

# SP2 digital VCO upgrade

SP2 has officially leveled up. This free firmware update unlocks enhanced MIDI control, MIDI CC implementation, new CV and GATE output modes, and a bunch of quality-of-life improvements. But the real big news is that the original analog oscillator (bless its pitch-drifting soul) has gone digital. That means vastly improved tuning precision and stability and 8 new variable waveforms to explore and run through SP2's rich and unruly analog filter and VCA. This update requires moving a jumper on the SP2 circuit board before uploading the new firmware. See the firmware update instructions below.

This manual covers the differences between the analog VCO firmware v1.2 and the digital VCO firmware v1.0. For full feature functionality, please see the digital VCO reference manual: [here](#).

## New features of SP2 digital VCO version 1:

1. Digital VCO
2. Fine-tune fader mode
3. ENV G and SLIDE G trigger/gate modes
4. Envelope gate probability as FX8
5. Triggered pitch change mode
6. VCO Pitch Limiter
7. CV pitch tracking mode
8. MIDI clock detection
9. FX controlled by MIDI notes
10. Envelope triggered by Note On mode
11. MIDI CC implementation
12. MIDI transpose
13. Improvements and bug fixes

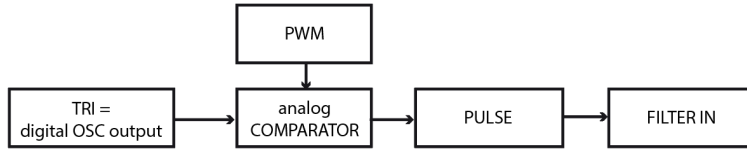
## New Button Combos:

SLIDE + MIDI + GATES = select waveform  
SLIDE + FINE-TUNE = set waveshape  
PATTERN + MIDI = toggle Triggered pitch mode  
MIDI + TRIG = toggle Trigger Envelope at Note On mode  
TRIG + SLIDE = toggle SLIDE G trigger/gate mode  
TRIG + PATTERN = toggle ENV G trigger/gate mode

Hold SCALE at power up = toggle VCO Pitch Limiter mode  
Hold PATTERN at power up = toggle CV Pitch tracking mode  
Hold SLIDE at power up = toggle FINE-TUNE fader function  
Hold PLAY + TEMPO + TRIG at power up = factory reset  
Hold SCALE + SLIDE at power up = calibration and test mode  
Hold MIDI at power up = firmware update mode

# 1. Digital VCO

**Note:** The new waveforms are output from the TRI jack. To hear these new waveforms most clearly, it is best to patch TRI out to FILTER IN to override the normalization of PULSE to FILTER IN.



**Note:** SLIDE+MIDI no longer accesses the automatic tuning feature because it is not necessary for the digital VCO.

## SLIDE + MIDI + GATES = select waveform

To select a WAVEFORM, hold both the SLIDE and MIDI buttons and press one of the GATE buttons.

- FRACTAL TRIANGLE ● ● 2x FRACTAL TRIANGLE
- ANIMATED FRACTAL TRIANGLE ● ● EXP SAW DETUNE
- SUPER TRIANGLE ● ● SUPER SAW
- TRIANGLE TO NOISE ● ● GLITCH RADIO

## SLIDE + FINE-TUNE = set waveshape

Hold the SLIDE button and move the FINE-TUNE fader to adjust the waveforms variable WAVESHAPE parameter.

The waveforms and their waveshaping parameters are:

- |  |                            |
|--|----------------------------|
| 1: fractal triangle  | fractal transformation     |
| 2: super fractal triangle: 2 detuned triangles fractal-transforming each other | exp. detune & lin. detune* |
| 3: animated fractaled triangle   | fractal to pulsing saw     |
| 4: exponential saw detune  | exp. detune                |
| 5: super triangle: 2 detuned triangle waves mixed together                     | exp. detune & lin. detune* |
| 6: super saw: 2 detuned saw waves mixed together                               | exp. detune & lin. detune* |
| 7: triangle to noise   | glitch morph               |
| 8: glitch radio  | radio tune                 |

\*exp. detune & lin. detune: At the lowest setting, the two oscillators are one octave apart and slightly detuned. Sweeping up to the middle setting, the lower oscillator will pitch up to almost the frequency of the static oscillator, creating a typical beating LFO effect. The second half of the fader is the linear detune of the two oscillators which means the beating LFO frequency should remain very similar across the octaves. At the highest setting, the two oscillators are at an almost identical frequency.

## WAVESHAPE



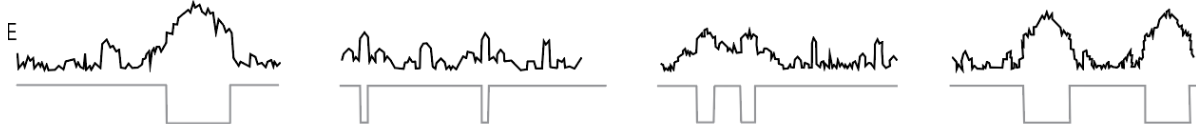
### WAVEFORM:

THE GRAY WAVEFORM IS THE PULSE OUTPUT DERIVED FROM THE TRI OUTPUT VIA ANALOG COMPARATOR

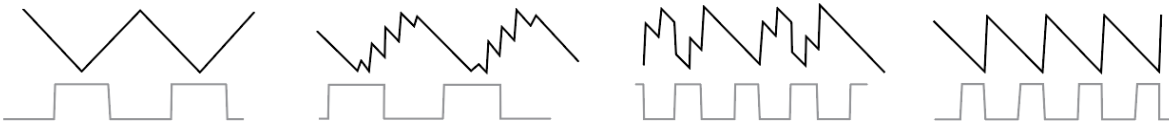
#### 1. FRACTAL TRIANGLE: TRIANGLE BEING PROCESSED BY INCREASING AMOUNT OF XOR BIT OPERATOR



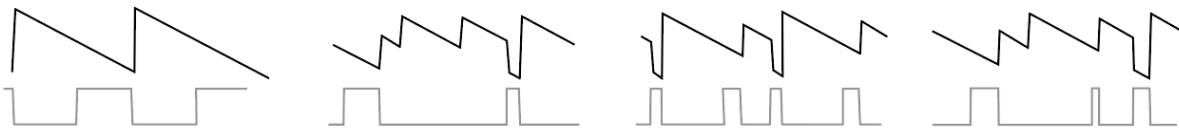
#### 2. SUPER FRACTAL TRIANGLE: TWO DETUNED TRIANGLES CROSS MODULATING VIA XOR BIT OPERATOR



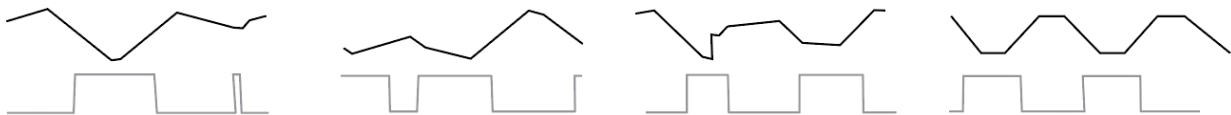
#### 3. ANIMATED FRACTAL TRIANGLE: TRIANGLE BEING PROCESSED BY OR BIT OPERATOR OF AMPLIFYING SUB OSCILLATOR



#### 4. EXP SAW DETUNE: TWO SAW WAVES DETUNED EXPONENTIALLY UP TO AN OCTAVE APART



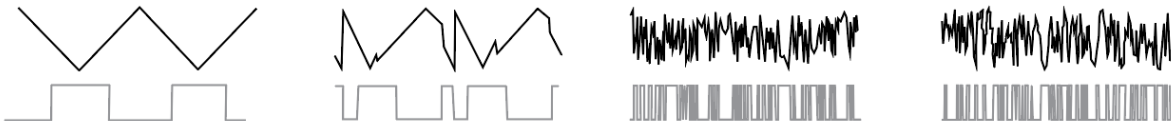
#### 5. SUPER TRIANGLE: TWO DETUNED TRIANGLES MIXED TOGETHER



#### 6. SUPER SAW: TWO DETUNED SAWS MIXED TOGETHER



#### 7. TRIANGLE TO NOISE: GLITCHY TRANSFORMATION VIA OVERFLOWING MULTIPLICATION



#### 8. GLITCH RADIO: GRANUAL SONIFICATION OF THE RAM MEMORY OF THE SP2



## 2. FINE-TUNE fader mode

**Hold SLIDE at power up = toggle FINE-TUNE fader function**

The default FINE-TUNE fader function can be altered, so that the WAVESHAPE is the default function, and the FINE-TUNE function is only accessed by holding the SLIDE button. To change the default function of the FINE-TUNE fader, hold the SLIDE button while powering up the unit.

## 3. ENV G and SLIDE G trigger/gate modes

**TRIG + SLIDE = toggle SLIDE G trigger/gate mode**

**TRIG + PATTERN = toggle ENV G trigger/gate mode**

The ENV\_G and SLIDE\_G outputs can now be either a gate or a trigger signal.

Hold TRIG and press PATTERN to change the ENV\_G from gate to trigger.

Hold TRIG and press SLIDE to change the SLIDE\_G from gate to trigger.

While holding the TRIG button, the trigger/gate mode is indicated by the fader lights:

PITCH fader light OFF = ENV\_G trigger mode

PITCH fader light ON = ENV\_G gate mode

PITCH MOD fader light OFF = SLIDE\_G trigger mode

PITCH MOD fader light ON = SLIDE\_G gate mode

## 4. Envelope gate probability FX

Holding the TRIG button and the GATE 8 button is no longer SILENCER mode but a 50% probability for all signals related to triggering the envelope: ENV\_G output, normalized trigger to the envelope's TRIG input, and FX retrigger functions. FX loop recording can be applied to have permanent probability on certain steps.

TREMOLO ●  
RE-TRIG ● FAST RE-TRIG  
PITCH ENVELOPE ● ARPEGGIO  
NOISE ● LONG SLEW  
● GATE PROBABILITY

## 5. Triggered pitch change mode

**PATTERN + MIDI = toggle Triggered pitch mode**

Hold PATTERN and press MIDI to activate/deactivate the mode in which the oscillator pitch is updated only at active envelope gates. That means if you only have active envelope gates at steps 1 and 5, the oscillator pitch will also update only at steps 1 and 5. The envelope gate probability is taken into account when rendering the oscillator pitch.

Note: This setting is not stored in the memory after SAVE.

## 6. VCO Pitch Limiter mode

**Hold SCALE at power up = toggle VCO Pitch Limiter mode**

For more focused tonal work, the PITCH fader can be limited to avoid the subsonic LFO territory. Hold SCALE while powering up the unit to toggle the VCO Pitch Limiter mode.

## 7. CV pitch tracking mode

### **Hold PATTERN at power up = toggle CV Pitch tracking mode**

The CV output can now output the exact voltage that represents the pitch of the SP2 oscillator (including slides) = CV TRACK mode. The original CV SEQ mode is still available. In the CV SEQ, the CV only outputs voltages from the sequencer – excluding slides, pitch fader and pitch modulation. To alternate between these two modes, hold PATTERN while powering up the unit.

Note: Please remember that MIDI+PATTERN still switches between the CV Out being used either for Velocity CV or sequencer CV output.

## MIDI Implementation:

### 8. MIDI Clock detection

Automatic MIDI Clock detection: When no MIDI Clock is present, the SP2 will use the internal TAP tempo or the analog clock at the SYNC IN input. If the MIDI clock is present, it will use the MIDI clock. Using the MIDI clock can be disabled by holding MIDI and pressing PLAY, so the light at the PLAY button is OFF.

While holding the MIDI button, the MIDI clock will only work if the light at the PLAY button is ON.

### 9. FX controlled by MIDI notes

MIDI notes above the 8th octave (above note 96 = C7) control the temporary FX.

Notes 96-103 = FX 1-8, Notes 104-111 = FX 1-8 etc.

### 10. Envelope triggered by Note On mode

#### **MIDI+TRIG = Note On triggers the envelope**

Hold MIDI and press TRIG to activate/deactivate triggering of the envelope with every received MIDI Note On message. While holding the MIDI button the state is displayed on the MIDI Gate light.

### 11. MIDI CC implementation:

CC 0	BANK select: values 0-7 (1-8)
CC 1 (mod wheel)	WAVESHAPE 0-127
CC 2	PITCH fader 0-127
CC 3	PITCH MOD fader 0-127
CC 5	SLIDE time 0-127
CC 16	PATTERN selection: values 0-7 (1-8) (removes chain)
CC 17	SCALE selection 0-7 (1-8) (removes chain)
CC 18	select PLAY MODE 0-7 (1-8) (removes chain)
CC 19	SAVE current bank (any value)
CC 20	select WAVEFORM 0-7 (1-8)
CC 64 (sustain)	sustain pedal OFF<64, ON >=64
CC 123	all notes off – clears midi buffers

## 12. MIDI transpose

MIDI notes on channel 16 will transpose anything happening on the SP2. The MIDI transpose adds together with the transpose CV input. Note C2 (note 36) means no transpose. Notes above C2 are positive transpose in semitones (note 37= +1 semitone) and below C2 is negative transpose (note 35 = -1 semitone).

## 13. Improvements / bug fixes:

- improvement: tempo increments at lower tempos are bigger = more natural control at a slow tempo
- improvement: better filtering on VCO TRANSPOSE and MOD inputs.
- improvement: better filtering of PITCH, PITCH MOD, and FINE-TUNE faders.
- improvement: TRANSPOSE input calibration improvement
- improvement: does not play an octave higher than other synths (with the fine-tune fader at the lowest setting)
- improvement: removed lag between pitch change and trigger
- bugfix: the first step should never be shorter and, therefore, should always trigger the envelope
- bugfix: fixed overflow at the CV output with the highest notes
- bugfix: playmodes reflected when starting sequencer and using reset input
- bugfix: reset input triggers random step on random playmodes
- bugfix: first step not triggered when synced via MIDI

## New power up animation

New animation helps you easily tell apart analog VCO and digital VCO modes.

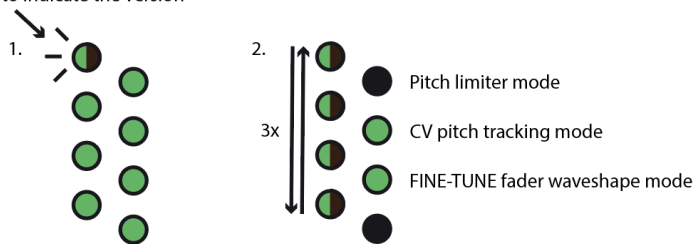
Digital VCO:

- 1: All lights are ON except one blinking – this light indicates the version of the digital VCO firmware.
- 2: lights 1, 3, 5, and 7 animate while:
  - the state of light 2 indicates the VCO Pitch Limiter mode
  - the state of light 4 indicates the CV Pitch tracking mode
  - the state of light 6 indicates the flipped function of the FINE-TUNE fader

**ANALOG VCO**  
firmware at startup  
lights OFF and one blinks  
to indicate the version



**DIGITAL VCO**  
firmware at startup  
lights ON and one blinks  
to indicate the version



# Installing the update:

A video manual of the update is available at our [YouTube channel](#).

## Step 1: Flip the jumper

Take a Phillips screwdriver and undo the backplate of your Softpop. Before removing the back plate, secure the side panels in place with tape. Reassembling the case after the upgrade will be much easier. Inside you will find a jumper marked VCO with ANALOG and DIGITAL positions. Move the jumper to the DIGITAL position, i.e., connect the middle pin to the outer right pin to make the new digital oscillator modes and firmware work. Put the backplate back on, aligning the sides properly in the slots, then put the screws back.

ANALOG VCO



DIGITAL VCO



## Step 2: Update the firmware

The Softpop's firmware can be updated by playing a wav file into its RESET jack.

Hold the MIDI button at power up to enter bootloader mode.

To upload new firmware, connect a cable from the RESET input to your computer/phone audio output, and play the wav file downloaded from the [product page](#) at maximum volume. Lights should animate the progress, and all should light up when the process is done. Power off and on after all lights come on.

The firmware version is indicated at startup by the corresponding number blinking several times.

## Calibrating the TRANSPOSE input

We recommend to re-calibrate the TRANSPOSE input after the update.

Patch the CV output to TRANSPOSE input and hold SLIDE+SCALE while powering up the unit. Wait until the GATE lights go off. Unpatch the cable and power cycle the unit.

If you want the calibration to be accurate, make sure you use a high-quality power source! We recommend a good quality wall charger or USB power bank.

# Firmware upload troubleshooting

In case the SP2 does not boot to normal operation, get back to bootloader mode and check the following:

- Check that you have set the jumper on the circuit board to the correct position - i.e., that you have bridged the middle and right pins (DIGITAL). The jumper is small and can easily be misaligned, so make sure it actually connects the pins.
- Powering via USB and playing audio from the same computer can sometimes cause issues (depending on the computer). Also, some power supplies may introduce noise into the device, which can disrupt the firmware update. That can also apply to expensive externally powered USB hubs. Sometimes changing the power source may help with updates if they fail repeatedly. We recommend updating the SP2 while powered by a good-quality wall charger or USB power bank.
- When updating the firmware via audio from the phone/computer, the GATE LEDs should run smoothly in one direction. If they do not move at all, the audio volume is too low or too high.
- If your audio output level is too low for the RESET jack, connect your phone/computer audio output to INPUT on the SP2. Set the INPUT slider in the middle, patch AMP to RESET, and play the wav file again.
- Make sure your phone or computer does not make any sound (e.g., notification/alerts) during the firmware upload, as this will cause the process to fail, and your unit will not work properly. We recommend turning on airplane mode before starting.
- If you still have no luck updating your SP2 via the RESET connector directly from your phone/computer, you can try the following method:

- 1) Connect your phone/notebook audio output to the AUDIO INPUT on the SPII.
- 2) Patch AMP to FILTER IN.
- 3) Patch OUTPUT to RESET.
- 4) Set the Filter Mode switch to LP (low-pass).
- 5) Set the RESONANCE fader to the minimum (all the way to the left).
- 6) Set the POP fader to SOFT (all the way to the left).
- 7) Set the CUTOFF fader to the maximum (fader all the way up).
- 8) Set the CUTOFF MOD fader to the minimum (fader all the way down).
- 9) Set the Input and Output faders to the maximum (all the way up).
- 10) Play the FW upgrade audio.
- 11) Re-calibrate the TRANSPOSE input after the update.

