v1.0

Looping in Retrograde.

Table of Contents

This manual covers Stardust firmware v1.0.

Get the latest firmware here!

Foreword

"Exploration is in our nature. We began as wanderers, and we are wanderers still. We have lingered long enough on the shores of the cosmic ocean. We are ready at last to set sail for the stars." — Carl Sagan

Ever since I was a child, I've had a fascination with outer space. I've always loved attempting to comprehend the vast distances between celestial objects, and realizing how just small humans are in the grand scheme of things. But overall, I think it's the notion of exploring the unknown that has always kept me coming back for more. Contemplating the universe encourages so many questions. In a world of ubiquitous computing where every answer is just a browser search away, it's sometimes nice to gaze into the night sky and realize just how little we know about the universe at large.

If there's any section of electronic music that has inspired a similar sense of awe in me, it's sampling technology. At the surface it appears straightforward, you record samples and you play them back. But once you get past the surface, an entire world of sound awaits. It's a spectacular feature of audio that as soon as you slow it down, reverse the playback direction, or chop it into smaller pieces, it becomes something different entirely. I have countless memories of playing around with samplers and getting to the point where I could not recall the original source material for the audio that I was listening to.

So here we are, with Stardust. I could list off a number of technical achievements, features, and bells and whistles that this module has, but that's not what makes it special. What truly makes it special is its capacity for exploring sound. I invite you to let go of preconceived notions about sampling or looping and let the module take you to new areas of sonic discovery. Find new sounds within existing source material, and then find even more new sounds within those. The beautiful thing is, the more sounds you discover, the more you'll realize are still out there.

Andrew Ikenberry
October 2024
San Clemente, California

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Description

Meet Stardust, a cosmic tape looper. Much like the cacophony of galaxies, supernovas, and stars we find in our own celestial canvas, Stardust captures layers of audio to construct new sonic imagery, and finds ways to take the esoteric, and make it concrète.

The foundation of Stardust is a stereo looper with all the essential controls to record and manipulate sound, while supporting click-less looping transitions, an ultra-low noise floor, and high-fidelity audio hardware. However, getting the perfect loop is only half of the equation - Stardust also focuses on the texture and vibe of your recordings. Dial in nostalgic warmth with wow & flutter / tape hiss controls, or take Stardust to new horizons with out-of-this-world DSP effects. And, much like the tape-machines of yore, Stardust can splice and rearrange its loops at the twist of a knob.

With an impressive set of front panel controls, the ability to save, recall, or export recordings, load samples via an included USB flash drive, and a host of configurable settings via our web editor Narwhal, Stardust is an all-encompassing looper device. Reach out into the vast unknown, one overdub at a time.

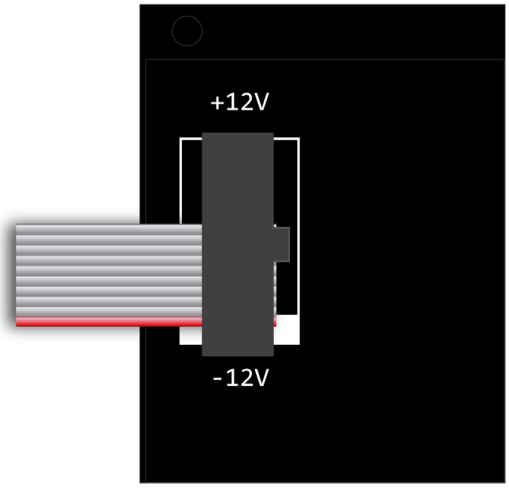
- Cosmic stereo tape looper
- Click-less looping: up to 10 minutes max mono, 5 minutes max stereo
- High-Fidelity Audio: 48kHz, 32-bit internal, 24-bit hardware, ultra-low noise floor
- Save, recall, import and export recordings via USB drive
- Wow & Flutter, Tape Hiss, Vintage Saturation, Reverb, and other DSP effects onboard
- Built on the Daisy platform for continued official updates, and community firmware hacking

Module Installation

To install, locate 18HP of space in your Eurorack case and confirm the positive 12 volts and negative 12 volts sides of the power distribution lines.

Plug the connector into your case's power supply unit, keeping in mind that the red band corresponds to negative 12 volts. In most systems, the negative 12 volt supply line is at the bottom.

The power cable should be connected to the module with the red band facing the bottom of the module.



Technical Specifications

General

- Width: 18HP
- Depth: 22mm
- Power Consumption: +12V=175mA, -12V=8mA, +5V=0mA

Audio

- Sample Rate: 48kHz
- Bit-depth: 32 bit (internal processing), 24-bit (hardware conversion)
- True Stereo Audio IO
- High fidelity Burr-Brown converters
- Based on Daisy audio platform

Controls

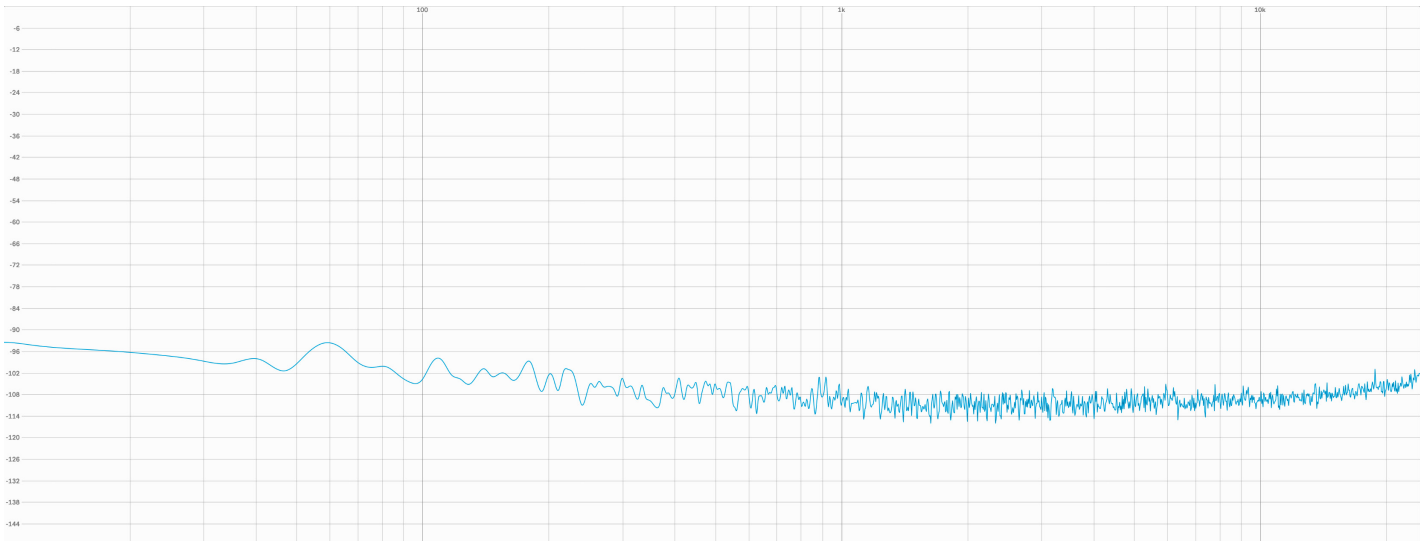
- Knobs
  - Resolution: 16-Bit (65,536 distinct values)
- CV Inputs
  - Resolution: 16-Bit (65,536 distinct values)

USB Port

- Type: A
- External Power Draw: up to 500mA (for powering external devices via USB). Please note that additional power drawn from the USB must be considered within your PSU's total current consumption.

Noise Performance

- Noise Floor: -94dB
- Graph:



Recommended Listening

Robert Fripp (1979). Frippertronics.

Robert Fripp is a British musician and member of the progressive rock group King Crimson. A guitar virtuoso, Fripp developed a new performance method using tape delay machines to loop and layer musical phrases to create ever evolving asymmetrical patterns. The technique was coined Frippertronics, and is now a fundamental technique for ambient performances.

Additional Listening: Robert Fripp (1981). *Let The Power Fall.*

Marcus Fischer - Live at the Whitney Museum
YouTube

Edgard Varèse - Poème èlectronique
YouTube

John Cage - Williams Mix
YouTube

Recommended Reading

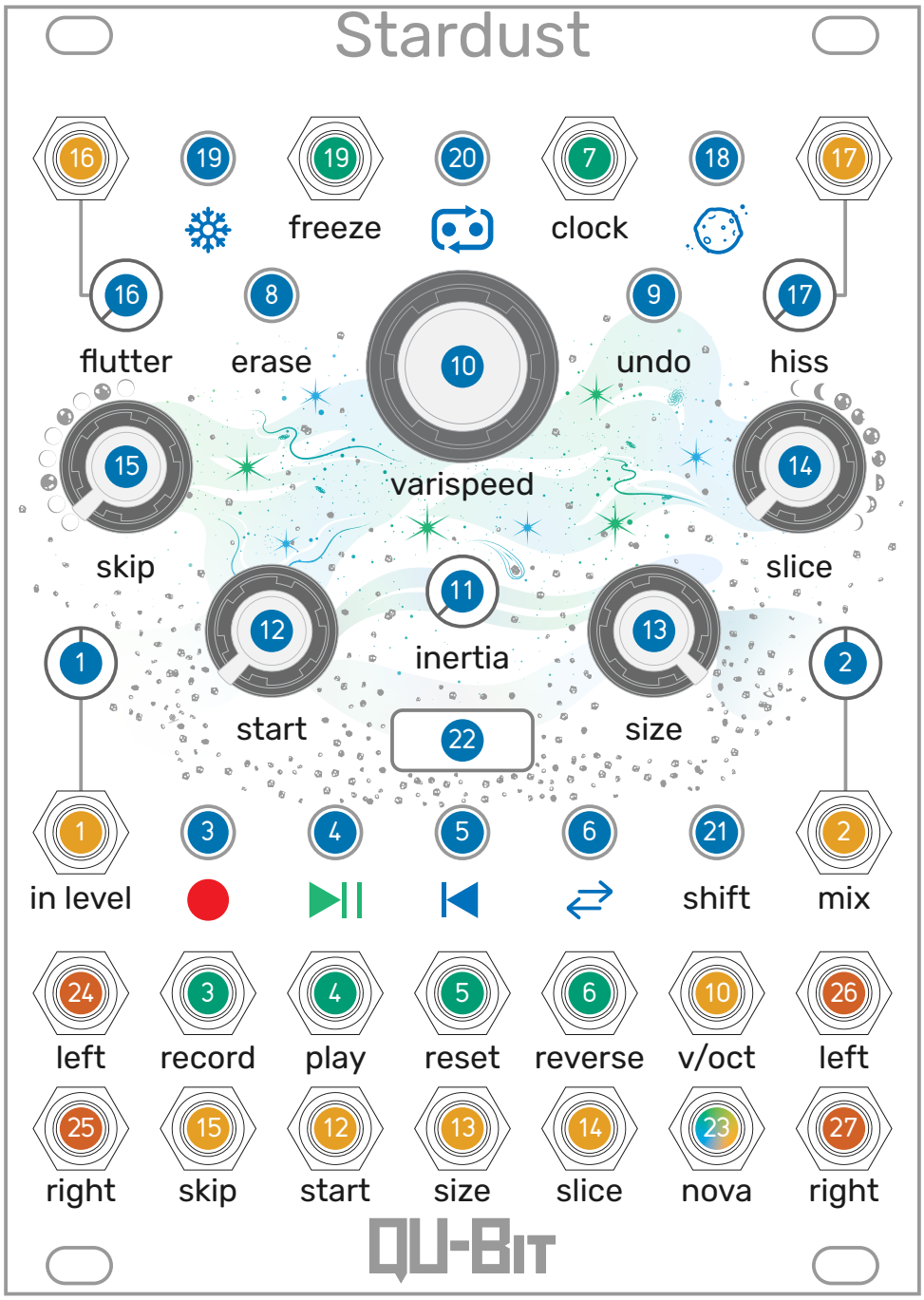
Musique Concrète
Wikipedia

Pierre Schaeffer
Wikipedia

Michael Chanan - Repeated Takes: A short history of recording and its effect on music
Google Books

Francesco Balilla Pratella - The Art of Noises. Futurist Manifesto
Library of Congress

John Cage - Williams Mix
Wikipedia



Tactile Controls CV Inputs Gate Inputs Audio IO

LED UI

Stardust's LED UI is more than just pretty lights. It also provides visual feedback for all sorts of functions, controls, and indications. This includes but is not limited to loop position, VU metering, loop saving and import/exporting, and more.

Custom LED colors: You can set Stardust's LED colors to whatever you like! Head to Narwhal to set the color codes for all 6 Stardust LEDs' colors.

1. In Level

- The **In Level** knob and CV input **control the incoming signal amplitude.**

  The knob is silent when the knob is fully to the left.

  Audio is at full amplitude when the knob is at center position.

  As the knob turns from center position to the right, tape saturation and compression are introduced to the incoming signal!

- **In Level CV Input** range: -5V to +5V

  Did You Know? You can control Stardust's pre-gain to use with line level, and instrument level signals by holding the Shift button and turning the In Level knob? Learn more about shift functions in the secondary functions section.

2. Mix

- The **Mix knob** and CV input **blend between the dry and wet signal**. When the knob is fully CCW, only the dry signal is present. When the knob is fully CW, only the wet signal is present.

- The default Mix curve is Constant Power.

  Mix CV Input range: -5V to +5V

  Did You Know? You can change Stardust's mix curve using Narwhal? Learn about the different mix curve options in the Configurator section of the manual, then head to Narwhal to try them out!

3. Record

- The **Record button** and gate input **start and stop recording audio** from the stereo input to Stardust's buffer. The Record LED is **red** when recording is active, and white when recording is inactive. The record state will change on button release, or on the rising edge of the gate input.

  When Stardust does not have an active buffer, the first recording sets the max buffer length to create your loop. Subsequent recordings are made within the active loop, and can be no longer than the maximum buffer length.

  If record is active past the loop end point, then it will continue recording at the loop start point.

- **Record Gate Input** threshold: +0.4V

  Did You Know? There are other settings that change the default behavior of Record, which are listed below. You can read more about each setting further in the manual!

  Loop Mode: Sets the macro recording behavior. Includes Sound on Sound, Replace, Frippertronics, and Re-sample recording modes.

  Punch-In Mode: Determines when recording will start/stop, either by manual input, stopping at the end of loop, or starting at the loop start and ending at the loop end.

  Persistent Buffer Memory: When a recording is complete, Stardust will automatically start saving the recording to memory. This is indicated by an **orange** LED blip under the Varispeed control. Once the blip has stopped, the buffer is saved and will be recalled between power cycles.

4. Play/Pause

- The **Play/Pause button** and gate input **start and stop the loop playback.**

  Pressing the button will start the loop playback from the current tape head position, and turn the play/pause LED **green**. Pressing the button again will pause playback and turn the LED white, leaving the tape head at its latest position.

  The playback state will change on button release, or on the rising edge of the gate input.

- **Play/Pause Gate Input** threshold: +0.4V

  Experiment: Turn up the Inertia knob before pressing the Play/Pause button. Notice how starting and stopping the loop lags? You just added a tape stop effect to your looper! Head to the Inertia section to learn more.

5. Reset

- The Reset button and gate input set the tape head back to the loop start point. The reset is activated when the button is released, or the gate signal goes high.

  The Reset LED will blink **gold** each time a reset is activated. The Reset LED will also blink **blue** when the loop point is hit.

- **Reset Gate Input** threshold: +0.4V

  Did You Know? Reset, along with a host of other controls on Stardust, can be clock synced! Read about Clock Mode, where reset will activate on the next clock pulse at the Clock input jack.

6. Reverse

- The **Reverse button** and gate input **change the playback direction of the loop**. The direction is reversed when the LED is **blue**, and white when the direction is forward.

  The reverse state changes on button release, or on the rising edge of the gate input.

  The reversed playback speed will match the forward playback speed set by the Varispeed encoder.

- **Reverse Gate Input** threshold: +0.4V

7. Clock

- The Clock gate input uses an external clock source to sync Stardust's parameters in Clock Mode. See the Clock Mode section to learn which controls are clock synced, and how they behave under an external clock.

- **Clock Gate Input** threshold: +0.4V

8. Erase

- The Erase button deletes the current buffer and stages Stardust for a new recording.
  The buffer is erased when the button is released. If the button is held for more than 2 seconds the erase will be canceled, should you change your mind!

  Did You Know? If you accidently erase your buffer, you can bring it back from the endless void of space by pressing the Undo button!

9. Undo

- The **Undo button removes the last recording to the buffer**. This allows Stardust to re-record the previous loop layer without removing the whole loop up to that point!

  Undo is activated when the button is released.

  Undo and Frippertronics: Due to the nature of the technique, Undo does not operate while Stardust is in Frippertronics Mode.

  Did You Know? You can lock the Undo point in your loop! This allows you to undo up to a certain point, no matter the amount of recordings. Learn more in the secondary functions section!

10. Varispeed

- The Varispeed encoder and 1V/Oct input control the loop playback speed. Since this is a varispeed control, the playback speed and pitch are directly connected to one another.

  Turn the encoder clockwise to increase the playback speed and pitch up to 8x playback speed (+3 octaves).

  Turn the encoder counter-clockwise to decrease the playback speed and pitch to /4 playback speed (-2 octaves).

  Click the encoder button to return to x1 playback speed.

- 1V/Oct CV Input range: -5V to +5V

  Did You Know? You can change the Varispeed range to go through x0 playback speed and into reverse playback, similar to Nebulae! Find out how to change this configurable setting in the Narwhal section of the manual.

11. Inertia

- The Inertia knob controls the amount of lag between user input and playback speed, resulting in a tape stop effect!

  The effect is off when the knob is fully to the left. As the knob is turned to the right, the amount of tape lag ranges from short, vinyl stops to drawn out motor failures (max 2 second lag).

  Did You Know? You can adjust the Inertia slope to dial in the ratio of speed decrease lag and increase lag. Head to the secondary section of the manual to learn about Inertial Slope!

12. Start

- The **Start knob** and CV input **set the loop start point within the recorded buffer.**

  When the knob is fully to the left, the loop start is at the beginning of the recorded buffer. When the knob is fully to the right, the start position is at the end of the recorded buffer.

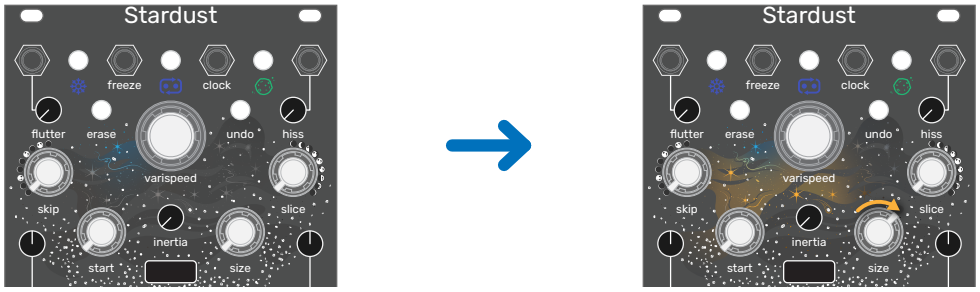
  The Start position is indicated by a **blue** LED animation in the galaxy LED cluster.

- **Start CV Input** range: -5V to +5V

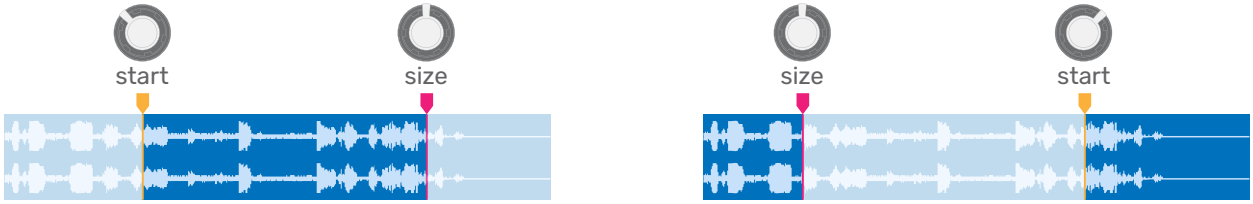
13. Size

- The Size knob and CV input set the loop size relative to the loop start point. When the knob is fully to the left, the loop size is 5ms. The loop size will increase while turning the knob to the right, reaching the full buffer length when fully to the right.

  The loop size is indicated by a **gold** LED streak across the galaxy LED cluster.



Start, Size, and Buffer Loop Point: If the loop size extends past the recorded buffer end point due to the loop start position, the loop will continue at the beginning of the recorded buffer.



- **Size CV Input** range: -5V to +5V

14. Slice

- The **Slice knob** and CV input **set the amount of splice points within the loop.** The splice points are evenly distributed across the loop. Slice will also randomly repeat splices.

  When the knob is fully to the left, there are no active splice points. As the knob is turned to the right, the number of splice points will increase by multiples (2, 4, 8, 16, etc.) until it is at its shortest splice length of 62ms.

  When the right glaxy LEDs are **purple**, Slice will not randomly repeat splices, but Stardust will still reference the splice amount across the rest of the module. You can read the Skip and Nova sections to learn more!

- **Slice CV Input** range: -5V to +5V

15. Skip

- The **Skip knob** and CV input **adjust the probability that a splice transformation will occur**. This can be a number of transformations, which you can find listed below. Skip will only apply the transformations in each zone, with the last two zones grouping the transformations together.

Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9
• Adjusts the amount of start position offset of a slice point.	• Adjusts the chance for a randomly reversed slice.	•Adjusts the frequency and intensity of panning and amplitude changes to slice points.	• Adjusts the amount of micro pitch changes to a slice point.	• Introduces the probability of octave pitch jumps to a slice point.	• Slice points will jump to random semitones.	• Introduces tape lag to the random semitone jumps.	• Combines Zones 1-5.	• Combines Zones 1-4 and Zone 7.

- **Skip CV Input** range: -5V to +5V

16. Flutter

- The **Flutter knob** and CV input **adjust the first effect assigned by the FX Mode button.**

  The effect is off when the knob is fully to the left, and at its maximum amount when fully to the right. See the Effect Mode section to find a full list of effects that Flutter can control!

- **Flutter CV Input** range: -5V to +5V

17. Hiss

- The **Hiss knob** and CV input **adjust the second effect assigned by the FX Mode button.**

  The effect is off when the knob is fully to the left, and at its maximum amount when fully to the right. See the Effect Mode section to find a full list of effects that Hiss can control!

- **Hiss CV Input** range: -5V to +5V

18. Effect Mode

- The **Effect Mode button selects the effect currently controlled by Flutter and Hiss.** All available effects run simultaneously. See the list below to learn each effect, and their controls.

Effect LED Color	Effect Mode	Flutter Control	Hiss Control
Blue 	Analog Tape Emulation	Wow & Flutter amount (pitch/ amplitude modulation)	Tape hiss amount (noise & compression amount)
Green 	Digital Audio Artifacts	Downsampling amount	Bitcrush amount
Gold 	Reverberation	Reverb amount	Reverb time
Purple 	Highpass/Lowpass Filtering	Highpass amount (dry to 12kHz)	Lowpass amount (dry to 25Hz)

Did You Know? If you are a bit lost keeping track of 8 effects controls and want a fresh start, holding the **Shift button** and pressing the **Reset button** will reset Stardust's controls to default values. This will set all effects to off!

Learn more about Stardust's shift combos in the secondary section of the manual.

19. Freeze

- The **Freeze button** and Gate input **lock and repeat a small portion of the loop**. Freeze is activated either when the button is released, or when the gate input goes high.

  In freerunning clock mode, the frozen audio length is 1% of the loop length, with a minimum possible length of 62ms.

  In Clock Mode, Freeze locks and repeats 1/32 of the clock signal's rate.

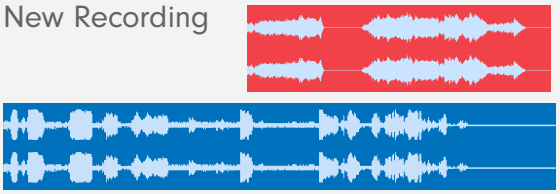
- **Freeze Gate Input** threshold: 0.4V

18. Loop Mode

- The **Loop Mode button selects the macro recording behavior for Stardust.** The active mode determines how audio will be recorded into an existing buffer.

Sound on Sound
The default loop mode on Stardust is Sound on Sound, in which newly recorded audio is added to the existing loop in its current position.

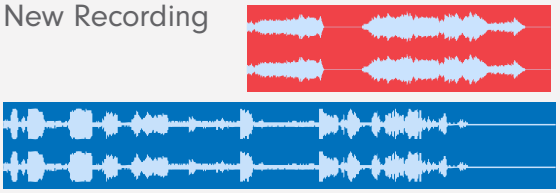
New Recording



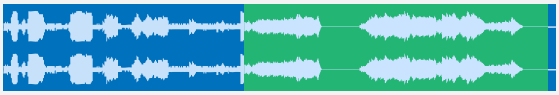
Result

Replace
When set to the Replace loop mode, a new recording will delete and replace the old audio at its current position.

New Recording



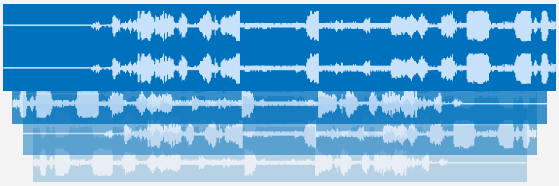
Result



Frippertronics
Inspired by the tape recording technique pioneered by Robert Fripp, the Frippertronics loop mode decreases the old loop amplitude each time Stardust adds a new recording. The older the audio is in the loop, the further it decays into the ether.

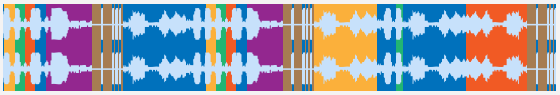
New Recording

Result



Resample
Recordings in this mode become new recordings of their own lengths, and include any playback modifications applied to the current loop (speed, direction, slices, skips, etc.). The Undo tree is baked into the resample as well, and undo-locking is ignored. You can still revert to your pre-Resample loop by pressing the Undo button.

Current, Mangled Loop



Result

21. Shift

- The **Shift button**, when held, **sets Stardust's front panel controls to their secondary functions**.

  This provides access to fine tune loop controls, DSP effects signal routing, punch-in recording effects, loop file access, and more.

Shift+Mix: LED Brightness

Holding Shift and turning the Mix knob adjusts the LED brightness on Stardust. Turn the knob fully to the left to dim the LEDs to 10% brightness, and turn the knob fully to the right for 100% brightness.

Shift+Record: Punch-In Record Mode

Holding Shift and pressing the Record button will cycle through Stardust's different record engaging and disengaging behaviors.

None
Recording is manual engaged and disengaged either by button press or gate signal.

Immediate Full
Recording will begin once manually engaged. The recording will automatically end once the loop hits its start point, or a loop reset is triggered.

Queued Full
Activating record will queue a new recording to begin at the next loop point. The Record LED will illuminate **gold** while queued and turn **red** when it hits the loop point.

The recording will end once a full loop occurs, or a reset is triggered.

A queued recording can be canceled before it starts by pressing the Record button or sending its gate input a signal.

Shift+Play: File Import

Holding Shift and pressing the Play button will load a .wav file from the Stardust USB drive into the buffer. Load your own loops and samples into Stardust with this awesome feature!

File Format
Name/Extension: loop.wav
Resolution: 16-bit
Sample-rate: 48kHz
Imaging: Stereo

Shift+Reset: Reset To Default Settings

Holding Shift and pressing the Reset button will reset all of Stardust's modes and effect settings to their default states.

Shift+Reverse: Clock Mode Toggle

Holding Shift and pressing the Reverse button will toggle Clock Mode on and off. When Clock mode is active, Stardust's front panel controls will adhere to the external clock rate. Affected controls include:

- Slice
- Skip
- Play/Pause
- Reset
- Reverse
- Freeze

Shift+Undo: Undo-Lock

Holding Shift and pressing the Undo button will activate Undo-Lock. When active, the undo point is locked in position. Undo-Lock is on when the galaxy LED closest to Undo is **blue**.

The Undo button will now toggle between main loop recording and undo tree recording. Audio will not bake into the main loop while Undo-Lock is active, and the undo tree cannot be erased unless Undo-Lock is deactivated.

Shift+Varispeed Turn: Octave Jumps

Holding Shift and turning the Varispeed encoder jumps the playback speed up and down by octaves, relative to the current playback speed.

Shift+Varispeed Click: Varispeed Range

Holding Shift and pressing the Varispeed encoder will cycle through the Varispeed range options. See the list below for the available options:

Blue: Unquantized
Green: Semitones
Gold: Octaves & Fifths
Purple: Octaves Only

Shift+Inertia: Inertial Slope

Holding Shift and turning the Inertia knob will adjust the envelope peak on Inertia. The nominal position is center on the knob.

If the knob is turned fully to the left, Inertia will only affect playback speed when decreasing, or when the loop is paused.

If the knob is turned fully to the left, Inertia will only affect playback speed when increasing, or when the loop is played.

Shift+Effect Mode: Pre/Post Effect Chain

Holding Shift and pressing the Effect Mode button toggles whether or not Stardust's onboard effects are applied to the dry signal.

The effects are applied only to the wet signal when the LED is **blue**. The effects are applied to the dry signal when the LED is **green**.

Shift+Freeze: Loop Export

Holding Shift and pressing the Freeze button will export the current recording and undo buffer as a single loop.wav file to the USB Drive. The file is formatted as a 16-bit, 48kHz stereo .wav file, which can be reimported into Stardust.

Shift+Loop Mode: Firmware Update

Holding Shift and pressing the Loop Mode button causes Stardust to perform a firmware update. When activated, Stardust looks for a new .bin file that does not match its current firmware version, and uses it to update the module.

22. USB Drive

- Stardust's USB drive is used to update firmware, apply configurable settings via Narwhal, import and export loop.wav files, and carries a digital version of the manual!

  The USB Drive is 1GB and formatted for FAT32.

Configurable Settings

Stardust carries a collection of configurable settings under the hood, all accessible via Narwhal, our web-based settings app.

Nova Output
Selects the output from the Nova CV/Gate jack.

Nova = end of loop, and end of slice gate output
Flair = end of loop gates
Spark = end of slice gates
Orbital = playback position in loop as a CV

Mix Curve
Selects the curve for the Mix knob.
Options: Transistion, Constant Power, Linear

Effect CV Lock
Choose if the Flutter and Hiss CV inputs affect the currently selected effect, or a specific effect.

Record Effects
When active, Stardust's Effect Modes are applied to the recorded buffer.

Reverb Type
Selects the reverb timbre between Normal, Bright, and Dark.

Varispeed Reverse Inclusion
Decides if reversed playback direction is included on the Varispeed encoder. When activated Varispeed no longer tracks 1V/Oct.

23. Nova

- Nova is a multifaceted signal output; a collection of interstellar discoveries found in Stardust. Use Nova to self patch Stardust, or to control other patch points in your rack! A staff favorite is using Splice and Nova to clock sync a modular patch to the Stardust loop!

  Did You Know? You can change Nova's output using the Narwhal and the USB drive onboard!

- Nova CV output range: 0V to +5V

- Nova Gate output amplitude: +5V. Gate Length: 50% duty cycle

24. Audio Input Left

- Audio input for Stardust's left channel. The left input normals to both channels when no cable is present in Audio Input Right.
  Input Range: 10Vpp AC-Coupled

25. Audio Input Right

- Audio input for Stardust's right channel.
  Input Range: 10Vpp AC-Coupled

26. Audio Output Left

- Audio output for Stardust's left channel.
  Input Range: 10Vpp

27. Audio Output Right

- Audio output for Stardust's right channel.
  Input Range: 10Vpp

More Than Sound

Like the explorers who've delved beyond our atmosphere, space has always inspired us to push the boundaries in our own sonic endeavors. We hope you too find a universe of sound in this module we've been dreaming up for over 5 years.

And, with every Stardust ordered, we will be donating a portion of the proceeds to The Planetary Society. Co-founded by Carl Sagan, the organization is "empowering the world's citizens to advance space science and exploration." Together, we aim to contribute to the advancement of science and discovery for future generations.

Lifetime Repair Warranty

No matter how long you've owned your module, or how many people have owned it before you, our doors are open to any and all Qu-Bit modules needing repair. Regardless of circumstances, we will continue to provide physical support for our modules, with all repairs being completely free of charge.*

Learn more about the lifetime repair warranty.

*Issues that are excluded from the warranty, but do not void it includes scratches, dents, and any other user-created cosmetic damage. Qu-Bit Electronix holds the right to void warranty at their own discretion and at any time. Module warranty may be voided if any user damage is present on the module. This includes, but is not limited to, heat damage, liquid damage, smoke damage, and any other user-created critical damage on the module.

Changelog

Version	Date	Description
v1.0.0	Nov. 13, 2024	• Release firmware.