# LushOne Inca Synth Module
Quick Reference Guide

Inca - Included effects

- Signal mixer and voltage processor
  - Mix or modify signals by summing, scaling and ofsetting
- Noise source
  - Random voltage source and percussive sound
- Sample and Hold
  - Capture and hold voltage levels from clock
- Low Frequency Oscillator (LFO)
- Analogue thumbstick with switch
- 3.5mm mono Break-in/Breakout

Lushprojects.com

Mixer/Signal Processor Introduction
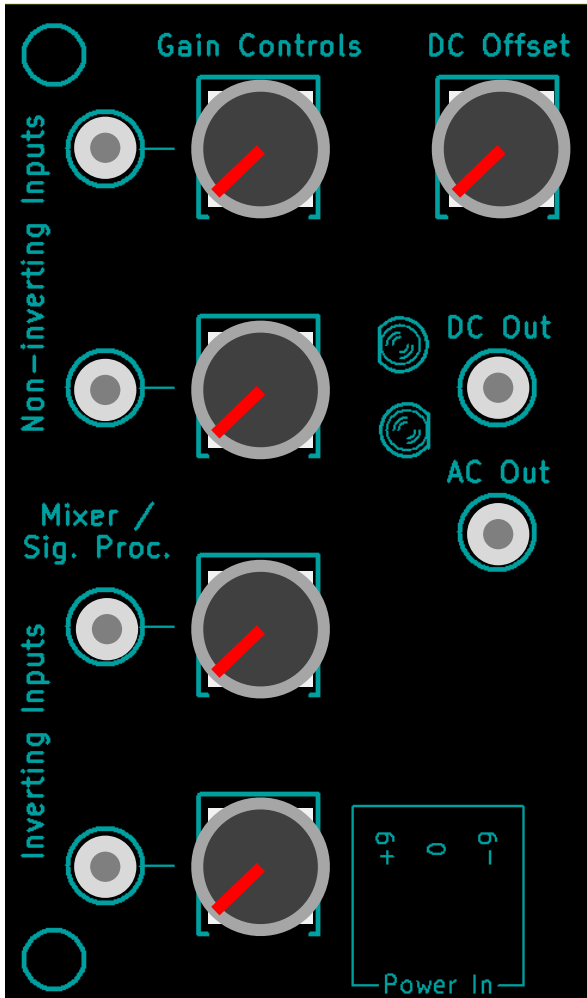
Applications:

- Sum various signals (with different gains)
- Rescale of offset a signal to change it's range
  - Modifies sound effects when applied to control voltages
  - Can be used to "normalize" signals between LushOne and other systems
- Works with audio signals or control voltages

Lushprojects.com

Mixer/Signal Processor Inputs and Controls
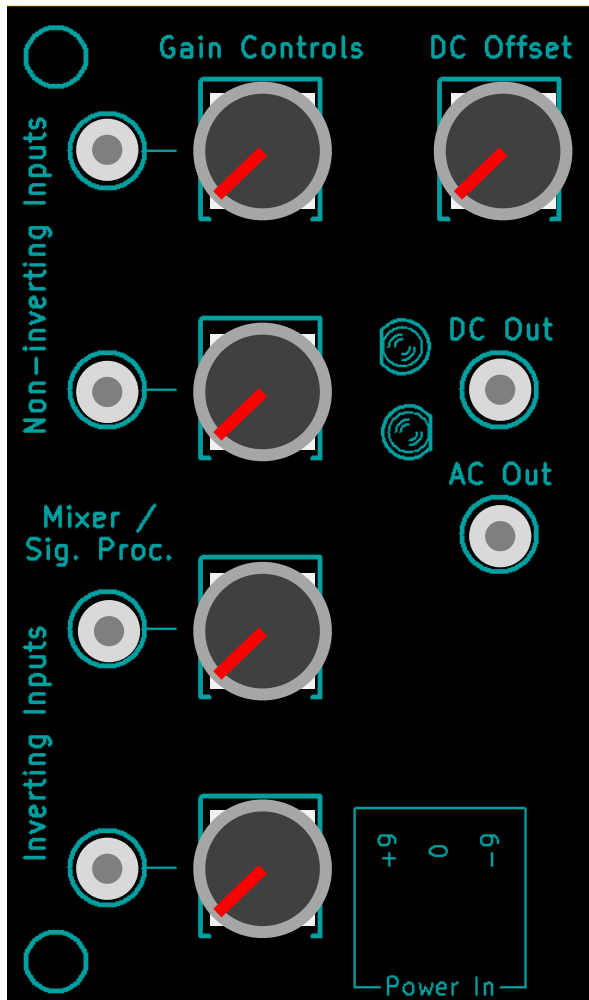
- Two non-inverting and two inverting inputs (inverting input voltages are subtracted instead of added)
- Each input has an independent gain control
  - Approximate gain range is 0 to x3
- *AC out* is the sum of the inputs multiplied by the gains and then offset to centre on 0V
- *DC out* is the sum of the inputs multiplied by the gains and then offset by the level of the *DC Offset* control
  - Centre of *DC Offset* is 0V
  - Range of *DC offset* is about -5V to +5V
- The two LEDs indicate the signal level at the DC output

Lushprojects.com

Mixer/Signal Processor – Signal level LEDs

- LEDs light up when DC output voltage is positive (upper LED), or negative (lower LED)

- LED brightness goes from dim (near 0V) to bright (at ±5V)

- You can see the effect of different voltages by adjusting the *DC offset* control with the inputs disconnected

- DC signals will cause steady lights
  Slow AC signals will cause flickering lights
  Fast AC signals will cause steady lights again (due to persistence of vision hiding the fast flicker)

- With practice you will learn to infer the signal behaviour from the pattern of the lights

DC Out = +5V

DC Out = +1V

DC Out = 0V

DC Out = -1V

DC Out = -5V

**Lushprojects.com**
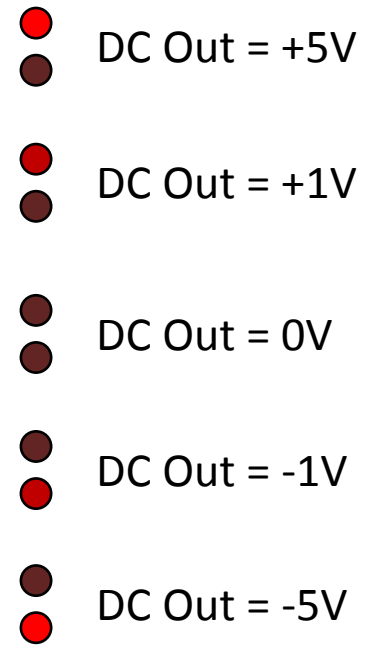
Mixer/Signal Processor – Precautions

- It is easy to accidently set up this module so that the output voltage range exceeds the permitted levels of the input being connected
  - Particularly when connecting to OSC1 CV or OSC2 CV on the LushOne base as these have strict 0V to +5V limits
- Use the LEDs or measurement tools to gauge the levels
  - Remember if the lower LED lights at all the signal is going negative so cannot be connected to the LushOne base CV inputs
- Cautiously adjust the gain and offset from "safe" ranges

Danger
High voltage

Lushprojects.com
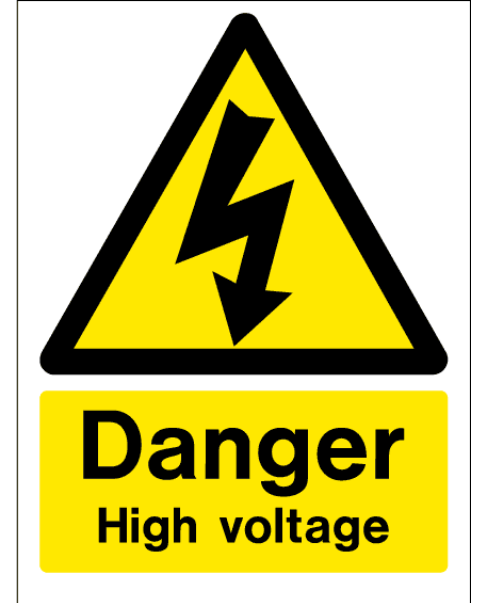
Mixer/Signal processor application ideas

- Use with the joystick outputs to modify range to suit your needs

- Set OSC2 to "Osc" mode and then mix with OSC1 to create harmonic base sounds
  - Like the Mini Moog!

- Match signal levels to connect the LushOne to external systems like guitar pedals or Eurorack synths

Lushprojects.com
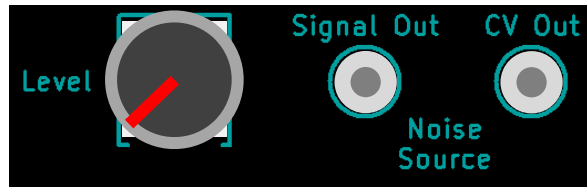
Noise Source

- Audio frequency noise source
- Level control applies to both outputs
  - Compensates for different noise levels due to different transistor characteristics
- *Signal Out* varies from approximately ±0.2V to ±2V
  - Suitable as an audio signal in to LushOne
- With *Level* at mid-point the *CV Out* varies approximately between 0V and +4V
  - Suitable as a control voltage source to other LushOne modules
  - No limits are applied to *CV Out* voltages so start with the *Level* low and raise slowly to avoid risk of overload to next stage

Lushprojects.com

Noise source application ideas

- Combine with oscillator signals via mixer and filter to create drum and cymbal sounds.

- Feed in to Ring Modulator for distortion effects

- Sample via Sample and Hold module to create lower speed random control voltages
  - Feed output of sample and hold in to mixer CV or oscillator CVs
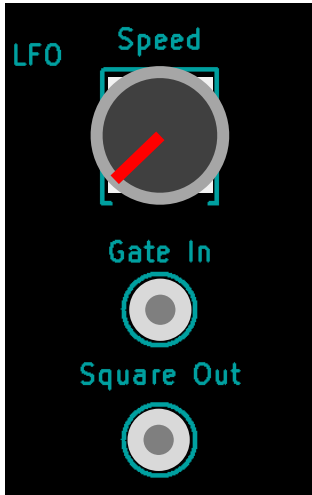
Sample and Hold (S/H)

- *Sample In* accepts a voltage between -5V and +5V
  (ie a control voltage or a signal)

- The input is sampled on the rising edge of the *Gate In* signal and held at *Sample Out* until the next sample

Lushprojects.com
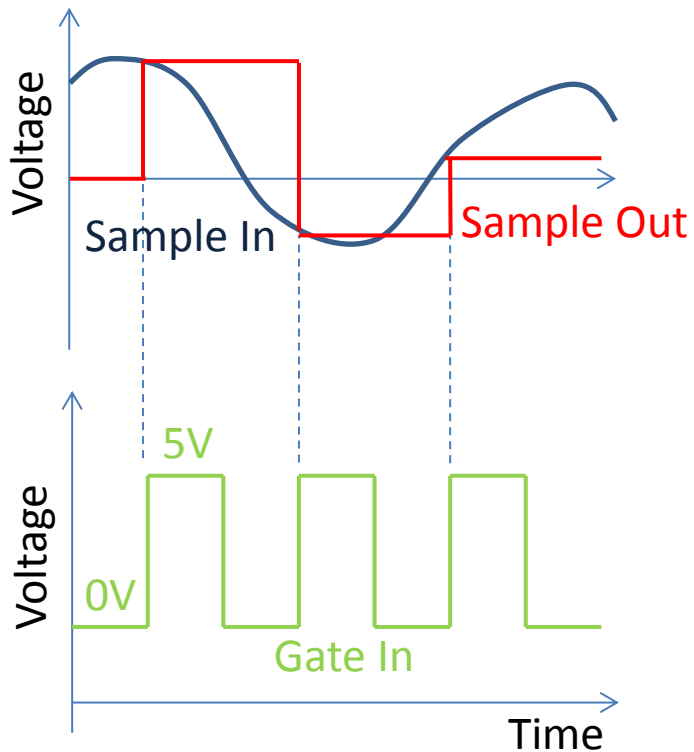
Sample and Hold application ideas

- Sample the noise *CV Out* and then feed to any CV input for quantized random effects

- Sample at with high sample frequency to create distortion

Lushprojects.com

Square Wave LFO

- Dead simple LFO primarily intended to drive the Gate In of the Sample and Hold

- *Square Out* is a 0V to 5V square wave

- If *Gate In* is unconnected or at +5V the LFO will run

- If *Gate In* is connected to 0V the LFO will stop

Lushprojects.com
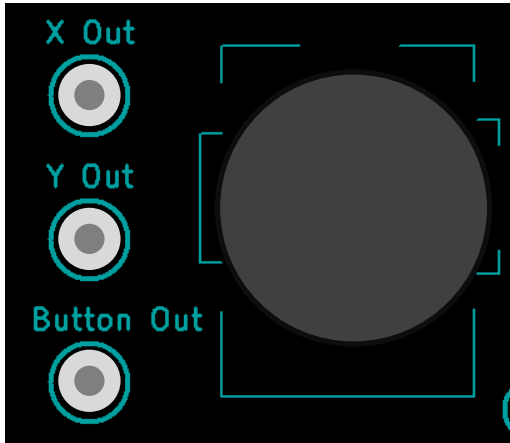
Joystick

- *X Out* and *Y Out* go from 0V to +5V based on the joystick position
- *Button Out* goes from 0V (joystick not pressed) to +5V (joystick pressed)
- Great for manual control of any CV
- Connect through the Mixer/Signal Processor to change range of polarity of outputs
- The joystick makes me smile

Lushprojects.com

Signal break-in/breakout

3.5mm mono jack socket

2mm Banana Connector

- Passive connector to break signals in/out of LushOne
- Tip of 3.5mm mono jack socket is connected to 2mm banana of LushOne
- Ring of 3.5mm jack socket is connected to GND on LushOne
- 3.5mm jacks are common on Euro module synths, so this helps interconnect between LushOne and Euro module

Lushprojects.com