

**seaside modular**

**proteus manual**

**software v1.2.3**

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# Introduction: *What is this thing?*

The tension between [predictability](#) and [surprise](#) is central to the experience of music. Take any set of notes, repeat them, and the pattern becomes a *thing*, an object in the mind. There's pleasure in repetition. However, if we repeat a pattern for too long, it becomes uninteresting, boring, and we start to crave change. Proteus is a tool that allows you to explore the balance between [repetition](#) and [novelty](#) in your music.



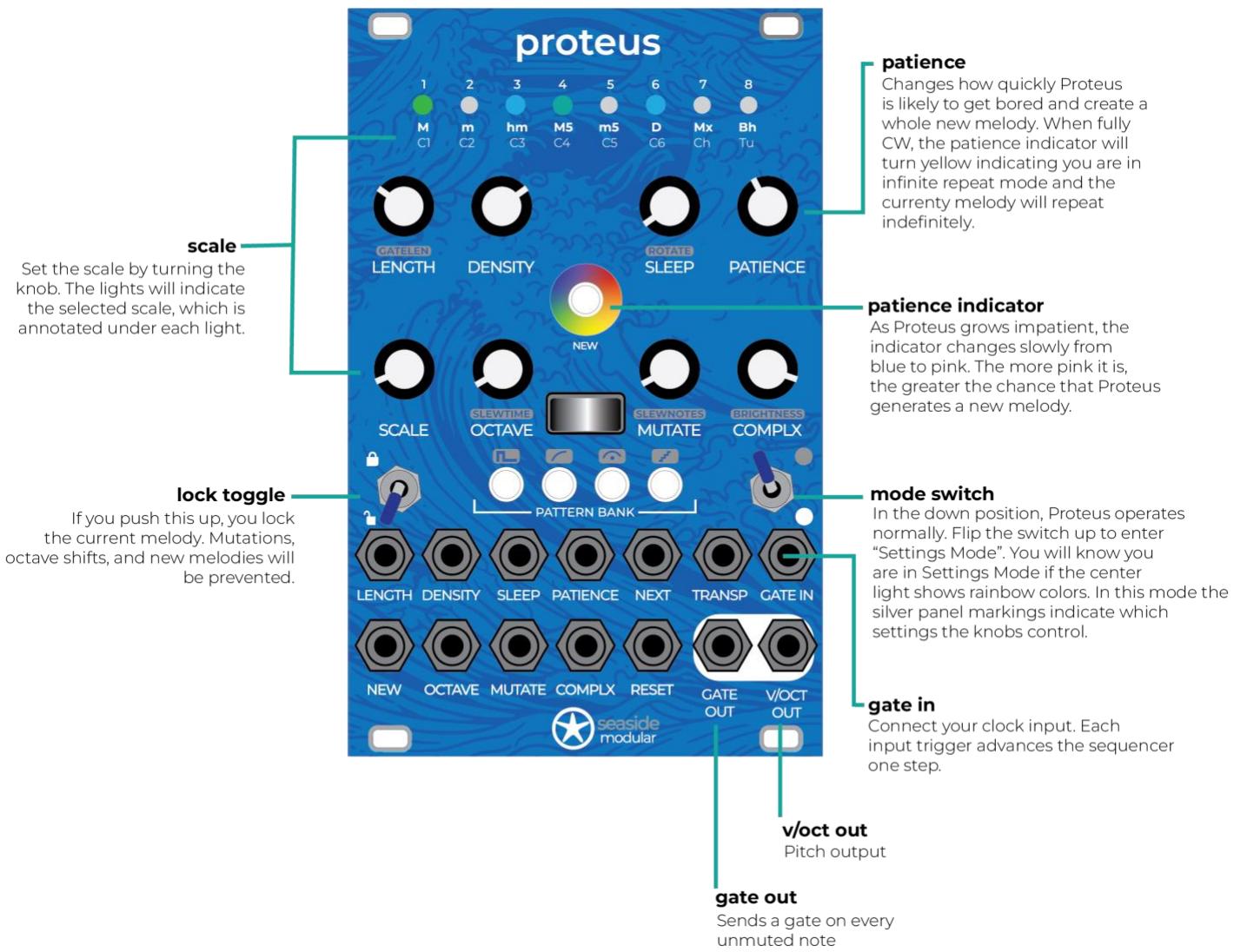
***The Greek Sea God Proteus***

Proteus starts by creating a sequence of notes, using an algorithm that strives to make sequences that are more musical than random. It then repeats that melody, over and over again. Each time it reaches the end of the sequence there is some probability that it will decide to scrap the sequence and make a brand new one. The probability of a new sequence increases over time according to a "patience" function, but [how quickly Proteus gets bored is up to you](#).

Proteus, in Greek Mythology, was a sea god. More specifically, he represented the changing nature of the sea, the ever-mutating quality of liquid water. When facing enemies, Proteus would quickly take a new form to avoid capture. And so you can think of the melodic patterns you create with this module as *protean*; that is, [able to change at a moment's notice, mutable, kaleidoscopic](#).

*NOTE: PLEASE DO NOT ATTEMPT TO OPERATE PROTEUS WHILE IN THE OCEAN. IT IS NOT WATERPROOF!*

# Proteus Basics



# Installation

Plug it into your rack and turn it on! The power header is shrouded so you shouldn't be able to plug your cable in the wrong way, but the -12V side is also labeled for you in case there is any question. The module also has reverse polarity protection in case you are very resourceful when it comes to plugging things in incorrectly.

## **Why didn't we screw you?**

You may have noticed that we didn't include screws in the box. We've found that there are many ways to screw in your modules, including 3mm and 2.5mm screws, or washer protected Knurlies (our personal preference). So we've left it up to you to use the screws you have to secure the module to your case rather than cluttering up your world with another little baggie of screws that you won't use. Research shows that 8% of waste found in the world's oceans is made of eurorack screws.

# Basic Operation

**Knobs & Jacks.** Every knob (except the scale knob) has a corresponding CV input jack. The CV inputs take -5 to +5 volts and these values sum with the corresponding knob position.

Since knobs can take on more than one function due to the Settings Mode, there is a “Knob Lock” mode whereby a knob must be turned back to a specific position to resume having an effect. See page 22 for more details.

## Quick Start

To get Proteus going, plug a clock input into the **GATE IN** jack, and connect the **GATE OUT** and **V/OCT** out to your voice generators. Each clock pulse will advance the sequence by one step.

Here is a suggested starting set of knob positions:

First, select a scale using the **SCALE** knob.

Set the sequence to 8 steps using the **LENGTH** knob.

Adjust the density of notes using the **DENSITY** knob.

Put the **PATIENCE** knob at noon.

Turn the **OCTAVE**, **MUTATE**, and **SLEEP** knobs fully CCW.

Put the **COMPLEXITY** knob fully CW.

Make sure the **LOCK TOGGLE** is in the up position.

Press the **NEW** button in the center to generate a new melody.

# Melody generation

**New melody generation.** There are three ways to create a new melody with Proteus:

- 1) Press the **NEW** button in the center
- 2) Send a trigger into the **NEW** jack
- 3) Wait for Proteus to get bored

**Melody complexity.** The algorithm that creates melodies is not simply picking a series of random notes. Human created melodies are not random; in fact people have a very hard time creating sequences that resemble those created by true random processes. Real melodies tend to repeat notes, they tend to move in ascending or descending trains, and they tend to use certain notes of the scale more often than a purely random selection would. Proteus attempts to replicate these features of human melodies, but its algorithm is adjustable by the **COMPLEXITY** parameter. Here's how the **COMPLEXITY** parameter works:



When the **COMPLX** knob is in the CCW position, new melodies will be very simple. Sometimes, they will be only one or two different notes. Use this setting if you want a more rhythmic melody, or maybe a simple bassline.



In the noon position, the melodies created are more complex, and they also tend to emphasize ascending and descending runs.



In the fully CW position, melodies are the most complex, and use Proteus's full intelligence to create the most interesting melodies it can create using a pre-curated balance of the internal parameters.

There is a smooth transition across these types from CCW to CW.

**Voltage output.** The melodies that Proteus creates are contained within the span of a single octave. You can think of the root note as C3, which corresponds by default to 2.0 volts (of course, whether or not this actually sounds like a C3 depends on how you tune your oscillator).

The **OCTAVE** parameter allows the whole melody to be transposed up or down one octave from this base octave (i.e., down to the C2 octave or up to the C4 octave). Therefore, by default Proteus's pitch output will always range from 1.0 to 4.0 volts (when there is no input to the **TRANSPOSE** jack – more on that later). You can change the default root voltage to 1.0 volts or to 3.0 volts using the advanced options in the config file (see below).

## Parameters

**Length.** This parameter determines how many steps there are in the sequence from a minimum of 2 to a maximum of 32. When you turn the length knob, the step lights will illuminate temporarily to make it easier for you to select a specific step length. The first page, step lengths 2-8, are red lights, then the lights turn orange to indicate that you are on page 2 (9 – 16 steps), then yellow for page 3, then green for page 4. The first note of the sequence always appears in green to let you know where the sequence starts.

**Density.** This parameter determines what percentage of the notes are actually played, and what percentage are rest notes. With the knob fully CW, all of the notes in the sequence will be played, at noon, 50% of the notes will be played, and fully CCW only a single note will be played. When you turn the Density knob, notes appear and disappear in an order that is specific to the sequence – the “rest order”. That means, that if you turn the knob down to 10%, then up to 90%, and back down to 10%, you will go back to the exact same notes at 10% that you had the first time the knob was there.

**Sleep.** This parameter allows you to set a number of beats to wait before repeating the sequence. For example, if you set **SLEEP** to 8, Proteus will play your sequence, then wait 8 beats before playing it again. The step lights illuminate to help you select the number of beats when turning the knob.

**Patience.** This parameter determines how fast Proteus gets bored with the same melody. With the knob fully CCW, Proteus will be very impatient, and

the probability of a new melody will increase very rapidly. If you turn the knob fully CW, patience becomes infinite and Proteus will never make a new melody. To indicate that you are in infinite patience mode, the center light will turn greenish and will no longer progress from blue to pink over time. Thus, if you want to “lock” the melody with CV, you can maintain a high voltage into the **PATIENCE** jack to keep Proteus in infinite patience mode. Note that this does not prevent mutations or octave transpositions. If you want to prevent all three of these changes at once, you can flip the **LOCK** toggle switch to the lock position.

**Scale.** This selects the scale or mode that the notes are drawn from. When you turn the knob, the step lights illuminate in red and below each light is an abbreviation that helps you remember which scale it corresponds to. When you reach the second page of scales the lights will be orange. The scales are:

PAGE 1:

1. Major (C D E F G A B)
2. Natural Minor (C D Eb F G Ab Bb)
3. Harmonic Minor (C D Eb F G Ab B)
4. Major pentatonic (C D E G A)
5. Minor pentatonic (C Eb F G Bb)
6. Dorian (C D Eb F G A Bb)
7. Mixolydian (C D E F G A Bb)
8. Bhairavi (aka Phrygian) (C, Db, Eb, F, G, Ab, Bb)

PAGE 2:

C1 – C6 – custom scales, see *below*

7. Chromatic (C C# D Eb E F F# G G# A Bb B)
8. Tuning – only outputs C to help you tune (C)

**Octave.** This parameter controls the probability of an octave transposition. Proteus will only stray one octave up and one octave down from the base octave. That means if the melody transposes up one octave, the next octave transposition will always be back down. When an octave transposition happens, the step 1 LED will show yellow.

**Mutate.** This controls the probability that a single note will change in the next cycle. If a note is changed, that note will appear in pink to let you know it has changed.

**Complexity.** Controls melody complexity for the next melody generated. See the Melody Generation section for more detail.

# Pattern Bank



**Saving patterns.** If Proteus generates a pattern you really like, you can save it in one of the four slots of the Pattern Bank. Just press any unlit button to save a pattern in that slot. The pattern will immediately be saved into RAM to be recalled at any time. The saved patterns will also persist through shutdown and restart of the module, (as will the currently playing pattern once it has repeated), but this save only happens when the clocked is stopped to avoid interruption of your playing sequence. If you want to save to persistent memory more frequently, you can change the settings in the online configurator.

You can only save into an empty slot, so if you want to want to overwrite a pattern, you need to clear it first (see below).

Proteus also makes an attempt to save the current melody even if you don't put it in one of the save slots. By default, this save happens when the incoming clock stops. But you can choose instead to save every X repetitions by changing the settings in the online configuration tool.

**Loading patterns.** To load a pattern, just press any lit button.

**Clearing patterns.** To erase a pattern from a slot, long-press a lit button. The button will go dark, indicating an empty slot.

**Cycling through patterns.** If you send a trigger into the **NEXT** jack, Proteus will load a pattern from the next filled slot. When a pattern loads this way, the corresponding button will flash to let you know which pattern has loaded. When you get to the last saved pattern, the next trigger will loop around to the first saved pattern.

# Settings Mode



Flip the right side toggle switch to the up position to access the Settings Mode.

When you are in Settings Mode, the center light will turn to rainbow colors. In this mode, the silver panel labels apply.



**Gate length.** Adjust the gate length, from 10% (fully CCW) to 100% (fully CW) of the inter-trigger gap.

**Rotate.** Rotate the sequence forward or backwards one step at a time. When the knob is in the 12'oclock position there is no rotation. Rotate the sequence forwards or backwards by turning the knob CW or CCW respectively.

**Slew length.** This setting only has an effect when Slew Mode is engaged (option button #2). Changes the time required to transition from one note to the next.

**Slew notes.** This setting only has an effect when Slew Mode is engaged (option button #2). Adjusts the number of notes that have slew applied.

**Brightness.** Adjusts the brightness of the LEDs.

# Option buttons

In Settings Mode, the pattern bank buttons become toggles for four different options.

-  **Vary Gates with Rests.** This setting will create longer gates when a note is followed by a rest note.
-  **Add Slew Notes.** This setting works in concert with the slew length and slew notes knob to add slew to some notes.
-  **Preserve Melody Parameters.** This option ensures that when you load a saved melody, it sounds exactly as it did when you saved it. When a saved melody is loaded, all knobs will be locked so that they will not affect the sequence until you turn them to positions that match the saved melody.
-  **Quantize Notes.** This setting constrains new notes to the currently selected scale when transposing using the Transpose jack, and forces an already playing melody to the selected scale.

# Knob lock behavior

When switching back and forth between modes, the knobs will take on different functions. To avoid the knob positions causing unexpected changes to your melodies, switching modes will “lock” the knobs. For instance, if you switch to settings mode and change Gate length, when you switch back to regular mode the sequence length will not change. To change the sequence length, you will need to first return the knob to its original position. When the knob is locked, moving the knob will bring up a display that shows you the current knob position in blue, and the original knob position in red. When they overlap, the lights will all turn purple indicating that the knob has been unlocked.

When you first turn on the module, the knobs will be locked. This is because all attempts are made for the module to sound exactly the same when you turn it on as it did when you last turned it off. If you had a great melody going, and after turning the module off you accidentally move one of the knobs, your melody will still sound the same when you turn the module on.

If you have the **Preserve Melody Parameters** (  ) option turned on, when you load a melody from the Pattern Bank, the knobs will automatically be locked so that their positions do not affect the newly loaded pattern. This ensures that the melody loads and produces exactly the same sound it did when you saved it, regardless of current knob positions.

If you are really annoyed by the Knob Locking behavior you can turn on “Simple Mode” in the web configurator and then Proteus will never lock its knobs. In Simple Mode, Proteus becomes one-knob-per-function, meaning all of the alternate functions from Setting Mode are disabled.

# Transposing Melodies

You can transpose your melodies by sending a v/oct signal into the **TRANSPOSE** jack. The incoming voltage will be added to the voltages produced by Proteus. Depending on the **quantize setting**, the resulting voltages may be quantized to the current scale to force the new notes to stick within the selected scale.

To turn on and off the quantize setting, enter Settings Mode by flipping the right toggle switch up. The fourth options button (  ) controls the quantize setting.

When the button is illuminated, after summing, the voltages will be quantized.

When the button is not illuminated, there is no quantization; the v/oct is the direct sum of the incoming voltage with the voltage of the melody tones.

**Quantization also affects how scale changes function.** For instance, if you create a melody in a minor scale, then change scale knob to major, if quantization is on, the notes will be quantized into the current, major, scale. If quantization is not on, the melody will not change (although any newly created melodies will use notes from the now selected major scale).

# Custom scales

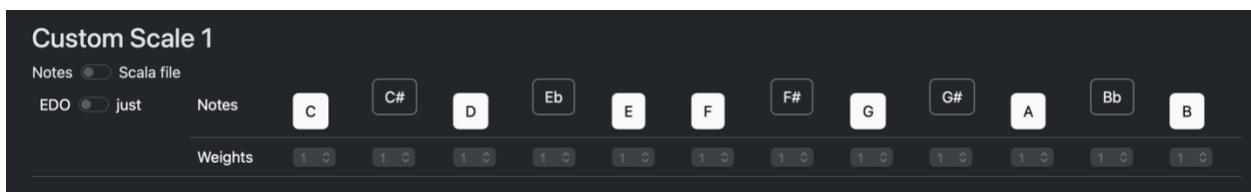
You have six custom scale slots that can be configured with the advanced options configurator website:

<https://seaside.digital/proteusconfig/>

That website helps you to create a settings file, called `proteus_config.json`. When you put this settings file on the USB stick and plug it into Proteus, the module will read the config file and read in your custom scales and advanced options. This file must be named exactly `proteus_config.json`, and must reside at the root level of the drive.

There are two ways to define a custom scale.

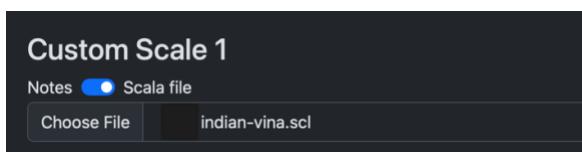
Option 1: Click the buttons to activate or deactivate the notes in your scale.



*Note: The EDO/just slider allows you to select “Equal Devision of the Octave” or “Just intonation” temperament.*

The weights under each note represent the likelihood that note will be chosen when a melody is generated. Higher numbers make the note more probable.

Option 2: Use a [Scala file](#).



Use the slider to select “Scale file” then Choose a .scl file. You must then copy your scala file onto the USB drive into a folder at the root level of the drive called “scala\_files”.

*Note: Weighting is currently unavailable from the user interface when using Scala files. When using a Scala scale, each note will be weighted equally, unless you manually enter weights into the json file.*

# Advanced Options

The advanced options configurator website also allows you to set certain advanced options.

<https://seaside.digital/proteusconfig/>

Current advanced options:

**Gate length passthrough.** This option passes the gate from GATE IN directly to GATE OUT. This means that the output gate will have the same length as the input gate.

**Lock knobs on startup.** When this option is on, knobs position will not affect the melody when the module is started up, until they are returned to their saved positions.

**Reverse lock switch.** When this option is on, the directionality of the lock switch is reversed.

**Base voltage.** By default, the root note of the scale is treated as C3 and outputs a voltage of 2.0 volts. The reason for this is that Proteus can only output voltages in the range 0.0 to 5.0. As we approach the extremes of this range, the accuracy of the output diminishes slightly. Therefore, the usable three octave range of 1.0 – 4.0 volts is the safest, and tuning your oscillator up or down can change the actual pitch ranges that you create. However, if you want to set the root voltage to 1.0 or to 3.0 you can select a value from the pulldown menu.

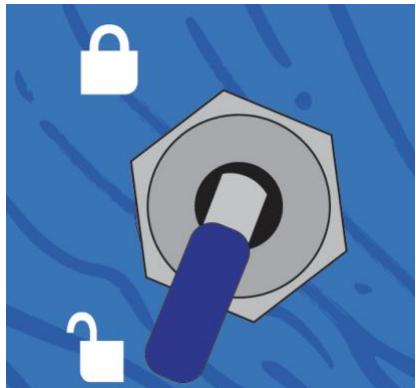
**Only save when stopped.** By default, this option is on, which means that Proteus will only save to the persistent flash memory when the incoming clock has stopped. This save operation can take a portion of a second to complete; if you save to persistent memory while your sequence is running you may notice a hiccup or even miss a beat. If you tend to play slower sequences, and you value persistence over timing, you can choose to turn this off and instead select a value for the “save every” option.

**Octave transpose direction.** By default, octave transposition can shift your sequence up one octave or down one octave from the base octave. You can change this to “up only” or “down only” to restrict the octave transposition to only go up one octave from the base or only down one octave from the base.

**Simple Mode.** Simple mode disables all the silver alternate functions, putting Proteus in a simple one-knob-per-function mode. Values for the alternate functions will revert to their default values and cannot be changed. The position on the knob will therefore always reflect the current parameter.

## Melody lock

You can use the **LOCK TOGGLE** to quickly lock your melody in place.



In the down position, the melody is free to change when Proteus gets impatient, and may transpose in octave or mutate notes depending on those parameters. Active notes appear light blue in the step indicators.

In the up position, the melody will never change. This also prevents octave transpositions and mutations. Active notes will appear purple in the step indicators while the sequence is locked.

# What do the colors mean?

The colors of the step lights are designed to be informative. Don't worry, you don't need to memorize these colors. In practice they are mostly self explanatory when you see them in context.



When the light is off, that step will not be played.



A blue light indicates an active step.



A green light indicates the very first step of the sequence.



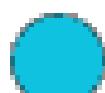
An orange light indicates that Proteus is sleeping on that beat.



A yellow light on the first step means an octave transposition has taken place.



A pink light means a mutation has taken place on that step.



A teal light indicates a slewed note.

# Changing the panel

The Proteus panel is reversible. If you prefer a less complicated panel, **without the labels for the secondary functions of the knobs**, you can remove the panel and re-install it on the other side.

*Removing the panel.* Remove the knobs. They can be very tight, so might require some light prying, just make sure not to damage the panel in the process. Unscrew the nuts underneath the knobs. Remove the jack nuts and the nuts around the switches. You can then remove the panel. Pop out the light pipes, being careful not to lose them. They are transparent and will disappear for months at a time if dropped. If you lose one, contact us, and we will chastise you for carelessness.

*Re-installing the panel.* Put the light pipes back in by pushing them through the panel on the other side. You may need to use a hard plastic object to push them all the way in. Reinstall the panel making sure all the buttons come through, then reinstall the jack nuts, pot nuts, and switch nuts, then press the knobs back onto the pots. Do not overtighten the nuts. Tightening the nuts too much can cause the buttons to get stuck due to slight bending of the panel.



If you'd like to try making your own front panel, there is a [template file](#) for the front panel that is open sourced. The only stipulation is that we request you not use the Seaside Modular logo (which is not included in the template).

# Tips and tricks

- To get a new “rest order” for your melody, change its length. For instance, with an 8 step sequence, if you change the length to 7 and then back to 8, a new rest order will be associated with the melody. This is because when length is changed, rests and rest order need to be recalculated to maintain the correct density.
- To force a melody back to its base octave, make sure the “Preserve melody parameters” option is unclicked, then save the melody and immediately load it (that is, double-click a blank Pattern Bank button). Saved melodies are always saved in their base octave form, so when you load them back, that’s what you’ll hear.
- If you only fill one slot in the Pattern Bank, you can use a trigger into **NEXT** to re-load that pattern. For example, you can load the melody from memory, let it mutate, and then reset it to its original form periodically by sending a trigger into **NEXT**.

## F.A.Q.

- What exactly is saved with a pattern?

When you save a pattern, you save all of the notes, the length of the sequence, the slew states, the mute states, the scale, the number of rest steps, and the gate length. If you have the “lock on load” option set, all of these parameters will be preserved when you re-load the pattern.

- What’s the difference between using the lock switch and turning the Patience knob all the way up?

The Patience knob only affects the probability of a new melody being created; when it is turned all the way CW, a new melody will never be created because Proteus has infinite patience. However, the melody could still be transposed and notes could be mutated depending on the positions of the Octave and Mutate knobs.

When the Melody Lock switch is in the upwards, locked position, all changes to the melody are prevented. It will not octave shift, it will not mutate, and new melodies will not be created.

# Updating Firmware

The latest firmware can be found here:

<https://seaside.digital/proteusconfig/firmware.php>

To update your module with the latest firmware, remove the USB stick from the module, plug it into your computer, and copy the firmware .bin file to the root level of the USB drive. Make sure there is only one .bin file on the drive. Plug it back in, power cycle the module, and it will update. The update may take about 10 seconds to complete, during which time the module will be unresponsive.

Note that you can power cycle the module by holding the New Melody button for 10 seconds.

Rarely, a firmware update will require calibration afterwards. If so, the firmware will be marked with “CALIBRATION REQUIRED”. If you turn on Proteus after a firmware update and it’s not working, this may be why. See [instructions for calibration](#) below.

When Proteus starts up, it writes a file called **version.txt** to the USB drive that contains the current firmware version number.

# Calibration

The module comes factory calibrated. However, if you need to perform a calibration, this section will explain how to do it.

The symptoms of a mis-calibrated module are one of the following:

- 1) the output voltages are not accurate
- 2) the transpose input is not accurately adjusting the voltages by the proper amount
- 3) the output pitches change when you toggle the **CALIBRATION TOGGLE** even when there is no input to the **TRANSPOSE** jack.

To perform calibration you will need a constant DC voltage source (Mordax DATA is sufficient, but accuracy of calibration depends on how accurate your voltage source is. To use DATA as a voltage source, [check out this video](#)).

To enter calibration mode, hold the first and last Pattern Bank buttons while you start up the module. You will know you are in calibration mode when you see the step lights displaying a rainbow.

Press the NEW button to begin the process.

You will now see one single step light illuminated. Plug a **1 volt** source into the TRANSPOSE jack. Press the NEW button once.

You will now see two lights illuminated. Plug a **2 volt** source into the TRANSPOSE jack. Press the NEW button once.

You will now see three lights illuminated. Plug a **3 volt** source into the TRANSPOSE jack. Press the NEW button once.

Now the lights will be rainbow and all illuminated. Connect the TRANSPOSE jack to the V/OCT OUT jack with a patch cable. Press the NEW button once. The lights will turn purple, and after a few seconds the module will boot.

After the module boots, press the New Melody (center) button. Your module is now calibrated.

# Troubleshooting

## I'm having a problem with the module. Help!

- First, reboot the module
- Try pressing the New Melody (center) button
- Make sure you are sending in a clock trigger. Some issues resolve themselves when a clock pulse comes in
  - Try updating to the latest firmware
  - If problems persist, try Calibrating the module
  - If you still have issues, ask on our Discord or send a message to [support@seaside.digital](mailto:support@seaside.digital)

## When the module turns on, the pattern bank lights are on but nothing else happens.

- This generally means the module needs to be calibrated.

## One of my buttons is stuck.

- This can happen if the faceplate is too tight. Try loosening the jack nuts, the toggle switch nuts, or the potentiometer nuts.

## The module will not turn on at all. I think I fried it!

- We told you not to put it in salt water.

# Support

You can ask for help on our Discord Server:

<https://discord.gg/pNR2ZPgWgq>

Or contact us by email at [support@seaside.digital](mailto:support@seaside.digital)

## Acknowledgements

Proteus would not have been possible without the support, encouragement, and inspiration from many, many people. Special thanks to the testers of Proteus, who made feature suggestions that significantly improved the module and helped to root out a million bugs: Anton Riehl, Synthdad, Bill Get Still, Stujay, Oscidigi, Moonbass Alpha, and Surco. Big thanks to Divkid for his ongoing support and for creating the wonderful community which has nurtured the modular spirit. Thanks also to all the VCV Rack users who fiddled with Proteus, providing feedback and musical inspiration over the years.



*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.*



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