

**LushOne Synth 104  
External Interfacing**

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## What are we going to do?

- Show how to hook up the LushOne base unit to external modules
- Introduce non-MIDI control systems
- Connect other inputs to the filter

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## Connecting power supplies

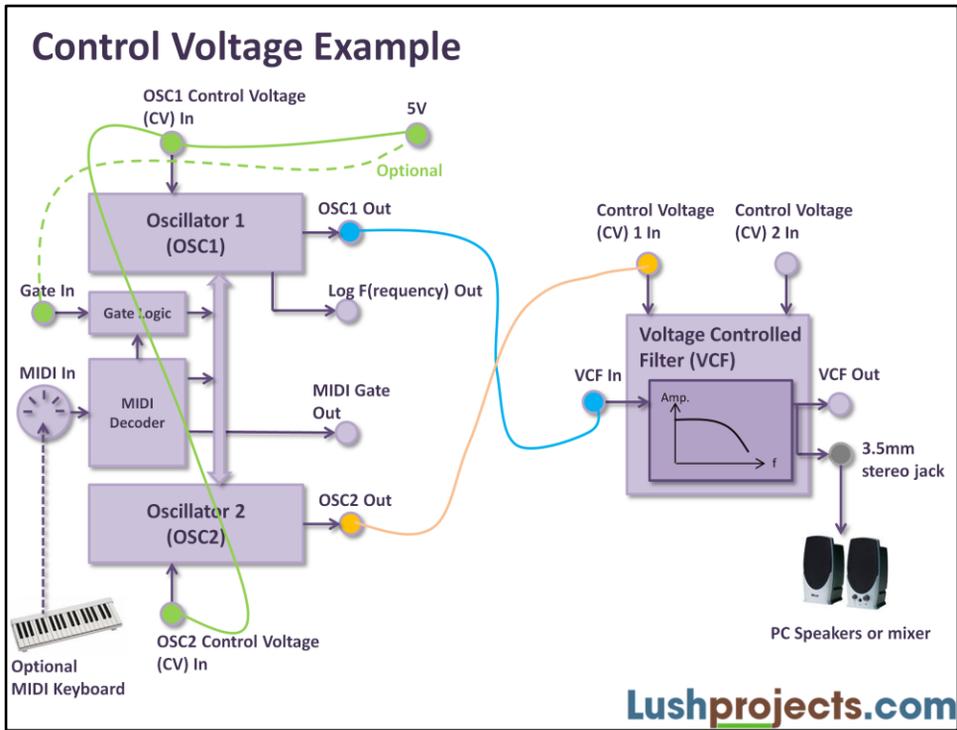
- Patch sockets provided for ground and 5V
  - Treat 5V as reference only – don't put too much load on it
- Also switched solder points for 0V, +9V and -9V near the power in connectors
  - Can use these to power external circuits
- When connecting to external circuits remember to join the ground leads together!

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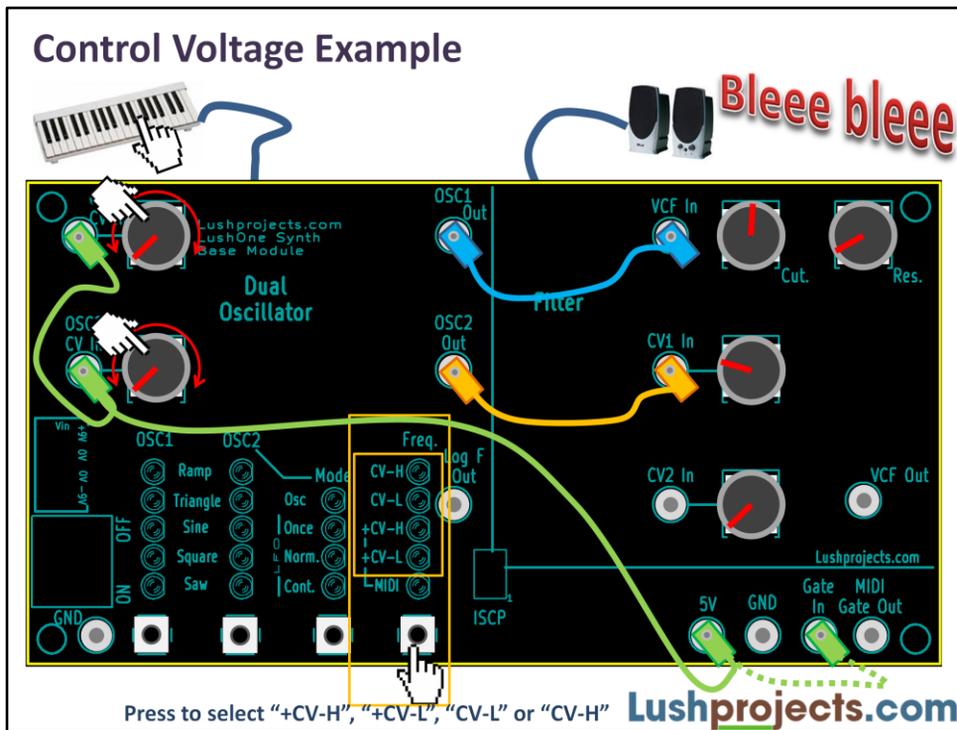
## Control Voltages

- All control voltages are 0V to 5V
  - Inputs: OSC1 CV, OSC2 CV, Filter: CV1, CV2
  - Outputs: Log F, OSC2 Out
- Approximately 10k $\Omega$  input load so you may need external buffers from high impedance sources
- Gain controls set input to “0V” on lowest setting
  - Except OSC1 CV where the gain control sets to “2.5V” on minimum
- LushOne doesn’t have over-load protection on inputs so be cautious!

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You can connect a 5V input to the OSC1 and OSC2 control voltages and use the gain controls to change the instrument.



You are going to need an extra patch lead to build this example – but you can probably bodge one using wire or a crocodile lead. Patch the LushOne as shown and set the Freq. mode. The oscillators can now be controlled with the oscillator control voltage (CV) gain controls instead of (or as well as) the MIDI control.

This is the detail of the Freq. modes:

### +CV-L, +CV-H

For OSC1 the frequency set by the CV is added to the frequency of the MIDI note. A CV of +2.5V is treated as 0. A CV less than 2.5V will reduce the note frequency. A CV more than 2.5V will increase the note frequency. As noted before setting the gain control for OSC1 CV to minimum sets the control voltage to 2.5V (ie no change to the MIDI note).

For OSC2 the frequency set by the CV is added to the frequency of the MIDI “modulation” control. A CV of 0 is treated as 0 and a positive CV will increase the OSC2 frequency.

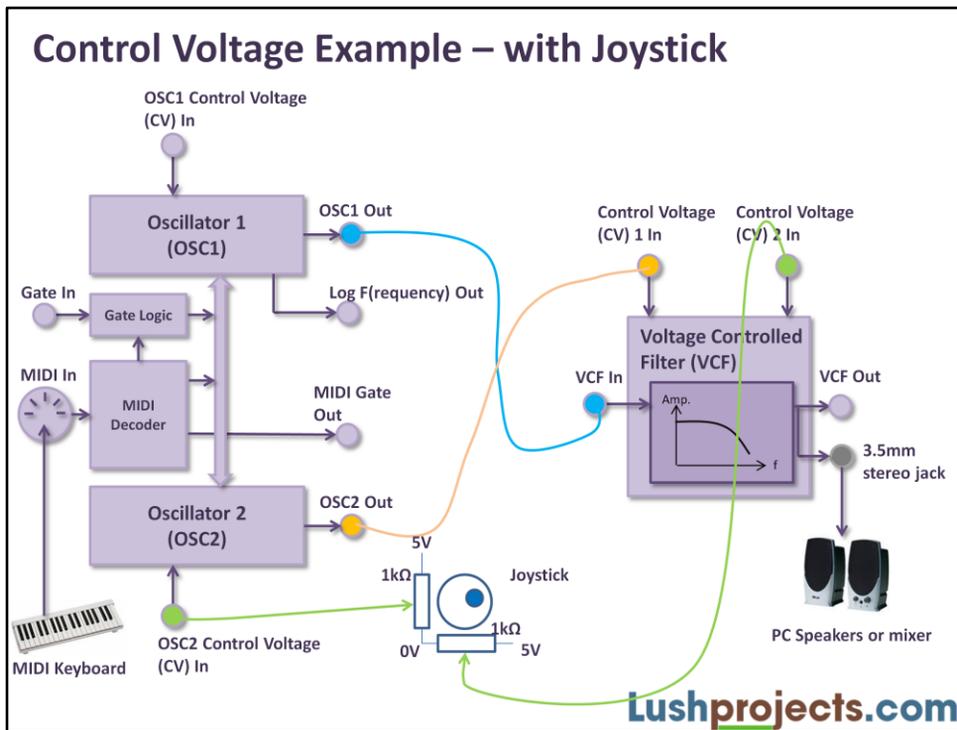
The “-L” mode has low sensitivity on the CV inputs. The “-H” mode has high sensitivity but some quantization due to the D to A conversion process used may be audible.

## **CV-L, CV-H**

No MIDI input is used for the oscillators (except for the gate control)

For OSC1 and OSC2 the frequency depends on the CV. A CV of +2.5V is around the middle of the range. The “-L” mode has low sensitivity on the CV inputs and restricts the range of sounds to around the middle of the oscillator’s ranges. The “-H” mode has high sensitivity and covers the full oscillator range but some quantization due to the D to A conversion process used may be audible.

To generate a sound without a MIDI keyboard it will be necessary to connect the “Gate In” to 5V as shown by the dotted line and demonstrated in module 101.



External analogue inputs between 0V and 5V can be used to drive the control voltages. In this case we connect a joystick to OSC2 CV and a filter CV to allow the modulation to be controlled by a joystick. You will need to set “Freq.” to one of the CV modes for the OSC2 CV input to be active.

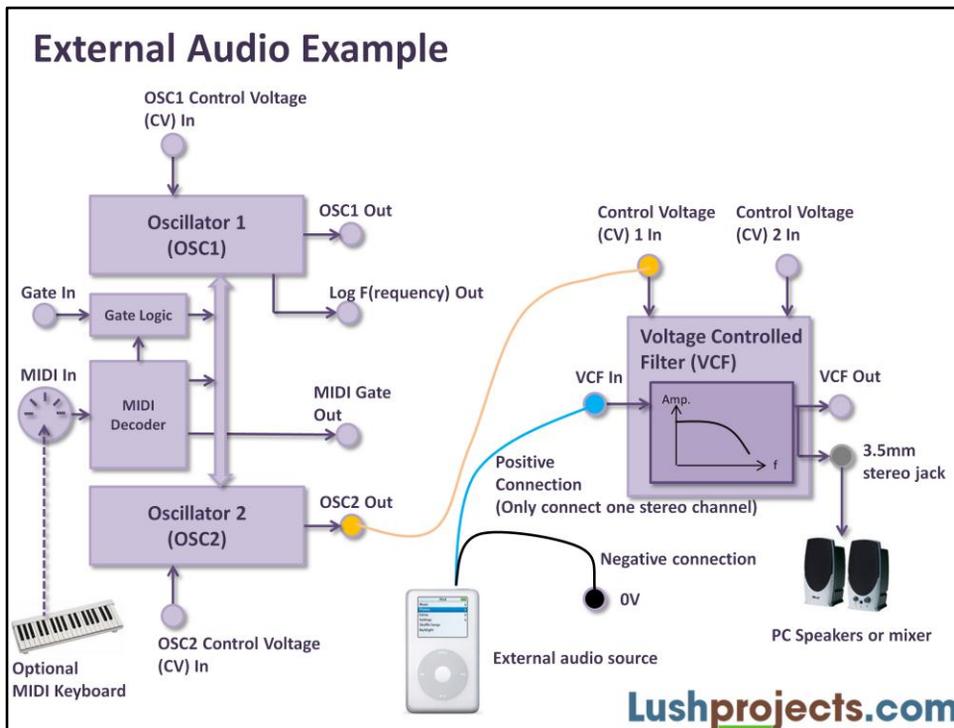
Other types of analogue inputs could be light sensors, distance sensors and so on.

The CV inputs have about a 10kΩ load so a buffer might be needed for some types of analogue input.

## External connection of audio signals

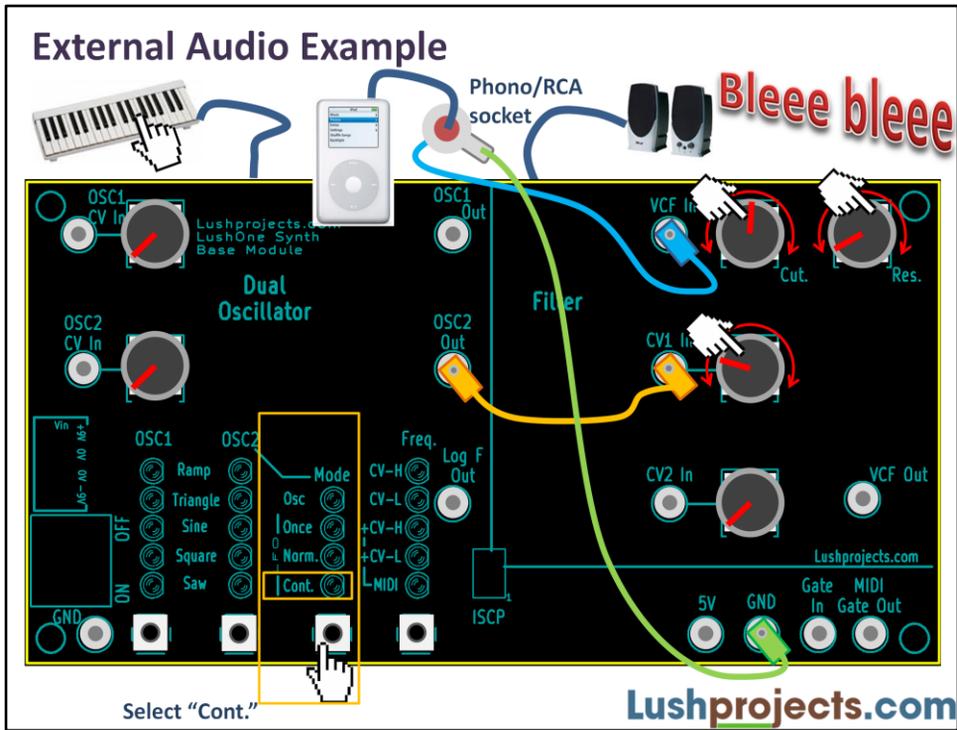
- Audio signals (OSC1 out, VCF in, VCF out) are -0.5V to +0.5V
  - Sorry to purists who want all synth signals to be equivalent
- As with the control voltages these can be connected to external inputs/outputs
  - Further filters/processors
  - Mixers
  - Other audio inputs

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By making up a suitable lead (a female phono/RCA socket to 2mm patch leads is good) you can connect external audio devices to the LushOne. Note that you need to connect the ground as well as the signal lines.

In this example we've connected an iPod to the filter input. You can then use the filter to manipulate the external audio. To make OSC2 oscillate without a keyboard set the OSC2 Mode to "Cont." (see module 102).



A practical build of the previous example.

It is of course also possible to combine external audio inputs with external control voltage sources.

## External Gates

- Two digital signals (0V = Off, 5V = On) related to the gate
- “Gate In” signal
  - If unconnected or at 0V then the OSC1 gate is controlled by MIDI – gate is normally closed
  - If at 5V then the gate is open and OSC1 will run
- “MIDI Gate Out” signal
  - 0V if no MIDI note is playing
  - 5V if a MIDI note is playing
  - Very short dip between notes if played legato

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## Recap

You've now explored pretty much all the capabilities of the LushOne.

- Use external control voltages
- Use external audio signals

Hopefully there will be additional modules in the future to expand the effects.

Go and have fun.

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