ADDAC System ADDAC508 Swell Physics Eurorack Module User Guide

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ADDAC System

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Specifications

- **Size:** 10HP
- **Depth:** 4.5cm
- **Power Consumption:** 70mA +12V, 40mA -12V

Product Description

- The ADDAC508 Swell Physics module is designed to simulate ocean swell behaviour using a Gerstner Wave algorithm.
- It offers controls to adjust the virtual height of the ocean swell, wind effects, buoy spacing, simulation speed, operation modes, and CV outputs.

Usage Instructions

SWELL Size Control

- The SWELL Size knob adjusts the virtual height of the ocean swell.
- Turn clockwise for a bigger swell size and counterclockwise for a smaller swell size.

AGITATION Control

- The AGITATION macro controls the wind and secondary swells to create interference waves.
- Adjust this knob to add complexity to the generated waves.

SPREAD Control

- The SPREAD knob sets the distance between buoys, affecting how related or unrelated the outputs are.
- Smaller spreads make outputs more related, while bigger spreads make them more unrelated.

SIMULATION SPEED Control

- Use the SIMULATION SPEED knob to adjust how fast the wave simulation is calculated.
- Turning it clockwise increases the speed, similar to adjusting the frequency on an LFO.

A / B MODE Control

The A / B MODE switch sets the operation mode:

- Mode A – Scrolling Mode: Computes a Gerstner wave in a scrolling manner where all buoys follow the same path.
- Mode B – Evolving Mode: Computes a Gerstner wave normally with points affecting each other for different paths.

GATE 14 and OUTPUTS

- GATE 14 outputs a gate when output 3 is larger than output 4.
- The module also features 4 16-bit CV outputs, an average output of all CVs, and LEDs indicating output states.

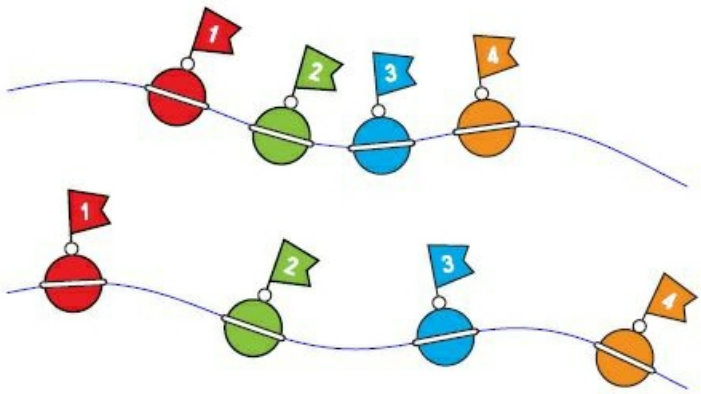
FAQ

- **Q:** What is a Gerstner Wave?
- **A:** A Gerstner Wave is a progressive wave of permanent form on a fluid surface, often used in computer graphics to simulate water surfaces.
- **Q:** How can I create complex interference waves?
- **A:** Use the AGITATION control to adjust wind and secondary swells that interact with the main wave, creating complex interference patterns.

Welcome to ADDAC508 SWELL PHYSICS USER'S GUIDE

WELCOME
Following our ADDC503 Marble Physics here is a new simulation of a physical system. This time imagine a small

area in the middle of the ocean, in this area we place 4 equally spaced buoys anchored to the bottom in such a system that we can control the spacing between the buoys. Imagine we can control the elements and agitate the waters at will which in turn will make the buoys move up and down as the water surface moves.
Finally, imagine the buoys would wirelessly transmit their absolute height directly to your module outputs where they would be mapped to a voltage signal.



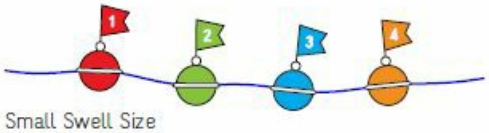
We use a Gerstner Wave as the motor behind the 2d wave generation. In fluid dynamics, a Gerstner Wave is described as “a progressive wave of permanent form on the surface of an incompressible fluid of infinite depth”. Gerstner waves are often used in computer graphics to simulate any type of water surface, if you’ve seen any animation film or computer game with water surfaces in it most probably it features a Gerstner wave generating it.

Tech Specs

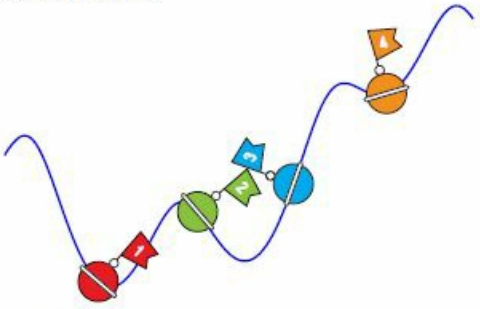
- 10HP
- 4.5cm deep
- 70mA +12V
- 40mA -12V

MODULE DESCRIPTION

Starting from the top [SWELL Size] controls the virtual height of the ocean swell, or more precisely the maximum amplitude between the highest crest and the lowest trough.

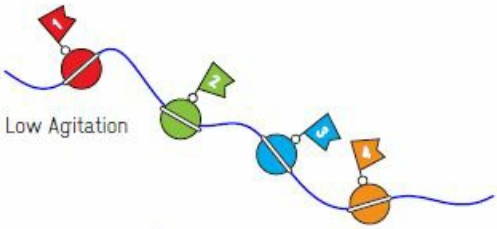


Small Swell Size



Big Swell Size

[AGITATION] is a peculiar macro that controls wind and secondary swells that create more complex interference waves.

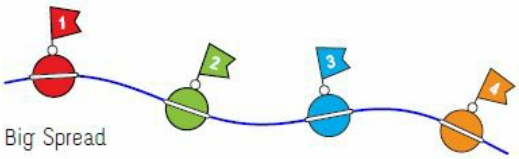


Low Agitation

High Agitation

[SPREAD] sets the distance between buoys, smaller spreads make the outputs more related or closer to each other while bigger spreads will make the outputs more unrelated.

Small Spread



Big Spread

[SIMULATION SPEED] controls how fast the simulation is calculated just like a frequency control on an LFO.

[OFFSET] and [OUTPUT GAIN] allow to set all 4 CV outputs to any voltage range between ±5V or 0 to +10V.
There's only one CV input for these 2 functions the [CV IN] switch allows to route the input to a prefered one.

[BIPOLAR / POSITIVE] switch sets all outputs voltage range to either ±5V or 0 to +10V

[A / B MODE] Sets the operation mode:
A - Scrolling Mode
B - Evolving Mode
Also used to set Clipping Mode (Page 8)

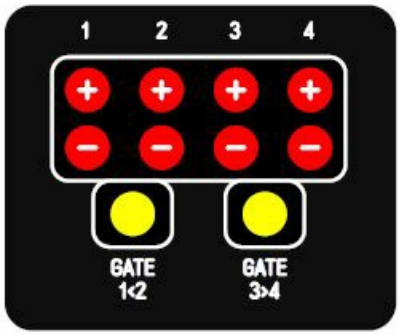
[GATE 1<2] Outputs a +5V Gate On while output 1 is smaller than output 2

[GATE 3>4] Outputs a +5V Gate On while output 3 is bigger than output 4

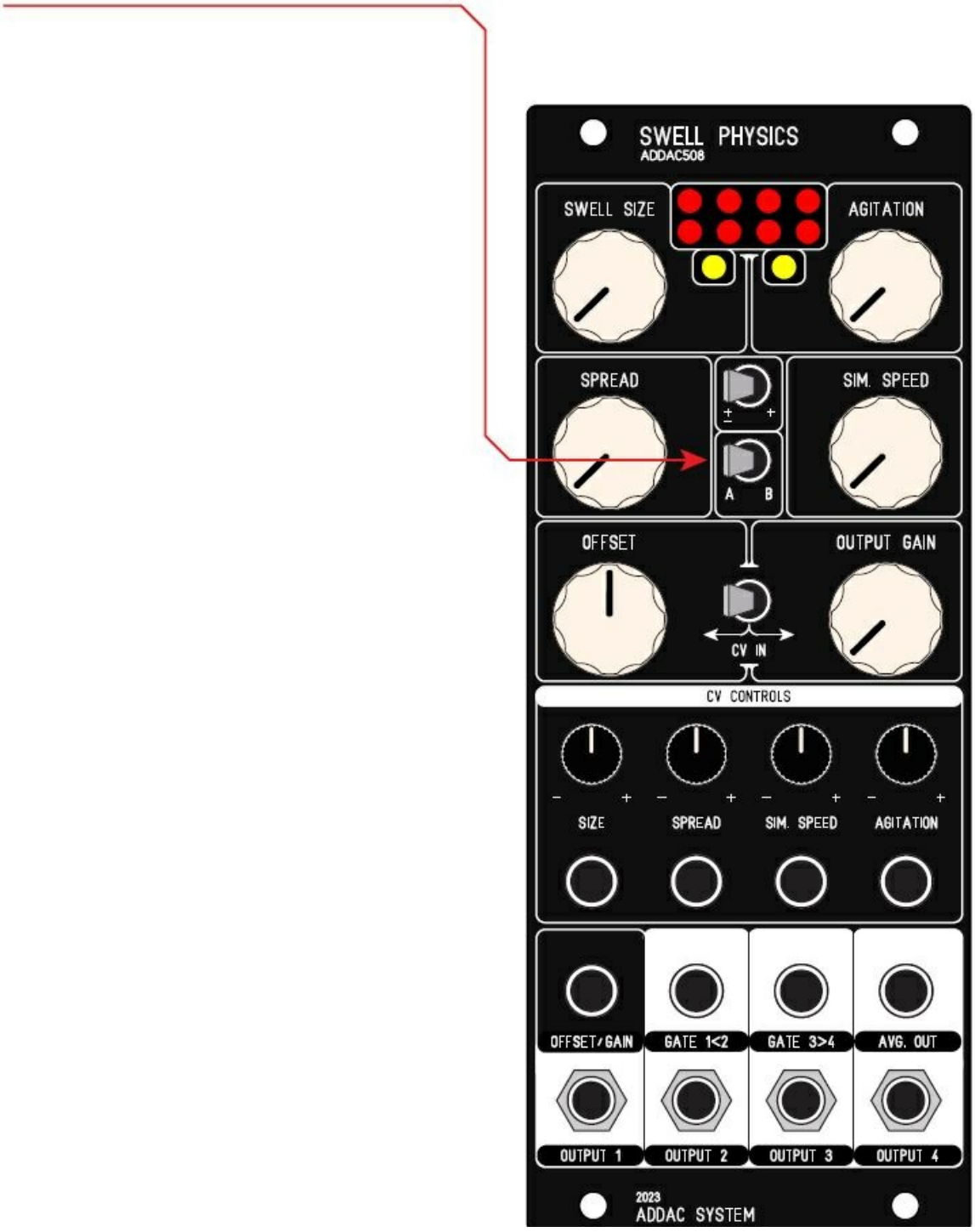
[OUTPUTS 1 to 4] 16 bit CV outputs

[AVERAGE OUTPUT] Average of all 4 CV Outputs

[TOP LEDS] Red LEDs show the bipolar state of all outputs, Yellow LEDs show the 2 gates state.



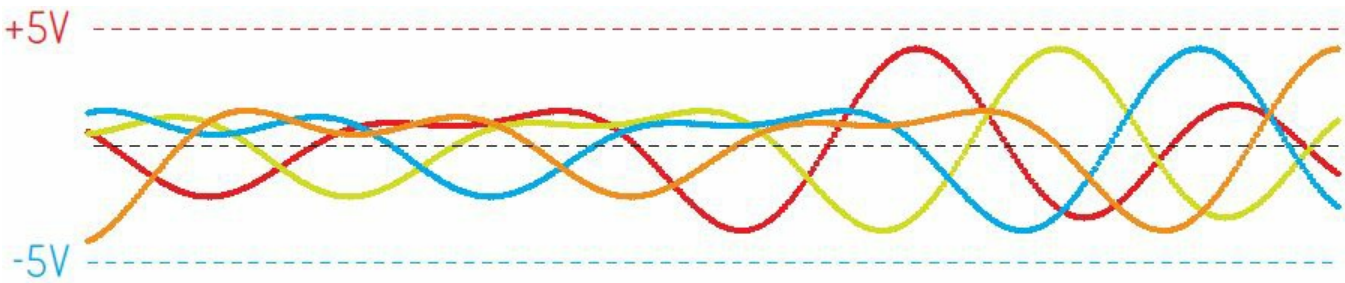
A B MODES



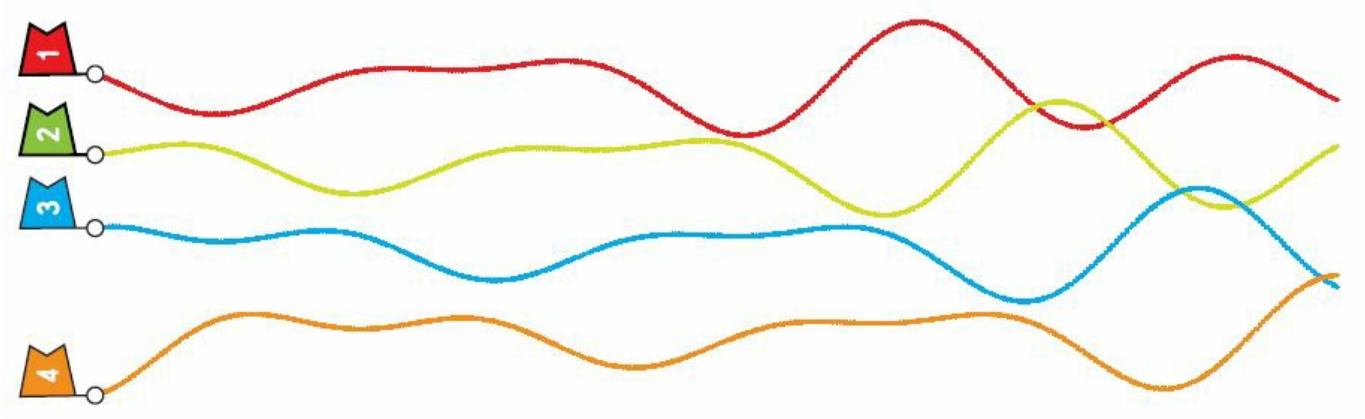
MODE A – SCROLLING

Scrolling is a particular way to compute a Gerstner wave. At every step, we calculate a single wave position at the leftmost point and push all previously generated points forward. This makes all buoys follow the same path, in this mode [SPREAD] works as a delay

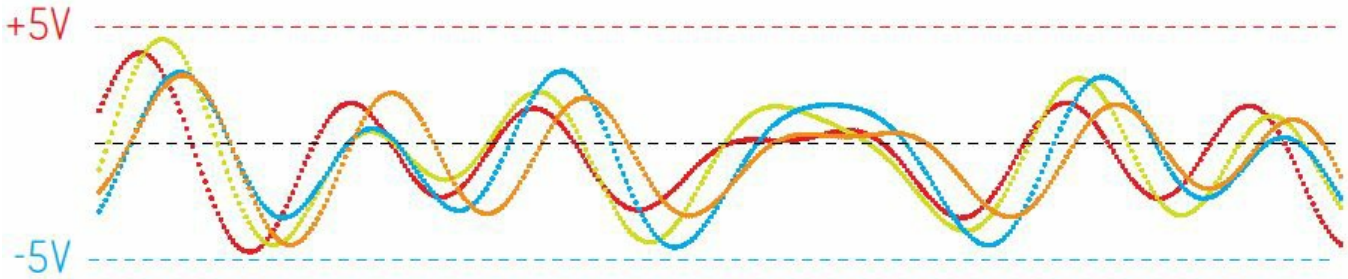
Here’s a Mode A plot of all buoys over time



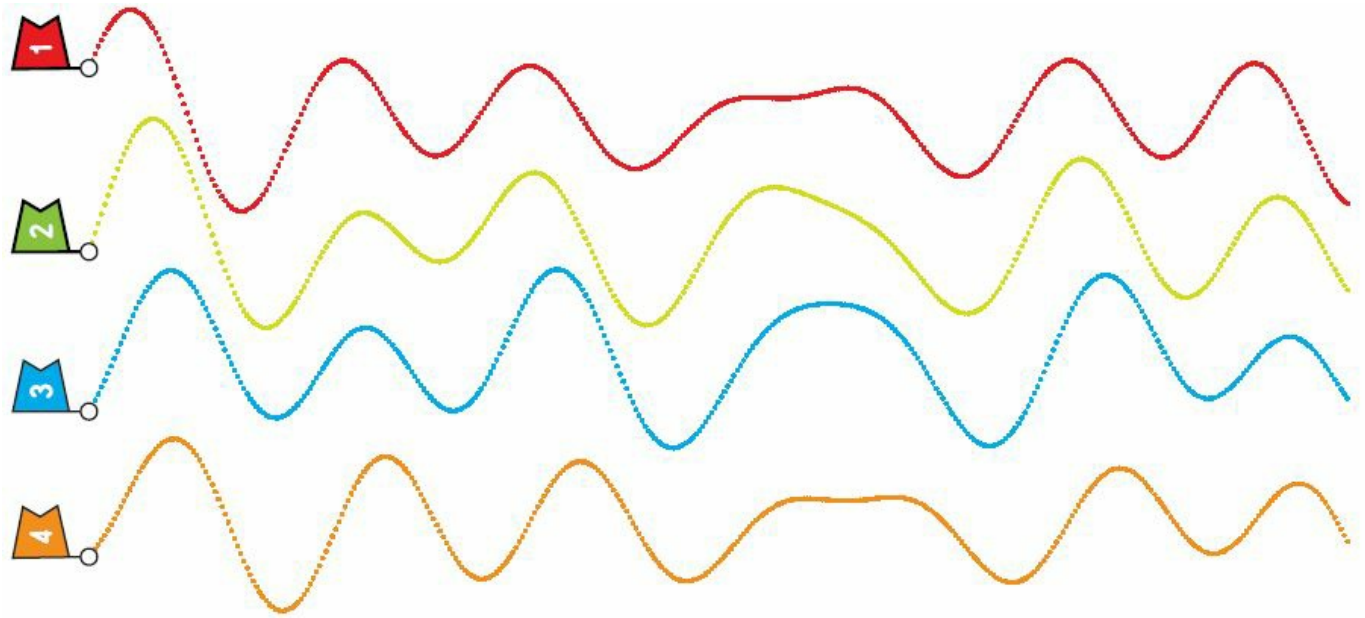
- Here’s the same plot with channels offset for better readability



MODE B – EVOLVING
Evolving is the normal computation for a Gerstner wave, at all steps, all points in the wave are calculated according to the settings and the points close by which also affect each other in a symbiotic relationship resulting in different paths for all buoys which are more or less related according to the settings.
Here's a Mode B plot of all buoys over time



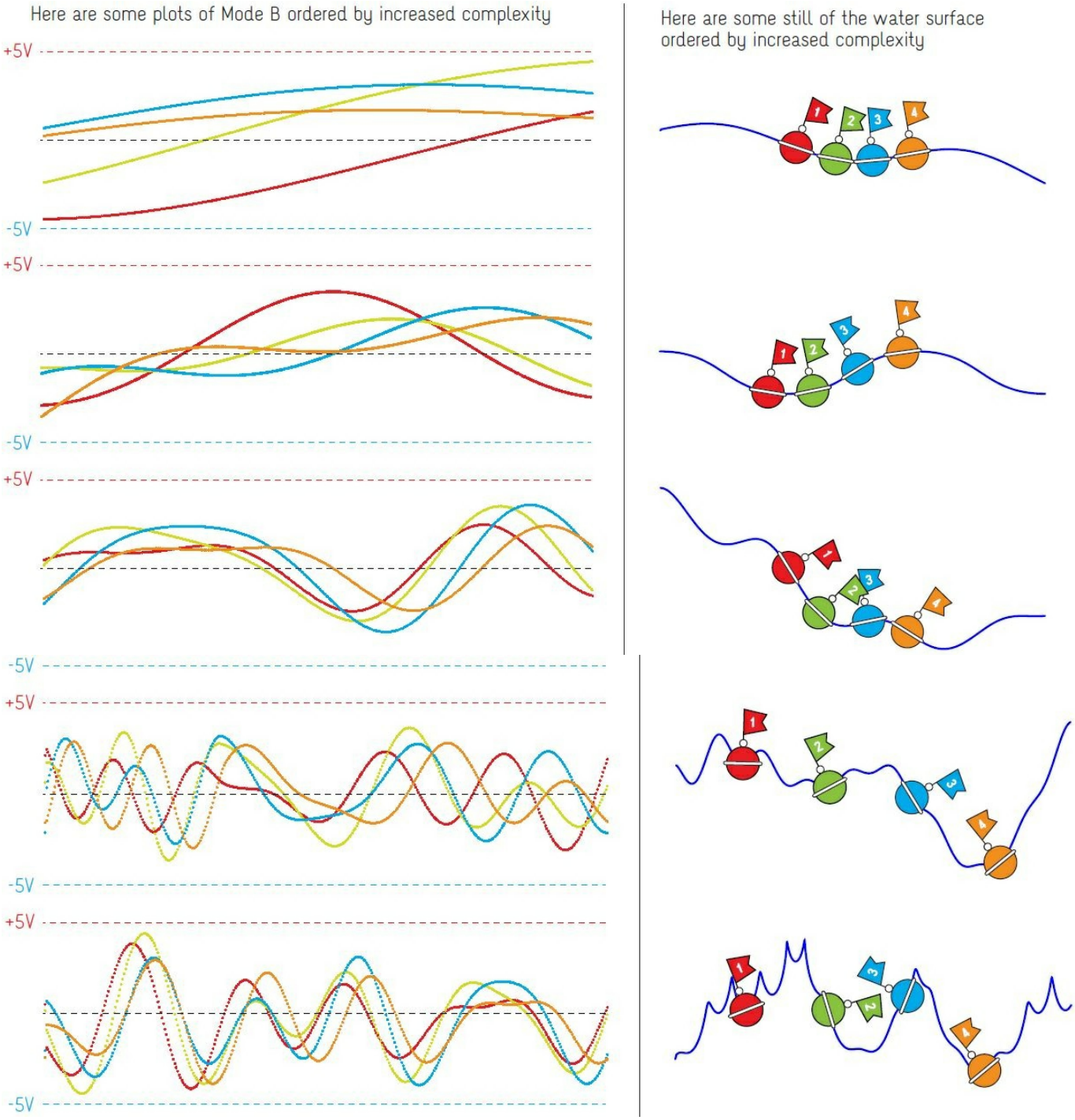
- Here's the same plot with channels offset for better readability



OUTPUTS – WATER SURFACE

- The outputs will always reflect the state of the water surface, the controls available allow to set this surface from the stillness of a pond to the complexity of a high sea storm.

- If completely still, using [SWELL SIZE] fully CCW, the outputs will all be either zero or +5v depending if in Bipolar or Positive mode. As the user increases the [SWELL SIZE] and [AGITATION] controls the surface becomes more complex.



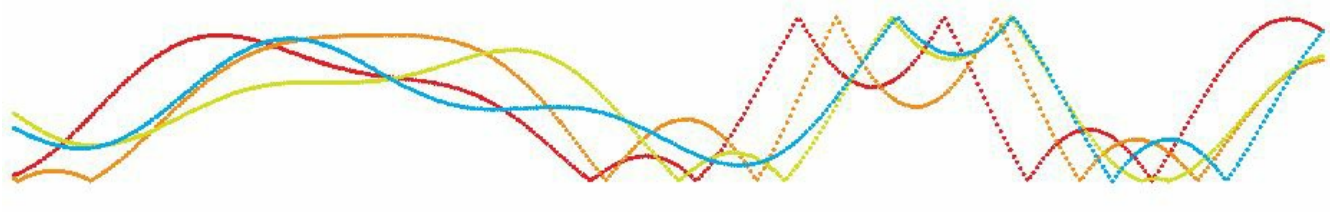
CLIPPING MODES

- It is possible to clip the waveform by setting the swell size higher than midnight.
- To change the clipping mode flick the MODE A/B switch back and forth faster than 1/2 a second.
- The current mode is not visible but will be reflected on the outputs.

There are 3 clipping modes available:

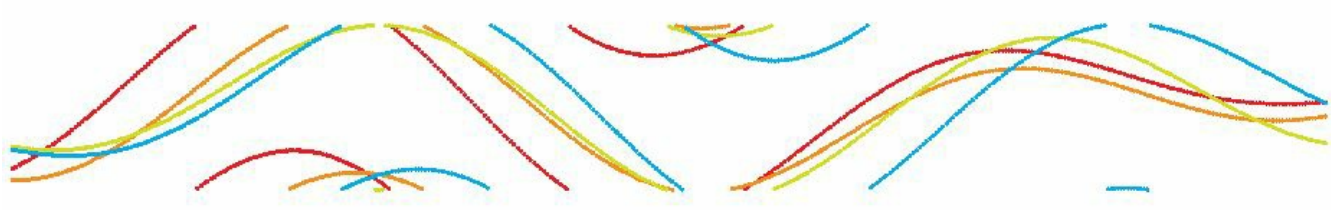
1. Fold (default)

Like any wave folder, it folds the wave by inverting the direction when above/below the maximum/minimum range.



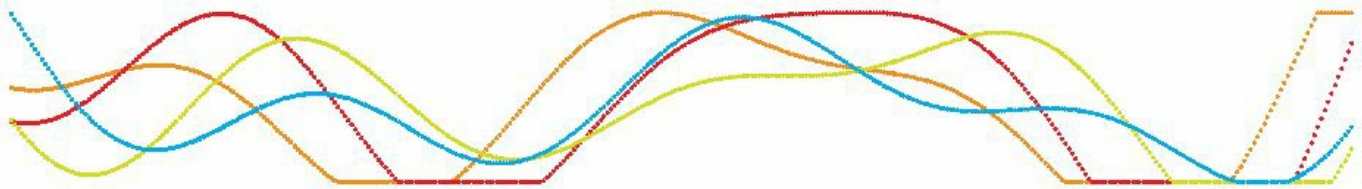
2. Thru

   This forces the wave to go through its minimum/maximum range into the oposite end.

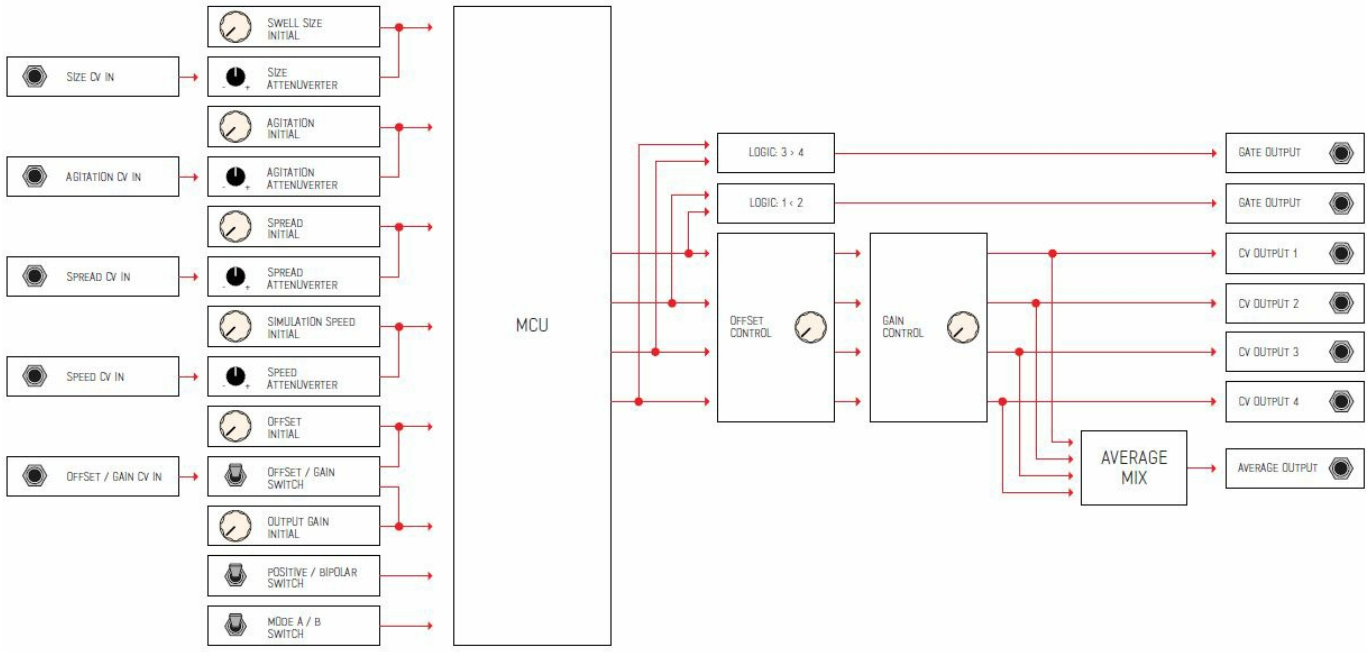


3. Limit

   Simply limit the wave to the minimum/maximum range.



SIGNAL FLOW DIAGRAM



For feedback, comments or problems please contact us at: **addac@addacsystem.com**.

Documents / Resources

	ADDAC System ADDAC508 Swell Physics Eurorack Module [pdf] User Guide ADDAC508, ADDAC508 Swell Physics Eurorack Module, Swell Physics Eurorack Module, Physics Eurorack Module, Eurorack Module, Module

References

- User Manual