

The extended manual

Unlocking the full power of your Whale

Extra functionality and some undocumented channels

The official firmware contains a lot more than the 12 main channels. We thought it would be too much to have them all playing right away, so the access to these additional channels **needs to be unlocked first**.

Similarly to how a factory reset is performed by pressing a few buttons in sequence (**>+++--->**), the unlocking is done by pressing **-+-+-+>** (that is, four times minus and plus, followed by play). It might not work at every moment and in every channel so ideally you should do this shortly after powering your whale on.

To confirm this special command was successfully executed, you will hear a voice message. Unlocking does not need to be repeated again, as the flag is stored in permanent memory (same as most of the other settings, such as volume levels, tempo, tuning, equalizer). However, resetting to factory defaults will clear this setting.

More commands

There are other sequences that do a specific command, and are accessible at every time (in both standard and unlocked mode). These are things which you would not normally require to adjust, but might be useful when recording sounds from the Whale via line input instead of listening to it on headphones, or when recording unusually quiet sounds. These settings are either persistent (stored in memory that is not cleared during power on or reset), or temporary (cleared during power on and reset).

++++ (5x volume plus) increases analog output (volume by 6db, up to 0dB maximum level. Persistent setting.

----- (5x volume minus) decreases analog volume by 6db, down to the minimum level of -50dB. Persistent setting.

+++++ (6x volume plus) increases AGC (automatic gain control) maximum gain by 6dB, up to 50dB. Temporary setting.

----- (6x volume minus) decreases AGC maximum gain by 6dB, down to 4dB. Temporary setting.

Please be careful when adjusting gains and volumes, at higher levels it is easy to get a feedback loop. Even though there are other measures in place (output limiter), your ears might suffer.

+ - + - + - (3x plus and minus) toggles keypad beeps. They are enabled by default but might be in the way if you want to adjust parameters while recording. This is a persistent setting, turn the beeps on again by repeating this command.

Specific functionality in certain channels

Filtered channels

These are all channels that use low-pass or high-pass filters and usually a sampled background to create the soundscape (four elemental channels and other wind-based ones).

*To keep it compact, here we will use (+->) style to denote command, *P for permanent and *T for temporary setting.*

(-) sets tuning to 432Hz *P. **(+)** sets tuning to 440Hz *P. **(++)** randomizes chord progression *T. **(- - -)** sets filters to low-pass *T. **(+++)** sets filters to high-pass *T. **(- - - -)** decreases resonance *T. **(++++)** increases resonance *T. *Resonance commands can be repeated multiple times.*

Song of wind and ice

This is the passive channel (that does not use mics), by default it is the last one (12th). *All settings here are temporary.*

Holding (>) for 2 seconds activates isochronic tones program, same as how binaural beats are enabled in filtered channels. Also, colours to indicate Alpha/Beta/Delta/Theta are the same (amber, blue, green, turquoise).

(+) increases isochronic tone volume *T. (-) decreases tone volume *T (independently of the “wind” volume which is, as usual, controlled by holding plus and minus longer).

(++) increases length of isochronic tone *T. (- -) decreases length of isochronic tone.

Bytebeat

This channel (locked by default, 14th) generates chiptune-like music from mathematic formulae (please refer to on-line documentation for more details). *All settings here are temporary.*

(+) loads next song. (-) adjusts stereo panning and turn off echo (cycles through 4 panning options with and 4 without echo). *T

(- -) decreases speed *T, first by fractions: 1/2, 1/3, 1/4, ... 1/8, then halving it down: 1/16, 1/32, ... 1/128.

(++) increases speed *T, the same way in reverse order: if speed is less than 1/8 double it, otherwise increase fractions up to default speed of 1/1).

Chopper

Locked by default, 15th channel, where everything is controlled by accelerometer. It cuts your voice in pieces and spreads them left and right depending on whale orientation. The exact behaviour is too complex to describe here and subject to change or expand in future with more options and features.

Clouds

Credits for this amazing sound engine belong to **Émilie Gillet** of **Mutable Instruments**. It was ported from STM32 to ESP32 platform with only minimal modifications. The complete code is there but not all parameters or modes are bound to existing controls. Currently there are only 5 patches defined however you can add more and tweak parameters in real time using USB cable and observing debug information via serial terminal, while pressing buttons. Also, in future updates some parameters will be bound to accelerometer. It is easy to get into a runaway state (e.g. by adding too much reverb or feedback), so be careful. Complete documentation about reprogramming and extending the whale (both software and hardware) can be found at phonicbloom.com/diy

Holding (>) for 2 seconds toggles freeze, status is indicated by the LED (blue = frozen, cyan = unfrozen)

(+) moves on to the next patch. (-) moves back to the previous patch.

(++) increases hard limiter *T. (- -) decreases hard limiter *T. The limiter might be in the way when louder sounds are recorded, but while listening on headphones it is good to leave it at default settings.

(+++)

enables direct modification of parameters. In this mode, all relevant info is transmitted over serial USB and can be viewed via a standard terminal at 115200 baud rate.

Use (>) to select a parameter, then (+) and (-) to tweak its value. After pressing (>) multiple times, a complete set of parameters is printed, that can be copy-pasted to the config file.

(- - -) exits the direct parameters mode.

DCO

This “digitally controlled oscillators” channel is based on the sound engine from **Tiny-TS** by **Jan Ostman**, a monophonic touch pocket synth based on ATmega328 MCU. The code has been ported to STM32 and later ESP32 platforms and extended to run multiple oscillators at once, in stereo. In this firmware version, it is running a set of 32 independent oscillators with have individually defined parameters, but for the simplicity the implemented controls affect all of them at once. Oscillators can run a few basic waveforms, there is a delay line that can be enabled/disabled and the external audio can be mixed in too.

Holding (>) for 2 seconds toggles between accelerometer and buttons as a means to select a specific parameter. By default, you select the parameter by slightly tilting your whale left-right, the LED light changes to indicate what is

currently being selected. To adjust the parameter's value, tilt the whale front-back. The scale wraps around near the horizontal position, which allows to jump between maximum and minimum values, creating interesting results.

Parameters that can be controlled, and their respective LED indicator, are: FREQUENCY (white), SPREAD (cyan), PHASE (pink), ENVELOPE (green), RESONANCE (red).

The "spread" parameter defines how the base "frequency" is applied to all oscillators, higher value means they are farther apart in their respective tuning.

In the alternative mode, parameters are selected by buttons instead of tilting the whale left-right, which might be handier or more precise when you aim to generate a specific drone sound. Here the accelerometer only controls parameters' values.

(+) selects next parameter. **(-)** selects previous parameter.

(++) slows down the delay line *T (multiple steps possible). **(--)** speeds up the delay line. Adjusting delay speed in fact changes the "oversampling" timing of ADC and DAC, where the sampling rate does not change, but more than one sample is captured or emitted at the time. Therefore, this control is not continuous but only integer steps are possible. It does not clear the buffer, so you can use it to pitch-bend the recorded audio up and down by 2x - 8x.

(+++) cycles through available waveforms: from sine to square, triangle, off and back to sine. The "off" option mutes oscillators, it is useful when you only want to use the delay line *T.

(- - -) disables or enables delay line, useful if you only want to get the drone sound *T.

(+ -) randomizes all parameters *T.

(- +) enables parameters drifting *T. Cycles through multiple options that select various timing and amount of drifting.

The delay line only decays minimally, 90% of sound is retained at each loop. By turning the whale upside-down, you can lower this ratio and erase delay line contents faster. By turning the whale on its left side, recording is stopped and content of the delay line is retained at 100%, allowing for continuous looping of stored audio.

[Dekrispator](#)

Credits for this amazing sound engine goes to **Xavier Halgand**. In its original form, Dekrispator runs on STM32F4 "Discovery" development board, and is controllable by MIDI. It has been ported to ESP32 and modified so external audio is mixed in before most of the effects (flanger, chorus, delay) are applied, this allows you to affect the sound with your voice. There is an internal sequencer running to which the sound from microphones can contribute or even completely override. There is a randomizer and 37 selected patches are defined in the config file, you can add more following instructions at phonicbloom.com/diy

Holding (>) for 2 seconds enables and disables echo/envelope/filters. The LED colour indicates what is currently enabled: echo (red), envelope (green) and filters (blue), including combinations of. For example, if only echo+filters is enabled, the LED glows pink, echo+envelope glows in amber, all three effects enabled make the LED glow white.

(+) selects next patch *T. **(-)** selects previous patch *T.

(++) selects next pre-defined sequence *T (sequences are stored in config file as well). After going through all sequences, a random sequence is generated – one single note going up and down a few octaves (same as the default sequence).

(- -) loads recently generated random patch from persistent memory.

(+++) generates random patch *P. This only generates patch itself without the "effects" part.

(- - -) generates random effects settings *P. These are different from the basic effects selected by holding (>). Please see on-line documentation for more details.

While generating random patch and effect, the values are transmitted over serial line for easy copy-pasting into the config file.

DrumKit

This is a very simple channel where you control three drums and one cymbal. The whale should be held in upright position and then “drumming” in four directions as if there were invisible drums around. It is also possible to hit two of them at once. LED light indicates which one has been hit (blue=kick, red=snare, green=cymbal, pink=hi-hat).

Holding (>) for 2 seconds is a shortcut to enable/disable echo delay (cycling through multiple timing).

Granular sampler

This channel records small fractions of sound (grains) and plays them back at different pitch. By default, the sound is sampled continuously. Tilting the whale left-right selects between minor and major basic chord and increases stereo spread, front-back increases or decreases amount of voices (grains) that play in parallel.

Holding (>) for 2 seconds records and holds the sample. Clicking (>) again releases it and continues sampling.

(-) detunes the chord *T. Multiple steps are possible.

(+) reverses the detuning *T, multiple steps get it back to original setting.

(++) selects a song instead of static chord *T. A few songs from filtered channels are used here (stored in the config file).

Reverb

This channel runs a simple reverb that continuously adjusts the size of the buffer, which is perceived as a pitch that slowly goes down or up, depending on settings. It can also be stopped.

Tilting the whale front-back controls low-pass filter (front = lower cut-off point). As the microphone is more sensitive in higher frequency ranges, this is useful for filtering out noises and leaving only drumming, humming or singing.

Holding (>) for 2 seconds stops the “decay”, leaving reverb buffer at where it was.

(+) enables decrementing of reverb buffer size, where the perceived pitch goes up.

(-) enables incrementing of reverb buffer size, where the perceived pitch goes down.

The delay line is available and working independently on the reverb. Tilting the whale left-right changes the timing, just like in most of the other channels.

Complete list of channels

This is a default order, you can override it by holding (>) and (+) as explained in the basic manual.

1. Earth element, “Air on the G string”, forest
2. Wind element
3. Water element, “Rachel’s song”, sea
4. Fire element, space channel with reverb
5. Reverb, decaying
6. Granular sampler
7. DCO, “Seasick Jonah”
8. Drum kit
9. Space channel (without reverb)
10. Clouds by Émilie Gillet / Mutable Instruments
11. Dekrispator by Xavier Halgand
12. Song of Wind and Ice (with isochronic tones)

Extra channels (need to be unlocked):

13. Water element with alternative background (creek), featuring “Ghost in the Shell” score
14. Bytebeat, music from math formulas
15. Chopper
16. Pass through (if you want to use the whale as a sensitive stereo microphone for field recording)
- 17-20. Water element with sea/creek background and alternative low-pass settings or chord progression
- 21-23. Water element with three alternative sea backgrounds, featuring chord progression from the amazing “Notjustmoreidlechatter” by Paul Lansky
24. High-pass filters driven, voiceover background, chord progression from “Notjustmoreidlechatter”