OnBoard Drone Synth - User Guide

The OnBoard Drone Synth is a DIY synthesizer that enables the performance of up to 5 independent voices. Each voice is monophonic with controls over pitch, release time, detune, timbre, pitch wander, vibrato, pulsing amplitude variation, and volume level. The stereo output from all voices is passed through overdrive, filter, two independent delays with cross modulation, and reverb. Sonically, the Drone Synth embraces the post digital and somewhat gritty aesthetic of DIY audio culture.

Controls Overview

- There are 5 monophonic voices, each with a **touch pad trigger** and **potentiometer** (dial) to adjust parameters.
- **Dial** 6 adjusts global parameters.
- **Dial** 7 adjusts the master volume.
- **Buttons** on pads 13 and 14 change (decrement and increment) the parameter mode.
- The **LED** on the S3 MINI changes colour to indicate the current parameter mode.
- The **OLED display** shows the voice levels, current mode, and parameter values.

Dial 1 Voice 1 Param	Dial 2 Voice 2 Param	Dial 3 Voice 3 Param	Dial 4 Voice 4 Param	Dial 5 Voice 5 Param	Dial 6 Global Param	Dial 7 Volume
Pad 1	Pad 2	Pad 3	Pad 4	Pad 5	Mode Dec	Mode Inc

Controls can be quite sensitive, so subtle changes are encouraged. Hold button 13 or 14 and touch pad 8-12 to jump between parameter modes.

Parameter Modes

#	LED	Potentiometers 1 - 5	Dial 6
1	Red	Voice oscillator frequency (PITCH)	Global Frequency
2	Green	Voice amplitude release duration (RELEASE)	Global Release
3	Blue	Voice detune (DETUNE)	Scale
4	Yellow	Voice FM mod depth (TIMBRE)	Global Filter
5	Purple	Voice automatic pitch change probability (WANDER)	Wander range
6	Orange	Voice LFO depth for vibrato (VIB AMNT)	Global Overdrive
7	Cyan	Voice LFO speed for vibrato (VIB RATE)	
8	Mauve	Voice Sample and Hold amplitude mod depth (PULSE)	S&H Speed
9	Lt Green	Delay 1 & 2 rate and depth, delay feedback & x-mod (EFFECTS)	Reverb Level
10	White	Voice mix level (MIXER)	

After switching modes, dials need to re-latch to parameter values. Small dots appear below the on-screen dials when pots are unlatched to indicate if a pot is lower or higher than the latch value.

Details

Pitch relationships:

The pitch adjustment for each voice is relative to the previous voice, expect for voice 1. Each voice can be tuned up to an octave above or below the previous voice. The pitches of all voices are also relative to the global key transposition, up or down one octave (50 is C). The pitch-interdependence between voices affords range separation between them and is a constraint to assist with timbre modification – see below. Pitches are quantised to a scale, selected on the Detune page. 11 scales are available; 0 - Major pentatonic, 1 - Minor pentatonic, 2 - Lydian, 3 - Aeolian, 4 - Dorian, 5 - Phrygian, 6 - Mixolydian, 7 - Locrian, 8 – Whole tone, 9 – Chromatic, 10 - Continuous.

Duration:
Voices are triggered by touching the pads 8-12. Sounds sustain whilst touched and the length of a voice's sounding after release is controlled in Release mode and is set independently for each voice. The attack of the voice is also subtly adjusted by the release value. The multiply (MLT) control effects all voice release times. At the mid-point multiplying release times by 1, and reducing them when dialled to the left, and increasing them when dialled to the right. The combination of voice release time and multiply values allows a tone to be sustained for up to 60 seconds.

Timbre:
The timbre of each voice starts as a triangle wave, which can be detuned against a copy of itself on the Detune page. The Timbre page allows control of frequency modulation depth for each voice. Voices are modulated by the voice to its right; voice 1 modulated by voice 2, voice 2 by voice 3, and so on. The carrier to modulator ratio is determined by the relationship between a voice's frequency (carrier) and that of the next voice (modulator). Voice 5 self modulates and can feedback into a noise state at maximum levels. Modulations accumulate or cascade up the voice chain, so voice 1 can have up to 4 modulation sources.

Automatic Pitch Wander:
The Wander page determines the probability that a voice's pitch will change automatically. Pitch changes are randomly selected relative to the current pitch (i.e., a random walk). The range of pitch change is specified for all voices by the RNG control – varying between a whole-note to an octave above or below the current pitch.

Vibrato:
Pitch vibrato can be added to each voice. The speed and depth of the vibrato can be adjusted per voice on the VIB RTE and VIB AMT pages.

Pulsation:
The amplitude of each voice can be step-changed by a regular sample-and-hold (random) amount. The depth of the modulation is adjusted per voice by the Pulse amount. The speed of change is varied for all voices using the SPD dial.

Effects:
There are two delay lines, a reverb, an overdrive, and a global filter. On the Effects page, Pot 1 = delay 1 rate, Pot 2 = delay 1 depth, Pot 3 = delay 2 rate, Pot 4 = delay 2 depth, Pot 5 = delay cross modulation depth. Pot 6, the REV amount, controls the reverb depth applied to all voices. The DRV (on Vib Amt page) adjusts the amount of overdrive effect applied to all voices. A global filter is applied to all voices. The CUT dial (on Timbre page) adjusts the cutoff frequency. In the mid-point there is no filtering, to the left a low-pass filter is applied, and to the right a high-pass filter is applied.

Mixer:
The volume level of each voice is controlled in the Mixer mode. Dial 7 controls the overall volume.

Power

The Drone Synth can be powered via USB or battery. When a powered USB C cable is connected to the Microprocessor it powers the instrument and if an 18650 rechargeable battery is connected that will be charged. When disconnected from USB, the Drone Synth can be powered by the 18650 rechargeable battery and the Battery On-Off switch becomes operational. When powering from USB it is best to have a battery switch set to Off. Always disconnect the USB power when not actively using the device. To reset the device, press the RST button on the S3mini.