LushOne Synth 202
Contour Module –
VCA (Voltage Controlled Amplifier)

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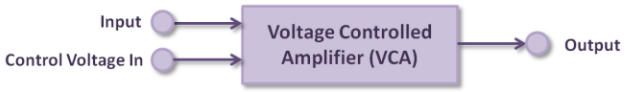
What are we going to do?

- Use the voltage controlled amplifier (VCA) and the ADSR envelope to change note dynamics
- Demo VCA as a control voltage multiplier

What is a VCA?



- Amplifier where:

  Gain $\propto$ Control Voltage

- For any amplifier

  Output = Input x Gain

- Therefore

  Output $\propto$ Input x Control Voltage

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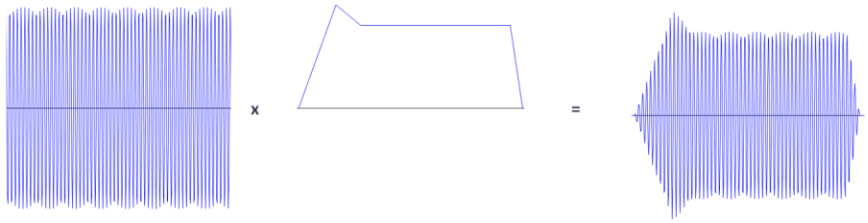
Practically

Input is audio wave

CV is note shape

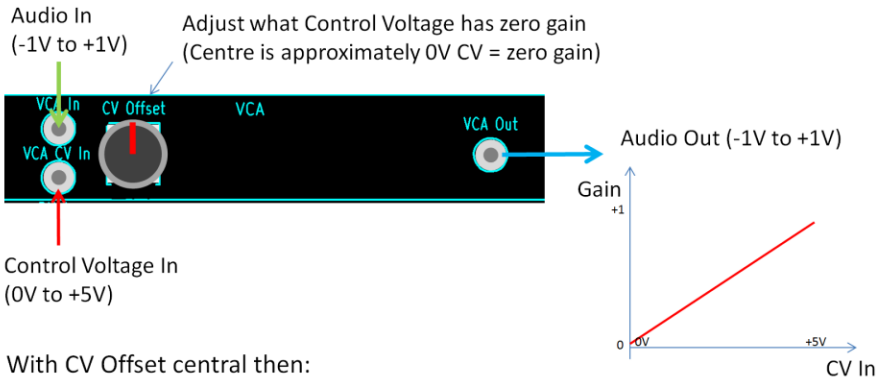


Eg ADSR output

Note with changing dynamics

Can think of the VCA as an *amplitude modulator*

Contour VCA



- With CV Offset central then:
  - 0V CV = zero gain
  - +5V CV = gain of one
- CV Offset control adds an offset to the CV allowing you to move the zero point
  - Turning CV offset to left raises the CV voltage that has zero gain (makes the VCA less sensitive)

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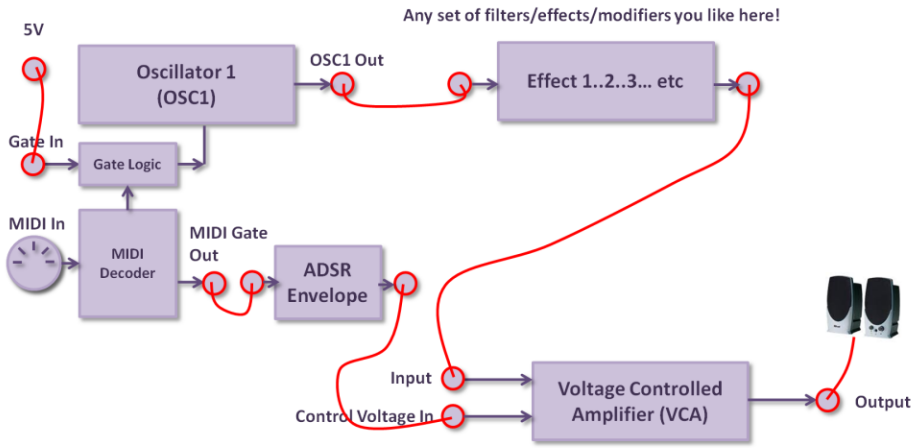
Common design pattern



- The VCA is often last in a chain of effects to shape final note and make sure there is silence if no note held

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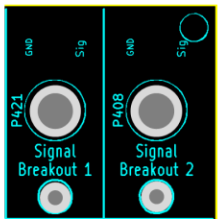
Bringing VCA output externally



RCA/Phono socket

2mm banana socket

- Break-in/Breakout connectors on the LushOne allow connection to external world
- 2mm socket is connected to centre pin of phono socket
- Ground of phono socket is connected to GND on LushOne
- When the Contour is in use then the final output will probably not be the output of the VCF on the LushOne base
  - 3.5mm jack output on LushOne base is no longer useful
  - Use a breakout connector to connect to external amp instead

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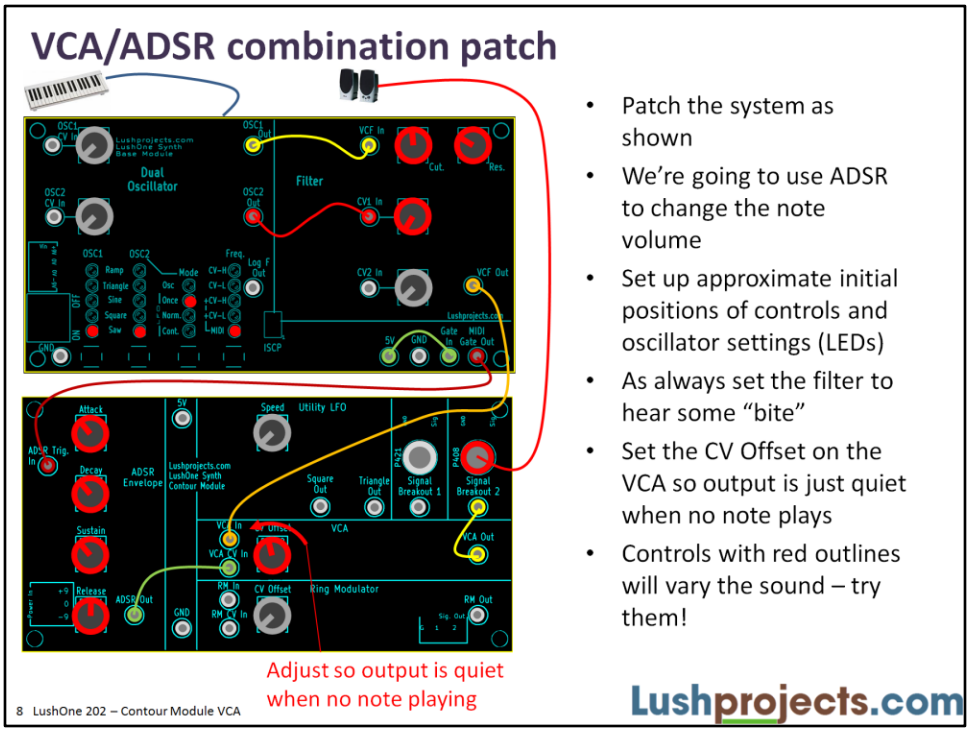


We're going to use the VCA to change the note volume based on the output of the ADSR.

Note that in this scenario we want to connect the "Gate In" on the LushOne base to 5V to override the built-in gate so that we can hear the release sound of the note after the key is lifted.

Start by setting the CV offset just above centre and then turn anticlockwise (left) slowly until no sound is heard when note is released. You may need to do this iteratively after playing a few notes to find the best setting.

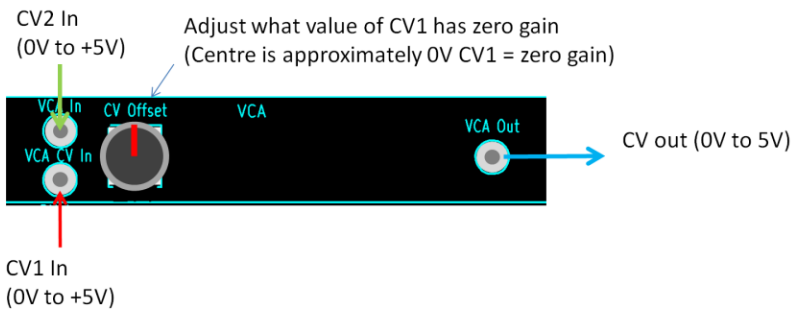
The filter controls will change the quality of the sound.

The ADSR controls will change how the dynamics of the note respond to key presses. Try high, medium and low settings for each of the ADSR controls.

VCA as control voltage multiplier

- The VCA is DC coupled and accepts inputs in the CV range

Direct Current coupling means it works at all frequencies down to 0Hz (ie a DC signal). The absolute values of inputs and outputs are maintained even for static signals.
AC coupling requires a varying signal at an audio frequency and the output is normalized around 0V.



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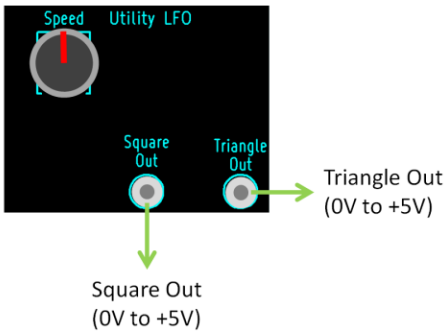
Contour Low Frequency Oscillator (LFO)



- Utility LFO useful as input to the VCA or Ring Modulator

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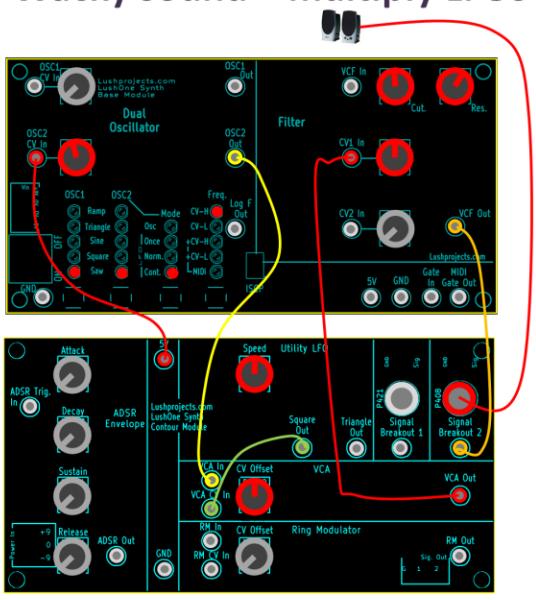
Wacky sound – multiply LFOs and feed to filter



- Patch that works without a MIDI keyboard
- Set up approximate initial positions of controls and oscillator settings (LEDs)
- Uses self-resonance inside the filter to create sounds so turn Res up quite high
- Multiplying the LFO outputs in the VCA creates strange beating effects
- Try different wave shapes from the LFOs
- Controls with red outlines will vary the sound

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Next time

- Using the ring modulator