

# Shifty

Voice Allocator | Hocketing Controller | Analog Shift Register | Sequential/Manual Switch



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## Compliance



This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Intellijel Designs, Inc. could void the user's authority to operate the equipment.

Any digital equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.



This device meets the requirements of the following standards and directives:

EMC: 2014/30/EU  
EN55032:2015 ; EN55103-2:2009 (EN55024) ; EN61000-3-2 ; EN61000-3-3

Low Voltage: 2014/35/EU  
EN 60065:2002+A1:2006+A11:2008+A2:2010+A12:2011

RoHS2: 2011/65/EU

WEEE: 2012/19/EU

## Installation

Intellijel Eurorack modules are designed to be used with a Eurorack-compatible case and power supply. We recommend you use Intellijel cases and power supplies.

Before installing a new module in your case, you must ensure your power supply has a free power header and sufficient available capacity to power the module:

- Sum up the specified +12V current draw for all modules, including the new one. Do the same for the -12 V and +5V current draw. The current draw will be specified in the manufacturer's technical specifications for each module.
- Compare each of the sums to specifications for your case's power supply.
- Only proceed with installation if none of the values exceeds the power supply's specifications. Otherwise you must remove modules to free up capacity or upgrade your power supply.

You will also need to ensure your case has enough free space (hp) to fit the new module. To prevent screws or other debris from falling into the case and shorting any electrical contacts, not leave gaps between adjacent modules, and cover all unused areas with blank panels. Similarly, do not use open frames or any other enclosure that exposes the backside of any module or the power distribution board.

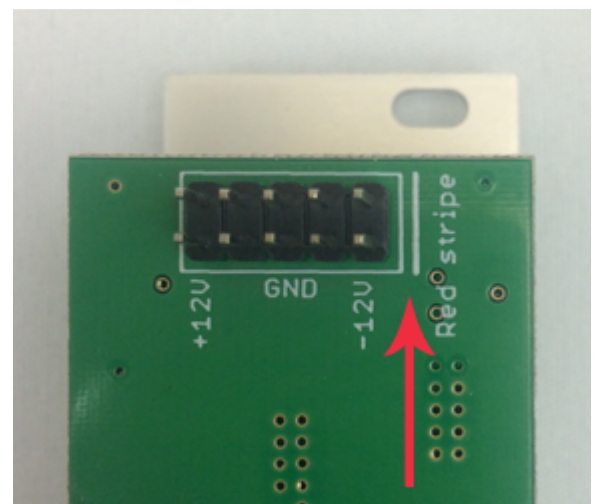
You can use a tool like [ModularGrid](#) to assist in your planning. Failure to adequately power your modules may result in damage to your modules or power supply. If you are unsure, please [contact us](#) before proceeding.

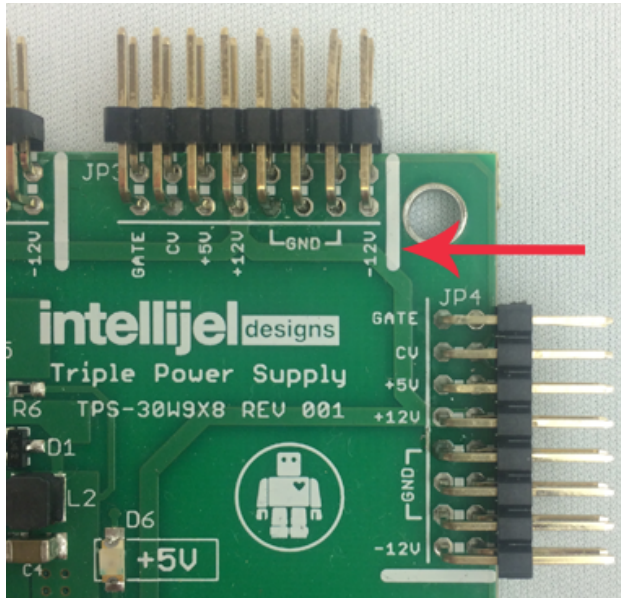
## Installing Your Module

When installing or removing a module from your case always turn off the power to the case and disconnect the power cable. Failure to do so may result in serious injury or equipment damage.

Ensure the 10-pin connector on the power cable is connected correctly to the module before proceeding. The red stripe on the cable must line up with the -12V pins on the module's power connector. The pins are indicated with the label -12V, a white stripe next to the connector, the words "red stripe", or some combination of those indicators.

Most modules will come with the cable already connected but it is good to double check the orientation.



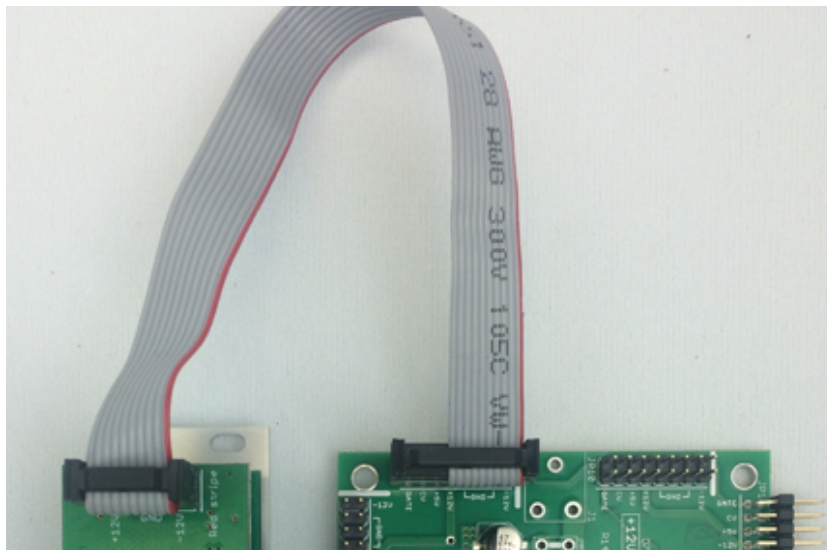


Be aware that some modules may have headers that serve other purposes so ensure the cable is connected to the right one.

The other end of the cable, with a 16-pin connector, connects to the power bus board of your Eurorack case. Ensure the red stripe on the cable lines up with the -12V pins on the bus board. On Intellijel power supplies the pins are labelled with the label “-12V” and a thick white stripe:

If you are using another manufacturer’s power supply, check their documentation for instructions.

Once connected, the cabling between the module and power supply should resemble the picture below:



Before reconnecting power and turning on your modular system, double check that the ribbon cable is fully seated on both ends and that all the pins are correctly aligned. If the pins are misaligned in any direction or the ribbon is backwards you can cause damage to your module, power supply, or other modules.

After you have confirmed all the connections, you can reconnect the power cable

and turn on your modular system. You should immediately check that all your modules have powered on and are functioning correctly. If you notice any anomalies, turn your system off right away and check your cabling again for mistakes.

## Overview

The Intellijel Shifty distributes gate and CV signals from a single source to as many as four different destinations.

At its core Shifty is essentially a combination of four sample and hold stages, a sequential gate and a sequencer controller. This collection of functions allows for some specific and useful utility applications.

One of the primary uses for Shifty is to take a monophonic sequence source and route each new note of the sequence to two, three or four different synthesizer voices in a specific pattern. In this way you can create pseudo polyphonic sequences since each voice can be triggered to play and sustain while the next voice in the sequence is triggered. This is called: **Voice Allocation Mode**. Another term for this is [hocketing](#).

Shifty can also function as a digital emulation of an **Analog Shift Register**. An Analog Shift Register is essentially a little 4-slot voltage recorder and sequencer. When the first clock is received, Shifty passes the corresponding CV value to the first output. When the next clock is received, the previous CV value shifts to the second output so that the new CV can appear at the first output. Each time Shifty gets a new clock, its corresponding CV value is sent to the first out, while older CVs continue to shift down. There is no fifth output, so after four gates, the oldest CV value simply disappears. This can be an interesting way to create chords of up to four stacked notes when used with a pitch sequence source that has a harmonious series of notes (e.g. a pentatonic scale works really well). Even just using two of the outputs yields a variety of melodic interplay and is an excellent way to make a simple sequence much more complex and dynamic. Unlike its analog counterpart, Shifty's shift register mode does not suffer from voltage droop over time.

Finally, Shifty features an alternate Sequential/Manual Switch Mode, which lets you route one CV/Gate input to any of four CV/Gate outputs, and switch between those outputs either manually or remotely.

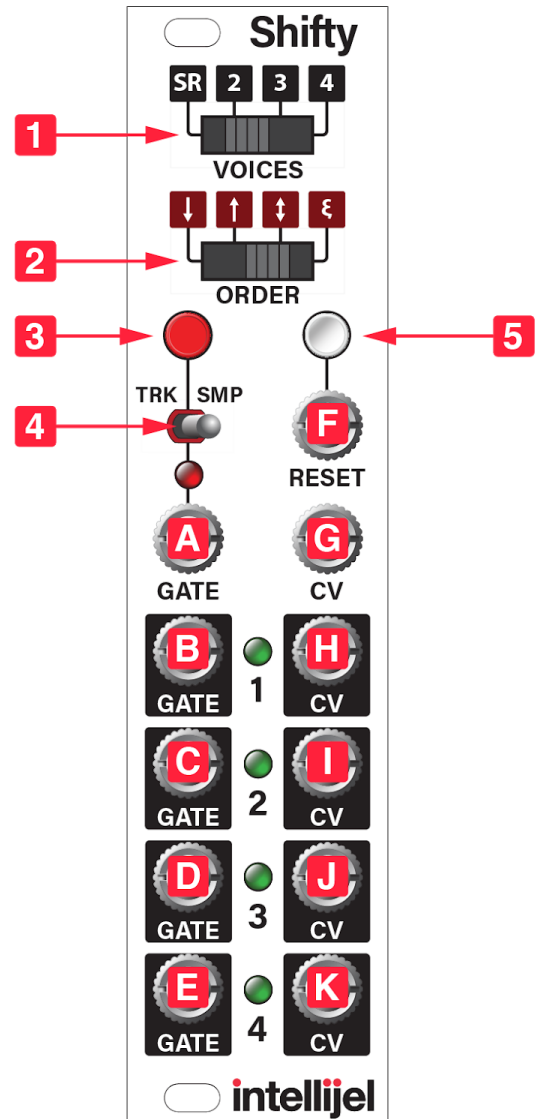
## Features

- In voice allocate mode (VOICES 2-4) the direction switches are for UP, DOWN, PINGPONG and RANDOM
- In Shift Register mode (SR) the directions are UP, DOWN, TOGGLE (via reset) and SCATTER.
- Manual button for sampling/tracking and advancing the sequence
- Manual reset button and jack
- Gate input can configured to act as a track or sample control via toggle switch
- An alternate Continuous Tracking mode can be selected instead of the standard Track & Hold mode.
- A special Sequential/Manual Switch Mode lets you route one CV/Gate input to any of four CV/Gate outputs, and switch between those outputs either manually or remotely.
- Pitch input can sample or track pitches in the range of 0-10V
- The pitch outputs are driven by a precision quad DAC.
- Firmware is updateable via USB

# Front Panel

## Controls

1. **VOICES** - This switch selects the number of voices, or outputs, used by the module. In the first setting, SR, it causes the module to operate as a shift register.
2. **ORDER** - This switch selects in which order the input is assigned to the outputs. The options are: ascending, descending, ping-pong, and random.
3. **GATE** - Manually triggers the gate input.
4. **TRK / SMP** - Toggles between track & hold and sample & hold modes.
5. **RESET** - Manually triggers the reset.



## Inputs and Outputs

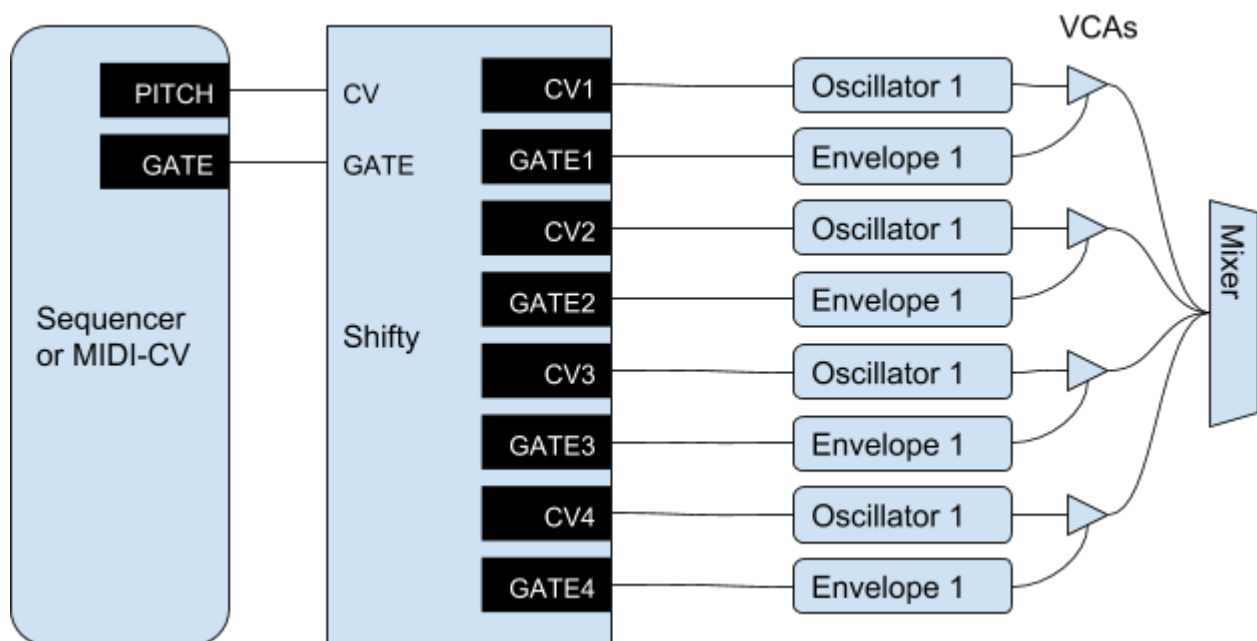
- A. **GATE** - The gate input that triggers sampling of the CV input and advances the output assignment.
- B. **GATE 1** - Gate output for voice 1
- C. **GATE 2** - Gate output for voice 2
- D. **GATE 3** - Gate output for voice 3
- E. **GATE 4** - Gate output for voice 4
- F. **RESET** - The reset input resets the voice allocation algorithm back to its first position.
- G. **CV** - The CV input which is sampled on each incoming gate. The input voltage range is 0 to 10 V.
- H. **CV 1** - The CV output for voice 1
- I. **CV 2** - The CV output for voice 2
- J. **CV 3** - The CV output for voice 3
- K. **CV 4** - The CV output for voice 4



## Instructions

The most straightforward way to use Shifty is to distribute the sequence from one sequencer to multiple voices. For example you can use the PITCH and GATE outs of the Metropolis to control up to 4 different oscillators and envelope generators. Simply connect the PITCH and GATE out to the CV and GATE ins of the Shifty, and then connect each pair of CV and GATE outputs to an oscillator pitch input an envelope trigger. Each GATE and CV output pair is considered a “voice”.

Then use the VOICES switch to select how many voices are being used, and the ORDER switch to select in which order they are assigned. See the diagram below for a simple illustration of the patching:



It can be musically pleasing to use four similar-sounding voices to get complex intertwined melodies, but it can also be interesting to use four totally different sound generators for a more complex ensemble. Experiment with different voice settings!

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## Voice Allocation Mode

**Voice Allocation Mode** is the primary mode of Shifty which is enabled whenever VOICES is set to 2, 3, or 4. In this mode Shifty will play one of the four voices each time it receives a gate. The order in which the voices are played is determined by the ORDER switch. There are four ORDER settings: **Forward**, **Reverse**, **Ping-Pong**, and **Random**.

In **Forward** mode the first incoming gate will sample the CV, output it on CV1, and then trigger GATE1 for the duration of the incoming gate. The second received gate will sample the CV, output it on CV2, and then trigger GATE2, etc. After the output reaches the maximum number of voices, the assignment wraps back around to the voice 1. If the RESET jack receives a gate, or the RESET button is pushed, the next voice to be allocated will be voice 1.

In **Reverse** mode the assignment starts at the last voice. For example if the VOICES switch is set to 3, the first incoming gate would trigger voice 3. The next voice 2, and finally voice 1 before wrapping back around to voice 3 again. In the case of a reset, the next voice to be allocated will be the last one.

**Ping-Pong** mode functions like a combination of Forward and Reverse modes. It begins like Forward mode except that once the last voice is reached, the direction of assignment reverses to act like Reverse mode. When assigning in reverse, once voice 1 is reached, it begins assigning forward again, etc. Upon reset the voice assignment begins at voice 1 again.

**Random** mode will randomly assign each sampled CV to a different voice, without repeating the same one twice in a row, in order to make the assignment more musically interesting. The exception is when the number of voices is 2, in which case Shifty will just randomly select between the first two voices with equal probability. In the case of a reset the assignment is still random but the last assigned voice is forgotten.

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## Shift Register Mode

**Shift Register** mode is a digital emulation of an Analog Shift Register (ASR). It is enabled when the VOICES switch is set to the leftmost position (**SR**). This mode works differently from the other three VOICE settings: Instead of replacing one of the CV outputs, the other voices are “shifted” to make way for the new one. All four GATE outputs become active on each received input.

For example, suppose ORDER is set to **Forward** and initially all of the CV outputs are 0: [0, 0, 0, 0]. If when the first gate is received the CV input is 1 volt, the outputs will become: [1, 0, 0, 0]. If when the next gate is received the CV input is 2 volts, the output will now be: [2, 1, 0, 0]. As you can see, the input is always assigned to voice 1, and what was previously voice 1 becomes voice 2, voice 2 becomes voice 3, and voice 3 becomes voice 4.

If the ORDER is set to **Reverse**, the incoming CV is always assigned to voice 4, and voice 4 shifts to voice 3, voice 3 to voice 2, and voice 2 to voice 1.

If ORDER is **Ping-Pong**, the shift register acts as if it is in Forward mode until the RESET button is pushed or a gate is received on the RESET input. Then it begins acting as in Reverse mode until the next reset turns it back to Forward.

Finally, with **Random** order, the input replaces a random voice and then to make things more interesting, the voices are randomly re-assigned.

## Track & Hold / Sample & Hold

The TRK/SMP switch selects between two different ways of reacting to the incoming CV: Track & Hold and Sample & Hold.

When using **Track & Hold**, the currently assigned voice’s CV output will follow changes to the CV input for as long as the input gate is high. This allows any pitch bends, slides, or other articulation to affect the assigned voice.

When using **Sample & Hold**, the currently assigned voice’s CV output assumes the value of the CV input and then does not change until the next time it is triggered.

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## Manual/Sequential Switch Mode

Switch Mode lets you route one CV/Gate input to any of four CV/Gate outputs, and switch between those outputs either manually or remotely. This has numerous advantages, including the ability to connect one keyboard (or sequencer) to Shifty's input, and route it to any one of four different oscillator's or voice modules (or to all four outputs simultaneously).

For example, assume Metropolis sequences a Plonk in your first song; a Shapeshifter in your second song; and a Rubicon<sup>2</sup> in your third song. Using Shifty's Manual/Sequential Switch Mode, you can quickly make these routing changes without repatching.

- 1. Connect your source module (sequencer, keyboard, etc) to Shifty's CV and GATE inputs.**

In this example, we connect the PITCH and GATE outputs of a Metropolis to Shifty's CV and GATE inputs.

- 2. Connect up to four destination modules (oscillators, envelopes, etc.) to Shifty's CV and GATE outputs.**

In this example, we connect CV 1 and GATE 1 to Plonk's PITCH and TRIG inputs; CV 2 and GATE 2 to Shapeshifter's PITCH 1 and SYNC/TRIG inputs; and CV 3 to Rubicon<sup>2</sup>'s 1V/OCT input (and GATE 3 to the envelope triggering the VCA through which we route Rubicon<sup>2</sup>'s output).

- 3. Toggle into Switch Mode by long-pressing (>1 sec) the RESET button.**

One of the four output LEDs will light solid to indicate which of the four outputs is receiving the input CV and Gate signals.

- 4. Press the RESET button to manually switch between outputs (or use the RESET input jack to remotely switch outputs).**

Switch Mode respects your VOICES and ORDER selections. For example, if you have ORDER set to to the far left position (ascending), then each press of the RESET button selects the output below the current output. Similarly, if you have VOICES set to "3", then the RESET button rotates between the first three outputs, and ignores the fourth.

**NOTE:** If you set VOICES to SR, then Shifty's CV and GATE input is routed to all four outputs simultaneously, allowing for some serious voice stacking or chord creation.

- 5. To exit Manual/Sequential Switch Mode, long-press (>1 sec) the RESET button.**

**NOTE:** If the TRK/SMP switch is set to TRK, Shifty automatically uses Continuous Tracking (rather than Track & Hold) as described in the next section.

## Continuous Tracking Mode

Besides *Sample & Hold* and *Track & Hold* modes, Shifty can be put into a special *Continuous Tracking* mode. In this mode, Shifty tracks the input CV continuously, sending any and all CV changes through to the active CV output, regardless of whether or not Shifty is receiving a gate signal. Any gate signal will, of course, force a change to another output per the settings of the VOICES and ORDER switches.

Contrast this with the more typical Track & Hold mode, in which Shifty tracks the input CV and sends it through to the active CV output ONLY when Shifty receives a high incoming GATE signal (or the GATE button is held down).

To toggle between Continuous Tracking and Track & Hold modes:

- 1. Set the TRK/SMP switch to TRK, then long-press both the GATE and RESET buttons (>1 second).**

Each time you do this you will toggle between Continuous Tracking and Track & Hold.

You can visually see which mode you're in by looking at the Gate LED immediately below the TRK/SMP switch. Specifically:

- When Continuous Tracking is enabled, the Gate LED is lit continuously (if the switch is in the TRK position)
- When Track & Hold is enabled, the Gate LED lights only when a gate is received (or the Gate button is held down).

*NOTE: Continuous Tracking mode has no effect on Sample & Hold mode, and the state (Continuous vs. Track & Hold) saves to flash memory, and survives rebooting.*

Continuous Tracking is particularly useful if you want to use a gate to switch between outputs, while ensuring that any incoming CV signal gets continuously transmitted through to the active output.

## Sampling Delay Compensation

Due to the nature of how many Eurorack sequencers or MIDI interfaces are implemented their CV output can lag their gate output by up to a few milliseconds. The consequence is that if a module like Shifty samples its CV input immediately upon receiving a gate it may read a value that is slightly higher or lower than that which the sequencer is outputting. If this CV is being used to control the frequency of an oscillator it will result in it sounding out of tune.

In the case of Shifty if the module is being used in track & hold mode mode this is rarely a problem because this behaviour will simply result in a short and usually inaudible pitch glide at the beginning of the note. However in sample & hold mode if the CV is sampled too early, the note will be slightly out of tune.

Fortunately Shifty provides a way to compensation for this via a configurable **gate delay**. With the gate delay disabled the CV output for the selected voice will reflect the CV input as soon as possible. With the gate delay enabled the CV output and its corresponding gate will have a slight delay before updating. This allows the incoming CV to settle at its target value.

**Configuring the amount of delay compensation is simple:**

- 1. Turn off your modular system.**
- 2. Hold the GATE button on Shifty.**
- 3. Turn on your modular system.**
- 4. Use the VOICES switch to select the amount of delay compensation.**

When set to “SR” the compensation is disabled, while settings 2, 3, and 4 provide increasing amounts of delay.

- 5. Push the RESET button to confirm and save your settings.**

You will need to experiment with different settings depending on which sources of gate and CV you are using and find what works best for your system.

## Calibration

Shifty comes calibrated out of the factory and usually there should be no need to perform calibration. However, should you need to do so, please perform the following steps:

1. **Hold the RESET button while powering on your modular system.**

Shifty will start up in calibration mode.

2. **Connect a patch cable from the CV input to CV 1 and move the VOICES switch to the SR position.**

The LED next to CV 1 should be illuminated.

3. **Press the GATE button.**

The calibration procedure will begin and the red LED gate LED will illuminate.

4. **Once the gate LED turns off, move the patch cable from CV 1 to CV 2. Move the VOICES switch to position 2, and press the GATE button again.**

5. **Repeat step 4 for CV 3 and CV 4.**

6. **Restart your modular system.**

The calibration is automatically saved.

## Firmware Updates

### Firmware 1.1 (October 2018)

- *New Feature:* [Manual/Sequential Switch Mode](#)
- *New Feature:* [Continuous Tracking option](#)

### Firmware 1.0

- *Initial Release*

## Technical Specifications

Width	6 hp
Maximum Depth	44 mm
Current Draw	52 mA @ +12V 5 mA @ -12V