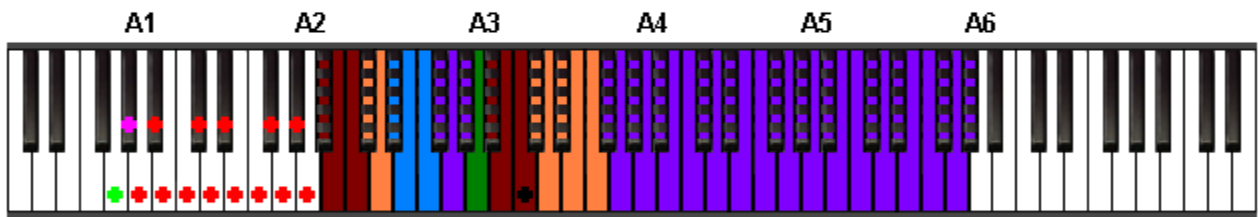
-**Secondary** strings are those which are not a part of an E Major chord, or strings 9, 7, 2 and 1 (D3, F#3, D#4 and F#4). When you engage the sustain pedal (CC#64), these strings become available where their pitches were only available on the primary strings with the pedal up. In this state there are different bending possibilities, which, when combined with the options afforded by the pedal-up state, offer a very high level of harmonic and melodic flexibility.

Here are the active key ranges per string when the instrument is in open position (default CC#4 setting):

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

Click one of these links to see a video that shows how the keyboard zones change as neck position is advanced:

[Video 1 - Fast](#)
[Video 2 - Slow](#)

Try playing an E-major chord with the pedal up. Move the pitch wheel upward and notice how the notes of the chord bend. Playing an A-major chord and moving the wheel down will reverse this. Now try playing a close-voiced B-Major chord. Notice how one note will bend undesirably. This is because the secondary strings are what allow this voicing. Press the sustain pedal and play the chord. Moving the wheel up will bend it to a C#-minor chord. Each state allows a different group of options for harmonic and melodic motion using legato and pitch wheel movement, depending on the chords chosen and the neck position. Here again is a table illustrating the common chordal movements that can be performed using the pitch-wheel in open position:

Pedal UP:	Pedal DOWN
E-Major → (up) → A-Major	B-Major → (up) → C#-Minor
A-Major → (down) → E-Major	C#-Minor → (down) → B-Major

4) More About Expression

The above guides give you everything you need to get a basic grasp of how the Wavelore Pedal Steel Guitar works. All the same, there are many considerations that will be important for you to make when choosing exactly how you will play and use the instrument. Please read the following sections if you want to know more about getting the most out of your library!!

4.1) Position Playing (CC#4)

We've already made mention of playing in a particular "position". The position demonstrated so far is the one that is active by default when you load the instrument, the "open" position. Open position is so-named because its available pitches are those which are available on a real pedal steel when the slide is *not* used. When discussing stringed instruments of any kind, a string that is not stopped with the finger, or in this case, a slide, is referred to as an "open string". When open strings are used in conjunction with those notes that are close to them, the instrument is said to be played in "open position". As we move up the neck of the guitar, we advance, one semitone at a time, through positions one, two, three and so on. Positions are important on stringed instruments because different positions will have drastically different sounds. The Wavelore Pedal Steel Guitar has twenty-four positions, plus the open position, for a total of twenty five, and each one has a different sound as well as different chordal possibilities.

Each position has a peculiar arrangement of strings across the keyboard. The diagram in the Really Quick Start guide shows which notes of the keyboard are played on which strings in open position. If you have a reasonable grasp of the musical possibilities in open position, you can start transposing things you've learned so far by moving CC#4 by the same number of semitones as your transposition.

If you're still not sure what any of this is about, start by thinking of open position as the key of E. Technically, any position can play in any key, but certain chord progressions and types of movement can lend themselves well to certain positions. Start with these facts about open position:

- 1) In open position, you can play any inversion of an E-Major chord.
- 2) In open position, you can play any inversion of an A-Major chord.
- 3) In open position, any inversion of an E-Major Chord can bend to an A-Major chord by moving the pitch-wheel up all the way.
- 4) In open position, any inversion of an A-Major chord can bend to an E-Major chord by moving the pitch-wheel down all the way.
- 5) Either of the above two bending tricks can be reproduced by playing legato from G# to A, and B to C#, or the reverse. Alternately, one can slide just one of these notes using portamento. For example, play an E-Major chord and hold it while playing an A above the G#. This bends just the G# to A, resulting in an E-sus4 chord.
- 6) Any inversion of an E-Major chord can slide to an F#-minor chord, or vice-versa, by playing legato from E to F#, G# to A, and B to C#.
- 7) Any inversion of an E-Major chord can bend to a B7 chord, or vice-versa by playing legato from G# to A, and E to D#, keeping the common tone, B. *Note: This voicing of B7 omits the fifth, F#.*
- 8) Any inversion of an A-Major chord can bend to a B7 chord, or vice-versa, by playing legato from C# to B, and from E to D#, keeping the common tone, A. *Note: This voicing of B7 omits the fifth, F#.*
- 9) Mixing legato slides with pitch wheel movements can allow interesting harmonic variations. For example and E Augmented triad (E, G#, C), can bend to an A Major Chord by raising the pitch wheel fully while playing legato from C to B. There are many such possibilities. Experiment!

4.2) Harmonic Vocabulary Tutorials

Now let's take a moment to explore some harmonic vocabulary using open position:

Tutorial 1: Playing in open position with the pedal up

Make sure CC#4 is set to zero so the instrument is in open position. The way the strings are mapped to the keyboard allows us to play diatonic harmonies idiomatically. Let's start with a simple I-IV progression in E-major. Play the following example, making sure to play the moving notes legato. It may help to use 2 hands. Note the octave-treble clef meaning the third space on the staff is middle C.



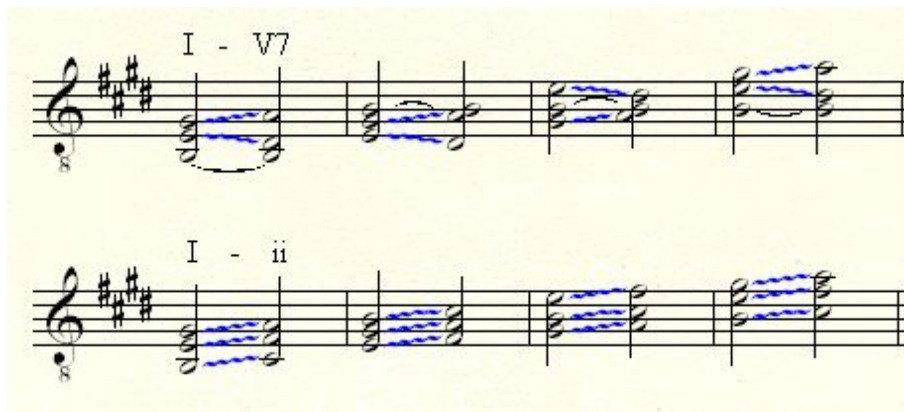
[click image for video](#)

The G# should slide up to the A and the B should bend up to the C#. Now try it again and play the second chord as softly as you can. The notes should bend more slowly. CC#5 lets you adjust how sensitive this feature is. Try staggering the A and C# or playing one harder than the other. Try playing the example backwards. Inversions of the chord progression will also work:



[click image for video](#)

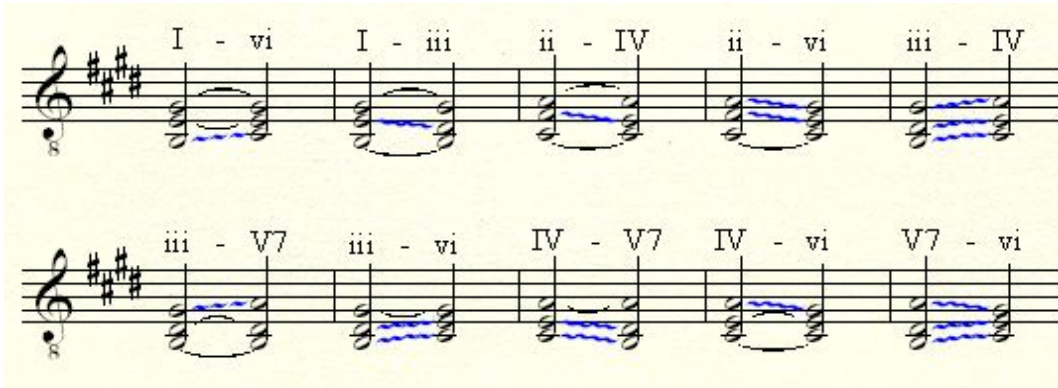
The next inversion (an octave above the original) will not work in this position because the highest open string is G#. Playing the G# and B together makes it slide between the 2 notes. To play this entire example an octave higher we'd have to set the position slider to 12. Now let's try some other chord progressions:



[click image for video](#)

Notice in the I - ii progressions from the above example's video demonstration that the performances use an unconventional fingering technique

The idea of being able to invert any progression is a big part of being able to play idiomatically on the instrument. It's just like a slide player moving to higher strings and being able to get the same bends to work. It also works for these diatonic progressions:



[click image for video](#)

Also try these secondary dominant progressions or other chromatic alterations of the progressions we've covered so far:



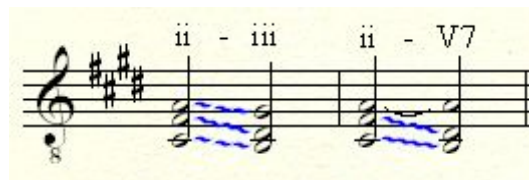
[click image for video](#)

Apart from being able to invert these progressions we can play any of them with several wider voicings:



[click image for video](#)

A few more progressions are possible this way but they create a bend of a minor third, which wouldn't usually happen on a pedal steel:



[click image for video](#)

The obvious next step is to put some of these changes together to make longer progressions. There's a lot of expressive ability built in for this type of playing so you'll want to practice some of the different techniques discussed in the rest of user's guide. Try sequencing a chord progression and soloing over it in the higher register.

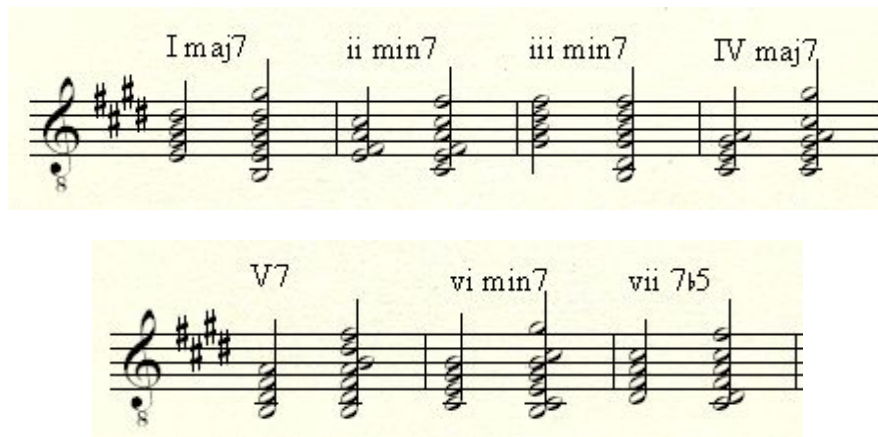
Tutorial 1b: Playing in open position with the pedal down

Pushing the sustain pedal brings a few more strings into the mix, thus reducing the bend range of some strings, and providing us with more harmonic possibilities. Close voicings of the V chord and vii become available, as well as all of the diatonic 7th chords. There are of course fewer possibilities for sliding between chords in this mode as the range of each string is fairly small. However, it does open up some possibilities for moving to and from the V, shown here in their lowest and highest possible voicings:



click image for video

With smaller intervals being possible, we can now play close voicing of the diatonic 7th chords. In this example the first chord in each bar is the simplest voicing possible, and the second chord is the fullest voicing.



Once you have a feel for what's possible within open position, you can learn to apply those techniques to other keys by placing CC#4 in the correct position, and transposing the music accordingly. The most straight-forward example of transposing on the Wavelore Pedal Steel is transposition by an octave:

- 1) Move CC#4 until the voice counter says, "Twelve".
- 2) Play the licks or chord progressions that you know from open position, but one octave higher. You'll hear that the part sounds an octave higher, and you'll notice that all bends (legato and pitch-wheel) work in exactly the same way as in open position.

Of course, we can also transpose into other keys altogether:

- 1) Move CC#4 until the voice counter says, "Seven".
- 2) Play the licks or chord progressions you know from open position, but transpose them into the key of B Major. If you don't want to play the part differently, the chances are good that your MIDI controller has a transpose button. Set it to "+7" semitones. Consult your controller's documentation if you're not sure how to do this. Again, you'll hear the part, only this time a perfect fifth higher than if it were played in open position.

Not only do the strings bend by the same amounts as they do in open position, but the new pitches you play will actually trigger samples that are *taken from higher up the length of each string!* This is because we sampled all strings for their entire lengths and configured each position to use the samples from the appropriate range of each string. Often, there is more than one way to play a note, chord or phrase, and learning to reproduce certain licks in multiple positions can give you a wider range of choices when determining what the instrument will sound like. For example:

Play an A Major chord in open position, then move to fifth position and play it again. Same chord, different sound. The reason is that the same pitches have been played, but the actual samples played are different based on which strings would have those notes available in a given position on a real pedal steel guitar.

The above examples illustrate position control, which is not only an important part of guitar and pedal steel playing in general, but is specifically one of the features that make this virtual version of the instrument so versatile.

4.3) A Brief Detour: About the Voice Guide

Having twenty-five positions assigned to a single continuous controller is a simple way to make all positions accessible, but it can present some problems. The first is the question of how one can practice any degree of precision when selecting a position. The answer is the "Voice Guide". The voice guide responds to MIDI controller messages by triggering samples of a human voice calling out numbers that correspond to the position activated by the controller's latest value. Basically, if you want position twelve, start by moving CC#4 toward the middle of it's range. As you approach the correct value, the voice counter will call ascending numbers until you stop. If you go too far, coming back down will also call numbers, but in descending order.

Of course, this workaround might be cumbersome in a live performance situation for two possible reasons:

- 1) Who wants to hear the voice counters over the front-of-house speakers at a live performance??
- 2) Quick changes of position can be difficult even with the aid of the position counters, since the increments between positions are so small.

Fortunately, there are solutions available to help use the instrument in a live setting:

- 1) You can route the audio produced by the voice guide to a different set of outputs, which could be useful for monitoring the voice over stage monitors or in headphones, but without sending the audio to the house speakers. Please see section [5.1](#) for instructions on doing so.
- 2) Most controllers have assignable buttons that can be set to send specific values of assigned CC#'s. Many can also be set to "toggle", so that one button can be made to send two values alternately. Combining one button configured in this way with an assigned fader can give quick access to four values (0 and 127 using quick movements of the fader toward its extremes, plus the two toggle values chosen for the button). Each additional toggle button can add two more quickly accessible values.

This technique can be strategically used for quick, reliable changes into pre-planned positions. In sequencing, one can configure this automation ahead of time for playing in complex parts. Refer to your MIDI controller/sequencer documentation for instructions on how.

- 3) The version 2.5 update includes assignable keyswitches. You can now specify a range of positions and the keyswitches that will set them, in addition to the standard CC-based position controller. Also included is auto-position mode, for hands free position control. See sections [4.4.1](#), [4.4.2](#), and [5.3](#) for details.

4.4) Position Playing, Continued

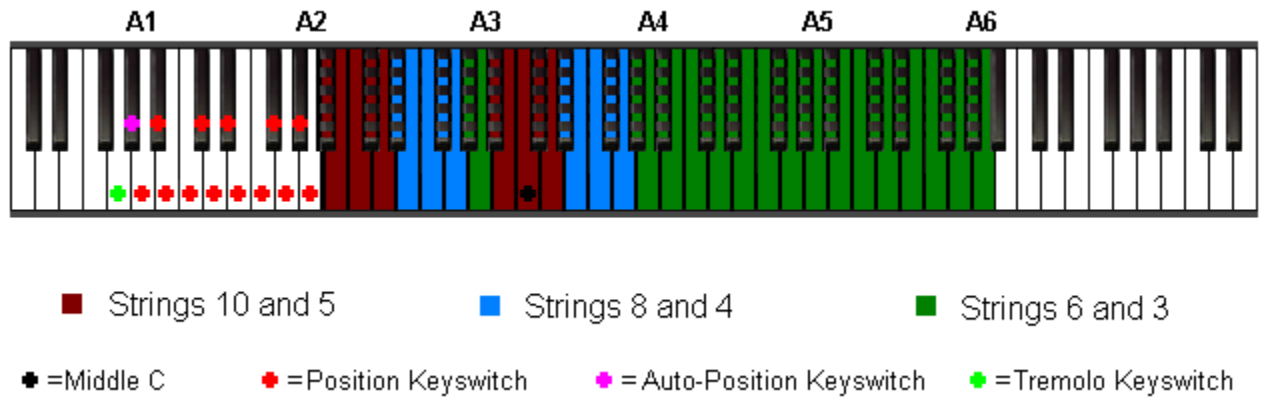
Once familiar with how positions allow different harmonic and melodic possibilities, it will be useful to know just how far to move CC#4 to reach a particular position. This is especially true if you are sequencing position changes using envelopes drawn into your MIDI sequencer. To help you do this kind of editing, here is a diagram illustrating the CC#4 values that will put the instrument into any desired position.

Positions Zero (Open) through 24, MIDI CC Values

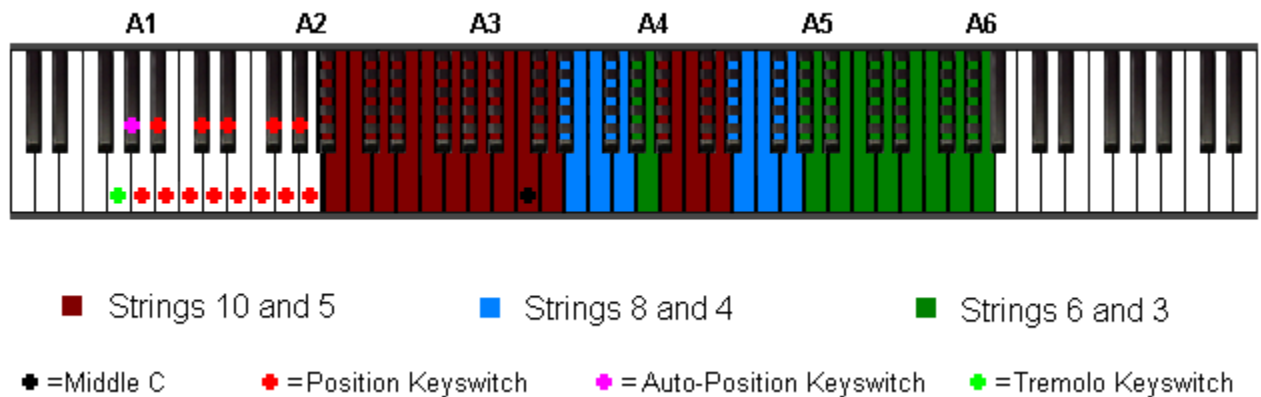
Position	CC#4 Value Range
Open	0-0
1	1- 6
2	7- 11
3	12- 17
4	18-23
5	24-29
6	30-35
7	36-40
8	41-45
9	46-50
10	51-55
11	56-60
12	61-66
13	67-71
14	72-76
15	77-82
16	83-88
17	89-93
18	94-99
19	100-105
20	106-110
21	111-116
22	117-121
23	122-126
24	127-127

4.4.1) New Position Controls in Version 2.5

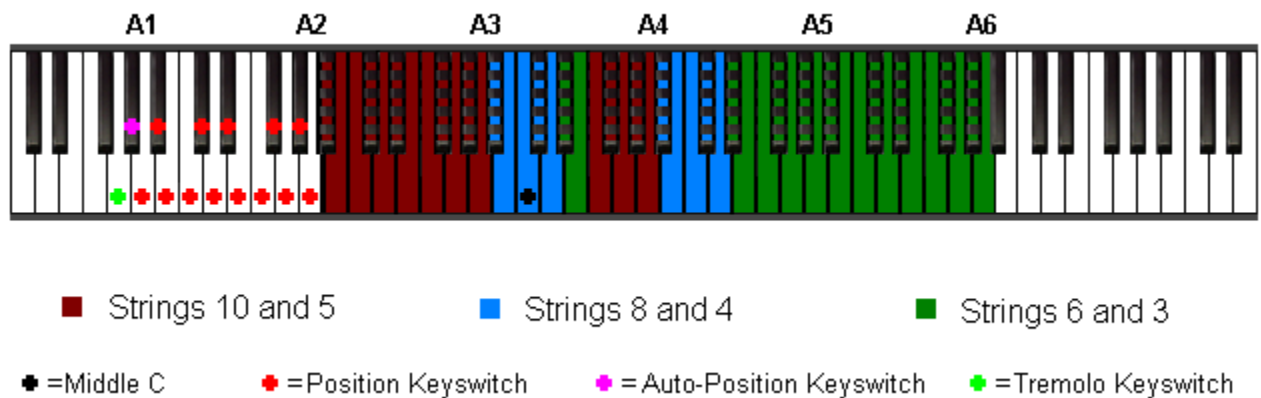
In addition to the tradition MIDI CC#-based ability to change positions, version 2.5 now uses assignable keyswitches for position changes. Have another look at the open position's keyboard layout for the primary strings:



Notice in the legend at the bottom of the diagram that position keyswitches are marked with a red cross; and that the default range of position keyswitches spans from A1 to A2. These thirteen keys activate the thirteen positions ranging from the open position to the twelfth position. Thus, playing A1 will set the position to open and sound the voice guide that confirms the fact. At this point, the keyboard splits will work as illustrated above. Playing A2, however, will activate twelfth position, and the keyboard splits will end up looking like this:



You can see from the diagram above that the keyboard's split points have moved up one octave. Playing, for example, an E2, will change the position to the seventh, making the keyboard layout work as illustrated below:



Each position has its own unique keyboard layout for both the primary and secondary string groups. For comprehensive diagrams of all positions, see [Appendices A3 through A5](#).

4.4.2) Auto-Position Mode

Now that you know the two ways to manually set the neck position, you may find it useful in certain situations to use “Auto-Position Mode”. Auto-Position Mode is toggled on by hitting the keyswitch located at G#1 (the pink cross in the illustrations above).

Once Auto-Position Mode is activated, the instrument will automatically set the neck position for you each time you start a new phrase. Here's how it works:

- 1) A “starting string” is selected from each of two menus located on the “Keyswitches” page of the instrument's user interface. One menu represents the starting string for the primary string group (default: string 4), and the other represents the starting string for the secondary string group (default: string 1).
- 2) When no notes are being held on the keyboard, the instrument is “listening” for the first note played. When you play a note, the instrument detects which note is played, and calculates the position in which that note is played on the preselected starting string. The instrument remains in that position until a new phrase is begun, or until a manual position change is made. You can specify differing starting strings for both the primary and secondary string groups:
 1. If the primary string group is active (sustain pedal or CC#64 is at a value of zero), the position will be set to the one where the first note played is available on the primary starting string, making it possible to transpose licks to higher or lower pitch-levels without manual position changes. Here's an example:

With Auto-Position Mode turned **OFF**, and with the instrument set to open position, play an A-Major arpeggio, as follows: E4, C#4, A3. Now bend the C#4 to a D and back by playing and releasing D4 while holding the rest of the chord. It will look and sound like [this video demonstration](#)

Repeat this gesture on a B-Major (a whole step higher), by playing: F#4, D#4, B3, and bending the D#4 to E and back by playing and releasing E4 while holding the rest of the chord. It will look and sound like [this video demonstration](#).

The two phrases are alike in playing technique, but they do not sound alike at all. This is because the split points in open position do not allow the same bending ranges as those needed to reproduce the phrase a whole tone higher. To be more specific, the F#4 slides down to the D#4, rather than sustaining while the new note is played. In order to make this phrase sound like the one above, we must set the instrument to second position. Try manually setting the position to position two, and try the lick in B again. It works – [like in this video demonstration](#).

Now reactivate Auto-Position Mode by playing G#1, and try playing the two licks again, this time not bothering to change position manually at all. Don't move CC#4, and don't play any position keyswitches. [Here's what it should look and sound like](#).

Notice, this time, that both licks work as intended, despite the absence of any manual position control. It worked this time because Auto-Position Mode was active; Since the lick works when it starts on string four, we set the starting string to string four, and Auto-Position Mode automatically sets the instrument to position two when a new phrase was started a whole step higher.

[Here's a video of what would happen if we continue to play the same phrase at further transposed pitch levels with Auto-Position Mode turned on](#)

2. If the secondary string group is active (sustain pedal or CC#64 is at a value of 127), the position will be set to the one where the first note played is available on the secondary starting string, making it possible to transpose licks to higher or lower pitch-levels without manual position changes. Here's an example:

With Auto-Position Mode turned OFF, and with the instrument set to open position with the sustain pedal held, play a B-Major arpeggio, as follows: F#4, D#4, B3. Move the pitch-wheel all the way up. It will look and sound like [this video demonstration](#).

Repeat this gesture one octave higher. It will look and sound like [this video demonstration](#).

The two phrases are alike in playing technique, but they do not sound alike at all. In fact, the second example consists of just one note that slides through the three pitches played. This is because when the instrument is in open position, all three of these pitches lie on string one's keyboard range. To play the lick an octave higher, we need to put the instrument in twelfth position.

Try manually setting the position to position twelve, and try the same lick again. It works – here's a [video demonstration](#).

Now reactivate Auto-Position Mode by playing G#1, and try playing the two licks again, this time not bothering to change position manually at all. Don't move CC#4, and don't play any position keyswitches. [Here's a video of what it should look and sound like](#).

Notice, again, that both licks work as intended this time around, despite the absence of any manual position control. It worked this time because Auto-Position Mode was active; Since the lick works when it starts on string one, we set the secondary starting string to string one, and Auto-Position Mode automatically sets the instrument to open position when the first phrase was begun of F#4 with the pedal down, and then set it to twelfth position when a new phrase was started a whole step higher.

[Here's a video of what would happen if we continue to play the same phrase at further transposed pitch levels with Auto-Position Mode turned on](#).

As you can see, auto-position mode can be very useful for making easy position changes, especially in contexts where a certain phrase is being played at different pitch levels. Here are a couple of things to keep in mind when using auto-position mode:

1. Playing block chords can put you at risk of landing in the wrong position – this can happen if the note intended to be the first note of the phrase is not played first. Instead of playing chords with no intention of starting on a particular string, aim to play the note which you need to fall on that starting string just a split second before the others. This will guarantee that auto-position mode functions as you need it to.
2. Starting a phrase on a note which is outside the playable range of the starting string will put the instrument in either position one or position twenty-four; if the starting string is string four and you start a phrase on a B3, the instrument will set itself to open position, and the note will sound on string five, since B3 is below the playable range of string four (D#4 - G6). Similarly, if the starting string is string ten and you start a phrase on E5, the instrument will set itself to position twenty-four, and the note will sound on string eight, since E5 is outside the playable range of string ten (A#2 - D5).
3. Hitting a position keyswitch or moving CC#4 while auto-position mode is active will deactivate auto-position mode and put the instrument in the position specified. Toggling the auto-position keyswitch off again will leave the instrument in the last position it was automatically switched into.

4.5) Important Expressive Controls:

Other than using CC#4 for position control, you need to use several other controllers to get expressive performances out of the Wavelore Pedal Steel Guitar. These other controllers are your mod-wheel, expression pedal, the pitch-wheel, and CC#5 (portamento time).

4.5.1) The Mod-Wheel

This all important controller does three different things:

I) The mod-wheel controls vibrato depth and speed. Most pedal steel playing uses a gentle roll of the slide to impart a subtle, sinusoidal variation on the pitch of a given note or chord. Play a note or chord, and slowly move your mod wheel while holding it. You will hear the pitch waver slightly. Additionally, the vibrato increases in speed as you increase the mod-wheel's value. It is possible to assign separate controls for speed and depth if you wish: please see section [5.4](#) on page 17 for instructions if you'd like to separate these functions.

II) The placement of the mod-wheel at the moment a note is released determines which of the two available release-sample types are used (this function is also re-assignable to any other controller if desired):

- Over the lower half of the mod-wheel's range (0-60), the instrument will use "palm damp" release samples. These releases use the subtle effect of the string being muted with the palm of the hand.
- Over the upper half of the mod-wheel's range (70-80), the instrument will use "pick damp" release samples. These releases use a less subtle effect of the pick stopping the string, resulting in a more noticeable "click" sound.
- While the mod-wheel is in the middle of it's range (61-69), no release sample is played.

III) The placement of the mod-wheel at the moment a note is released determines the volume of whichever release sample is played (this function is also re-assignable to any other controller if desired):

- Over the lower half of the mod-wheel's range, the palm damp releases will be attenuated (turned down) as the wheel approaches the center position, at which point they will be fully attenuated (inaudible). With the mod-wheel at zero, the palm damps will be as loud as possible, but still subtle.
- Over the upper half of the mod-wheel's range, the pick damps will be attenuated as the wheel approaches the center position, at which point they will be fully attenuated. With the mod-wheel at 127, the pick damps will be as loud as possible.

4.5.2) The Expression Pedal

The expression pedal should, if assignable, be assigned to control CC#11, in which case it will function just like the volume pedal, whose use is extremely common in pedal steel playing. Pulling it all the way to the "rear" position (open), will turn the instrument down to inaudible. If you play a note in this state and move the pedal forward, the note will fade in. This controller can be used to create swelling and fading effects, and can be used along with velocity to influence the instrument's place in a mix.

Important: A Note on the "Zipper Effect"

The zipper effect is a common term for the tendency of MIDI control messages to sound less smooth than sources of analog control. In the case of the Wavelore Pedal Steel Guitar, it can be particularly evident when using the expression pedal. What happens is this: Unlike an analog volume pedal, the MIDI expression pedal only transmits 128 increments of data. Further, if the physical controller is moved quickly over a large range of values, the hardware will "steal" a significant amount of these increments. Imagine starting with the pedal at zero, hitting a note, and moving the pedal as quickly as you can to full value. The result could be that the volume does not progress smoothly from zero to 127, but rather jumps from zero to say, 24, then to 56, to 70, to 100, and finally to 127. Including the extremes, our smooth swell has been reduced from a nice sounding curve to a "stair case", with just six steps.

In order to avoid this problem, we recommend using the expression pedal in the same subtle manner as a real pedal steel player would use his or her volume pedal. Most of the time, they do not swell from off to full, let alone do they do so

quickly. When using the pedal to affect the attack of a note, it's usually rocked back to about 50% of it's volume, and the forward motion is much slower than our above example. Experiment to gain a feel for just the right pedal technique.

4.5.3) *Pitch-Wheel*

The default settings for pitch-wheel behavior allow a number of stock pedal steel style chordal bends, since each string of the instrument has its own pitch-bending range. For example, one of the easiest tricks to perform using the pitch-wheel is the I → IV progression. In the open position, this is an E-major → A-major progression, performed by one of two means:

- Play any E-major chord, and move the wheel up all the way. The E note remains static while the G# moves to an A, and the B moves to a C#, spelling an A-major chord.
- Play any A-major chord with the wheel moved all the way down. Your A note will sound as a “pre-bent” G#, and your C# will sound as B. Then move the wheel to the center position to return the pitches to those you played, sounding an A chord.

Similarly, while the secondary string group is active, most inversions of the B-major chord can bend upward to a C#-minor chord, creating a V → vi progression:

- Play a B-major chord (B3, D#4, F#4) with the pedal down, and move the wheel up. The B will bend to a C#, the D# to an E, and the F# to a G3, spelling a C#-minor chord.
- Reverse the progression by starting with the wheel moved up fully, then return the wheel to its center position.

This progression does not work on all inversions of the B-major chord; if you play, for example, B2, D#3, and F#3, then move the wheel up, the D# does not bend at all, leaving the C#-minor chord incomplete. To finish the change, use portamento to slide the D# to E while performing the pitch-wheel movement.

You can also perform the following trick to slide into an F#-minor chord:

- With the pedal up, play B3, F#4, and G#4 together (this could be viewed as an E-major with the root pre-bent to the ninth, F#).
- Move the wheel all the way up, bending the B to a C#, and the G# to an A, spelling an F#-minor chord.

Try the same trick, but starting from a pure E-major chord, (eg: B2, E3, G#3), and move the wheel up while using portamento to slide the E to an F#. This is a true I → ii progression.

The same possibilities exist when using the “Enhanced” preset for pitch-wheel behavior (see section XX for details), with two important additions:

With the pedal up, and E-major chord, rather than bending downward to an A-major chord, will bend to a B7, where the interval between G# and E will resolve inward (the notes move in opposite directions) to sound A and D#. The reverse is true when bending back up from this position.

With the pedal down, the E-major will also bend down to a B chord, but this time with no seventh, and with more “correct” voice leading than when using the original preset; B stays static, while E bends to D# and G# bends to F#. Again, the reverse occurs when starting with the wheel already down. This is different from the original preset in that the original preset has B bending down to A, sounding a seventh (A), but omitting the root (B). With the enhanced preset, you have access to both the V and the V-7 chord in any position.

Using either pitch-wheel preset, there are a great many possibilities for sounding chord progressions via bends combined with keyboard portamento. In fact there are too many for us to codify. Please experiment liberally, and note your findings! If there is something you want to do, but can't, you may be able to accomplish it using a custom pitch-wheel setup: Please see [Section 5.2](#) for instructions for setup of custom pitch-wheel configurations.

4.5.4) *Portamento Time (CC#5)*

Having a controller assigned to CC#5 is important because it allows access to the extremes of slide speed. The default

speed allows a considerable range to be accessed via velocity of target notes, but using CC#5 allows you to play slides that are extremely fast or slow. By default, portamento speed is controlled by a combination of velocity and CC#5, which allows bends of different speeds to be played without having to change any controllers. In this configuration, CC#5 allows access to faster and slower ranges of speeds. That is, with CC#5 at zero, velocity will change bend speed from very fast to medium fast, whereas with CC#5 at 127 will allow velocity to modulate speed between medium slow and very slow. There are many user-definable parameters. Editing them to taste is covered in [Section 5.1](#).

5) Editing the Instrument's Setup

There is always a possibility that a given instrument configuration will not behave in the way you may prefer. Given the enormous number of possible opinions on how any instrument should be configured, we've done everything possible to offer the best out-of-the-box programming we can in this library, but you may still have certain reservations or differences of opinion. These differences could be about a wide variety of choices, including:

- Choice of assigned controllers: Many may want, for example, to have the instrument use different controllers for vibrato and release control, where our configuration uses the mod-wheel for both.
- Vibrato style: Our choice was one of a medium-slow, subtle vibrato. You may find a need for a more aggressive vibrato.
- Slide speed ranges: You may only want your bends and slides to vary from half a second in length to a full second, whereas our original setup offers a range from very fast to very slow. You can configure bend speed ranges and control sources in almost any variety you wish.

In addition to these variables, there are countless other ways in which the instrument could be different, and some of those ways could be better, at least for certain people or projects. This section contains instructions on some of the many ways that you can customize the sounds in the library to suit different needs or tastes.

5.1) About the Pitch/Volume Page (Default View)



Concept:

In the screen-shot above, the various knobs and buttons allow you to configure the expression control (volume), bend speed control sources and range, neck position control (including on/off, routing, and volume controls for the voice guide), sustain pedal usage, and the MIDI control for alternating the primary strings with the secondary ones.

Controls:

- 1) *Page Menu*: This control is always visible, and allows you to view the settings displayed by default, the settings for pitch-wheel behavior, keyswitches, release sample behavior, the virtual amplifier models, or the about box.
- 2) *Volume Control*: Choose your MIDI continuous controller for volume pedal emulation. Alternatively, set it to 128 to activate "learn mode". While in learn mode, you can simply move the controller on your MIDI keyboard that you wish to assign as the expression control. Click "OK", or play a note on your keyboard, and your assignment is saved.
- 3) *MIDI Bend Speed Controller*: Choose your MIDI continuous controller for bend/slide speed control. Alternatively, set it to 128 to activate "learn mode". While in learn mode, you can simply move the controller on your MIDI keyboard that you wish to assign as the speed control. Click "OK", or play a note on your keyboard, and your assignment is saved. Once set, moving the assigned controller will change the speed of bends to the

corresponding point between the minimum and maximum speeds (displayed in item # 5).

- 4) *Speed Control Source*: Allows four possible choices of how slide/bend speed is determined:
 - I) *Controller*: The controller assigned by item # 3 will determine the duration of all pitch bends.
 - II) *Velocity*: The velocity of the “target note” (the note that the original pitch will bend up or down to) sets the speed of the bend.
 - III) *Velocity + Scale*: The velocity of the “target note” (the note that the original pitch will bend up or down to) sets the speed of the bend, but the speed will be scaled by the percentage of the full speed range displayed in item #6.
 - IV) *CC+Velocity*: The MIDI controller set in item #3 will determine the CC-based speed of the bend, but the velocity of the “target note” (the note that the original pitch will bend up or down to) will offset the speed in either direction, depending on whether the target note’s velocity is less than 64 (slows the bend) or greater than 64 (speeds the bend up).
- 5) *Bend Speed Range(min and max)*: Set the fastest (min) and slowest (max) bend times, whose values then will be interpolated by your choice of control sources and/or velocity scaling when playing bends and slides.
Velocity → Speed Scaling Factor: The extent to which target note velocity offsets the CC-based speed of the bend is determined by this control. Setting it to zero will prevent velocity from affecting bend speed, whereas setting it to 100 will allow the full specified range of speeds to be accessed.
- 6) *Velocity Scaling Factor*: Determines the extent to which target note velocity affects bend speeds. Lower values limit the effect of velocity, whereas higher values allow a greater portion of the overall speed range to be accessed without moving the assigned CC.
- 7) *Neck Position Control*: Choose the MIDI continuous controller that will be used to select the active neck position. Alternatively, set it to 128 to activate “learn mode”. While in learn mode, you can simply move the controller on your MIDI keyboard that you wish to assign as the neck position control. Click “OK”, or play a note on your keyboard, and your assignment is saved.
- 8) *Voice Guide On/Off*: Activates or deactivates the voice guide. If active, a voice will call the number of the active position when the neck position control is moved.
- 9) *Voice Guide Volume*: Set the volume of the voice guide to taste.
- 10) *Use Volume Control*: Adds the volume control as set in item #2 as an additional volume control for the voice guide; If set to “On”, your assigned volume CC will further attenuate voice guide samples triggered by position changes. If it is set to “Off”, the voice guide volume will only be affected by item #9.
- 11) *String Switch*: Choose your MIDI continuous controller for real-time switching between primary and secondary strings. Alternatively, set it to 128 to activate “learn mode”. While in learn mode, you can simply move the controller on your MIDI keyboard that you wish to assign as the switch control. Click “OK”, or play a note on your keyboard, and your assignment is saved. Once set, moving the assigned controller to a zero value will activate only the primary strings, whereas moving it to a value of 127 will activate a combination of the primary and secondary strings.
- 12) *Voice Guide Routing*: This button lets you route the samples triggered by position control or keyswitch to alternate outputs of your sound card. Set to 1 / 2 if you wish to hear the voice guide through the same monitoring system as the instrument, or set to 3 / 4 if you wish to monitor the voice guide separately. The second setting can be useful for monitoring the voice guide in live performance where it is undesirable to broadcast the voice over the main system.
- 13) *Use Sustain*: This button can be used to set whether the sustain pedal will function in a traditional manner or not. Since the pedal allows a convenient hands-free controller for primary/secondary string switching, it may not always be desirable to allow it to also hold notes. It can, however, make certain chordal bending techniques easier, since sustaining a chord allows the fingers to release before striking any target notes to which the sounding chord tones will bend. Using this control and optionally re-assigning the string switch (#11, above), the

user can decide just how to configure the combination of switching and sustaining.

5.2) About the Pitch-Wheel Page



Concept:

In version 2.5, you can now specify the range (in semitones) for the pitch-wheel, with discrete control over both the upward and downward range of each individual string. The original settings are included as a preset, as well as a new “enhanced” setting which allows the wheel to resolve tritones in contrary motion – see below for an explanation of the importance of this ability. Also included are several “lock” functions, which allow simultaneous setting of all strings, which saves editing time.

Controls:

1) *Preset Menu*: Presents the following options:

I) Original – Sets the pitch-wheel's effect on the individual strings as follows. Strings are color coded using the same scheme as the keyboard diagrams in the “Really Quick Start” and “Quick Start” guides earlier in this document :

String #	Upward Range (Semitones)	Downward Range
1	+2	-2
2	+1	-1
3	+1	-1
4	0	0
5	+2	-2
6	+1	-1
7	+2	-2
8	0	0
9	+1	-1
10	+2	-2

II) Enhanced – Sets the pitch-wheel's effect on the individual strings as follows. Ranges that differ from the “original” preset are highlighted according to the same color code as the keyboard diagrams in the “Really Quick Start” and “Quick Start” guides earlier in this document:

String #	Upward Range (Semitones)	Downward Range
1	+2	-2
2	+1	-1
3	+1	+1
4	0	-1
5	+2	0
6	+1	+1
7	+2	-2
8	0	-1
9	+2	-1
10	+2	0

Note that all of the highlighted strings have different ranges for their upward and downward wheel movements. The exceptions are strings six and three, both of which will always bend upward by one semitone whether the wheel is moved up or down. The benefit to this system is derived from one very typical gesture often employed by pedal steel players:

When in open position, combinations of strings 3, 4, 6, 8, and 10 (the primary strings) together with pedaling can be used to play all three of the I (E-major), IV (A-major), and V7 (B7) chords. Playing, say, strings 5, 4, and 3 with no pedals will produce an E-major chord (B3, E4, and G#4). Stepping on the first two pedals will bend the B and the G# to C# and A respectively, resulting in an A-major chord (C#4, E4, and A4). Releasing the first pedal will bend the C# back to a B while the A remains unchanged. Simultaneously moving the right knee lever will drop the E down to a D#, resulting in a B7 chord (B3, D#3, and A4), which can resolve back to E-major (B3, E4, G#4). In notation, the process looks like this:

E A A B7 B7 E

I⁴ IV⁶ IV⁶ V⁷ V⁷ I⁴

Notice the contrary movement of the A → G# and the D# → E in measure three. While previously only possible using simultaneous keyboard portamenti in opposite directions, it's now possible to perform this chordal bending technique using just the pitchwheel; with the “enhanced” preset enabled, follow these guidelines:

- 1) Play the E chord in measure one.
- 2) Move the pitch-wheel all the way up to transition to an A chord.
- 3) Return the pitch-wheel to the center position, and play the A chord in measure two.
- 4) While holding the A chord, play B3 and D#4, either together or one at a time.
- 5) With the pitch-wheel pulled all the way down, play the E chord in measure three. What will sound is the B7 in the same measure.
- 6) Return the wheel to the center position – the B7 chord will bend to the E chord, with the D# ascending to E and the A descending to G#, just like the voice leading a pedal steel player would use, but without the necessity of playing awkward contrary legato technique on the keyboard.

To summarize the purpose of this new wheel configuration: This setup allows the I chord in the key whose tuning corresponds to the current position (Open = E, 1st = F, 2nd = F#, etc) to bend upward to the IV chord, and downward to the V7. Further, the I bends conveniently downward to a V (no 7th) when the string switch is on (default: sustain pedal), and the V → vi (B → C#m) movement attainable with the switch engaged is still preserved.

I) Lock All: This preset will allow you to change any one of the values shown for the per-string wheel ranges and quickly match all others to it. It is useful if you'd like to set the entire instrument to use the wheel traditionally. For example, if you wished to have the entire instrument bend upward by two semitones and downward by two semitones, you would choose this preset, and could then set the all strings by adjusting any one string's upward or downward range.

II) Lock All Upward: Similar to "Lock All", but only locks the upward values of the strings' wheel ranges to each other. Use this setting if you want to set all strings' upward pitch-wheel ranges to the same value at once, but still want to maintain separate editing capability for the downward ranges.

III) Lock All Downward: Similar to "Lock All", but only locks the downward values of the strings' wheel ranges to each other. Use this setting if you want to set all strings' downward pitch-wheel ranges to the same value at once, but still want to maintain separate editing capability for the upward ranges.

IV) Lock Upward+Downward: Locks each string's downward and upward values. Moving any string's downward or upward value with this preset engaged will set the opposite wheel direction to the negative of the value set. For example, with this preset selected, changing string one's upward wheel range to "+5" will set that string's downward wheel range to "-5". Use this preset if you want to change each string's values individually, but want their up/down values to be the same, as in traditional pitch-wheel behavior.

- 2) *Individual Pitch-Wheel Range Values:* Each value edit field is the value (in semitones) that that string can bend upward or downward. You can click the arrows, click and drag, or double-click and type a value. All ranges are from -12 to +12, and either upward or downward ranges can use either positive or negative numbers; thus, it is possible to "invert" the pitch-wheel behavior for any string of the instrument if desired. To implement inverted wheel behavior, simply set the desired string's upward range to a negative value and set its downward range to a positive.

There are many possibilities for interesting harmonic tricks and sound effects to be discovered when you start experimenting with the pitch-wheel settings. To return the instrument to its factory state, simply select "original" from the presets menu.

5.3) About the Keyswitches Page



Concept:

In the screen-shot above, the various controls allow you to configure a series of keyswitches and the range of positions that they will make available. From this page, you can also switch the voice counter for keyswitched position changes on or off, as well as set parameters for “auto position mode”, which can be used to let the instrument set your position based on a preselected starting string for each phrase played.

Controls:

- 1) *Minimum position Keyswitch*: The lowest keyswitch, which will correspond to the minimum position via keyswitch (set in #3). Set to 128 to activate learn mode. Once in learn mode, play the desired minimum keyswitch, and click “OK” to accept your assignment.
- 2) *Maximum Keyswitch Display*. This label displays the note name of the highest keyswitch, which is automatically set based on the minimum keyswitch and the position range, set in items #3 and #4.
- 3) *Minimum Position Via Keyswitch*: this control sets the lowest neck position that will be available via keyswitch. For example, if set to 0, hitting the minimum position keyswitch set in #1 will activate the open position. If set to 10, hitting the minimum position keyswitch will activate position ten.
- 4) *Maximum Position Via Keyswitch*: this control sets the highest neck position that will be available via keyswitch. For example, if set to 10, hitting the maximum position keyswitch set in #2 will activate the tenth position. If set to 12, hitting the maximum position keyswitch will activate position ten.
 - Please note: Since the number of keyswitches and the number of keyswitchable positions must be equal, editing any of controls 1, 3, or 4 will have effects on the others. For example, if positions 0-12 are available and the minimum position keyswitch is re-assigned to G1, the maximum position keyswitch will change to G2 to reflect this change. Additionally, if the maximum position via keyswitch is then boosted to 13, the maximum position keyswitch will increase by one MIDI note value to G#2, in order to keep the number of keyswitches the same as the number of positions used.
- 5) *Voice Guide on KS*: De/Activates the triggering of voice guide samples for position changes via keyswitches. Since the voice guide was originally included to aid with CC# triggered position switching, it may be necessary to use it for that purpose, but not for keyswitches, since they are easier to change accurately on the fly.
- 6) *Auto-Position Mode*: Switches between auto position off and auto position by keyswitch.
- 7) *Auto-Position Keyswitch Display*: Shows the keyswitch used to toggle auto-position mode on or off. The note will always be one semitone below the minimum position keyswitch, and is set as such automatically when the minimum position keyswitch is changed. Also displays the current auto-position mode status (on or off).
- 8) *Auto-Position Primary Start String*: Set the starting string for phrases begun with the string group switch set to

zero (default: sustain pedal – [see section 4.1 - About the Pitch/Volume Page](#), control # 11). When the first note of a phrase is played on the primary strings, the position will be set to the one corresponding to the location of that note on the selected string.

- 9) *Auto-Position Secondary Start String*: Set the starting string for phrases begun with the string group switch set to 127 (default: sustain pedal – [see section 4.1 - About the Pitch/Volume Page, control # 11](#)). When the first note of a phrase is played on the secondary strings, the position will be set to the one corresponding to the location of that note on the selected string.

5.4) About the Vibrato/Damping Page



Concept:

In the screen-shot above, the various knobs and buttons allow you to configure the vibrato depth and speed, and assign MIDI controllers for real-time control of those parameters. From this page, you can also assign controllers for real-time selection and attenuation of release samples. There is also a master volume knob for release samples.

Controls:

- 1) *Vibrato Depth Controller*: Choose your MIDI continuous controller for vibrato depth. Alternatively, set it to 128 to activate “learn mode”. While in learn mode, you can simply move the controller on your MIDI keyboard that you wish to assign as the vibrato depth control. Click “OK”, or play a note on your keyboard, and your assignment is saved.
- 2) *Maximum Vibrato Depth*: Set the maximum vibrato depth to taste. This will be the width of the pitch fluctuation while the controller assigned in item #1 is at a value of 127.
- 3) *Vibrato Speed Controller*: Choose your MIDI continuous controller for vibrato speed. Alternatively, set it to 128 to activate “learn mode”. While in learn mode, you can simply move the controller on your MIDI keyboard that you wish to assign as the vibrato speed control. Click “OK”, or play a note on your keyboard, and your assignment is saved.
- 4) *Maximum Vibrato Speed*: Set the maximum vibrato speed to taste. This will be the speed of the pitch fluctuation while the controller assigned in item #3 is at a value of 127.
- 5) *Release Sample Selector Controller*: Choose your MIDI continuous controller for release sample selection. Alternatively, set it to 128 to activate “learn mode”. While in learn mode, you can simply move the controller on your MIDI keyboard that you wish to assign as the release selector. Click “OK”, or play a note on your keyboard, and your assignment is saved. Once set, this controller will determine which type of release sample is played when a note is released. [See section 4.5.1 for more details.](#)
- 6) *Release Sample Attenuation Controller*: Choose your MIDI continuous controller for real-time release sample volume control. Alternatively, set it to 128 to activate “learn mode”. While in learn mode, you can simply move the controller on your MIDI keyboard that you wish to assign as the release volume control. Click “OK”, or play a note on your keyboard, and your assignment is saved. Once set, this controller will determine which how loudly release samples are played when a note is released. [See section 4.5.1 for more details.](#)
- 7) *Release Sample Master Volume*: Set the master volume of release sample playback to taste. This setting will change the volume of the release samples in addition to the release sample attenuation controller.

5.5) About the Amplifier Page



Concept:

In the screen-shot above, the various knobs and buttons allow you to configure the tone of the instrument. EQ, reverb level, amp model and mic configuration can all be adjusted from this page.

Controls:

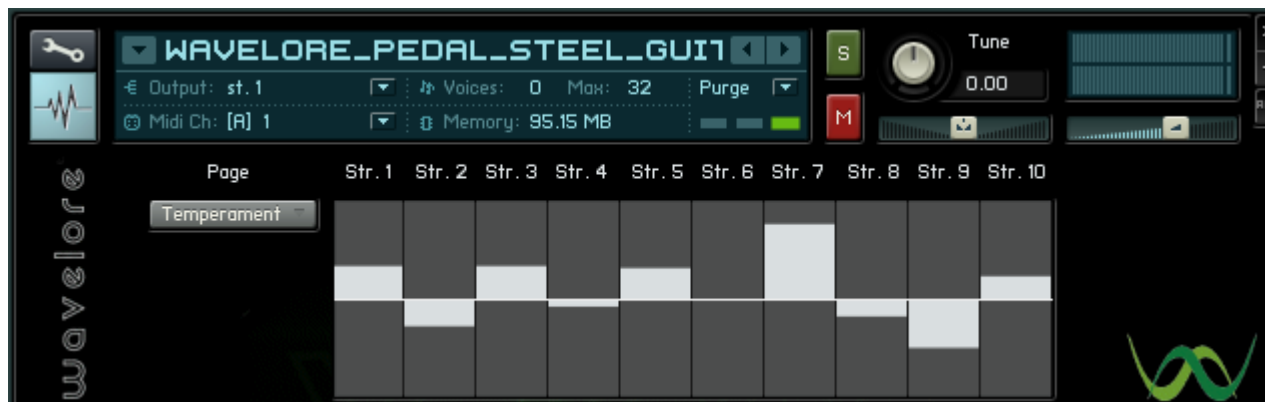
- 1) *Amp Simulation On/Off*: Acts as a bypass control for the amp simulation. You may want to set this to "Off" if you wish to use a 3rd party amp simulator with the instrument.
- 2) *Reverb Level*: Set the desired amount of reverb to taste. This control is only available for the first two amp models (see item #3, below), since the classic tube amp has no built-in reverb.
- 3) *Amp Type*: Choose between three possible amp models: Steel Guitar Amp, Modern Tube Amp, or Classic Tube Amp.
- 4) *Bright/Full Selector*: Set to "Bright" to add extra treble to the active amp model.
- 5) *Stereo/Mono Mic Selection*: Changes the available option in item #6 (see below) between pairs of stereo mics and single mono mics.
- 6) *Microphone Selector*: Choose the active microphone(s). Stereo options include a close pair of dynamic mics, an ambient pair of condenser mics, and two mixed configurations: One with a room mic on the left channel and a close mic on the right, the other being the opposite (Room mic right, close mic left).
- 7) *Three-Band Equalizer*: Set the bass, middle and treble output of the instrument to taste. Please note that extreme changes to these settings can result in significant volume changes that may result in clipping. Adjust the master volume (shown above the treble knob) to compensate.
- 8) *Tremolo*: This button performs two functions: First, it indicates the status of the Tremolo effect by highlighting when tremolo is active. Additionally, clicking this button will bring up the tremolo controls:



- 1) Speed: Set the rate at which the volume will oscillate.
- 2) Depth: Set the depth to which the volume will oscillate.
- 3) Switch Mode: Choose whether the tremolo is always off, always on, de/activated by keyswitch (“KS”), or de/activated by MIDI controller “CC”)
- 4) Switch: When Switch Mode is set to “Switch w/KS”, this control will allow you to set which key toggles tremolo on or off. When set to “Switch w/CC”, it will allow you to assign the controller used for the same purpose. Whether using a CC or a keyswitch, the control can be set to 128 to activate learn mode; Move your desired controller, or play the desired keyswitch, and click “OK” to accept the assignment.

Return to the amplifier page (or view another page) by selecting it from the “page” menu at the top left!

5.6) About the Temperament Page



Concept and Controls:

The screen-shot above shows ten sliding controls, each of which will “tune” one of the instrument's ten strings by up to +/- 50 cents, or a half a semitone. Temperament is used by advanced pedal steel players to allow their instruments to sit better harmonically in mixes featuring other instruments, such as strings or vocals, which may not be played in exactly equal temperament.

Advanced users may consider using this feature for the same sort of purpose, but with no changes made to this setting, the Wavelore Pedal Steel Guitar will play in “equal temperament”, which is the norm in most recording and performing situations.

5.7) Saving Your Changes

To save any changes you've made to the instrument, simply open the save dialog from within Kontakt and save the instrument under a new filename. You'll be able to load the instrument with your preferred configuration at a later time. If you are hosting Kontakt within your DAW, saving your project will save the changes made, but the original instrument will remain unchanged unless you use the save dialog.

6) Where to Get More Help

At Wavelore, we consider it our duty to ensure that you have the best possible experience with our products and support. If you've read this far, you probably already know that there is nothing simple about this instrument...well, there is one simple thing:

If you're having trouble, e-mail us and we'll help you!! We're at:

support@wavelore.com

There is also a support section on our website which will contain updates to the product as they become available, and currently contains links to a number of useful resources.

A2) Written Pitches Per-String (Sounding one octave lower than written)

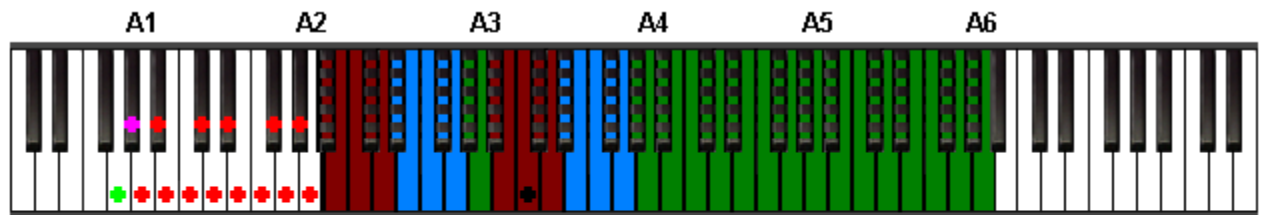
Here are the notes of the 1st twelve frets of each string, as shown on the octave-treble clef:

The image displays ten staves of musical notation, each representing a string. Each staff begins with an octave-treble clef and a sharp sign (#) on the first line, indicating a key signature of one sharp (F#). The notes are written as quarter notes on a five-line staff. The strings are labeled from String 1 at the top to String 10 at the bottom. The notes for each string are as follows:

- String 1: F#, G, A, B, C, D, E, F#, G, A, B, C, D
- String 2: G, A, B, C, D, E, F#, G, A, B, C, D
- String 3: A, B, C, D, E, F#, G, A, B, C, D
- String 4: B, C, D, E, F#, G, A, B, C, D
- String 5: C, D, E, F#, G, A, B, C, D
- String 6: D, E, F#, G, A, B, C, D
- String 7: E, F#, G, A, B, C, D
- String 8: F#, G, A, B, C, D
- String 9: G, A, B, C, D
- String 10: A, B, C, D

A3) Position Diagrams 0-24 (primary strings) (Watch As Video)

A3.0 – Open Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

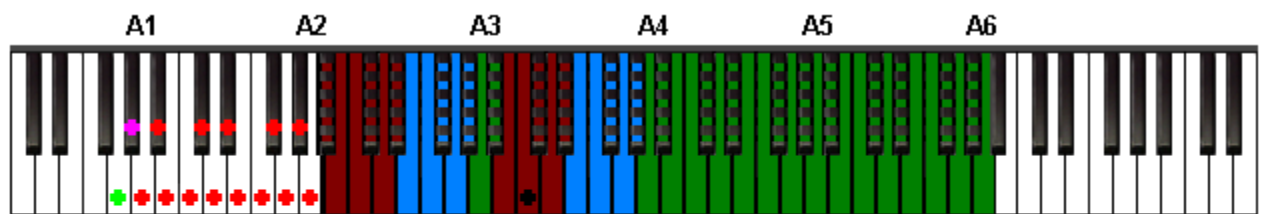
◆ =Middle C

◆ =Position Keyswitch

◆ =Auto-Position Keyswitch

◆ =Tremolo Keyswitch

A3.2 – Second Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

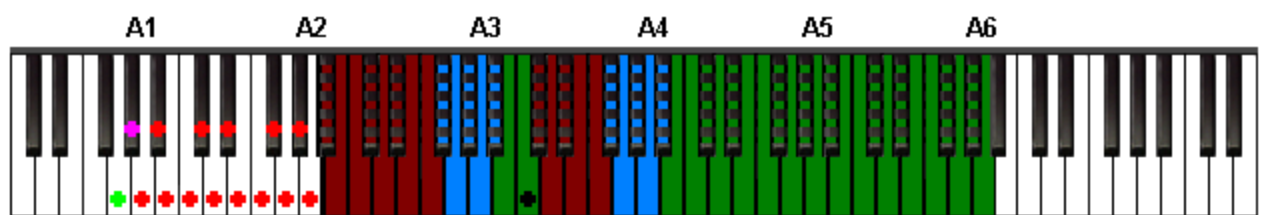
◆ =Middle C

◆ =Position Keyswitch

◆ =Auto-Position Keyswitch

◆ =Tremolo Keyswitch

A3.3 – Third Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

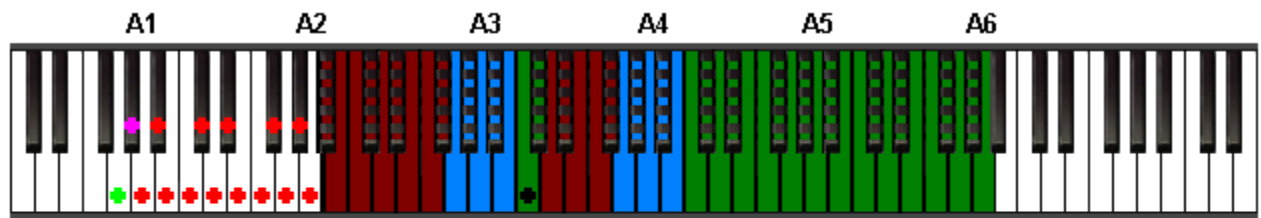
◆ =Middle C

◆ =Position Keyswitch

◆ =Auto-Position Keyswitch

◆ =Tremolo Keyswitch

A3.4 – Fourth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

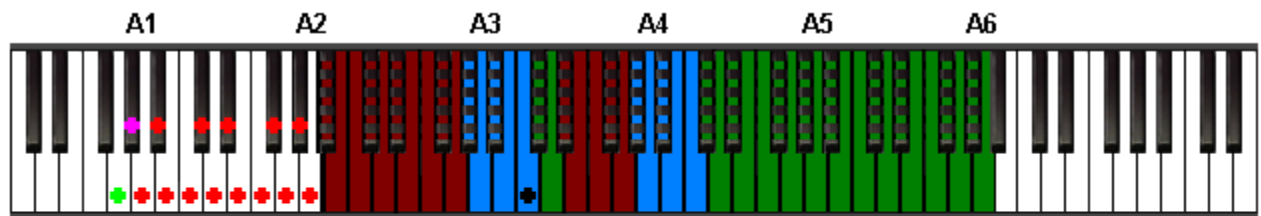
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.5 – Fifth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

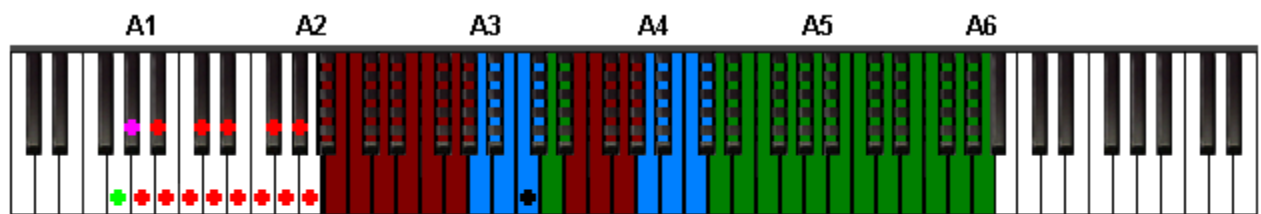
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.6 – Sixth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

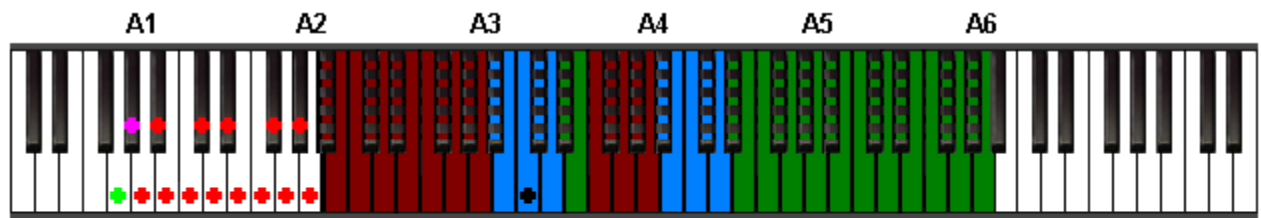
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.7 – Seventh Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

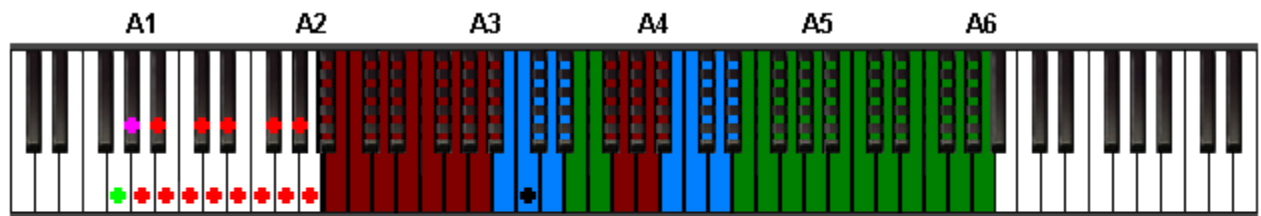
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.8 – Eighth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

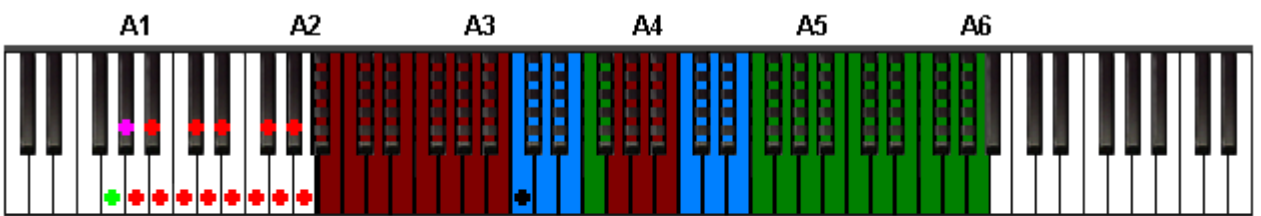
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.9 – Ninth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

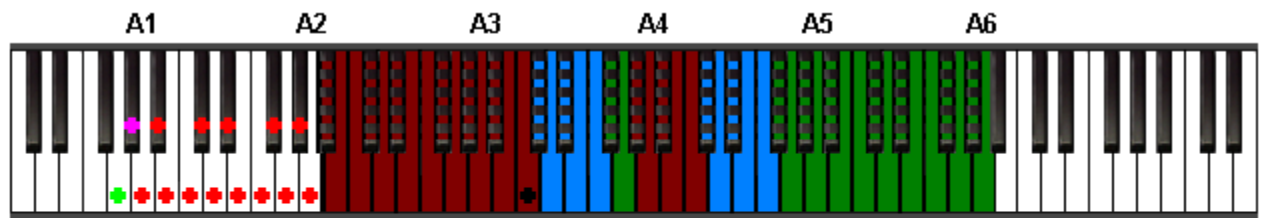
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.10 – Tenth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

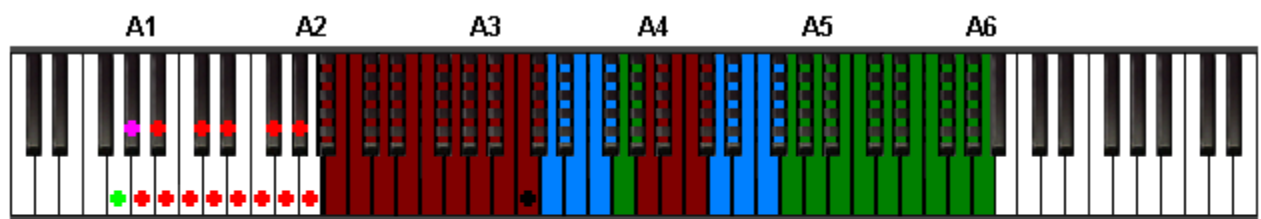
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.11 – Eleventh Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

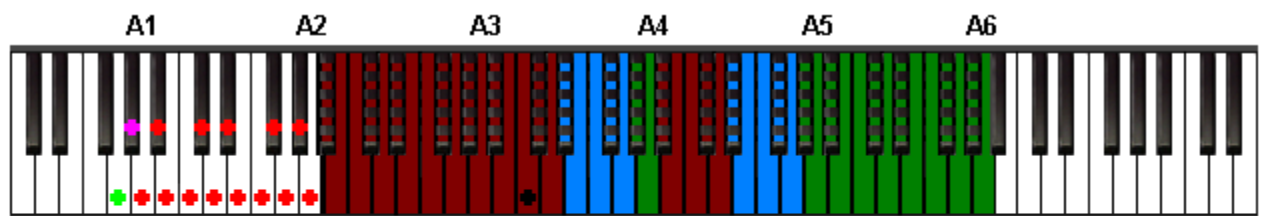
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.12 – Twelfth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

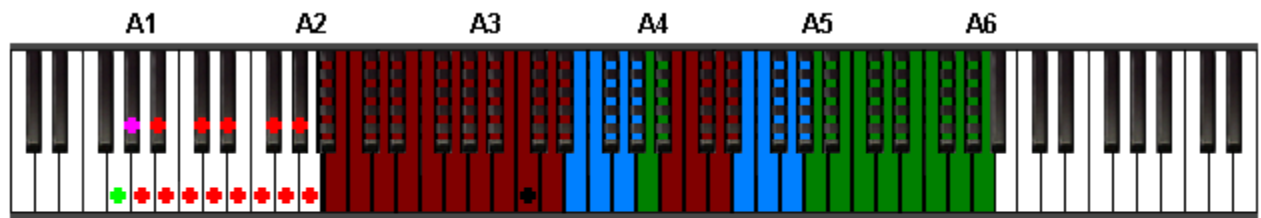
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.13 – Thirteenth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

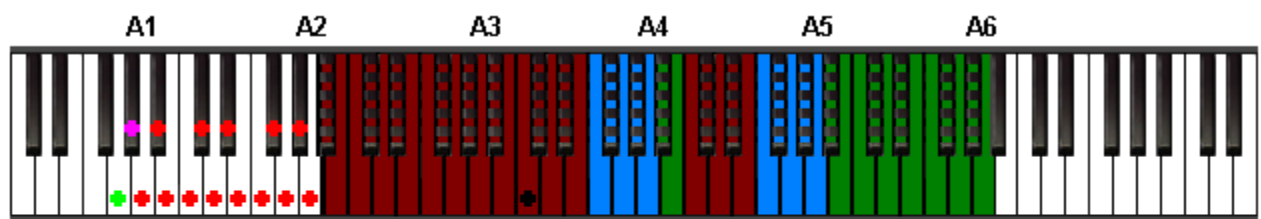
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.14 – Fourteenth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

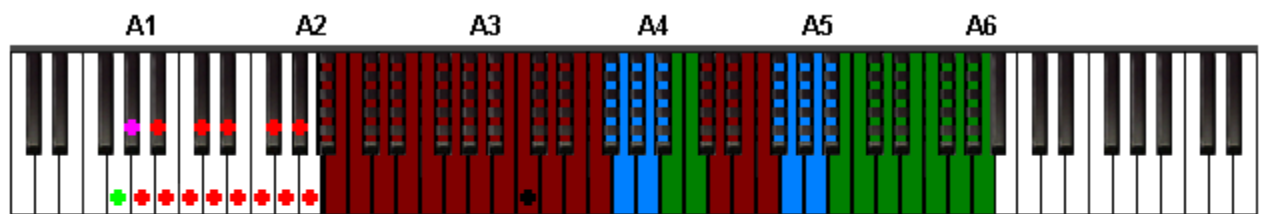
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.15 – Fifteenth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

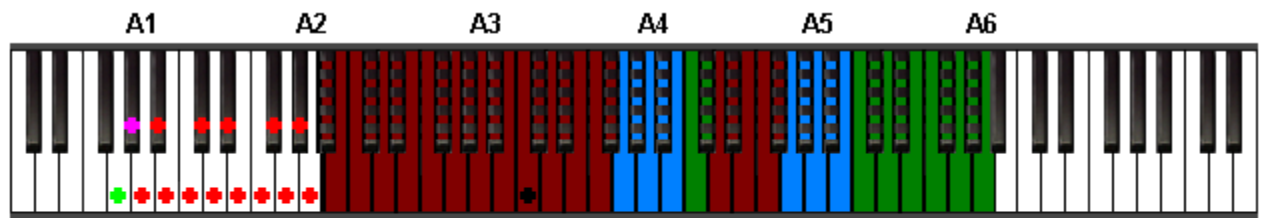
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.16– Sixteenth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

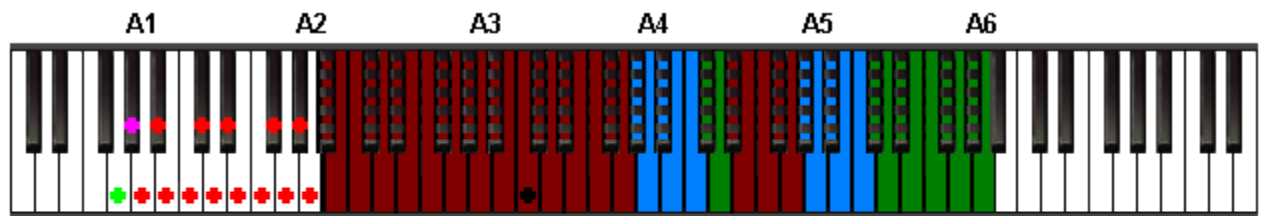
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.17 – Seventeenth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

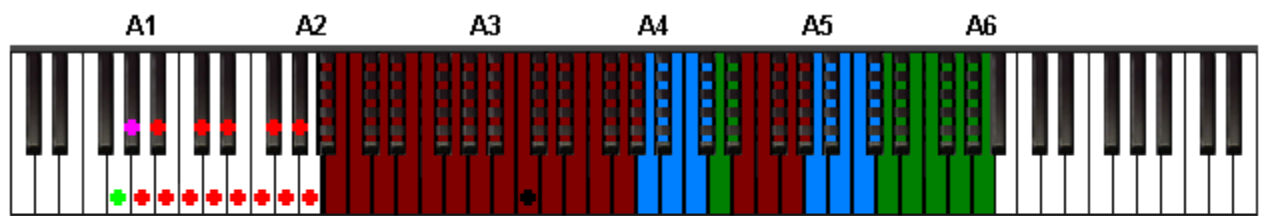
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.18 – Eighteenth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

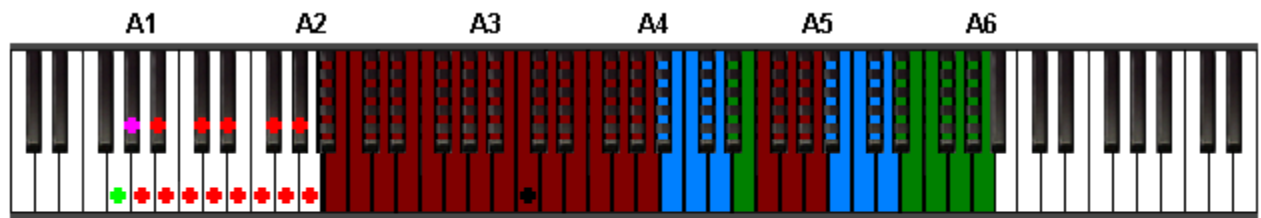
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.19 – Nineteenth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

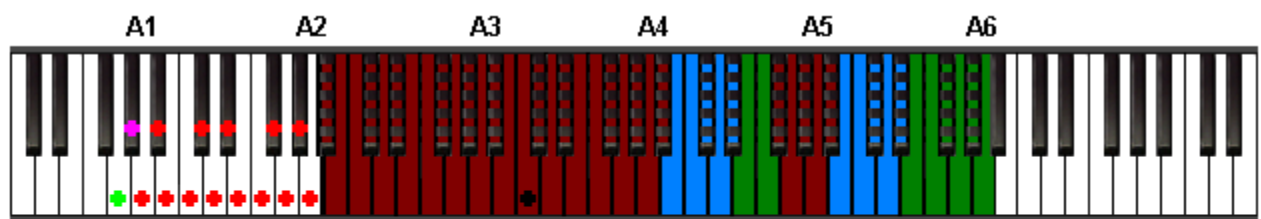
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.20 – Twentieth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

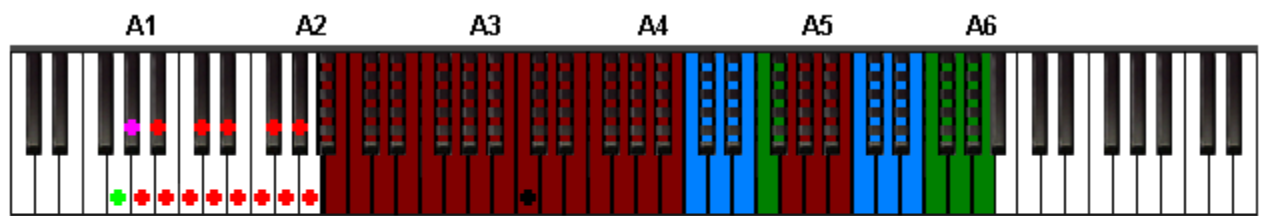
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.21 – Twenty-First Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

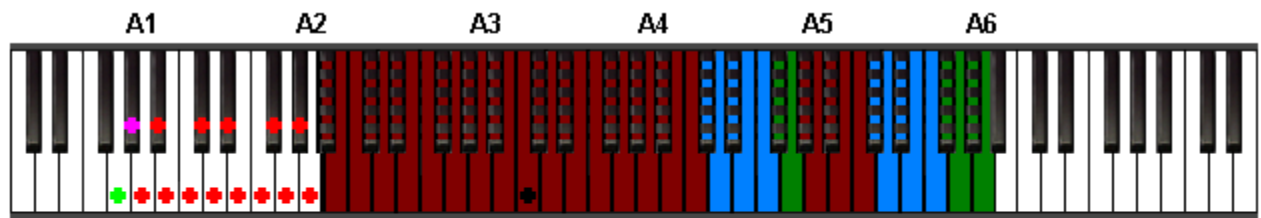
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.22 – Twenty-Second Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

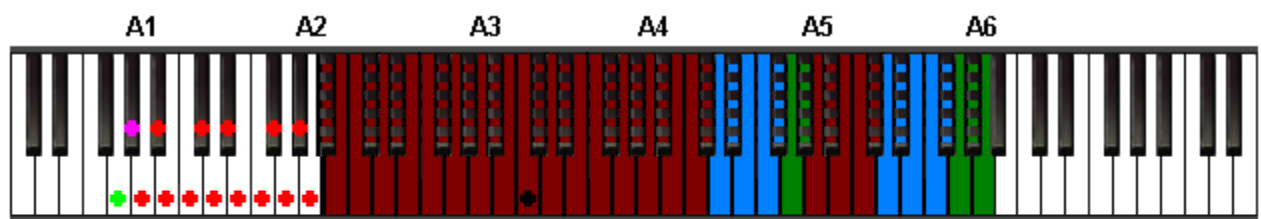
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.23 – Twenty-Third Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

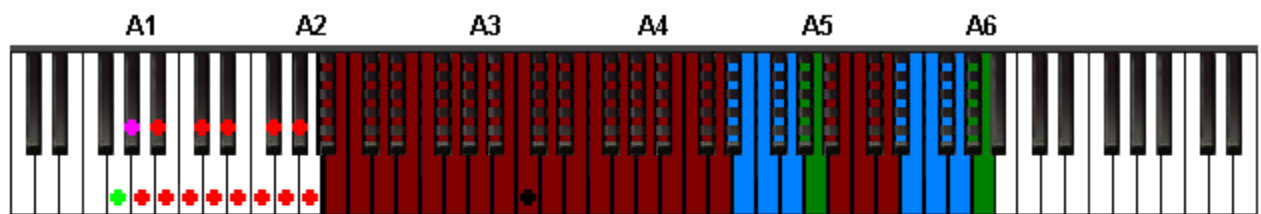
● =Middle C

● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

A3.24 – Twenty-Fourth Position



■ Strings 10 and 5

■ Strings 8 and 4

■ Strings 6 and 3

● =Middle C

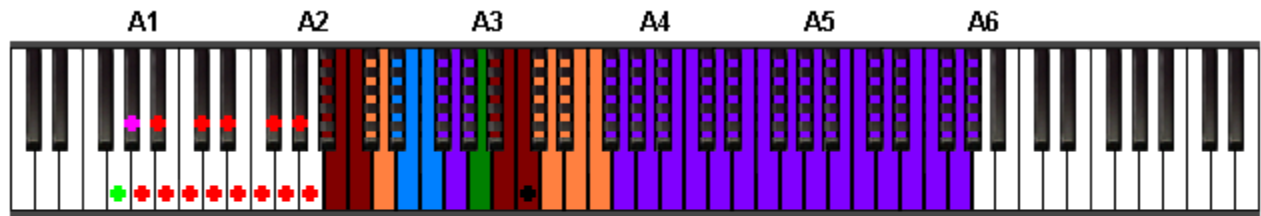
● =Position Keyswitch

● =Auto-Position Keyswitch

● =Tremolo Keyswitch

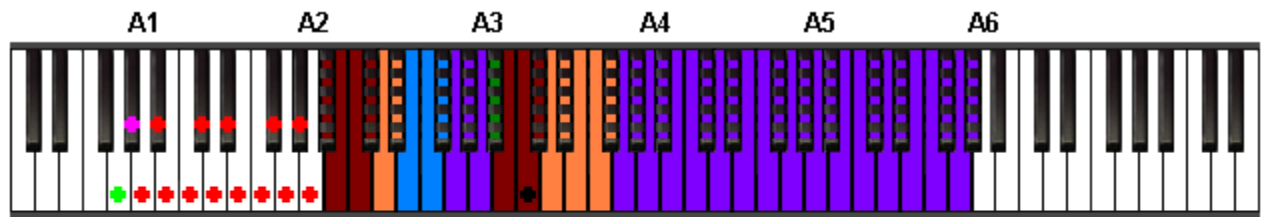
A4) Position Diagrams 0-24 (secondary strings) (Watch As Video)

A4.0 – Open Position



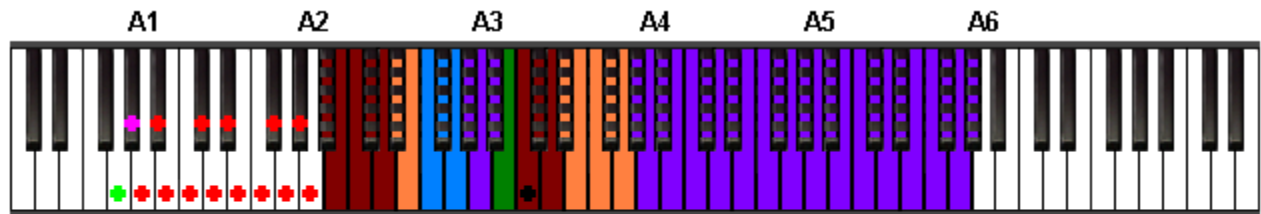
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A4.1 – First Position



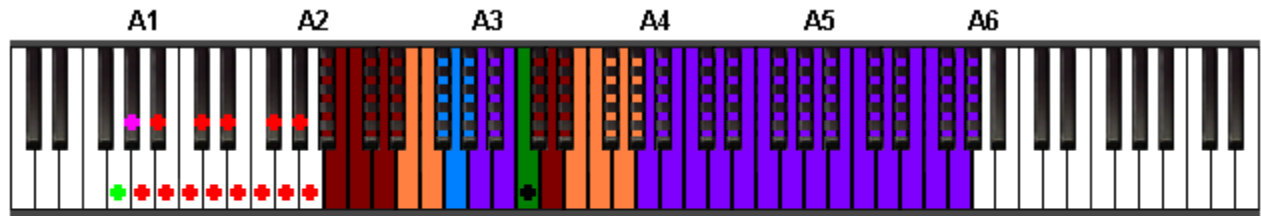
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A4.2 – Second Position



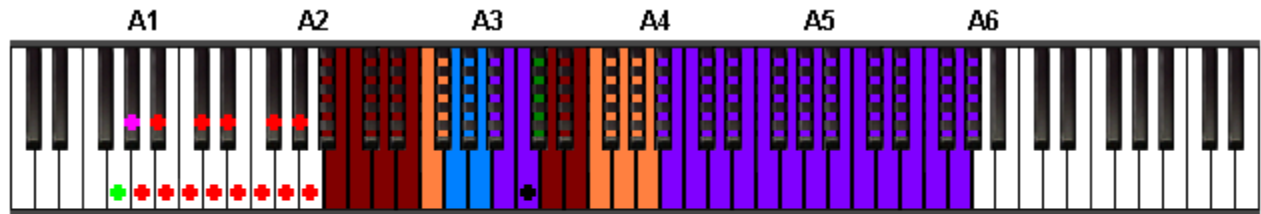
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A4.3 – Third Position



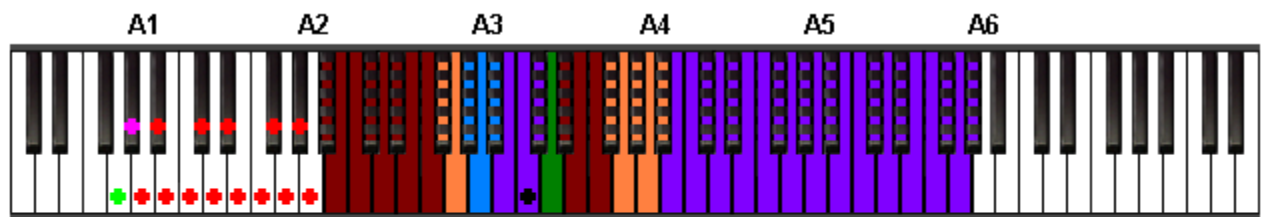
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch
-

A4.4 – Fourth Position



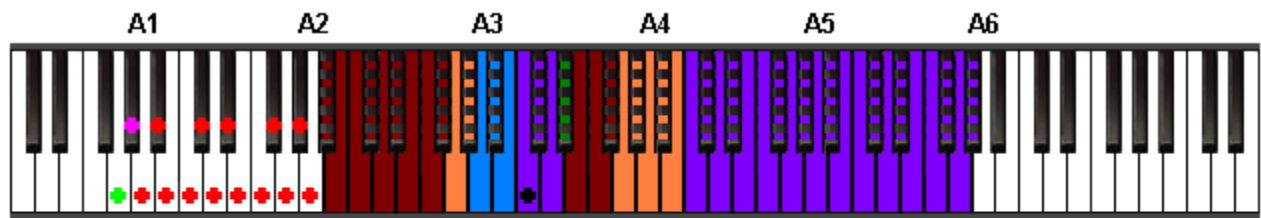
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch
-

A4.5 – Fifth Position



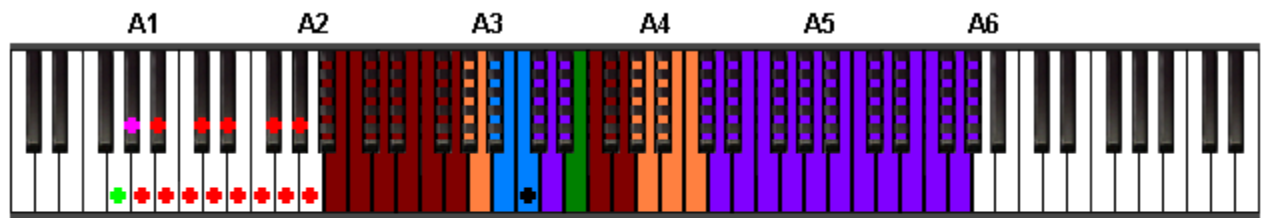
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.6 – Sixth Position



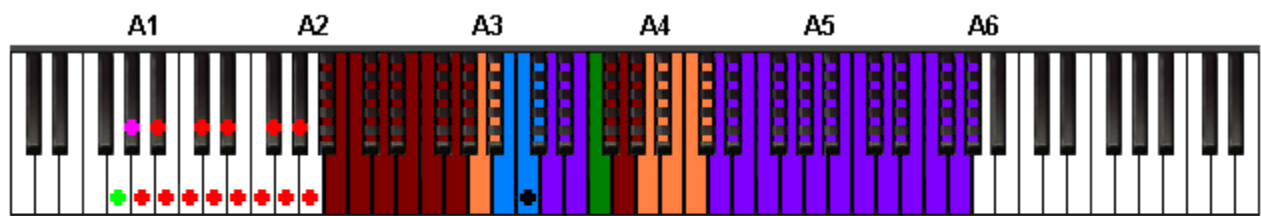
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.7 – Seventh Position



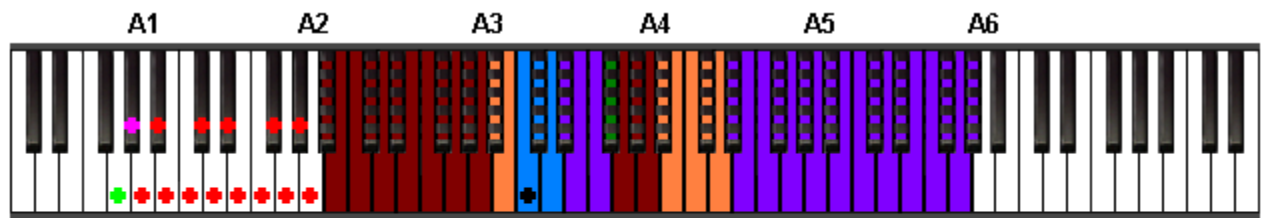
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.8 – Eighth Position



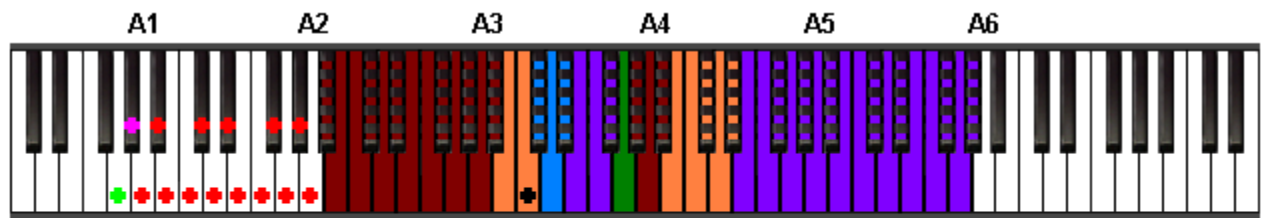
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.9 – Ninth Position



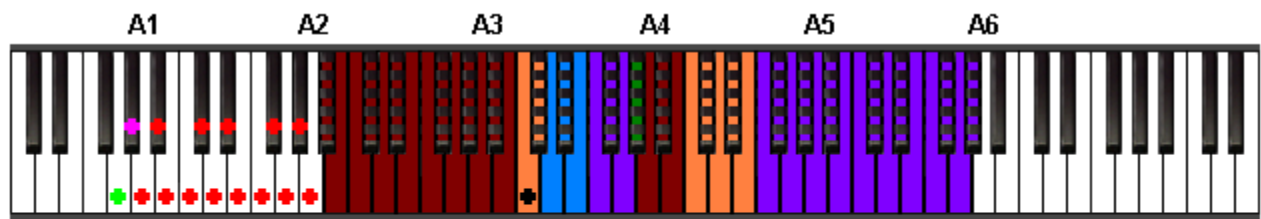
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.10 – Tenth Position



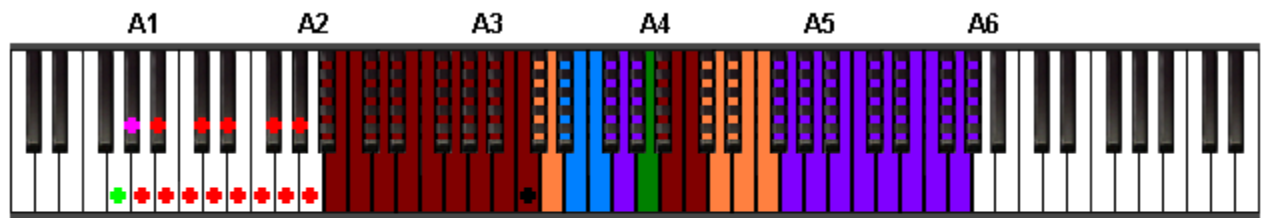
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.11 – Eleventh Position



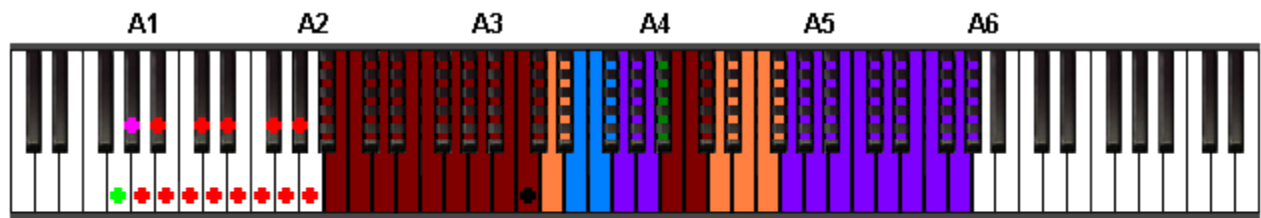
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
- =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.12 – Twelfth Position



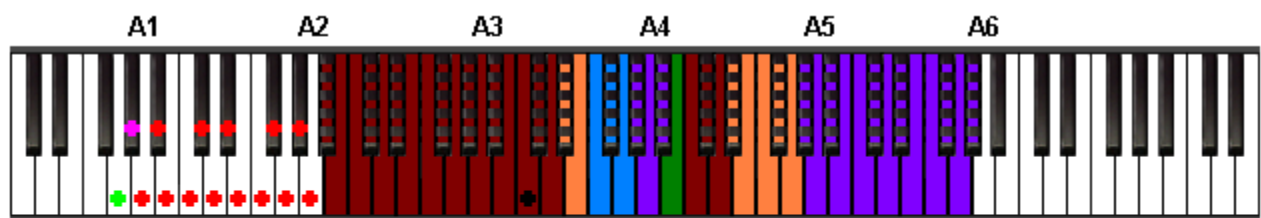
- Strings 10 and 5
- Strings 9 and 2
- String 8
- Strings 7 and 1
- String 6
- = Middle C
- = Position Keyswitch
- = Auto-Position Keyswitch
- = Tremolo Keyswitch

A4.13 – Thirteenth Position



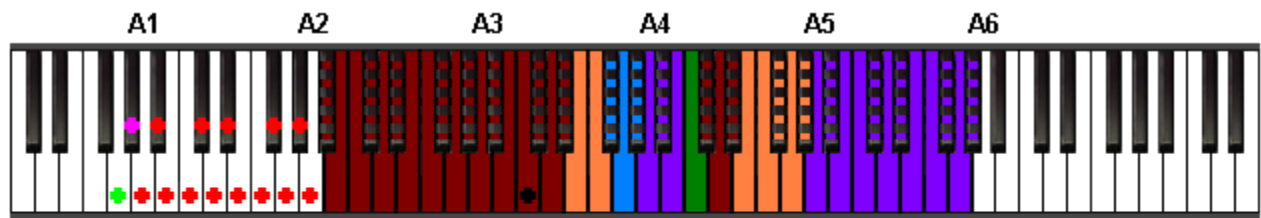
- Strings 10 and 5
- Strings 9 and 2
- String 8
- Strings 7 and 1
- String 6
- = Middle C
- = Position Keyswitch
- = Auto-Position Keyswitch
- = Tremolo Keyswitch

A4.14 – Fourteenth Position



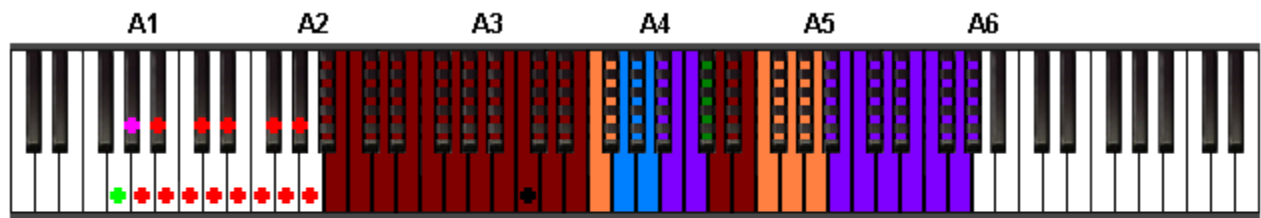
- Strings 10 and 5
- Strings 9 and 2
- String 8
- Strings 7 and 1
- String 6
- = Middle C
- = Position Keyswitch
- = Auto-Position Keyswitch
- = Tremolo Keyswitch

A4.15 – Fifteenth Position



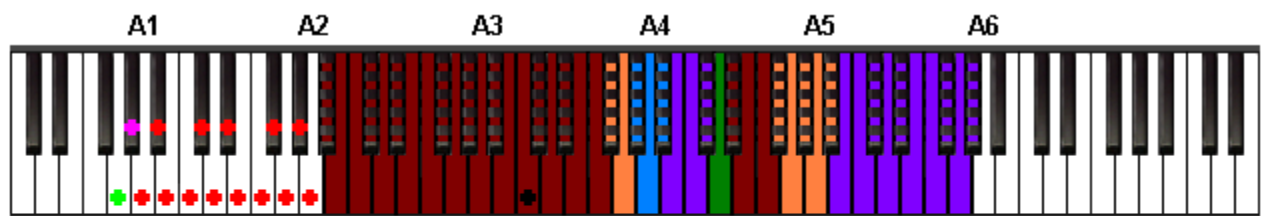
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
● =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.16 – Sixteenth Position



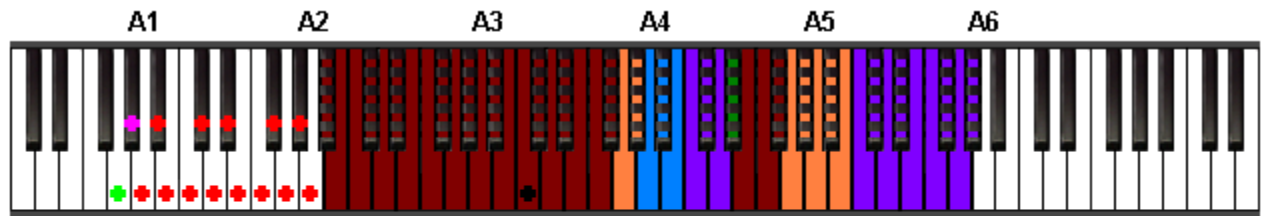
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
● =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.17 – Seventeenth Position



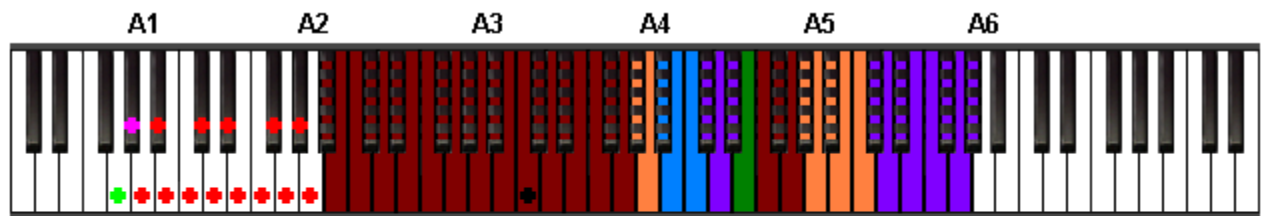
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
● =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.18 – Eighteenth Position



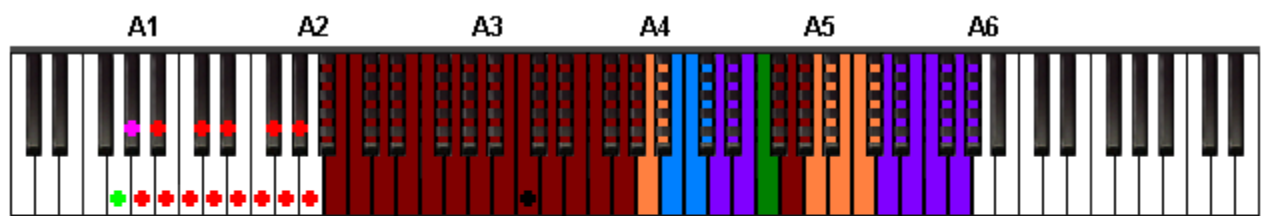
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
● =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.19 – Nineteenth Position



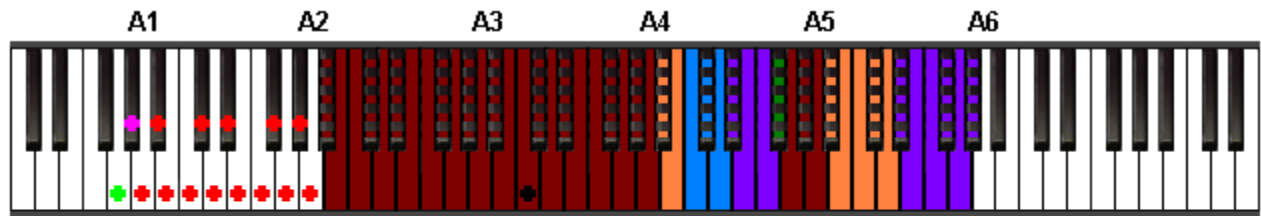
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
● =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.20 – Twentieth Position



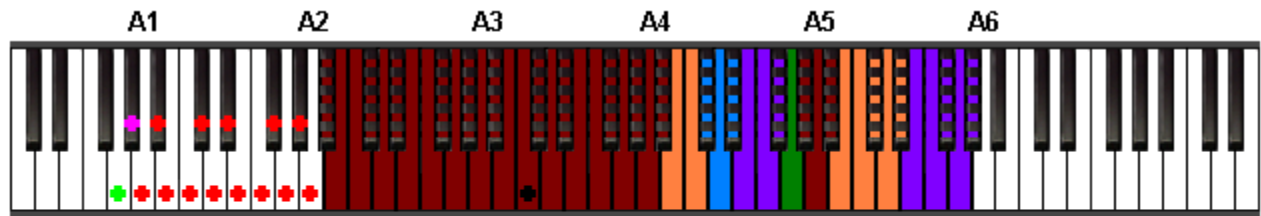
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
● =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.21 – Twenty-First Position



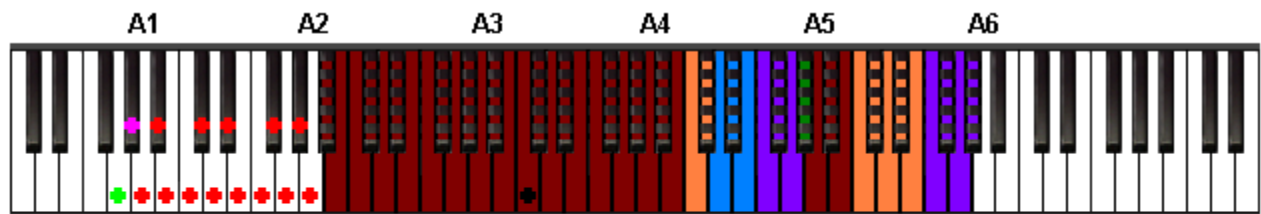
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
● =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.22 – Twenty-Second Position



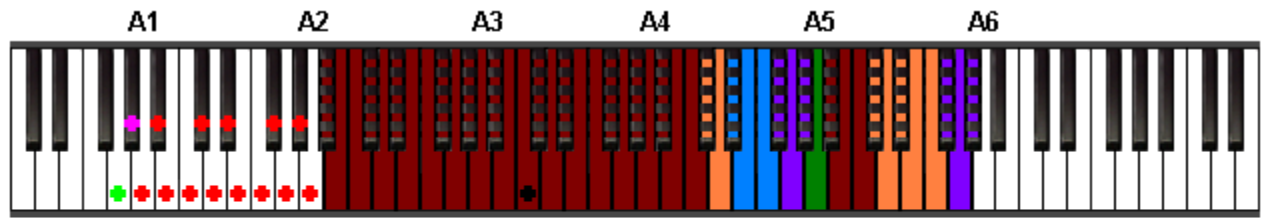
- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
● =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.23 – Twenty-Third Position



- Strings 10 and 5 ■ Strings 9 and 2 ■ String 8 ■ Strings 7 and 1 ■ String 6
● =Middle C ● =Position Keyswitch ● =Auto-Position Keyswitch ● =Tremolo Keyswitch

A4.24 – Twenty-Fourth Position

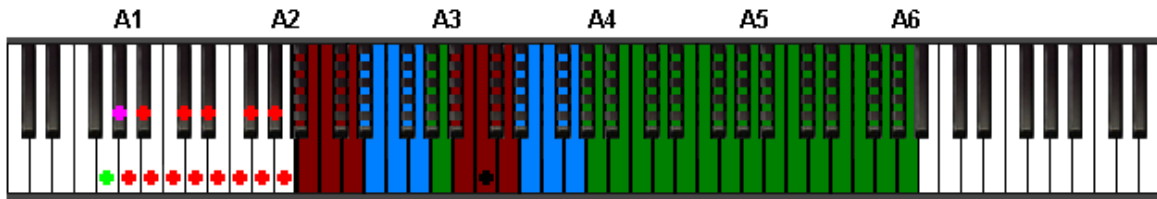


- Strings 10 and 5
- Strings 9 and 2
- String 8
- Strings 7 and 1
- String 6
- = Middle C
- = Position Keyswitch
- = Auto-Position Keyswitch
- = Tremolo Keyswitch

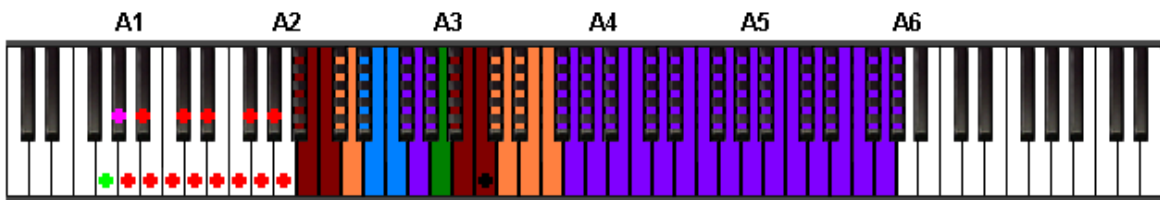
A5) Position Diagrams 0-24 (Primary and Secondary Comparison)([Watch As Video – Fast](#) [Watch as Video – Slow](#))

A5.0 – Open Position

Pedal Up:



Pedal Down:



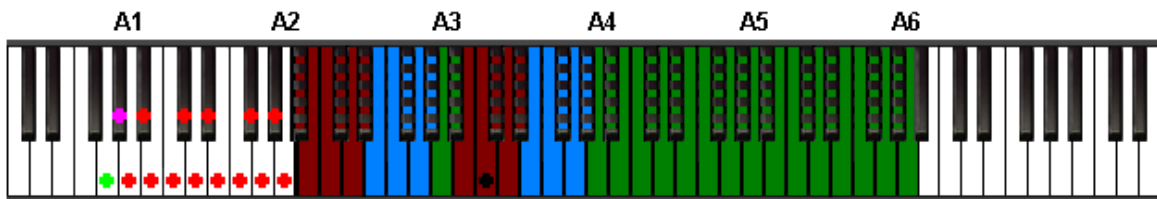
Primary Strings (■ Strings 10 and 5
■ Strings 8 and 4
■ Strings 6 and 3

Secondary Strings (■ Strings 9 and 2
■ Strings 7 and 1

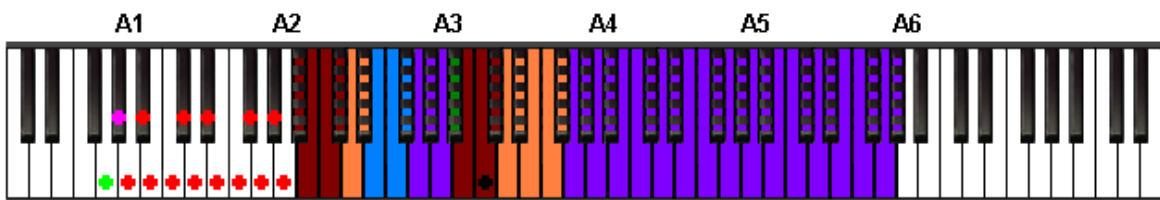
● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A5.1 – First Position

Pedal Up:



Pedal Down:



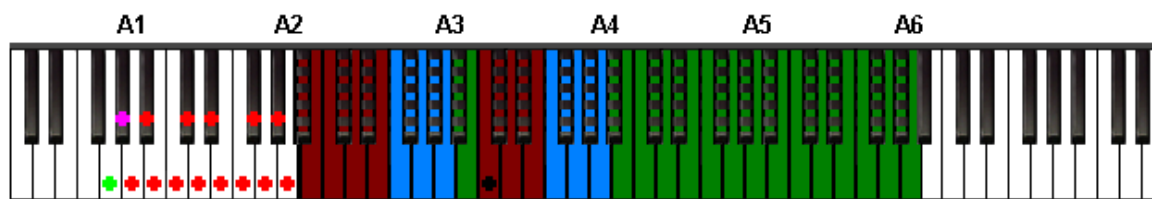
Primary Strings (■ Strings 10 and 5
■ Strings 8 and 4
■ Strings 6 and 3

Secondary Strings (■ Strings 9 and 2
■ Strings 7 and 1

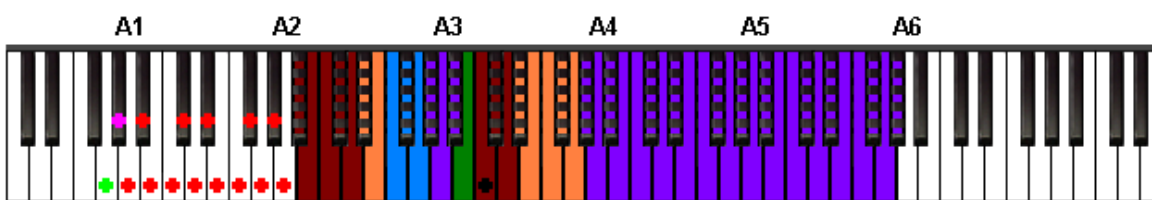
● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A5.2 – Second Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

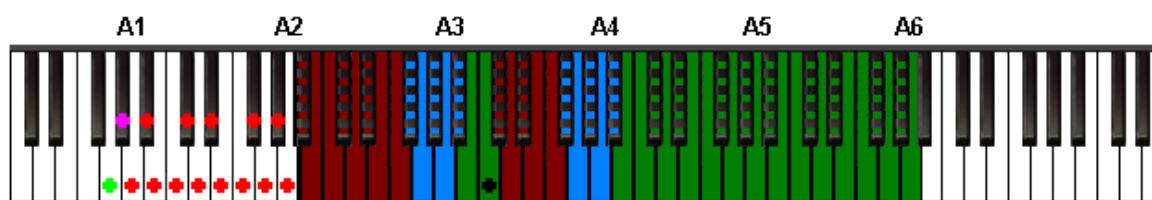
● = Position Keyswitch

● = Auto-Position Keyswitch

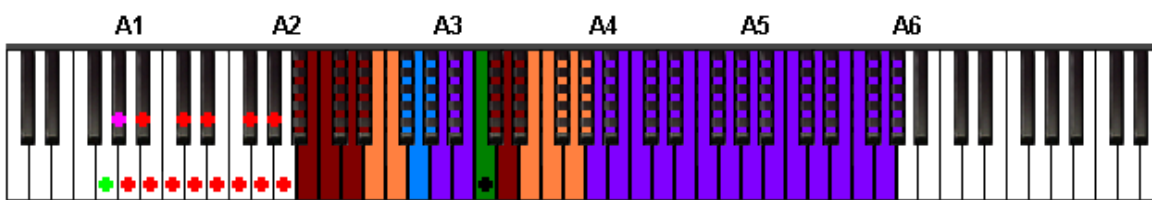
● = Tremolo Keyswitch

A5.3 – Third Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

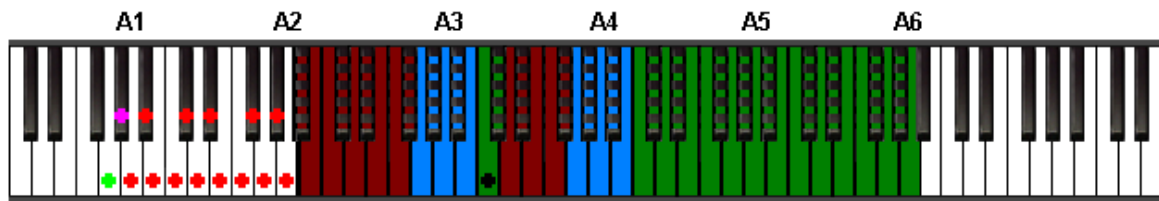
● = Position Keyswitch

● = Auto-Position Keyswitch

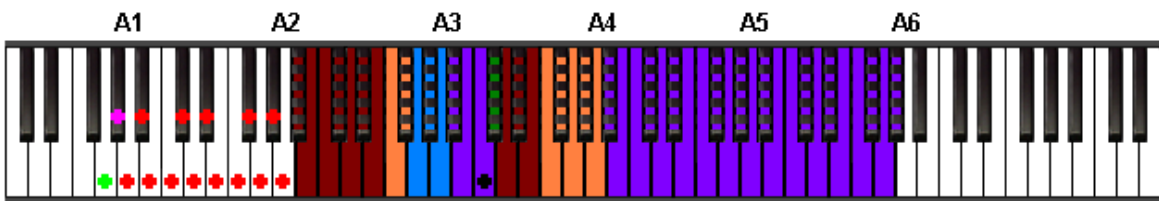
● = Tremolo Keyswitch

A5.4 – Fourth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

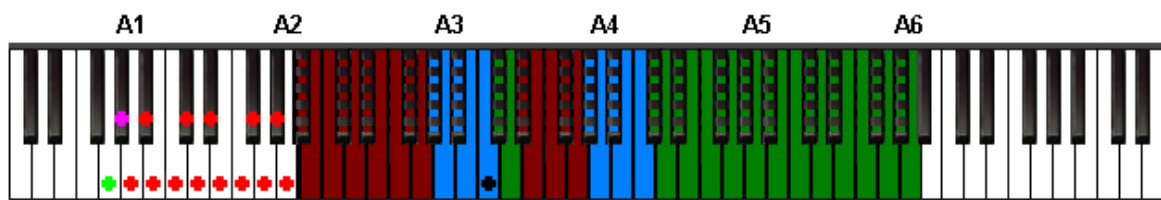
● = Position Keyswitch

● = Auto-Position Keyswitch

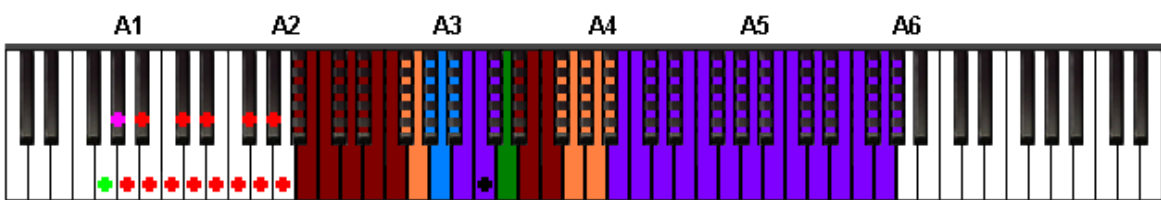
● = Tremolo Keyswitch

A5.5 – Fifth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

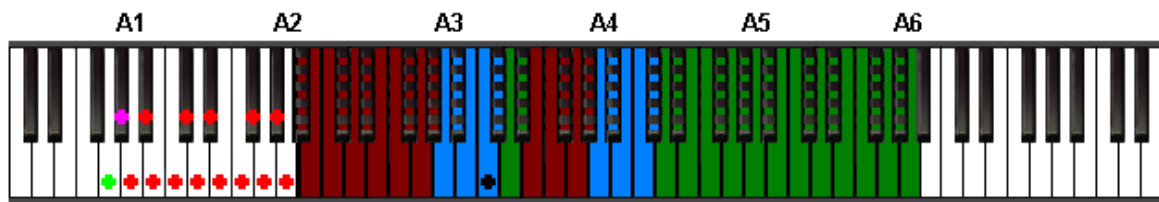
● = Position Keyswitch

● = Auto-Position Keyswitch

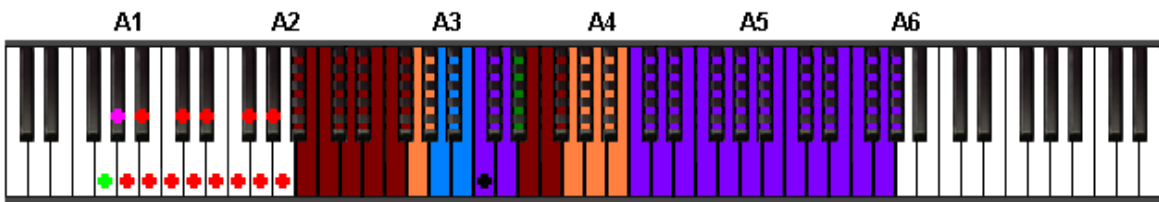
● = Tremolo Keyswitch

A5.6 – Sixth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

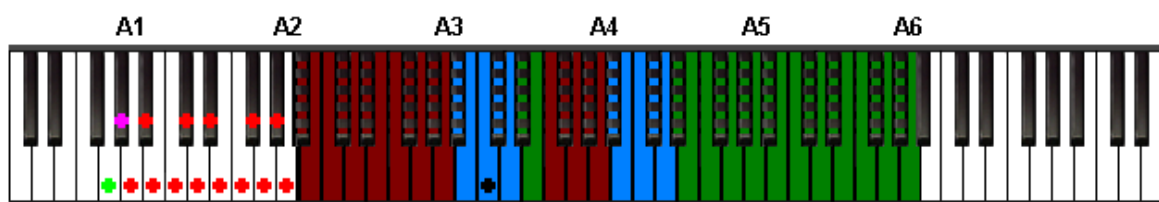
● = Position Keyswitch

● = Auto-Position Keyswitch

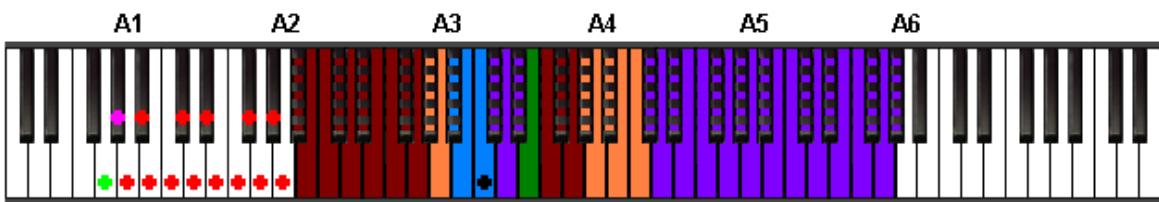
● = Tremolo Keyswitch

A5.7 – Seventh Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

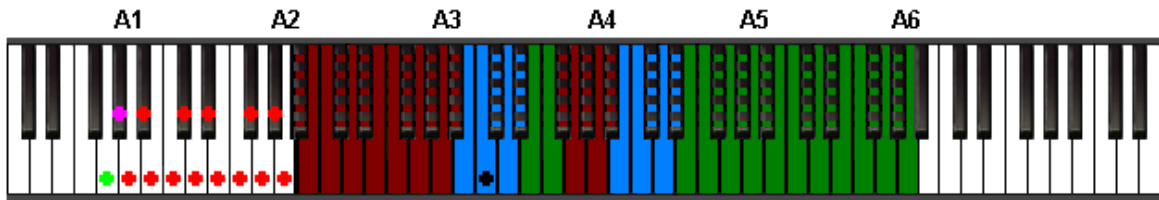
● = Position Keyswitch

● = Auto-Position Keyswitch

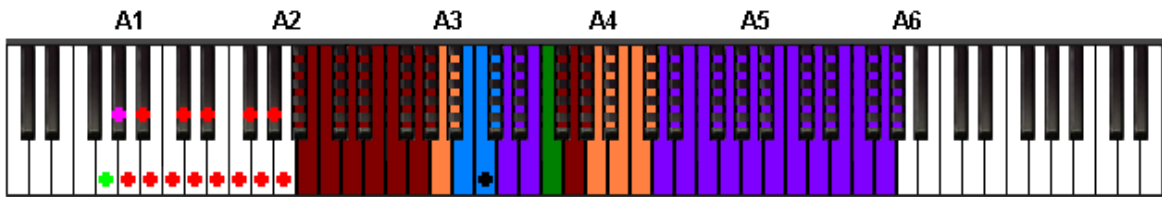
● = Tremolo Keyswitch

A5.8 – Eighth Position

Pedal Up:



Pedal Down:

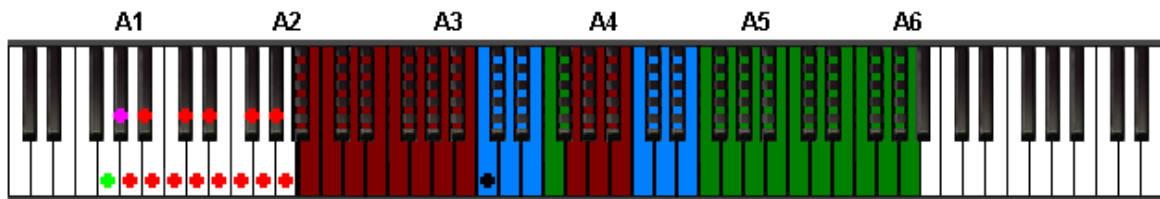


Primary Strings (<ul style="list-style-type: none"> ■ Strings 10 and 5 ■ Strings 8 and 4 ■ Strings 6 and 3 	Secondary Strings (<ul style="list-style-type: none"> ■ Strings 9 and 2 ■ Strings 7 and 1
--------------------------	--	----------------------------	--

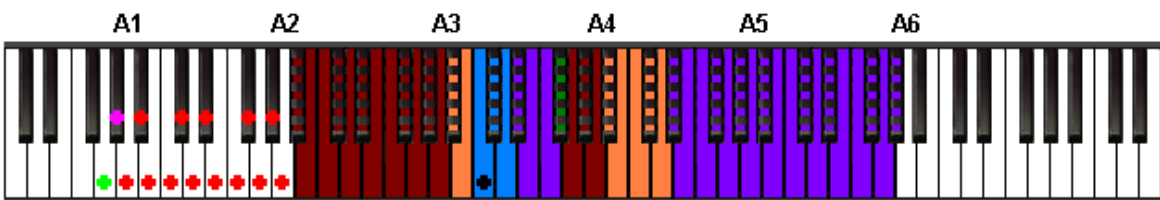
◆ = Middle C
 ● = Position Keyswitch
 ◆ = Auto-Position Keyswitch
 ● = Tremolo Keyswitch

A5.9 – Ninth Position

Pedal Up:



Pedal Down:

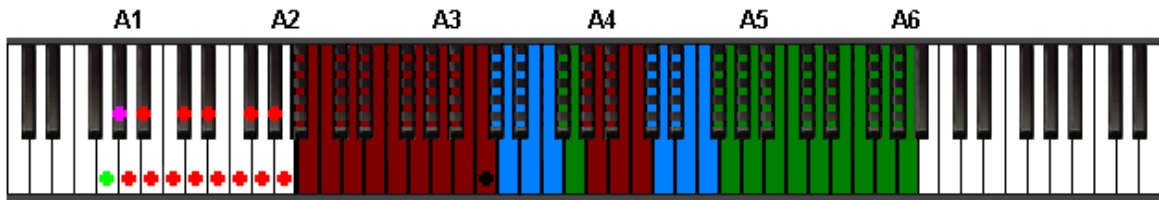


Primary Strings (<ul style="list-style-type: none"> ■ Strings 10 and 5 ■ Strings 8 and 4 ■ Strings 6 and 3 	Secondary Strings (<ul style="list-style-type: none"> ■ Strings 9 and 2 ■ Strings 7 and 1
--------------------------	--	----------------------------	--

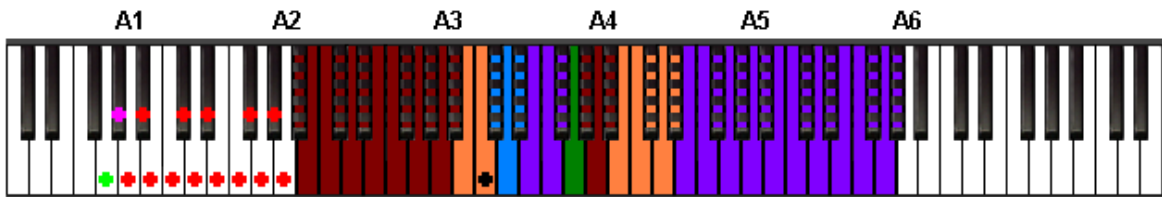
◆ = Middle C
 ● = Position Keyswitch
 ◆ = Auto-Position Keyswitch
 ● = Tremolo Keyswitch

A5.10 – Tenth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

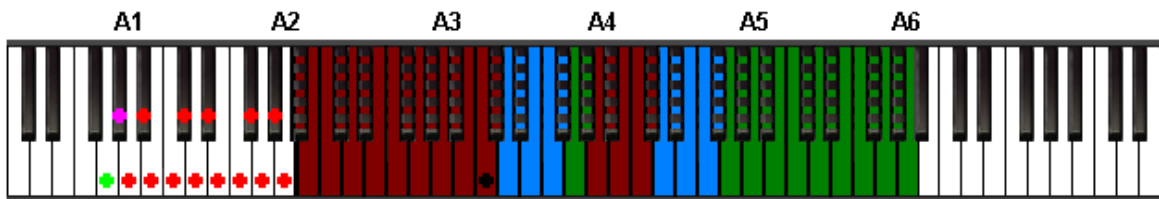
Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

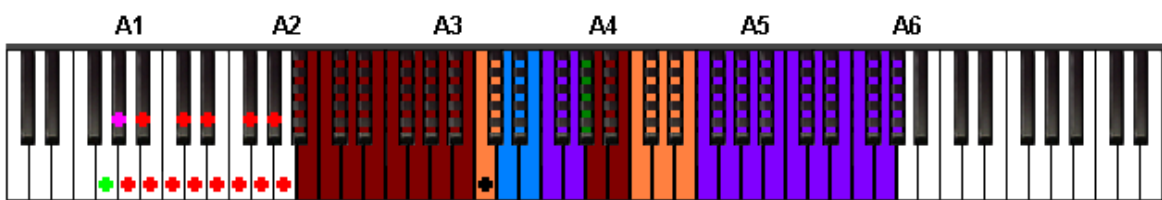
● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A5.11 – Eleventh Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

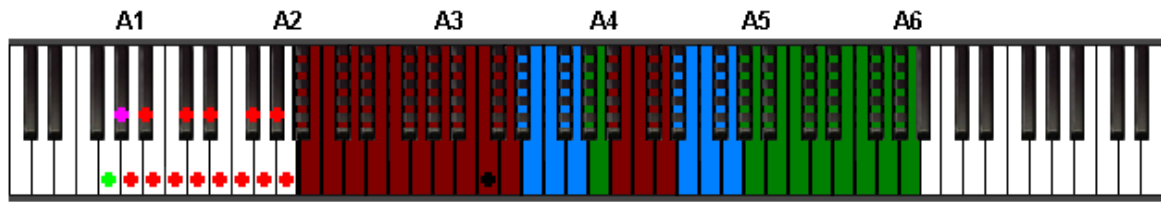
Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

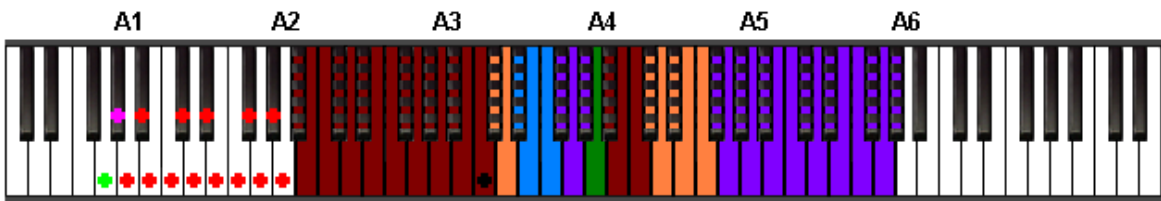
● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A5.12 – Twelfth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

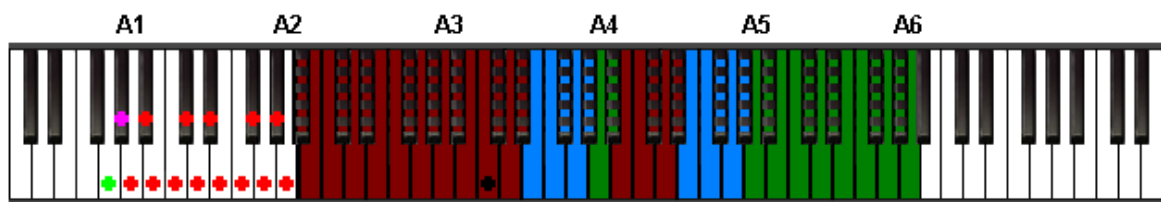
● = Position Keyswitch

● = Auto-Position Keyswitch

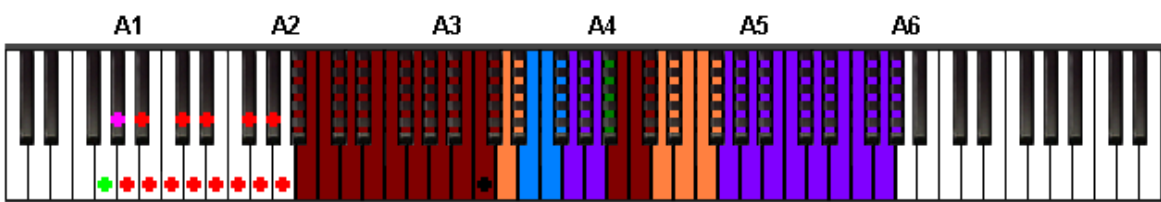
● = Tremolo Keyswitch

A5.13 – Thirteenth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

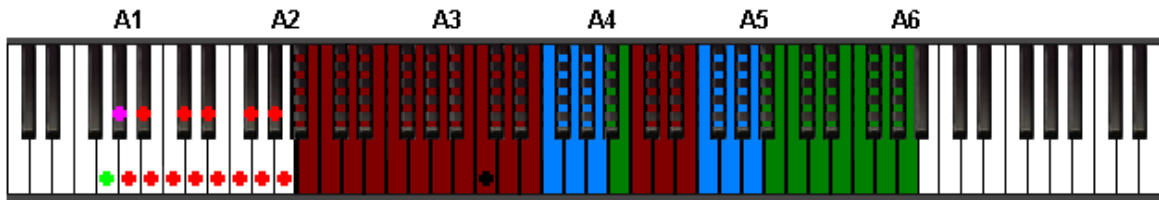
● = Position Keyswitch

● = Auto-Position Keyswitch

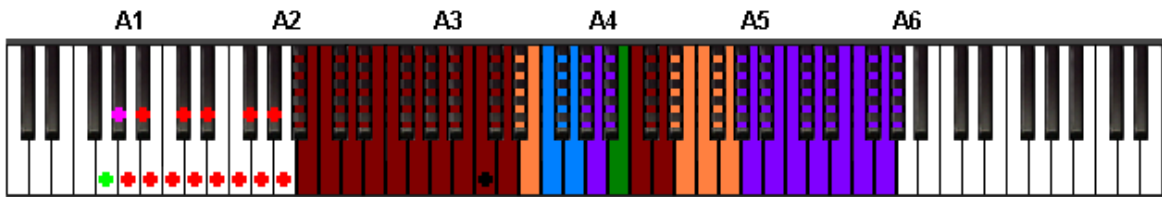
● = Tremolo Keyswitch

A5.14 – Fourteenth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

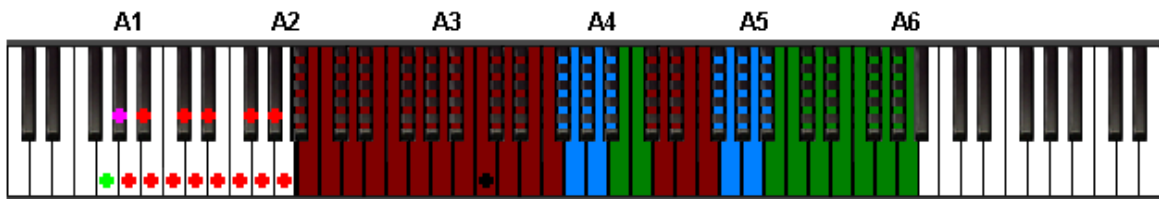
● = Position Keyswitch

● = Auto-Position Keyswitch

● = Tremolo Keyswitch

A5.15 – Fifteenth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

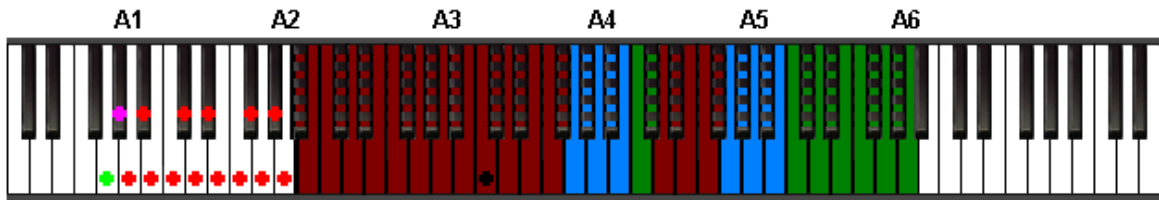
● = Position Keyswitch

● = Auto-Position Keyswitch

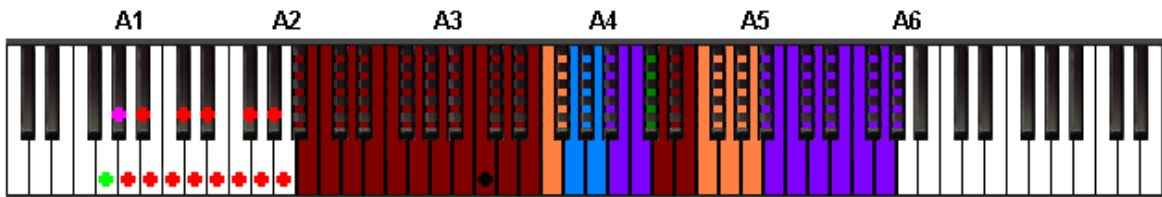
● = Tremolo Keyswitch

A5.16 – Sixteenth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

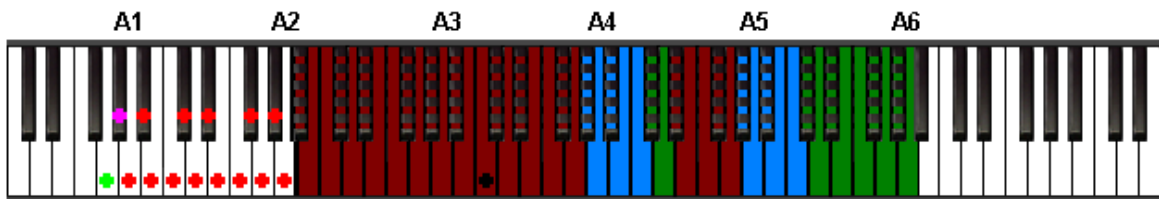
● = Position Keyswitch

● = Auto-Position Keyswitch

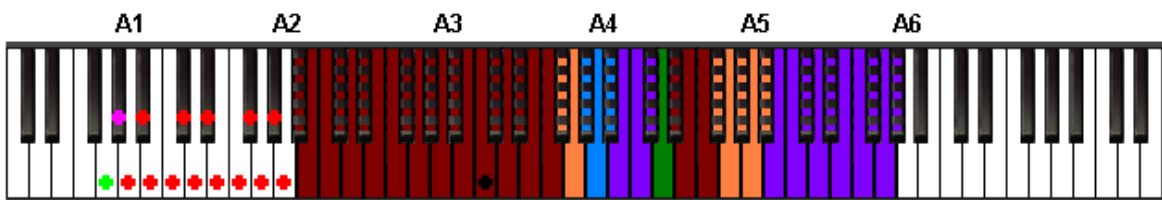
● = Tremolo Keyswitch

A5.17 – Seventeenth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

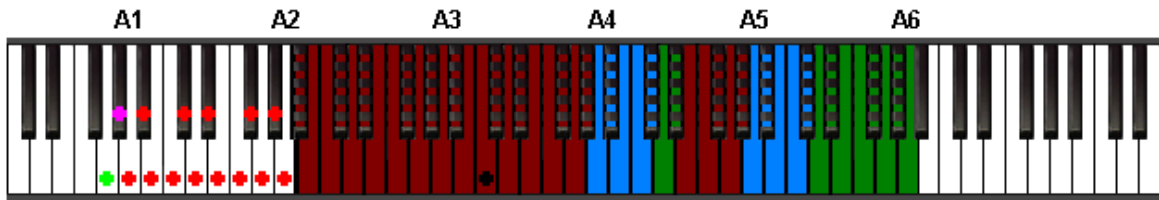
● = Position Keyswitch

● = Auto-Position Keyswitch

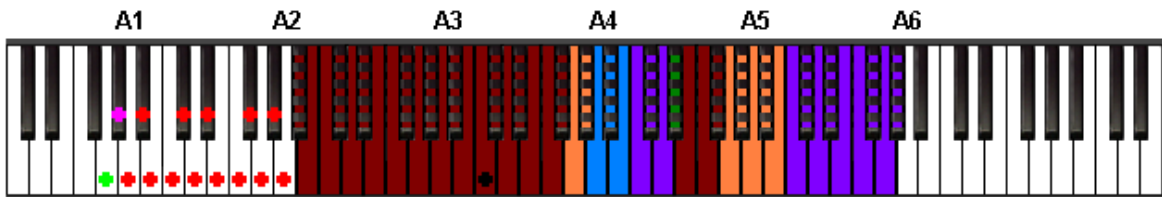
● = Tremolo Keyswitch

A5.18 – Eighteenth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

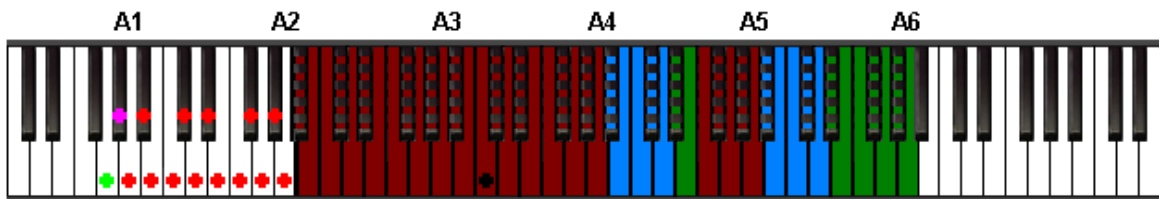
● = Position Keyswitch

● = Auto-Position Keyswitch

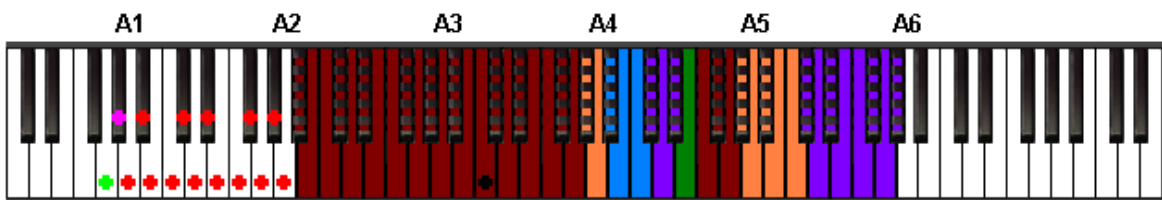
● = Tremolo Keyswitch

A5.19 – Nineteenth Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

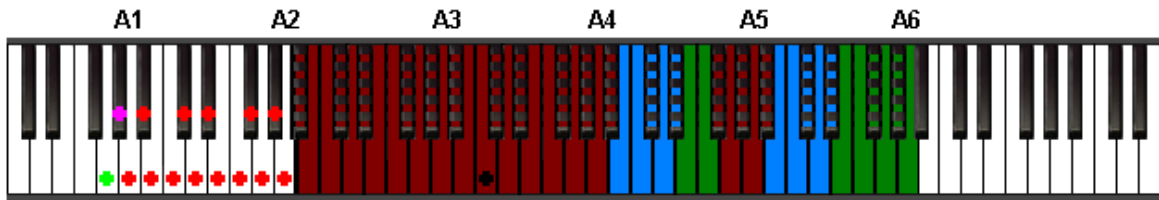
● = Position Keyswitch

● = Auto-Position Keyswitch

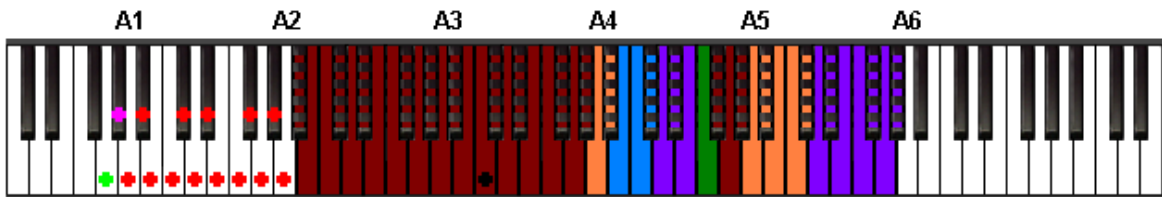
● = Tremolo Keyswitch

A5.20 – Twentieth Position

Pedal Up:



Pedal Down:



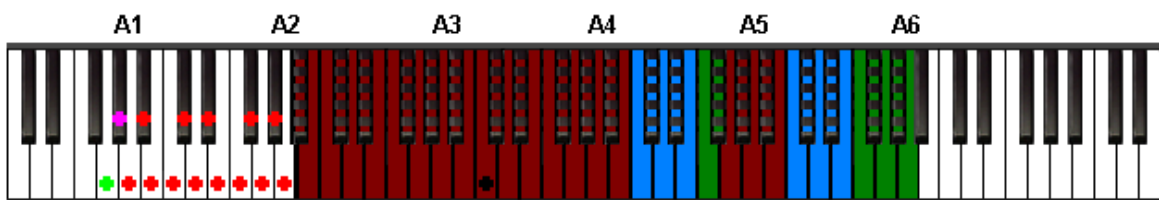
Primary Strings (■ Strings 10 and 5
■ Strings 8 and 4
■ Strings 6 and 3

Secondary Strings (■ Strings 9 and 2
■ Strings 7 and 1

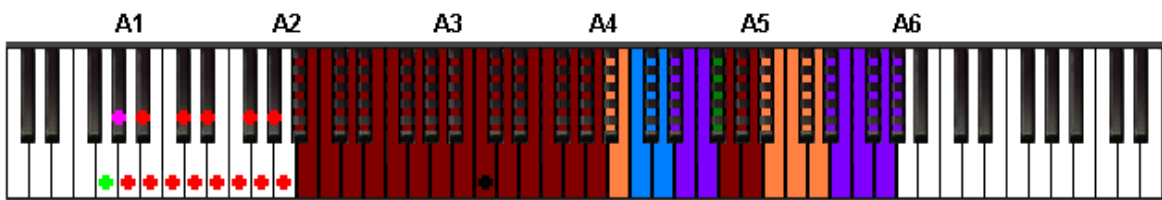
● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A5.21 – Twenty-First Position

Pedal Up:



Pedal Down:



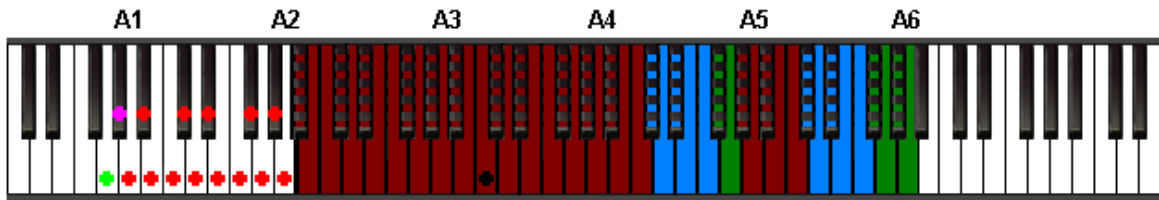
Primary Strings (■ Strings 10 and 5
■ Strings 8 and 4
■ Strings 6 and 3

Secondary Strings (■ Strings 9 and 2
■ Strings 7 and 1

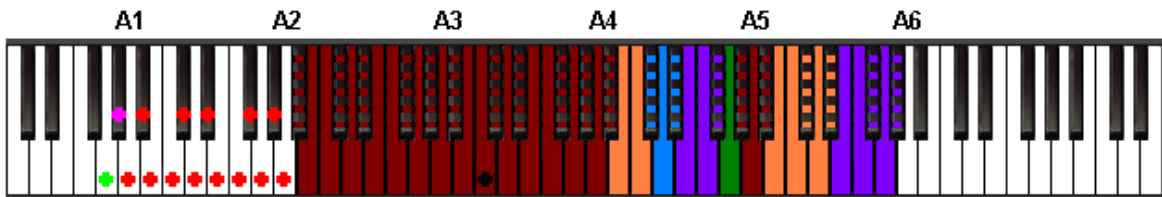
● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A5.22 – Twenty-Second Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

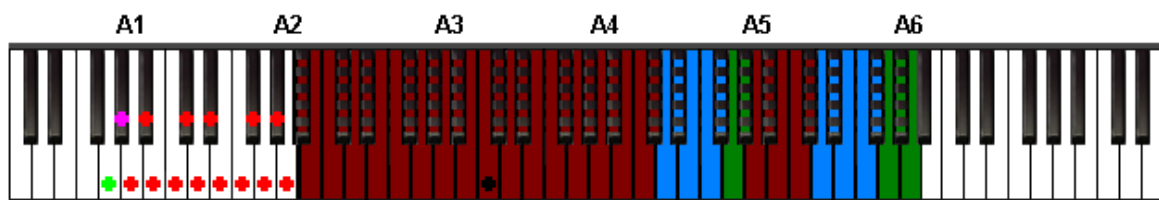
Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

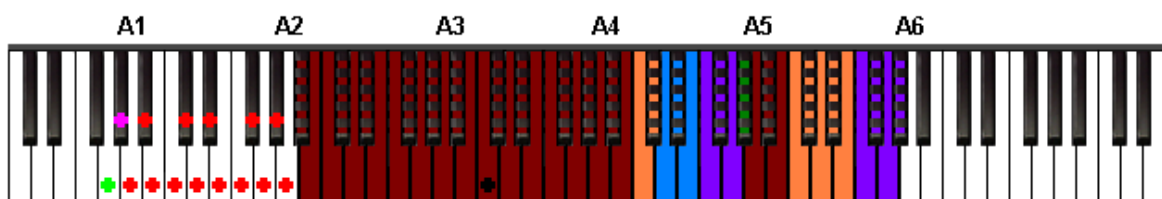
● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A5.23 – Twenty-Third Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

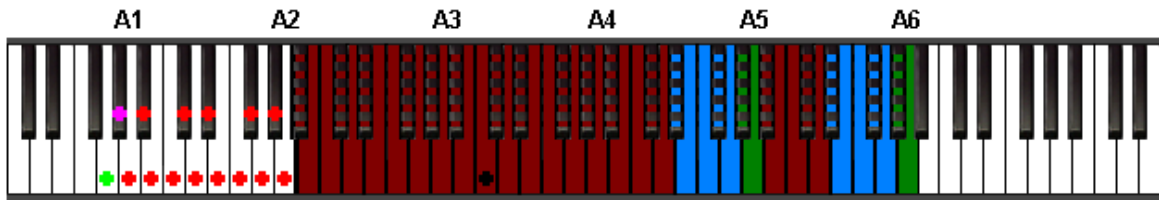
Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

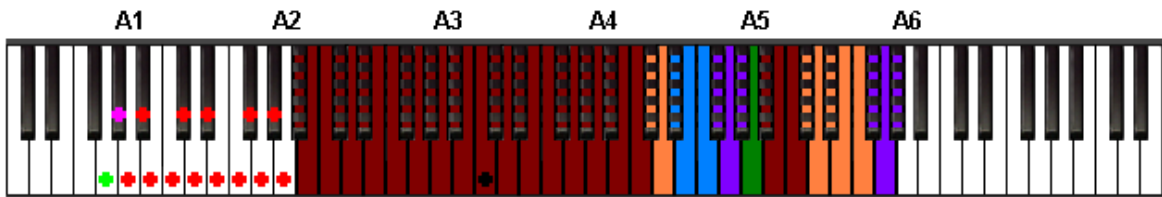
● = Middle C ● = Position Keyswitch ● = Auto-Position Keyswitch ● = Tremolo Keyswitch

A5.24 – Twenty-Four Position

Pedal Up:



Pedal Down:



Primary Strings (

- Strings 10 and 5
- Strings 8 and 4
- Strings 6 and 3

Secondary Strings (

- Strings 9 and 2
- Strings 7 and 1

● = Middle C

● = Position Keyswitch

● = Auto-Position Keyswitch

● = Tremolo Keyswitch

Appendix B: Credits

The following people played important roles in the creation of this software instrument:

Mark Belbin - Performance, audio editing, instrument design, documentation.

Steven Miller - Audio engineering, quality assurance.

Jim Van Buskirk – Audio engineering, voice recordings

Anna Houston – Vocal samples performance.

David Harvey - Photography, design concept, design. dkch@telus.blackberry.net

Luke Merdsoy, Mertz Creative Communications Inc. - Wavelore logos and visual concept. www.mertz.ca

Adam Foran - Performance tutorials

Chris Ledrew – Consultation. www.chrisledrew.com

Don Cuff - Consultation, instrument rental.

Last Updated: Nov 15, 2009