

ADDAC System
Instruments for Sonic Expression
Est.2009

INTRODUCING
ADDAC508
SWELL
PHYSICS

USER'S GUIDE . REV01
January.2024



From Portugal with Love!

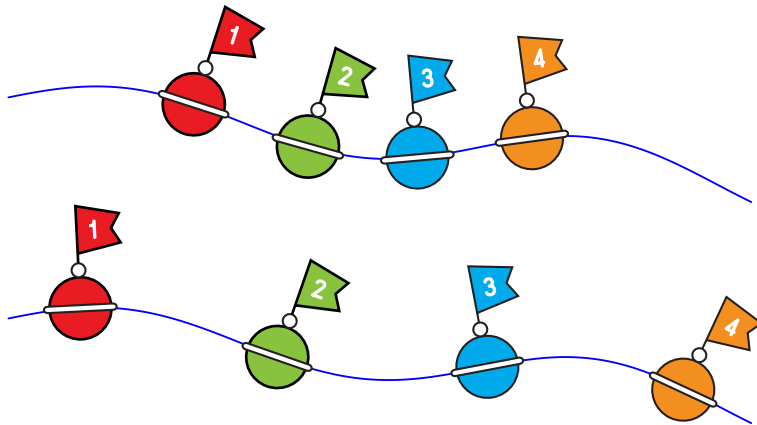
Welcome to: ADDAC508 SWELL PHYSICS USER'S GUIDE

Revision.01 January,2024

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.



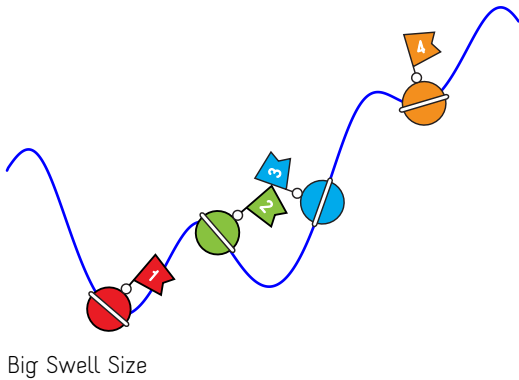
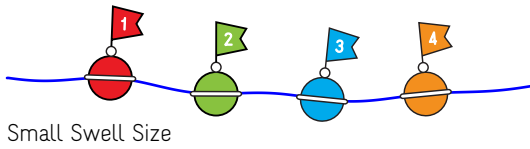
We use a Gerstner Wave as the motor behind the 2d wave generation. In fluid dynamics a Gerstner Wave is described as "a progressive wave of permanent form on the surface of an incompressible fluid of infinite depth". Gerstner waves are often used in computer graphics to simulate any type of water surface,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



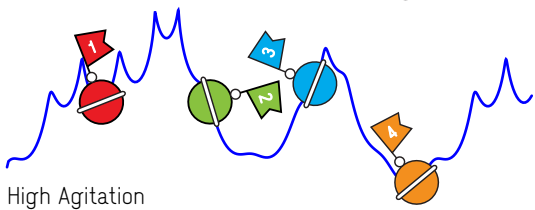
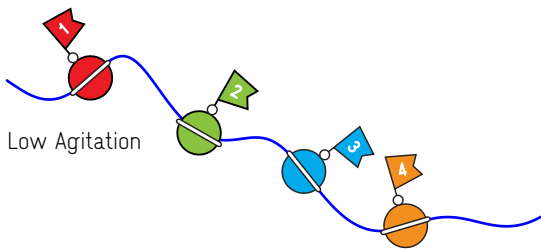
Tech Specs:
10HP
4.5cm deep
70mA +12V
40mA -12V

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.

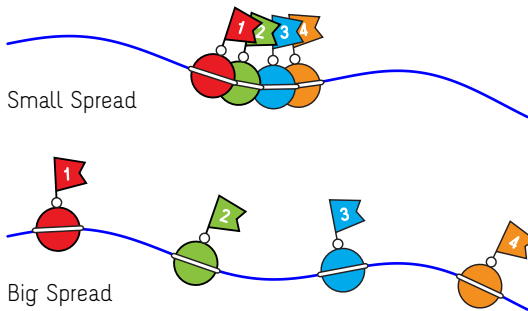


[AGITATION] is a peculiar macro that controls wind and secondary swells that create more complex interference waves.



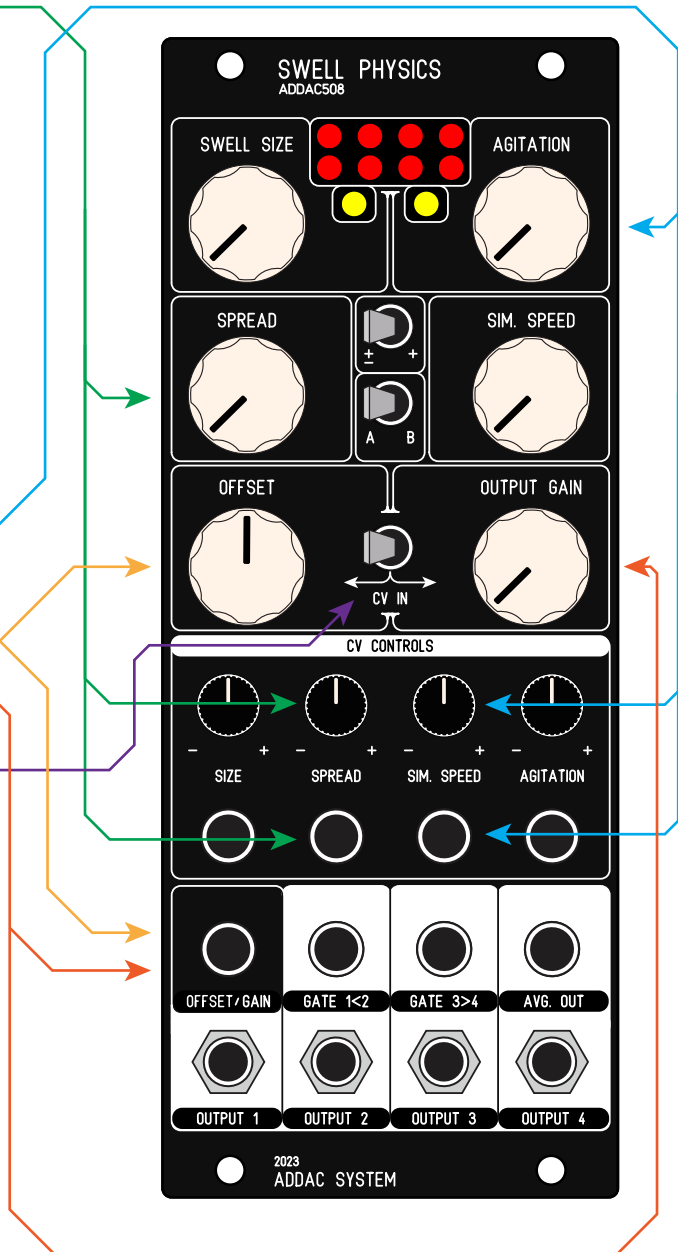
MODULE DESCRIPTION

[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.



[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 $\pm 5V$ 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 preferred one.



MODULE DESCRIPTION

[BIPOLAR / POSITIVE] switch sets all outputs voltage range to either $\pm 5V$ 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)

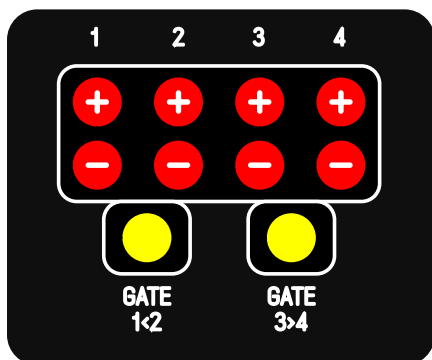
[GATE 1<2] Outputs a +5V Gate On while output 1 is smaller than output 2

[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.

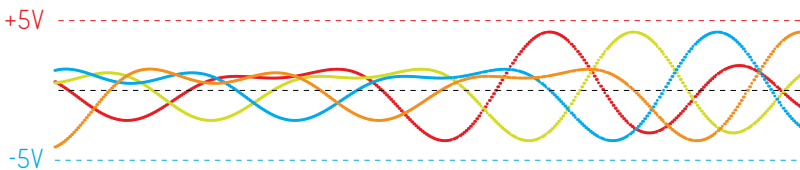


A B MODES

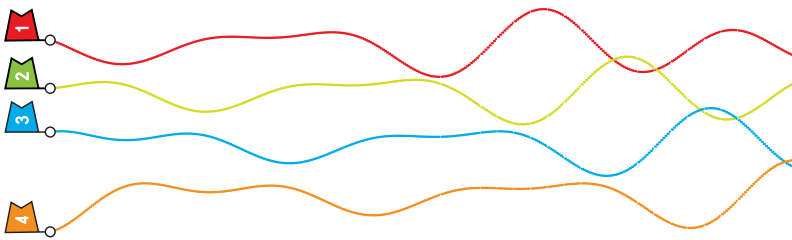
MODE A - SCROLLING

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

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



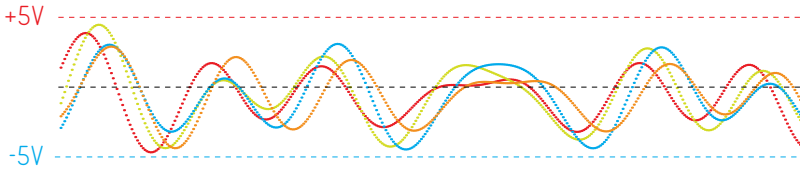
Here's the same plot with channels offsetted for better readability



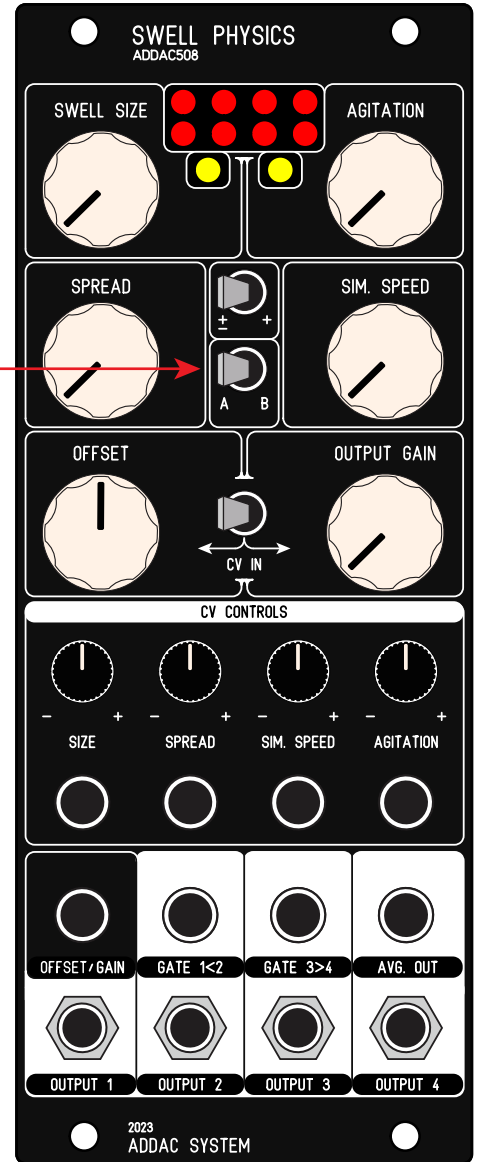
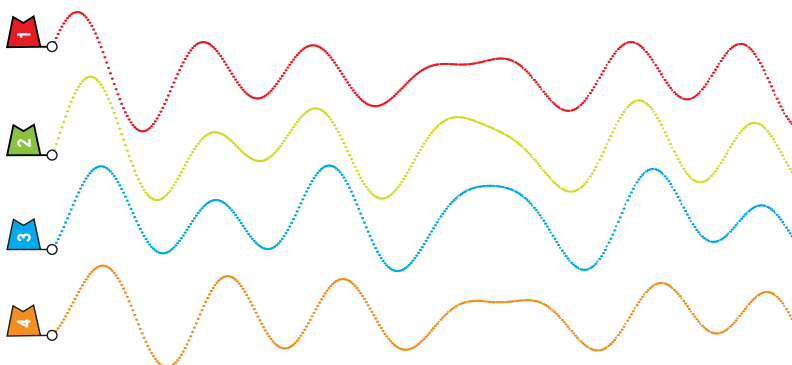
MODE B - EVOLVING

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 offsetted for better readability

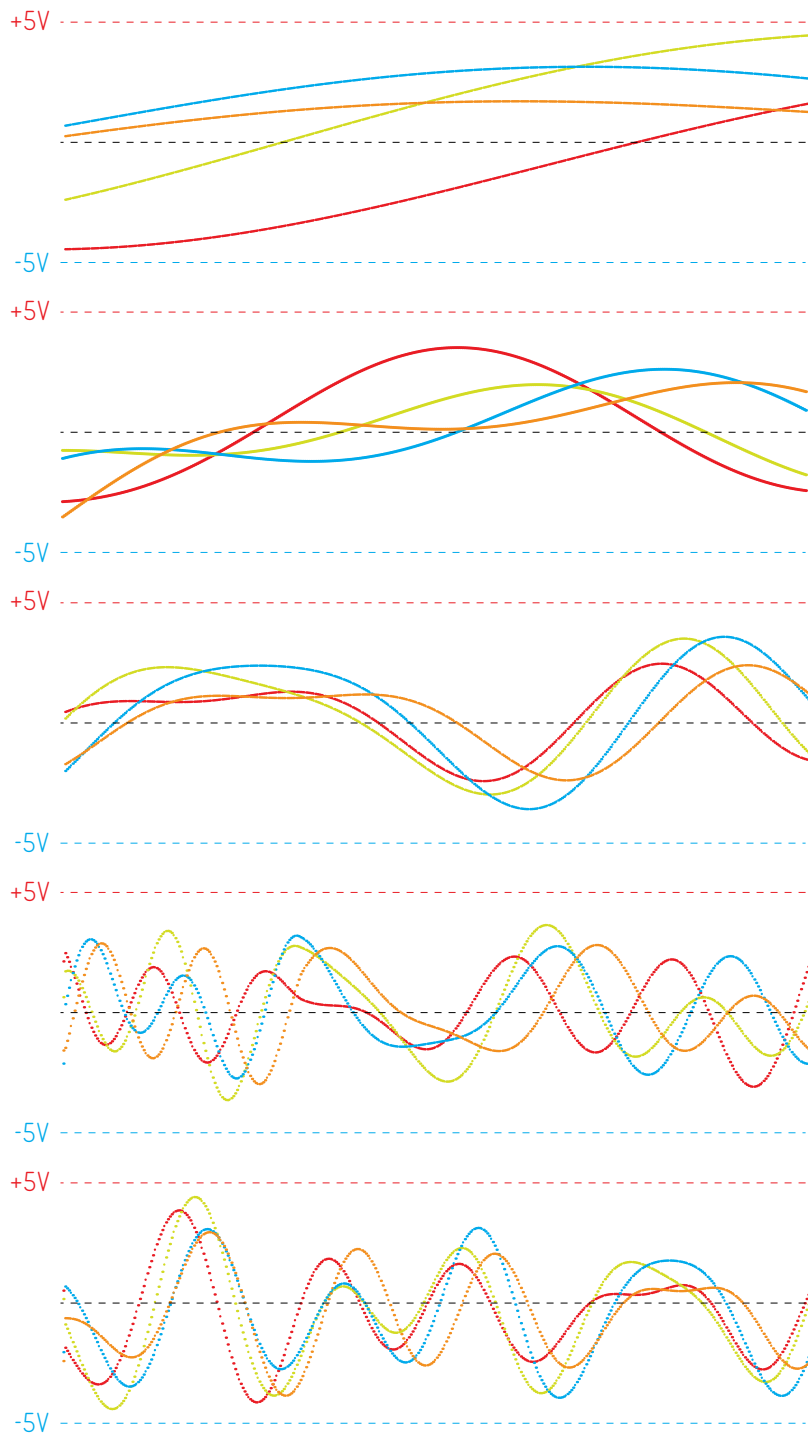


OUTPUTS - WATER SURFACE

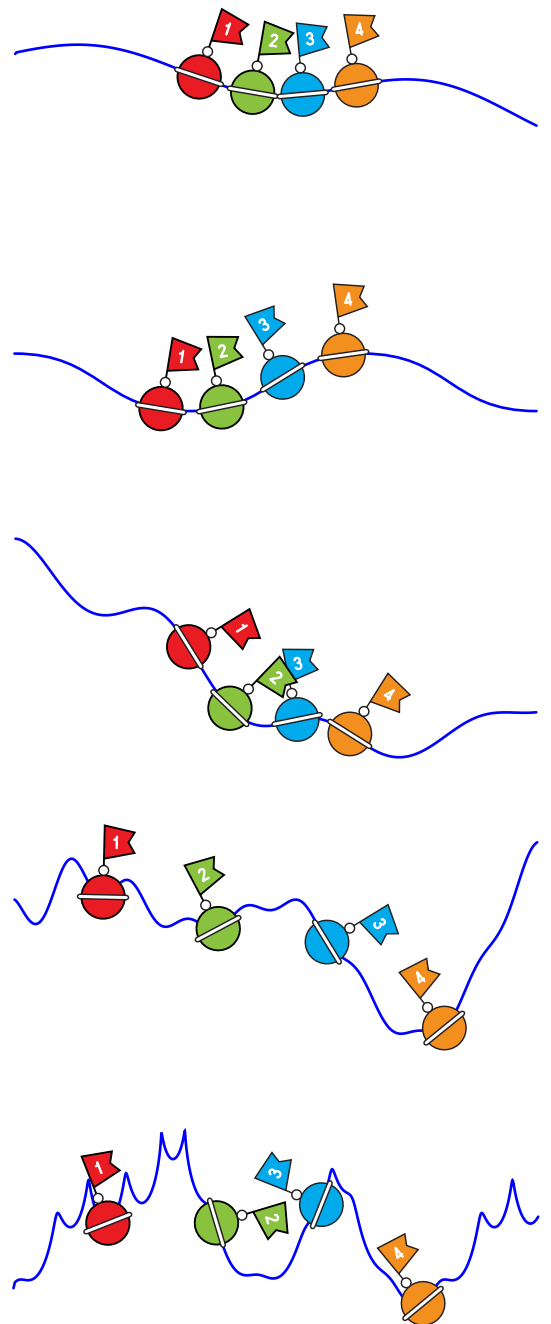
The outputs will always reflect the state of the water surface, the controls available allow to set this surface from the stillness of a pond to the complexity of a high sea storm.

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.

Here are some plots of Mode B ordered by increased complexity



Here are some still of the water surface ordered by increased complexity



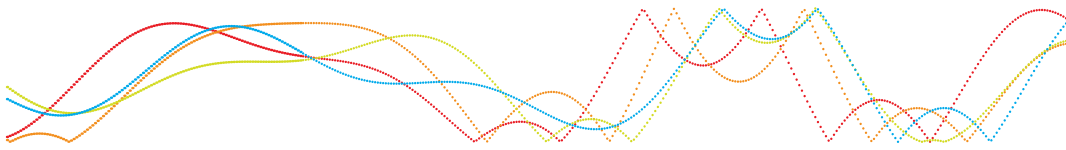
CLIPPING MODES

It is possible to clip the waveform by setting the swell size higher than 12 o'clock.
To change the clipping mode flick the MODE A/B switch back and fourth 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:

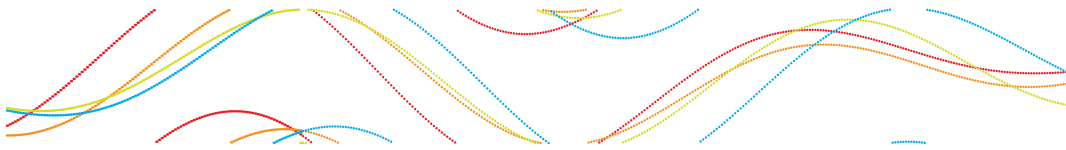
1. Fold (default)

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



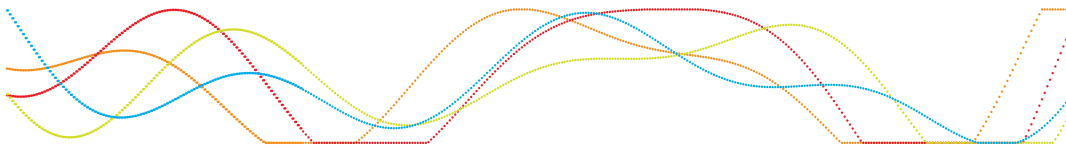
2. Thru

Thru forces the wave to go thru it's minimum/maximum range into the oposite end.

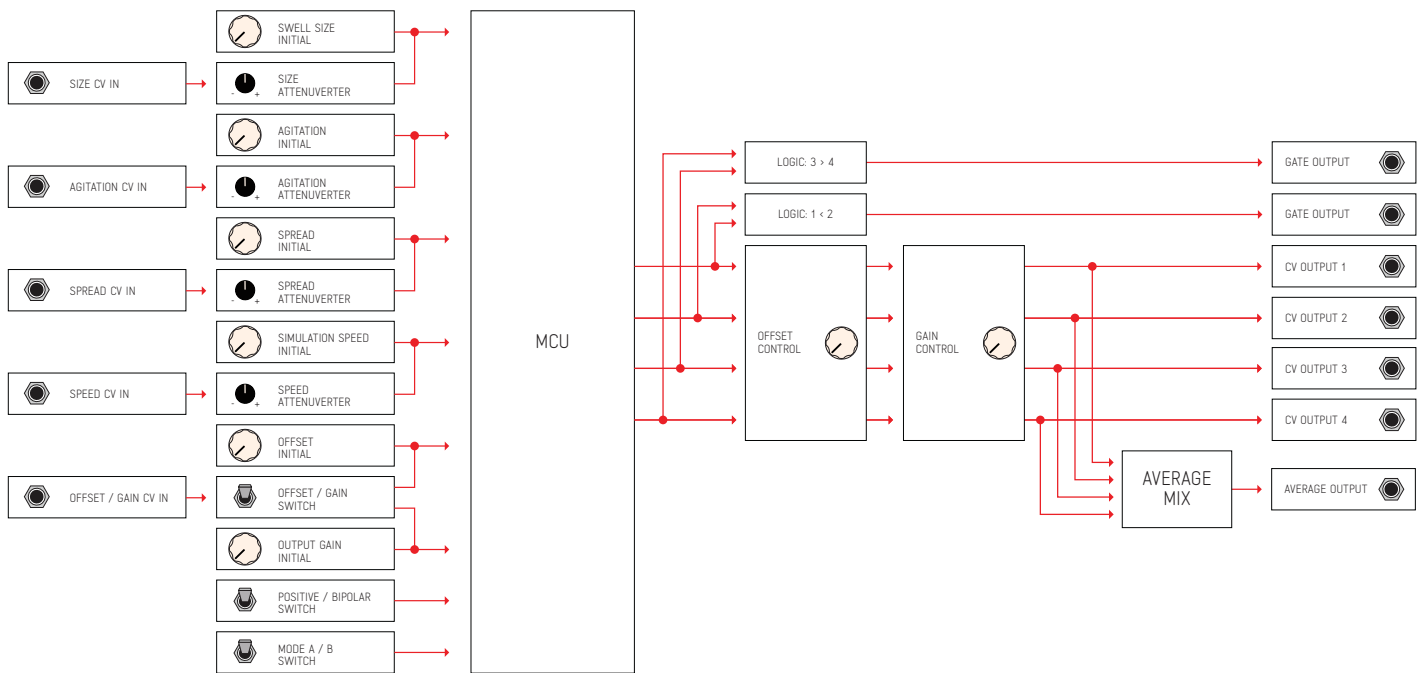


3. Limit

Simply limits the wave to the minimum/maximum range



SIGNAL FLOW DIAGRAM



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