

Grainsmith Field

iPad and iPhone

Contents

1. Grainsmith Field	7
2. Install Grainsmith Field	8
2.1 App Store install	8
2.2 First launch	8
Loading your own audio	8
2.3 Using Field as an AUv3 in a host	8
2.4 See also	9
3. Your first sound	10
3.1 What you see when it opens	10
3.2 Make a sound	10
3.3 Move around the sound	11
3.4 Shape the grains	11
3.5 Pitch and level	11
3.6 Load your own audio	12
3.7 Where to go next	12
4. Screen at a glance	13
4.1 Top bar	13
4.2 Waveform and ribbons	15
4.3 Panels	15
4.4 XY pads	15
4.5 Scrub deck	16
4.6 On iPhone	16
5. The panels	17
5.1 Main	19
5.2 Reverb	19
5.3 Delay	19
5.4 Grain Shape	20
5.5 Morph	20
5.6 ADV sheet on iPhone	20
6. The XY pads	21
6.1 How a pad works	21
6.2 The four pads	21
Grains	21
Scatter	22
Texture	22

Tone	22
6.3 Modulation on a pad	22
6.4 In an AUv3 host	22
7. Pitch	23
7.1 The Pitch ribbon	23
7.2 Pitch probability	23
7.3 The scale	24
8. Playheads	25
8.1 Open the Playheads panel	25
8.2 How many heads	27
8.3 Head 1	27
8.4 Heads 2 and 3	28
8.5 Chords	28
8.6 On the waveform	28
8.7 In Stretch	28
8.8 CPU	28
9. Stretch	29
9.1 Turn it on	29
9.2 What it responds to	29
9.3 What it ignores	29
9.4 Chords with voices	30
10. Modulation and MOVE	31
10.1 Open the slots	31
10.2 The six slots	32
10.3 Slot settings	33
LFO	34
EUCLID	35
10.4 Targets	35
10.5 Seeing what moves	35
10.6 MOVE	35
11. Recording into the buffer	37
11.1 The record button	37
11.2 The REC chip	37
11.3 The three modes	38
11.4 Loop length and window	38
11.5 Feedback	38
11.6 Wet / dry mix	38
11.7 The input meter	39

11.8 Bluetooth output disables recording	39
11.9 Live mode and the grains	39
11.10 After you record	39
11.11 Record Performance	39
12. Area Select	41
12.1 Open Edit Area	41
12.2 Drag the handles	41
12.3 Done and Cancel	41
12.4 Zoom to the selection	41
12.5 Clear the selection	41
12.6 How it maps to the engine	42
12.7 Presets	42
13. Presets	43
13.1 The preset browser	43
Favorites	43
Factory	43
My presets	43
13.2 Save	43
13.3 Step through presets	43
13.4 Unsaved changes	44
13.5 Import and export audio	44
14. Settings	45
14.1 Stretch	45
14.2 Instrument	45
14.3 Pitch	45
14.4 Controller Profile	45
14.5 MIDI Learn	46
14.6 Controller Setup	46
14.7 Tempo	46
14.8 Sample	46
14.9 About	46
14.10 Performance	46
15. MIDI and controllers	47
15.1 Free, Stretch and Instrument play modes	47
15.2 Playing notes in Instrument mode	47
Amp envelope	47
15.3 MIDI learn	47
Managing mappings	48

15.4	Controller profiles	48
15.5	Default CC maps	48
	OXI E16	49
	MIDI Fighter Twister	50
	Melbourne Roto-Control	50
15.6	Transport and performance buttons	50
15.7	CC feedback to controllers	51
16.	Roto-Control	52
16.1	The bundled profile	52
16.2	Knobs	52
16.3	Buttons	53
16.4	Selecting the profile in Field	53
16.5	Notes	54
17.	Performance	55
17.1	What drives CPU	55
17.2	Heads, Stretch and the open window	55
17.3	The grain-cloud display	55
17.4	Sample rate and buffer	55
17.5	Practical tuning	56
18.	Troubleshooting	57
19.	What is granular synthesis?	59
19.1	Opening hook	59
19.2	The core idea	59
19.3	In Grainsmith	60
19.4	Further reading	61
19.5	See also	61
20.	What's New	62
20.1	v1.6.1 — Loopy Pro input fix	62
20.2	v1.6.0 — Performance strip	62
20.3	v1.5.1 — AUM preset crash fix	62
20.4	v1.5.0 — Stretch, Key and Note Mode	62
20.5	v1.4.3 — Live mode crossfade	62
20.6	v1.4.2 — Usability	62
20.7	v1.4.1 — Synced LFO fix	62
20.8	v1.4.0 — Modulation, MOVE and Delay	62
20.9	v1.3.2 — Per-head Size and Spread	63
20.10	v1.3.1 — Playheads panel fix	63
20.11	v1.3.0 — Record Performance	63

20.12	v1.2.3 — Audio export fix	63
20.13	v1.2.2 — Longer recording	63
20.14	v1.2.1 and v1.2.0 — Multiple playheads and a new preset browser	63

1. Grainsmith Field

A granular synthesizer and effect for iPad and iPhone, built for touch. Load any audio, or record it live, and play it as a cloud of grains with four XY pads, a Morph macro, up to three playheads, and modulation.

Field runs as a standalone app and as an AUv3 effect in hosts like AUM, Loopy Pro and Logic for iPad. This manual covers version 1.6.

Looking for the desktop plug-in? Grainsmith for macOS and Windows has its own manual at docs.plasticfactory.com/grainsmith.

Your first sound

From opening the app to a sound you can play.

[Your first sound →](#)

Screen at a glance

Every control on the screen, numbered.

[Screen at a glance →](#)

What's new

Everything added since launch, version by version.

[What's new →](#)

What is granular synthesis?

The idea behind the instrument and what you can make with it.

[Read the theory →](#)

2. Install Grainsmith Field

Grainsmith Field is a native iOS and iPadOS granular instrument. One download gives you two things: a standalone app you launch from the home screen, and an AUv3 plug-in you load inside a host such as AUM or Logic. Both are built from the same code and installed together.

2.1 App Store install

Grainsmith Field is on the App Store. Search for **Grainsmith** by Plastic Factory and tap Get, or open the App Store link from plasticfactory.com.

- **Requires iOS/iPadOS 16.0 or later.** Devices that can't run iOS 16 aren't supported.
- **Universal app.** The same binary runs on iPhone and iPad. iPhone gets a compact layout of the same instrument.
- **Landscape only.** Field runs in landscape on both iPhone and iPad. Turn your device to landscape when you open it.

2.2 First launch

Tap the Grainsmith icon on your home screen. The app opens in standalone mode.

The first time you use a recording feature, iOS asks for microphone permission so Field can capture and granulate live sound. Accept it if you plan to record; you can decline and turn it on later under **Settings → Grainsmith → Microphone**. Playing back a loaded sample does not need the microphone.

Field keeps playing when you background the app, so a drone or loop continues while you switch away. The screen may still sleep during long passages; the audio keeps running.

Loading your own audio

Field integrates with the Files app. Presets you save appear in Field's folder under **On My iPad → Grainsmith**, and you can open audio files stored in Files directly into the app.

2.3 Using Field as an AUv3 in a host

This is the most common point of confusion, so read this part carefully.

Field is an audio-effect plug-in (type `aumf`), not an instrument plug-in. In your AUv3 host it loads in an audio-effect / FX slot, not the instrument slot. If you look for Grainsmith in your host's instrument list, you won't find it. Open the host's list of **audio effects** (often labelled FX or "Audio Unit Effects") instead.

The plug-in's identity, taken from the app's audio-component registration:

Field	Value
Type	<code>aumf</code> (Audio Unit music effect)
Subtype	<code>GiP1</code>
Manufacturer	<code>Grnu</code>
Name in host	Plastic Factory: Grainsmith Field

Because Field is an audio effect, it sits in the signal path and expects audio to reach it. To use Live mode and recording inside a host, route an audio source into the FX slot that holds Field. With nothing feeding the slot, Field has no input to capture. Loading a sample and playing it back from inside Field works without any external input; the Live and record features are the parts that need a source.

In the standalone app this doesn't come up. The standalone app runs its own audio pipeline and takes input from the device's microphone or line input directly.

Field registers as a sandbox-safe AUv3, so hosts such as AUM and Logic for iPad can scan and load it. Whichever host you use, the rule is the same: look in the audio-effects list, and feed the slot an input for Live and recording.

2.4 See also

- [Recording](#) for how to capture audio and set record length.
- [Performance](#) for what drives CPU and how to tune it.
- [Troubleshooting](#) if Field doesn't show up or won't make sound.

3. Your first sound

This page takes you from opening Grainsmith Field to a sound you can play with. It covers the standalone app on iPad and iPhone in version 1.6.

3.1 What you see when it opens

Field runs on one landscape screen. There are no tabs and no pages to dig through on iPad. From top to bottom you get the top bar, the waveform, the five control panels, the four XY pads, and the scrub deck.



The app opens with a sample already loaded, so you can make sound right away. If the built-in sample ever fails to load, the waveform reads "Drop a sample or tap Files" and you load your own audio first (see [Load your own audio](#)).

3.2 Make a sound

The transport starts stopped. Tap the play button near the top-right of the top bar to start playback. Grains begin spawning and the amber grain cloud animates across the waveform. Tap it again to stop.

That is the whole loop: audio is loaded, grains read from it, and you hear the result. Everything else on the screen shapes those grains.

3.3 Move around the sound

The waveform is a play surface, not just a picture. Touch it and drag left or right to move the read position. The grain cloud follows your finger.

Two more ways to move the read head live on the scrub deck at the bottom:

- **Scrub rockers** sit in the bottom corners. They are spring-loaded: push one and the read position moves forward or back; let go and the rocker springs back to center. Push a rocker further to scrub faster.
- **Freeze** is the button in the center of the scrub deck. Tap it and the read head holds its current position, so grains keep spawning from one spot in the sample instead of moving through it. Tap again to release. Freeze holds even while you scrub.

3.4 Shape the grains

The **Main** panel holds the five controls you reach for most. Drag a dial up to raise its value, down to lower it. Double-tap any dial to snap it back to its default.

Dial	What it does	Range	Default
Size	Grain length. Higher is longer, smoother grains; lower is short, clicky ones.	5 ms – 1500 ms (log)	~137 ms
Density	How many grains spawn per second.	1 Hz – 512 Hz (log)	~42 Hz
Speed	Playback rate through the sample. Center is stopped; right plays forward, left plays in reverse.	–200% – +200%	+100%
Jitter	Random timing offset added to each grain, for a looser, less metronomic cloud.	0 – 500 ms	50 ms
Spread	Random stereo placement per grain, from mono to a wide cloud.	0 – 100%	20%

Speed is a center-detent control: the value arc grows outward from the middle, so you can feel your way back to stopped or to full-speed forward.

The other four panels are next to Main:

- **Reverb** has two dials, Reverb (how much) and Space (the size of the space).
- **Delay** has Mix, Fdbk and Time dials and a SYNC pill. Mix starts at 0, so the delay is silent until you turn Mix up.
- **Grain Shape** picks the amplitude window each grain plays through: Soft, Round, or Sharp. Soft grains fade in and out gently; Sharp grains have hard edges.
- **Morph** is the single gold knob. Turn it up and it pushes nine grain settings at once along a curated path, so one gesture makes a big move. It offsets from wherever your own dials are set, so turning Morph back to zero returns everything to your values.

3.5 Pitch and level

Two vertical ribbons sit to the right of the waveform.

- **Pitch** transposes the grains. The center is unison; drag up or down for up to two octaves either way. When you let go, the ribbon snaps to the nearest note allowed by the current pitch mode (set in the gear menu). In Free mode it does not snap.
- **Level** sets the level of the grains. The top of the ribbon is 0 dB (no change); drag down to bring it toward –60 dB and, at the very bottom, silence.

On iPhone there is no Level ribbon. Level is a dial in the ADV sheet, along with Reverb, Grain Shape and Delay.

3.6 Load your own audio

Two ways to bring in your own sound:

- **Drag and drop.** From the Files app in Split View or Slide Over, drag an audio file onto the waveform and release. Field loads it.
- **Import from Files.** Tap the preset name in the top-left to open the preset browser, then "Import audio file..." and pick a file. Field accepts audio files through the standard iOS file picker.

Once your sound is loaded, press play and start shaping it with the dials and pads.

3.7 Where to go next

- [The screen](#) — "Screen at a glance", every region named.
- [Main](#), [Reverb](#), [Delay](#), [Shape](#), [Morph](#) — the five control panels.
- [The XY pads](#) — the four two-thumb performance surfaces along the bottom.
- [Pitch](#), [Recording and Live mode](#), [Area Select](#), [Presets](#), [Settings](#), and [MIDI and controllers](#).

4. Screen at a glance

The picture below is Grainsmith Field 1.6 on iPad, with numbers on the controls. Find the control in the picture, then read the entry with the same number underneath. Click or tap a number to jump to its entry. The entries link to the pages that go deeper.

Field runs on one landscape screen. There are no tabs and no pages to dig through on iPad. From top to bottom: the top bar, the waveform with its two ribbons, the five panels, the four XY pads and the scrub deck. iPhone has the same instrument in a smaller frame, with some controls moved. See [On iPhone](#) at the end of this page.



4.1 Top bar

1 Preset name. Shows the loaded preset, or the sample name if no preset is loaded. A * means you have changed something since the last save or load. Tap the name to open the preset browser. The arrows on either side step to the previous or next preset. See [Presets](#).

2 MOD. Opens Modulation, with six slots that move parameters on their own. The dot lights when any slot is running. See [Modulation](#) and [MOVE](#).

3 HEADS. Shows how many playheads are reading the sample, from 1 to 3, as coloured dots. Tap it to open Playheads, where each extra head gets its own Speed, Pitch, Size, Spread, Pan and Level, plus one-tap chords. In Stretch it reads VOICES. See [Playheads](#).

- 4

RIBBON. What the Pitch ribbon (15) snaps to when you let go: Octaves, Oct+5ths, Scale, Free or Chromatic. The default is Chromatic. See [The Pitch ribbon](#).
- 5

SCALE • KEY. Picks the scale, and the KEY that grains land on: Off, one of the twelve roots, or Auto. The dot lights when a key is set. See [The scale](#).
- 6

PLAY. Free, Stretch or Instrument. Free is the normal grain cloud. [Stretch](#) plays the whole buffer as one smooth time-stretch. Instrument plays grains from MIDI notes, with Attack, Release and Root Note in the same popover. See [MIDI and controllers](#).
- 7

PROB. How grains move when pitch probability transposes them: the interval, the range (1 to 3 octaves) and the direction. The default reads *Octaves ±1*. See [Pitch probability](#).
- 8

REC. The record mode: One-shot, Loop or Live, with the loop length, feedback and wet mix. It shows the mode and length, for example *Live 2.0s*. See [Recording and Live mode](#).
- 9

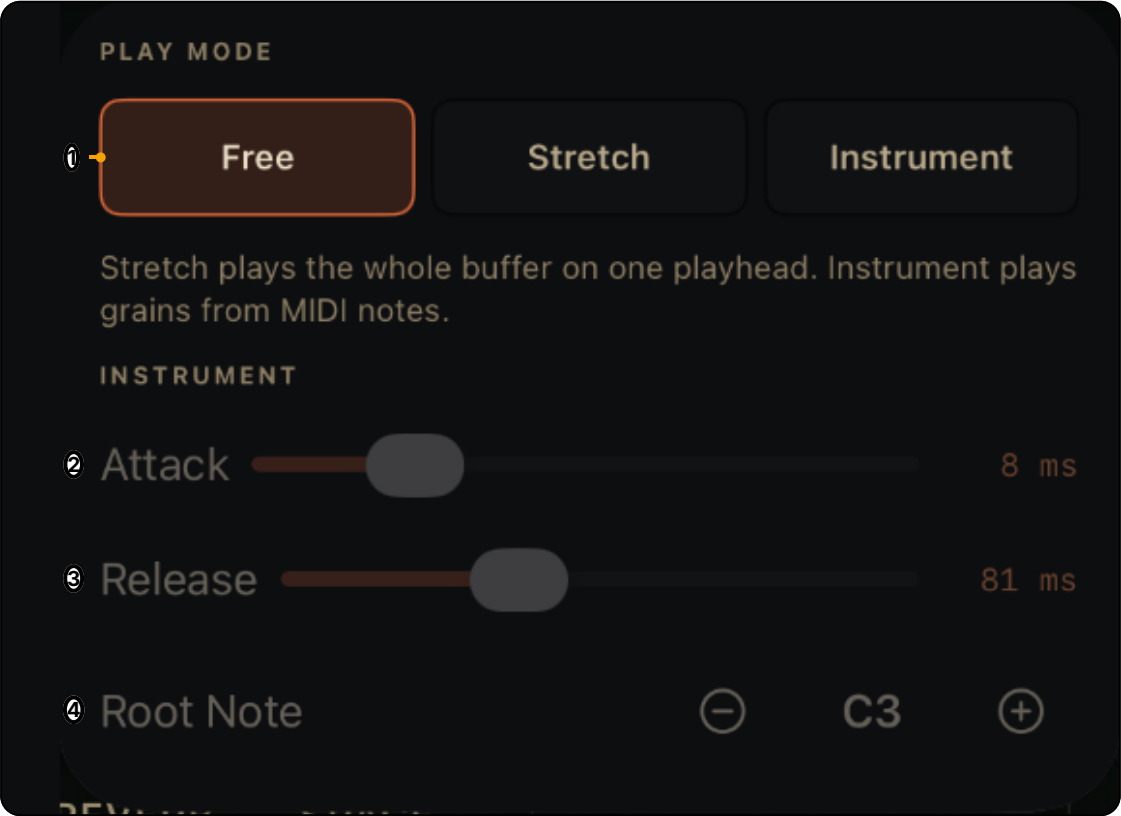
INmeter. The level of audio coming in. It changes colour near clipping.
- 10

Record. Tap to start recording into the grain buffer, tap again to stop. The REC chip (8) sets what kind of recording it makes. It is dimmed on Bluetooth audio, which cannot record.
- 11

Play. Starts and stops the grains.
- 12

Settings. Stretch, Instrument, every pitch setting, controllers, MIDI learn, the standalone tempo, Eco multi-head and About. See [Settings](#).

The chips (3 to 8) apply as soon as you tap a choice. Tap outside the popover to close it. A chip's dot lights when its setting is not at the default.



- 1

Play mode. Free, Stretch or Instrument. See [Stretch](#).

Attack. How fast a MIDI note fades in. Instrument mode only.

Release. How fast it fades out after you let go.

Root Note. The MIDI note that plays at the original pitch. See [MIDI and controllers](#).

4.2 Waveform and ribbons

Waveform. The loaded sample, the grain cloud and a line for each playhead. Touch and drag to move the read position. Double-tap with two or three heads to gather them at that spot. Long-press for the grain-buffer menu: export, copy, paste, [Edit Area](#) and clear. Badges in the corners show STRETCH, FROZEN and REC.

LEVEL. The level of every grain, from unity at the top down to silence. Double-tap for unity.

PITCH. Transposes the grains up to two octaves either way. The small label under PITCH shows the ribbon mode; tap it to change the mode here instead of in the RIBBON chip (4). In Instrument mode it reads TRANPOSE. See [Pitch](#).

4.3 Panels

Hold any dial in Main or Reverb to [modulate](#) it, or to MIDI-learn it in the standalone app. Hold any other dial for fine adjustment. Double-tap a dial to reset it.

Main. Size, Density, Speed, Jitter and Spread, the five dials you reach for most. See [Main](#).

Reverb. Reverb sets how much; Space sets the size of the room. See [Reverb](#).

Delay. A stereo delay for granular tails: MIX, FDBK (feedback) and TIME. SYNC locks TIME to note lengths from the host tempo, or from the standalone tempo in Settings. MIX starts at 0, so the delay is silent until you turn it up.

Grain Shape. Soft, Round or Sharp grain edges. Dimmed in Stretch. See [Grain Shape](#).

Morph. One gold knob that pushes nine grain settings at once. Hold it to open [MOVE](#), which lets Morph drift on its own. Dimmed in Stretch. See [Morph](#).

4.4 XY pads

Each pad moves two settings with one finger. A gold ghost puck shows where modulation is moving an axis. See [The XY pads](#).

Grains. Density across, Size up.

Scatter. Jitter across, Spread up.

Texture. Pitch probability across, Reverse up.

Tone. Filter cutoff across, resonance up.

4.5 Scrub deck

 **Scrub.** Two spring-loaded rockers, one in each corner. Push one to move the read position forward or back, up to 2× speed; let go and it springs back.

 **Freeze.** Holds the read position so grains keep coming from one spot. Tap again to release.

4.6 On iPhone

The iPhone keeps the top bar, the waveform and the scrub deck, and swipes the middle between a page of dials and the four XY pads. The rail on the left jumps between them.

- The chips are not shown, except REC (8). Play mode, scale, key and probability are in [Settings](#).
- HEADS (3) is a button on the dial page.
- LEVEL (14), Reverb (17), Grain Shape (19) and Delay (18) are in the **ADV** sheet on the dial page.
- On iPhone, Reverb and Space have no hold-to-modulate. Add them from a slot with **Add target** instead.

An iPad window that is narrow, such as an AUv3 in a host, shows a single **PERF** chip in place of RIBBON, SCALE · KEY, PLAY and PROB. It opens the same four panels as tabs.

5. The panels

Five panels sit below the waveform. They hold the dials that shape the grains and the effects after them. Every dial works the same way: drag up to raise the value, drag down to lower it, double-tap to reset to the default. While you drag, a bubble shows the current value.

What a hold does depends on the dial:

- Hold a Main or Reverb dial and the "Modulate " sheet opens. It lists Slot 1 to Slot 6, a MIDI Learn row in the standalone app, and Clear modulation once the dial has a route. See [Modulation and MOVE](#) and [MIDI and controllers](#).
- Hold any other dial (Delay, the ADV sheet, the playhead panel) and the next drag is in fine mode, for small precise changes.
- Hold the Morph knob and the MORPH MOVE sheet opens. See [MOVE](#).



-
- 1** **SIZE.** Grain length. See [Main](#).
-
- 2** **DENSITY.** Grains per second. See [Main](#).
-
- 3** **SPEED.** How fast the read position moves; center is stopped. See [Main](#).
-
- 4** **JITTER.** Random timing for each grain. See [Main](#).
-
- 5** **SPREAD.** Random stereo placement for each grain. See [Main](#).
-
- 6** **REVERB.** How much reverb. See [Reverb](#).
-
- 7** **SPACE.** The size of the room. See [Reverb](#).
-
- 8** **MX.** How much delay. Starts at 0, so the delay is silent until you turn it up. See [Delay](#).
-
- 9** **FDBK.** How many repeats. See [Delay](#).
-
- 10** **TIME.** The delay time, or a note length with SYNC on. See [Delay](#).
-
- 11** **SYNC.** Locks TIME to the tempo. See [Delay](#).
-
- 12** **Soft.** Gentle grain edges. See [Grain Shape](#).
-
- 13** **Round.** The default grain shape. See [Grain Shape](#).
-
- 14** **Sharp.** Hard grain edges. See [Grain Shape](#).
-
- 15** **MORPH.** One knob that pushes nine grain settings. Hold it for MOVE. See [Morph](#).
-

5.1 Main

The five grain dials you reach for most.

Dial	What it does	Range	Default
Size	Grain length. Longer grains are smoother; shorter grains are clicky and textural.	5 ms – 1500 ms (log)	~137 ms
Density	Grains spawned per second.	1 Hz – 512 Hz (log)	~42 Hz
Speed	Playback rate through the sample. Center is stopped; right is forward, left is reverse.	–200% – +200%	+100%
Jitter	Random timing offset added to each grain, for a looser cloud.	0 – 500 ms	50 ms
Spread	Random stereo placement per grain, from centered to a wide cloud.	0 – 100%	20%

Size and Density use a logarithmic taper, so the low end of each dial has fine resolution where small changes matter most.

Speed is a center-detent dial. The value arc grows outward from the middle, so you can feel your way back to 0% (stopped) or out to full forward or reverse. The taper is finest near the center, which makes slow speeds easy to set.

In [Stretch](#) the Density, Jitter and Spread dials are dimmed too.

5.2 Reverb

Two dials feed a built-in reverb.

Dial	What it does	Range	Default
Reverb	How much reverb is mixed in.	0 – 100%	25%
Space	The size of the reverb space.	0 – 100%	50%

On iPhone these two dials live in the ADV sheet, reached from the compact knob page.

5.3 Delay

A delay after the grains. It has three dials and a SYNC pill in the panel header.

Dial	What it does	Range	Default
Mix	How much delay is mixed in.	0 – 100%	0%
Fdbk	How much of the delay feeds back into itself.	0 – 100%	50%
Time	The delay time.	5 ms – 2730 ms (log) when SYNC is off	about 117 ms

Mix starts at 0, so the delay is silent until you raise it.

Turn SYNC on and Time becomes a tempo division instead of milliseconds. The dial steps through 16 divisions:

1/64	1/32	1/16T	1/16
1/8T	1/8	1/4T	1/4
1/4D	3/8	1/2	1/2D
1/1	3/2	2/1	4/1

The tempo comes from the host. In the standalone app, or when the host sends no tempo, it comes from the Tempo setting (see [Settings](#)).

The Delay dials cannot be modulated or MIDI-learned. A hold gives fine mode. Double-tap still resets a dial to its default. The delay settings are saved in presets.

On iPhone the Delay dials are in the ADV sheet, with a "Sync to tempo" toggle in place of the SYNC pill.

5.4 Grain Shape

Grain Shape sets the amplitude window each grain plays through, which changes how hard or soft the grain's edges are.

Setting	Sound
Soft	Grains fade in and out gently, for a smooth wash.
Round	A middle window. This is the default.
Sharp	Grains have hard edges, for a more percussive, grainy texture.

Tap a name to select it. On iPhone this control is in the ADV sheet. In [Stretch](#) this panel is dimmed and does nothing.

5.5 Morph

Morph is the single gold knob. Turn it up and it pushes nine grain settings at once along a set path, so one gesture makes a large, coordinated move in the sound. The settings it drives include Density, Jitter, Spread, the pitch and reverse probabilities, grain dynamics, and Scan (a slow sweep of where in the sample grains are read from).

Morph is additive. It offsets from wherever your own dials sit, so moving a dial while Morph is up still works, and turning Morph back to zero returns every setting to your values. When a dial is being pushed by Morph, a faint gold hint ring on that dial shows how far. A gold ring that orbits the dial is something else: it shows a modulation slot moving that dial (see [Modulation and MOVE](#)).

Hold the Morph knob to open MORPH MOVE, which sets how Morph moves by itself. See [MOVE](#). In [Stretch](#) the Morph knob is dimmed.

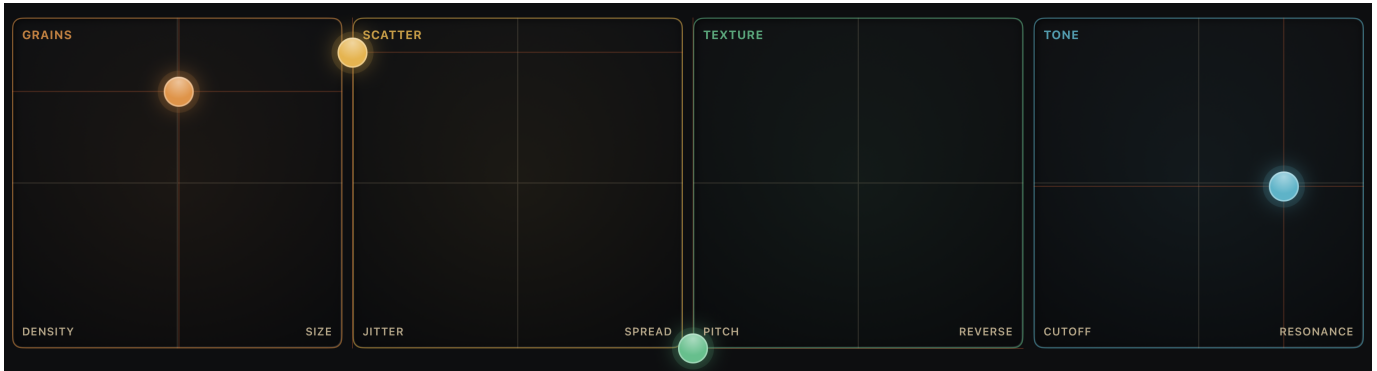
Scan does not have its own dial. It moves only through Morph, at a fixed rate. Turn Morph up to bring it in.

5.6 ADV sheet on iPhone

The iPhone has no room for every panel on the main knob page. The ADV button opens a sheet with LEVEL, REVERB, GRAIN SHAPE and DELAY.

6. The XY pads

Four square XY pads run across the bottom of the screen. They are the performance surface: each pad maps its horizontal and vertical axes to two grain settings, so one thumb moves two things at once. You can play up to four pads at the same time, one thumb per pad.



6.1 How a pad works

Touch anywhere in a pad and the puck jumps to your finger. Drag it around and both axes update continuously as you move. The horizontal position sets the X value, from the left edge (minimum) to the right edge (maximum). The vertical position sets the Y value, from the bottom edge (minimum) to the top edge (maximum).

When you lift your finger the puck stays where you left it. Nothing springs back, so a pad holds its last position until you touch it again.

A crosshair marks the center of each pad. When the puck crosses the center line on either axis you feel a small haptic tick, so you can find the middle without looking. While you are touching a pad, a bubble shows both axis values, for example `Density 22.6 Hz` `Size 137 ms`.

Each pad drives the same settings as the dials above. Move the Grains pad and the Density and Size dials move with it; turn those dials and the pad's puck moves. They are two views of the same values.

6.2 The four pads

Grains

Density and Size, the two controls that set the texture of the cloud.

Axis	Control	What it does	Range
X	Density	Grains spawned per second.	1 Hz - 512 Hz
Y	Size	Length of each grain.	5 ms - 1500 ms

Move up and to the right for a dense wash of long grains; down and to the left for sparse, short ticks.

Scatter

How loosely the grains sit in time and space.

Axis	Control	What it does	Range
X	Jitter	Random timing offset added to each grain.	0 - 500 ms
Y	Spread	Random stereo placement per grain, from mono to a wide cloud.	0 - 100%

At the bottom-left the grains are tight and centered. Push up and right and they scatter across time and the stereo field.

Texture

Two probability controls. Each one sets a chance, applied per grain.

Axis	Control	What it does	Range
X	Pitch	Chance that a grain is transposed away from the set pitch.	0 - 100%
Y	Reverse	Chance that a grain plays backward.	0 - 100%

The Pitch axis sets only the *chance* of transposition. How far a transposed grain moves, and whether it snaps to a scale, is set in the Pitch section of the gear menu (mode, range, direction, and scale), or on iPad with the PROB chip in the top bar. With the defaults, a transposed grain moves up or down within one octave. Turn the X axis up and more grains get transposed; leave it at the far left and every grain plays at the set pitch.

The Reverse axis works the same way: at the far left every grain plays forward, at the far right every grain plays backward, and in between you get a mix.

Tone

The filter.

Axis	Control	What it does	Range
X	Cutoff	Filter cutoff frequency.	0 - 100%
Y	Resonance	Filter resonance.	0 - 100%

6.3 Modulation on a pad

When a modulation slot is moving one of a pad's two settings, a gold ghost puck shows where the modulated value is, next to your own puck. Your puck stays where you left it. See [Modulation and MOVE](#).

6.4 In an AUv3 host

Field is also an AUv3 plugin. When a host automates one of a pad's two settings, a dimmed cyan puck appears at the value the host is sending, next to your own puck, so you can see where the automation is driving the pad. It fades out about a second after the host stops. Your own puck is unaffected, so you can still play the pad by hand while automation runs.

7. Pitch

Field has two pitch controls that do different jobs. The Pitch ribbon transposes every grain together. Pitch probability transposes grains at random, one by one, for a shimmering or chordal texture. Both share one scale setting.

7.1 The Pitch ribbon

The Pitch ribbon runs down the right edge of the waveform. Drag it up or down to transpose the grains. The center is unison (no transposition), and the ends reach two octaves up and two octaves down.

While you drag, the ribbon shows a continuous value. When you let go, it snaps to the nearest pitch the current ribbon mode allows, and it jumps to exactly the pitch the engine plays. In Free mode there is no snap.

Set the ribbon mode in any of three places: Settings, under Pitch; the RIBBON chip in the top bar (iPad); or the small mode label under PITCH on the ribbon itself, which opens a menu. The modes:

Mode	On release the ribbon snaps to
Octaves	Whole octaves only.
Oct+5ths	Octaves and fifths.
Scale	Notes of the chosen scale.
Free	Nothing. The pitch stays exactly where you left it.
Chromatic	The nearest semitone.

The ribbon mode defaults to Chromatic.

When the app is in Instrument play mode, the ribbon is labeled TRANSPOSE and offsets the notes you play in. See [MIDI and controllers](#).

7.2 Pitch probability

Pitch probability gives each grain its own chance of being transposed away from the ribbon pitch. Set the chance with the X axis of the Texture pad (see [The XY pads](#)). At the far left every grain plays at the ribbon pitch; move right and more grains get transposed. This is a per-grain random process, so a cloud of grains spreads into an interval or a chord instead of moving as one.

How far a transposed grain can move, and to what notes, is set in Settings under Pitch, or on iPad with the PROB chip in the top bar:

Control	What it sets	Options	Default
Probability	The intervals a transposed grain can jump to.	Octaves, Oct+5ths, Scale, Free, Chromatic	Octaves
Probability Range	How many octaves the jump can span.	1, 2, or 3 octaves	1 octave
Probability Direction	Which way grains transpose.	Both, Up, Down	Both

With the defaults, a transposed grain moves up or down by a whole octave.

7.3 The scale

The Scale is also set from the SCALE·KEY chip. On its own it only keeps you in key if the sample already sits at the root, because it snaps the transposition offset rather than the pitch itself. That is what KEY is for. Set KEY, in Settings under Pitch or on the SCALE·KEY chip (iPad), to one of the twelve roots or to Auto, and Grainsmith analyzes the recording's pitch when the file loads or a take stops, then lands every grain on a note of that key and scale, whatever pitch the sample is at and wherever in the buffer the grain came from. With the Pitch knob at zero that is TUNE: each grain corrected to the nearest note of the key, the sample's character intact, since this is varispeed and not formant correction. Auto reads the key off the sample instead of you choosing one, and grains with no clear pitch, like noise or hits, fall back to the plain Scale behavior. A chord collapses to whichever pitch is loudest. A grain long enough to run past the note it started on is controlled by Note Mode, in the same Pitch section:

Note Mode	What the grain does
Off	Keeps the pitch it started with.
Hold	Stays on its note. The grain is re-tuned as the recording moves underneath it. This is the default.
Sustain	Loops inside the note it started on.

Hold needs a Key and a scaled Ribbon Mode. Without them the Hold segment is dimmed. Sustain needs no key. Key and Note Mode are both marked Experimental. Key is at its best on single-line material with a clear pitch. It defaults to Off. The scales:

Major, Minor, Pent Maj, Pent Min, Dorian, Mixolydian, Harm Minor, Phrygian, Lydian, Locrian, Whole Tone, Chromatic.

Scale defaults to Major.

The pitch modes, scales, and the snapping math are the same code the desktop Grainsmith uses, so a patch pitches the same way on both.

8. Playheads

Field can read one sample with up to three playheads at once. Each head makes its own stream of grains, so you can play one sound against itself: at different speeds, a fifth apart, or panned across the stereo field.

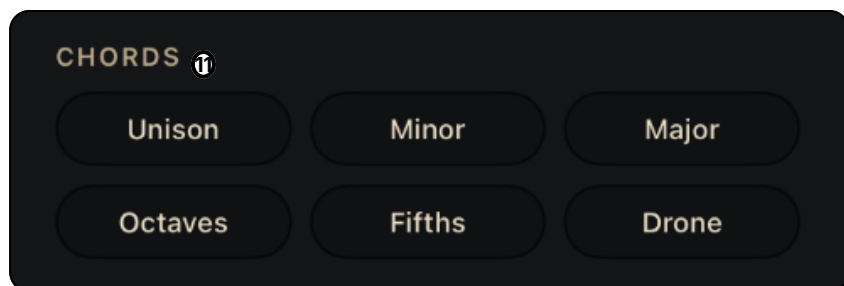
Heads save with presets, and with your session in a host.

8.1 Open the Playheads panel

- On iPad, tap the **HEADS** chip in the top bar. It shows a coloured dot for each head and the head count. See [Screen at a glance](#).
- On iPhone, and in narrow host windows, tap **HEADS** on the dial page.

The heads are coloured: head 1 is amber, head 2 green, head 3 gold. The same colours mark each head's line on the waveform.





- 1 **HEADS.** How many playheads, 1 to 3. See [How many heads](#).
- 2 **Reset.** Puts that head's dials back to their defaults.
- 3 **LEVEL** (head 1). Head 1's level.
- 4 **STAGGER.** Spreads the heads apart in time. See [Head 1](#).
- 5 **SPEED.** How fast this head moves; 0 holds it still.
- 6 **PITCH.** This head's transposition in semitones.
- 7 **SIZE.** This head's grain length. Follows head 1 until you change it.
- 8 **SPREAD.** This head's stereo scatter. Follows head 1 until you change it.
- 9 **PAN.** Where this head sits left to right.
- 10 **LEVEL.** This head's level. Head 3 has the same six dials in gold. See [Heads 2 and 3](#).
- 11 **CHORDS.** Sets the heads up in one tap. See [Chords](#).

8.2 How many heads

HEADS at the top of the panel picks 1, 2 or 3. A new head starts matched to head 1 in size and spread, so it sounds full right away.

8.3 Head 1

Head 1 follows the main Speed dial and the Pitch ribbon. With two or three heads it gets two more dials:

Dial	What it does	Range	Default
LEVEL	Head 1's level.	0 to 100%	100%
STAGGER	Spreads the heads apart in time. At 0 every head starts its grains together. Turn it up to spread them across each grain.	0 to 100%	0%

8.4 Heads 2 and 3

Each extra head has its own dials, and a **Reset** button.

Dial	What it does	Range	Default
SPEED	How fast this head moves through the sample. 0 holds it still.	−2.00× to +2.00×	0×
PITCH	Transposes this head, in semitones, on top of the Pitch ribbon.	−24 to +24	0
SIZE	Grain length for this head.	5 ms to 1500 ms	Follows head 1
SPREAD	Random stereo placement for this head's grains.	0 to 100%	Follows head 1
PAN	Where this head sits in the stereo field.	Left to right	Centre
LEVEL	This head's level.	0 to 100%	100%

SIZE and SPREAD follow head 1 until you change them. Double-tap either to make it follow head 1 again.

8.5 Chords

The **CHORDS** buttons at the bottom of the panel set the heads up in one tap:

Chord	Heads	What it sets
Unison	1	One head.
Minor	3	Heads 2 and 3 at +3 and +7 semitones.
Major	3	Heads 2 and 3 at +4 and +7 semitones.
Octaves	3	Heads 2 and 3 an octave up and an octave down.
Fifths	2	Head 2 a fifth up.
Drone	3	Heads 2 and 3 crawling slowly in opposite directions.

Every chord is a starting point. Change any dial afterwards.

8.6 On the waveform

Each head draws its own line on the waveform. Drag a head's line to move that head on its own. Double-tap the waveform to gather every head at the spot you tapped.

8.7 In Stretch

In [Stretch](#) the chip reads **VOICES** and the panel is called *Stretch Voices*. The voices share one playhead, so they share Speed, Size and Stagger, and those dials are dimmed. Pitch, Pan and Level still work per voice, which makes a stretched chord.

8.8 CPU

Every head adds grains, so three heads cost more than one. On older devices, turn on **Eco multi-head** in [Settings](#). It splits the grain rate across the heads instead of giving each head the full rate. See [Performance](#).

9. Stretch

Stretch is a second way to play a sample. Instead of a cloud of grains, Field plays the sound back as one smooth time-stretch. Speed and Pitch move independently: slow a phrase right down without it dropping in pitch, or shift its pitch without changing its speed.

Stretch saves with presets, and with your session in a host.

9.1 Turn it on

- On iPad, tap the **PLAY** chip and pick **Stretch**. See [Screen at a glance](#).
- On any device, open [Settings](#) and turn on **Stretch playback**.

Stretch works in the Free play mode only. Picking Stretch from the PLAY chip switches to Free for you. In Settings, the Stretch switch is dimmed while you are in Instrument mode. If you load a preset saved with Stretch while you are in Instrument mode, Field switches to Free so the preset plays the way it was saved.

While Stretch is on, a **STRETCH** badge shows in the corner of the waveform.

9.2 What it responds to

Control	In Stretch
Speed	How fast the stretch moves through the sample. Center is stopped; left plays in reverse.
Pitch ribbon	Transposes without changing speed.
Size	The length of the slices the stretch is built from.
Level	Output level, as usual.
Scrub rockers, Freeze and the waveform	Move, hold and show the stretch playhead, as they do for grains.
Area Select	The stretch loops inside the selected area.
Reverb, Delay and the Tone pad	Work as usual.

9.3 What it ignores

These controls are dimmed while Stretch is on, and they have no effect:

- Density, Jitter and Spread
- Grain Shape
- Morph, and with it MOVE
- In the Playheads panel: the extra heads' Speed, Size and Spread, and Stagger

Their settings are kept. Turn Stretch off and they come back as you left them.

9.4 Chords with voices

In Stretch the HEADS chip reads **VOICES**. Pick two or three voices in the panel and give each its own Pitch, Pan and Level. The voices share one playhead, so they always stay together in time. The **CHORDS** buttons in the panel are the fastest way to set one up. See [Playheads](#).

10. Modulation and MOVE

Modulation moves parameters on their own while you play. Field has six modulation slots, and each slot can drive up to four parameters. MOVE is a separate, simpler kind of motion that belongs to the Morph knob.

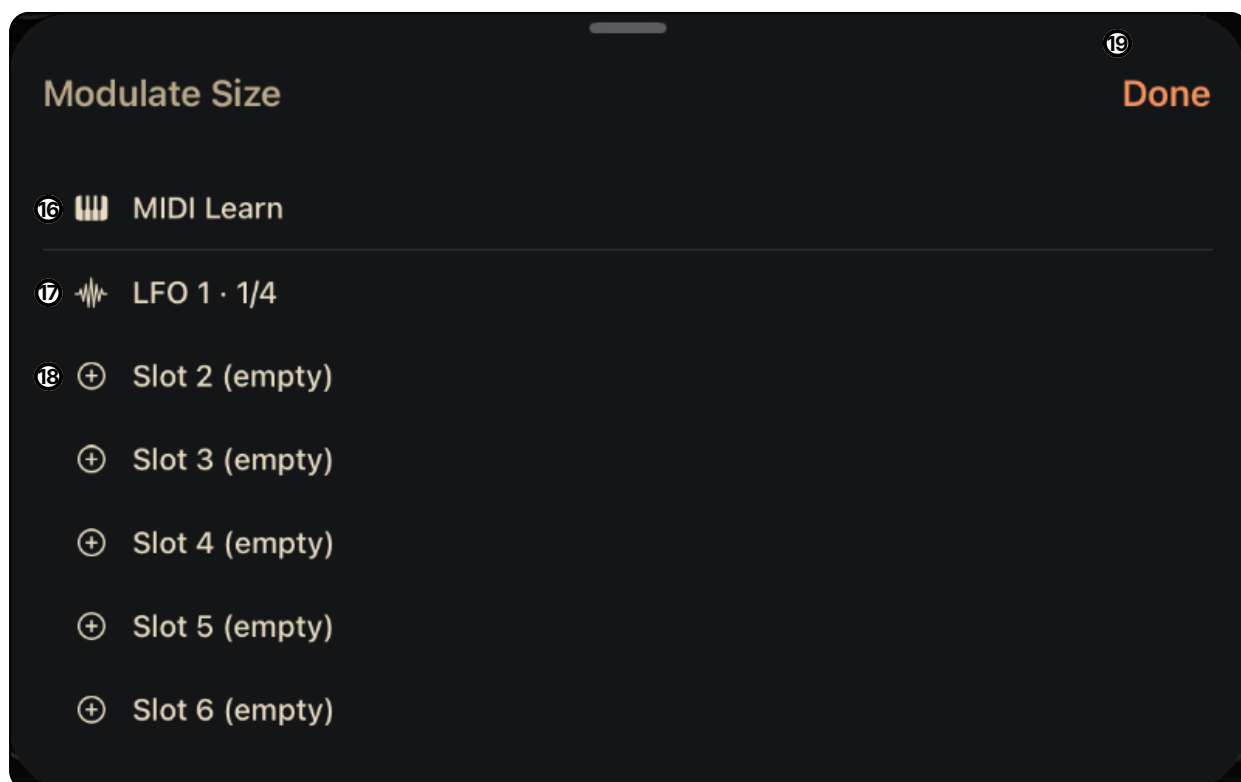
Both save with presets, and with your session in a host.

10.1 Open the slots

There are two ways in:

- **MOD** in the top bar opens the six slots. The dot next to MOD lights when any slot is running. See [Screen at a glance](#).
- **Hold a dial** in the Main or Reverb panel. A sheet titled *Modulate* and the dial's name opens. Pick a slot and the dial becomes one of that slot's targets. In the standalone app the same sheet has **MIDI Learn**, and **Clear modulation** appears once the dial is modulated.

On iPhone, Reverb and Space live in the ADV sheet, where holding a dial does not open the Modulate sheet. Add them to a slot with **Add target** instead.



16 MIDI Learn. Standalone app only. Arms the dial for the next controller you move. See [MIDI and controllers](#).

17 A running slot. Tap to add the dial to that slot as a target.

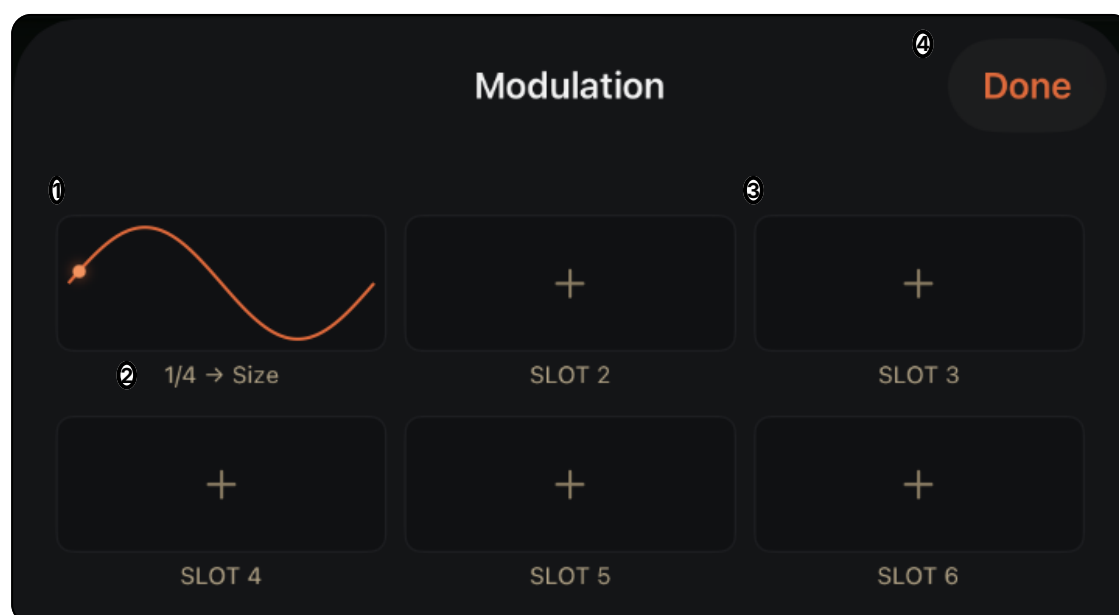
18 An empty slot. Tap to start that slot as an LFO with this dial as its target.

19 Done. Closes the sheet.

10.2 The six slots

MOD shows the slots as a grid of six live previews. An empty slot shows +. An LFO slot shows its waveform with a moving dot, and a Euclid slot shows its pattern with the current step lit. The line under each preview says what it is doing, for example $1/4 \rightarrow$ Grain Size or $1.0 \text{ Hz} \rightarrow 2 \text{ targets}$.

Tap a slot to edit it. An empty slot opens as an LFO.



1 Slot preview. A running slot shows its waveform or pattern, live. Tap it to edit the slot.

2 Status line. The rate and what the slot drives, for example $1/4 \rightarrow$ Size.

3 Empty slot. Tap to set it up. It opens as an LFO.

4 Done. Closes the sheet.

10.3 Slot settings

Slot 1

1/4 → unassigned

TYPE

OFF LFO EUCLID

SHAPE

Sine Tri Saw

Square Rand S&H

RATE

SYNC

POLARITY

BI UNI

TARGETS

Size

DEPTH

+ Add target

Use Add target for Position or Pitch, or long-press a knob to assign it.

5 Back. Returns to the six slots.

6 Live preview. The slot's shape, with a dot at the current point.

7 Type. OFF, LFO or EUCLID. The controls below change to match.

8 Shape. The LFO waveform. See [LFO](#).

9 RATE. How fast the slot runs.

10 SYNC. Locks RATE to note lengths from the tempo.

11 POLARITY. BI swings both ways around the dial's setting; UNI only adds.

12 Target. A parameter this slot drives. See [Targets](#).

13 DEPTH. How far this slot moves this target.

14 Remove. Takes this target off the slot.

15 Add target. Picks another parameter to drive, up to four per slot.

Type sets what the slot is: OFF, LFO or EUCLID.

LFO

Control	What it does	Range	Default
Shape	The waveform.	Sine, Tri, Saw, Square, Rand, S&H	Sine
RATE	How fast it cycles.	Free: 0.02 Hz to 20 Hz. Synced: 4/1 to 1/64.	Synced, 1/4
SYNC	Locks RATE to note lengths from the tempo.	On or off	On
POLARITY	BI swings either side of where the dial sits. UNI only adds to it.	BI, UNI	BI

The tempo comes from the host. In the standalone app it comes from **Tempo** in [Settings](#).

EUCLID

A Euclidean rhythm spreads a number of hits as evenly as it can across a number of steps. Each hit is a pulse of modulation.

Control	What it does	Default
HITS	How many pulses in the pattern.	4
STEPS	How long the pattern is, 1 to 16 steps.	8
ROTATE	Shifts where the pattern starts.	0
MORPH	0% gives hard on/off pulses. Turn it up to soften each pulse toward a ramp.	0%
RATE and SYNC	How fast the steps go, as for the LFO.	Synced, 1/4

The **Pattern** row shows the steps as dots, with the hits filled in.

10.4 Targets

Each slot drives up to four targets. Every target has its own **DEPTH** dial, from 0 to 100%, starting at 50%. Remove a target with the minus button next to it.

Tap **Add target** to pick from the full list:

Position, Grain Size, Density, Speed, Jitter, Spread, Pitch, Reverb, Reverb Space, Filter Cutoff, Filter Resonance, Pitch Random, Reverse.

Position and Pitch have no dial to hold, so Add target is the only way to reach them. Position moves the read point through the sample. Pitch moves the transposition.

More than one slot can drive the same parameter, and their movements add together.

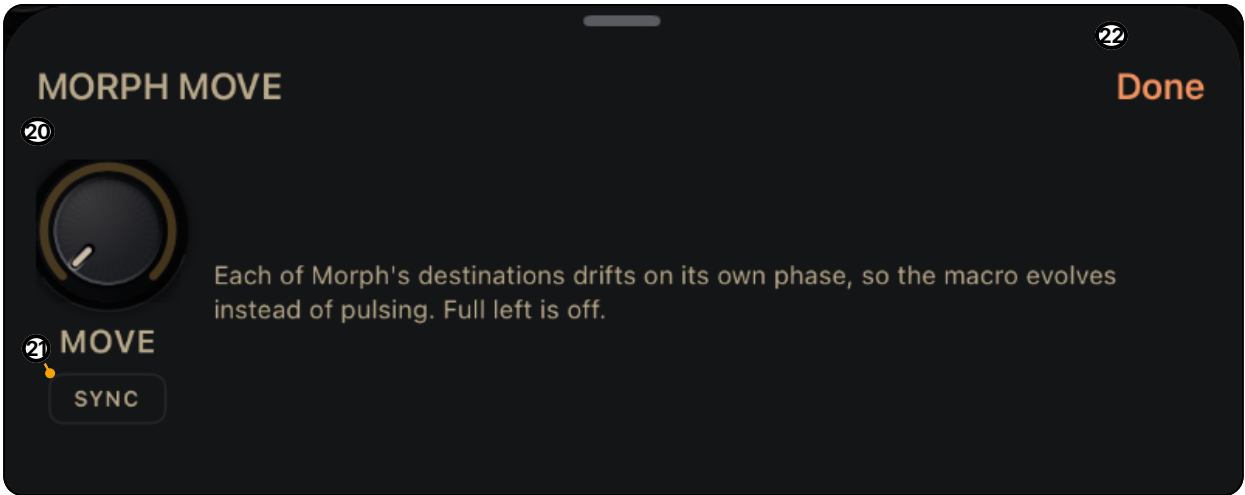
10.5 Seeing what moves

- A **gold ring** on a dial orbits at the value the modulation is giving it right now.
- A **gold ghost puck** on an XY pad shows where modulation is moving that pad's axes. See [The XY pads](#).

The other rings on a dial mean something else. The faint gold arc is how far Morph is pushing the dial. A cyan ring is host automation. An amber ring that pulses is MIDI Learn waiting for a controller.

10.6 MOVE

MOVE makes Morph drift on its own. Hold the Morph knob to open **MORPH MOVE**.



20 **MOVE.** How fast Morph drifts. Full left is off.

21 **SYNC.** Locks MOVE to note lengths from the tempo.

22 **Done.** Closes the sheet.

Control	What it does	Range	Default
MOVE	How fast Morph's destinations drift. Full left is off.	Off, then 0.02 Hz to 0.5 Hz	Off
SYNC	Locks MOVE to note lengths from the tempo.	On or off	Off

Each of Morph's destinations drifts on its own phase, so the sound evolves instead of pulsing in step. A dot next to the Morph knob shows MOVE is running.

The Morph knob sets how far MOVE can go. Each destination breathes between none of Morph's push and the full amount the knob is set to. With Morph at zero there is nothing to move, so turn Morph up first. Because the destinations spend time below the top, MOVE on sounds about half as strong as the same Morph setting with MOVE off. See [Morph](#).

In [Stretch](#), Morph is dimmed, and MOVE has no effect.

11. Recording into the buffer

Field granulates a buffer of audio. You can load a file, but you can also record straight into the buffer from the mic or from the audio reaching the plugin, then granulate what you just captured. The record button lives in the top bar, next to Play.

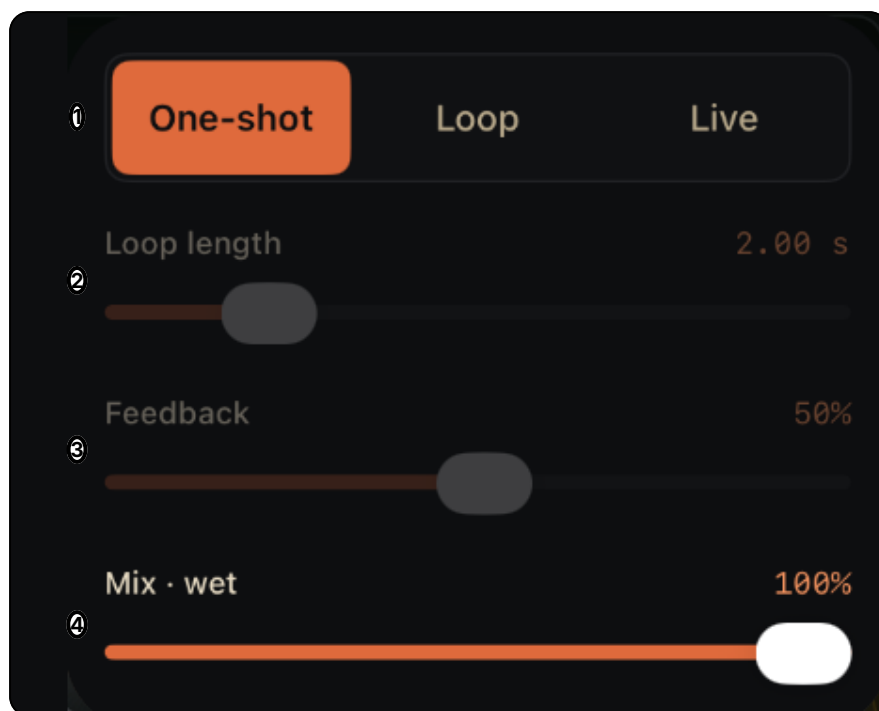
11.1 The record button

The record button sits at the right of the top bar, next to Play. It shows a circle when idle and a filled stop square while a recording runs. Every tap starts or stops a recording. There is no long-press, no mode badge and no first-use chooser.

While recording, a red write head sweeps across the waveform at the live capture position and a **REC** badge shows in the corner.

11.2 The REC chip

The REC chip sits just left of the IN meter, on iPad and on iPhone. It shows the current mode. On a wide screen it also shows the length in Loop and Live (for example "Loop 2.0s"). Tap it to open the record options without starting a recording. Changes apply as you make them.



1 Mode. One-shot, Loop or Live. See [The three modes](#).

2 Loop length. Reads *Window* in Live mode. Dimmed in One-shot. See [Loop length and window](#).

3 Feedback. Loop mode only. See [Feedback](#).

4 Mix · wet. Blends the grains with the dry input. At 100% you hear only the grains. See [Wet / dry mix](#).

11.3 The three modes

The options have a mode picker with three choices.

Mode	Picker label	What it captures
One-shot	One-shot	A single clean pass. Each recording replaces the buffer. No feedback.
Loop	Loop	A wrapping loop of a fixed length. Audio overdubs into the loop, and feedback sets how much of the previous pass survives.
Live	Live	A continuous rolling capture over a fixed window. No feedback, so the buffer always holds the most recent input.

One-shot is the default. In one-shot the recording auto-stops when it reaches the buffer cap of 120 seconds; you can also stop it by hand.

Loop and Live both wrap at a window you set. The difference is feedback: Loop keeps a share of what was already there so passes build up, Live always replaces so it reflects the latest input like a real-time effect.

The options always show all four controls. The ones that do not apply to the current mode are dimmed, not hidden.

11.4 Loop length and window

For Loop and Live, one slider sets the wrapping length. It reads "Loop length" in Loop mode and "Window" in Live mode.

Control	Range	Default
Loop length / Window	0.25 s – 10 s	2.00 s

The slider is dimmed in One-shot, which has no wrapping window.

11.5 Feedback

Feedback is active only in Loop mode and dimmed in the other two. It sets how much of the existing loop survives each time the record head wraps, so you can layer passes or let them decay.

Control	Range	Default
Feedback	0% – 98%	50%

One-shot and Live always record with feedback at zero, so they never overdub.

11.6 Wet / dry mix

The mix slider is active in every mode. It blends the dry input through to the output, which matters when Field runs as an insert effect in a host and you want some of the untouched signal to pass.

Control	Range	Default
Mix · wet	0% – 100%	100%

At 100% you hear only the granulated buffer. Lower it to pass dry input through alongside the grains.

11.7 The input meter

Left of the record button, a small **IN** meter shows the level of audio arriving at the plugin. It is a check that signal is actually reaching Field, from the mic in the standalone app or from the track in an AUv3 host. The bar turns ember when the input is close to clipping.

11.8 Bluetooth output disables recording

Recording needs a live input route. When the output is a Bluetooth device (AirPods or any A2DP / LE headset), Field runs playback-only and recording is turned off. The record button dims, and a tap shows an inline message: "Recording unavailable on Bluetooth audio."

The reason is how iOS handles a record-capable session over Bluetooth. Asking for record and playback together while allowing Bluetooth lets iOS route into the HFP headset profile, which collapses the sample rate to 8-16 kHz and wrecks quality. Field avoids that by dropping to a playback-only session whenever the output is Bluetooth, which keeps full-quality A2DP audio. Recording comes back the moment you switch to a wired or built-in output. If the output becomes Bluetooth while a recording is running, the recording stops.

Live mode is the mode most affected by this, since it depends on a continuous input stream.

11.9 Live mode and the grains

In Live mode the buffer keeps being overwritten while grains read from it. Since 1.4.3 the buffer crossfades under the grains as the record head passes. The grains stay where they are, so you do not hear a click or a jump when the head crosses a grain.

11.10 After you record

A recorded buffer is granulated exactly like a loaded sample. Every grain control, the XY pads, freeze, pitch, and [Area Select](#) all work on it the same way. The sample name updates to reflect what you captured (for example "Recorded", "Live loop", or "Live").

A fresh capture is held only in memory. Field tracks it as unsaved until you either export the audio or save it into a preset. Export lives in the waveform long-press menu ("Export audio..."); saving the buffer into a preset also clears the unsaved state.

11.11 Record Performance

Recording writes into the buffer. It does not capture what Field plays. "Export audio..." also saves the raw audio in the buffer, not the granulated result. To capture the performance itself, use Record Performance.

1. Tap the preset name to open the preset browser.
2. Tap "Record performance".
3. Play. A red banner reading "REC PERFORMANCE" with an elapsed time (mm:ss) shows at the top of the screen.
4. Tap the banner to stop. The row in the preset browser now reads "Recording... Tap to stop" and stops it too.

When you stop, a share sheet opens with the name, duration and size of the take. The file is already saved. Tap Share... to send it somewhere, or Done to leave it.

Takes are float32 WAV files. They are in the Files app, under On My iPad, in Field's folder, in a folder called Recordings. Names look like "Grainsmith Field 2026-07-17 14.32".

Notes:

- Recording keeps going when you switch apps or lock the screen. A Live Activity shows that it is running.
- If the recording is interrupted (a phone call, Siri) or the audio format changes mid-take, it stops early and keeps what it captured.
- Record Performance is in the standalone app only. It does not appear in the AUv3. In a host, record Field's track in the host.

See also: [Area Select](#) to confine grain reads to part of the buffer.

12. Area Select

Area Select confines grain reads to a sub-region of the sample. Instead of scanning the whole buffer, grains draw only from the part you mark between an in point and an out point. Use it to isolate a syllable, a hit, or a section, then granulate just that.

12.1 Open Edit Area

Long-press the waveform to open the "Grain buffer" menu. It lists:

- Export audio...
- Copy
- Paste (only when something has been copied)
- Edit Area...
- Clear Selection (only when a selection is set)
- Clear

Tap "Edit Area..." to enter edit mode. With no sample loaded there is nothing to select, so the item does not appear.

In edit mode the waveform un-zooms to show the whole buffer and two handles appear, one for the in point and one for the out point.

12.2 Drag the handles

Drag the left handle to set the in point and the right handle to set the out point. The handles can't cross or touch: the app keeps a minimum gap between them (2% of the buffer) so the region stays usable. Each handle also stays within the ends of the buffer.

As you drag, the selection updates live and the grain read region follows, so you hear the change while you set it.

12.3 Done and Cancel

A Cancel and a Done button sit over the waveform while you edit.

- Done commits the selection. The loop turns on over your in/out range and the waveform zooms to fill the view with just the selection. If you dragged the handles back out to nearly the whole buffer, Done treats that as no selection and returns to the full buffer with the loop off.
- Cancel throws away your edits and restores whatever region was there before you opened Edit Area, including its zoom.

12.4 Zoom to the selection

Once committed, the waveform zooms so the selection fills the width. This gives you finer control over position when scrubbing or playing within the region. While you are editing, the view always shows the whole buffer so you can place the handles against the full sample; the zoom applies after Done.

12.5 Clear the selection

With a selection active, long-press the waveform again and the "Grain buffer" menu shows "Clear Selection". Tap it to return to the whole buffer with the loop off and the zoom removed. Clear Selection appears only when a real sub-region is set.

12.6 How it maps to the engine

A selection drives three engine loop parameters together: loop enabled, loop in, and loop out. Committing, dragging, or clearing all push these in one step. A selection is a genuine sub-range with the loop on; the whole buffer with the loop off is not a selection, which is why "Clear Selection" only shows when a real region exists.

12.7 Presets

The in point, out point, and loop-on state are stored in presets. Save a preset with a selection active and it comes back with that same region when you load the preset later. A preset with no selection loads as the whole buffer.

See also: [Recording into the buffer](#) to capture audio you can then select within.

13. Presets

A preset stores a full patch: every dial and pad value, the playhead settings, modulation and MOVE, the delay, Stretch, the pitch and key settings, the Area Select region, and the audio buffer itself. Loading a preset brings back both the sound settings and the sample.

13.1 The preset browser

Tap the preset name in the top-left of the top bar to open the browser. At the top are three rows:

- **Save current...** saves the current patch.
- **Import audio file...** opens the iOS file picker so you can load your own audio.
- **Record performance** starts a performance recording. It appears in the standalone app only. See [Recording](#).

Below them are the lists. Tap any row to load it. A checkmark marks the preset that is currently loaded. Close the browser with Done.

Favorites

Every row has a star at the right. Tap it to add the preset to FAVORITES, which sits at the top of the list once you have one. Factory favorites come first, in catalog order, then your own alphabetically.

Factory

Factory presets are grouped by character. Each row has a one-line description.

Group	What is in it
Clean Stretch	Smooth, sustained pads and long tones. First Patch, Two Birds Hanging Out, Solid Pad, Sax Duel.
Frozen	Clean, crystalline freezes. Spectral Crystals.
Wide	Bright or slow sweeps spread across the stereo field. A Most Pleasant Saw, Clarinet Pretends It's A Violin.
Weathered	Irregular, unpredictable textures. Broken Harmonica, Grain Hocking, Extreme Weather, Wall Of Sound.

My presets

The presets you save are under MY PRESETS. Swipe a row left to delete it. Factory presets cannot be deleted.

13.2 Save

Save current... asks for a name. If the name is taken, the app adds a suffix so nothing is overwritten.

13.3 Step through presets

The two chevrons on either side of the preset name step to the previous or next preset and load it. The list wraps around at the ends.

By default the chevrons step through all presets. In the browser, the FAVORITES header has a toggle that reads "Chevrons: all" or "Chevrons: favorites". Set it to favorites and the chevrons step through your favorites only.

13.4 Unsaved changes

When you change any setting after loading or saving a preset, a  appears after the name in the top bar. It clears when you save again or load another preset.

13.5 Import and export audio

- To load your own audio, use **Import audio file...** in the browser, or drag a file from the Files app straight onto the waveform.
- To **export** the current grain buffer as a WAV, long-press the waveform and choose Export audio.... This is useful after you record a Live capture and want to keep the raw audio. See [Recording and Live mode](#).

14. Settings

Tap the gear in the top-right of the top bar to open Settings. Tap Done to close it. On iPad, several of these settings are also on the top-bar chips: RIBBON, SCALE-KEY, PLAY and PROB. See [Screen at a glance](#).

14.1 Stretch

A "Stretch playback" switch. It works in Free play mode only and is saved with presets. Controls that do nothing in Stretch are dimmed. See [Stretch](#).

14.2 Instrument

Sets how the app responds to playing.

- **Play Mode** switches between Free and Instrument. In Free mode grains run on their own as long as the transport is playing. In Instrument mode incoming MIDI notes trigger and gate the grains.
- When Play Mode is Instrument, three more controls appear: **Attack** and **Release** set the amplitude envelope for each played note, and **Root Note** sets the note that plays at the ribbon's center pitch. Attack runs from 2 ms to 2 seconds; Release runs from 10 ms to 4 seconds.

See [MIDI and controllers](#) for how notes drive the grains.

14.3 Pitch

Setting	What it sets
Ribbon Mode	How the Pitch ribbon snaps on release.
Scale	The scale shared by the ribbon's Scale mode and pitch probability.
Key	Lands every grain on a note of this key. Off, C to B, or Auto. Marked EXPERIMENTAL. Default Off.
Note Mode	What a grain does when it runs past the note it started on: Off, Hold or Sustain. Marked EXPERIMENTAL. Default Hold.
Probability	The intervals a transposed grain can jump to.
Probability Range	1, 2 or 3 octaves.
Probability Direction	Both, Up or Down.

Hold needs a Key and a scaled Ribbon Mode. Without them the Hold segment is dimmed. The full explanation is on the [Pitch](#) page.

14.4 Controller Profile

Standalone app only. Picks the default map from hardware MIDI CCs to Field's parameters. Your own MIDI-learn overrides always apply on top of the selected profile. See [MIDI and controllers](#).

14.5 MIDI Learn

Standalone app only. Lists the CC mappings you have made, each showing the channel and CC number, with a control to clear it. A Reset to Defaults control clears all of your custom mappings and returns to the profile's default map. See [MIDI and controllers](#).

14.6 Controller Setup

A link to the controller setup guide on the Plastic Factory site, plus a reminder to set your hardware's CC assignments to match.

14.7 Tempo

Standalone app only. A BPM stepper from 40 to 300, default 120. Field uses it for delay sync and for synced modulation when no host tempo is present.

14.8 Sample

Shows the name of the loaded sample.

14.9 About

Shows the app version and the engine name.

14.10 Performance

Eco multi-head is off by default. Turn it on to lower the CPU cost of running several heads by splitting the grain rate across them. It is a setting for your device, not for the sound, so presets do not save it. See [Performance](#).

15. MIDI and controllers

Grainsmith Field responds to MIDI in the standalone app. It connects to every MIDI source it can see, including USB and Bluetooth keyboards and CC controllers, and reconnects automatically when you plug or unplug a device.

When you run Field as an AUv3 plugin, the host owns MIDI. Notes and CC arrive through the host's plugin event stream, so the standalone MIDI input, MIDI learn, and controller profiles described here apply to the standalone app only.

15.1 Free, Stretch and Instrument play modes

Field has two play modes, set in Settings under Instrument. On iPad the PLAY chip in the top bar offers Free, Stretch and Instrument; see [Stretch](#).

- **Free** is the default. Grains run on their own for as long as the transport is playing. Incoming MIDI notes do not gate the sound.
- **Instrument** gates the grains with the notes you play. A note-on starts a voice, a note-off releases it, and the amp envelope shapes each note.

Switching from Instrument back to Free sends an all-notes-off so no voice hangs.

15.2 Playing notes in Instrument mode

Each note plays transposed from the root note. A note plays at `note - root note` semitones, so playing the root note itself plays at the original pitch. The root note defaults to C3 (MIDI note 60, with C3 as the name of note 60) and is set with the `-/` buttons in Settings under Instrument, or in the PLAY chip popover on iPad.

While Field is in Instrument mode, the Pitch ribbon down the right edge of the waveform is labeled TRANSPOSE. It offsets the notes you play, on top of the note-to-pitch mapping above.

Amp envelope

In Instrument mode, Attack and Release sliders appear in Settings under Instrument and in the PLAY chip popover. They set the amplitude envelope applied to each played note.

Control	Range
Attack	2 ms to 2 s
Release	10 ms to 4 s

Attack defaults to about 8 ms and Release to about 81 ms. The sliders show the live value in milliseconds next to each slider.

15.3 MIDI learn

MIDI learn binds a hardware CC to any dock dial. It works in the standalone app.

1. Hold a Main or Reverb dial. The "Modulate " sheet opens.
2. Tap the MIDI Learn row. The sheet closes and a pulsing amber ring appears around the dial to show it is armed.
3. Move the hardware control you want to bind. The first CC that arrives is captured.

The Delay dials, the ADV sheet dials and the playhead dials cannot be MIDI-learned.

The binding is a 7-bit linear mapping over the dial's full 0 to 1 range. Learn mode arms one dial at a time and cancels itself after 2 seconds if no CC arrives. To cancel an armed learn, open the sheet on the same dial again and tap MIDI Learn.

Binding a CC that is already assigned to another parameter moves it to the new parameter, and binding over a parameter that already has a mapping replaces the old one. Your learned mappings are saved and persist across launches.

Managing mappings

Settings has a MIDI Learn section (standalone only) that lists every mapping you have made. Each row shows the parameter name and its channel and CC, for example `ch 5 cc 2`, with a control to clear that one mapping. When you have no custom mappings the section reads "No custom mappings — using defaults." A Reset to Defaults control clears all of your mappings at once and returns to the profile's default map.

Your learned mappings always take precedence over the default CC map for the same parameter or the same channel-and-CC.

15.4 Controller profiles

Settings has a Controller Profile picker (standalone only) with three profiles:

Profile	Default channel
OXI E16	5
Roto-Control	1
MIDI Fighter Twister	1

The factory default is OXI E16. Selecting a profile chooses which default CC map takes top precedence. Your MIDI-learn overrides always apply on top of the selected profile.

Field merges all three built-in maps into its live CC table, so any of the three controllers works whether or not it is the selected profile. The selected profile decides which map wins when two profiles use the same channel and CC, and which profile's Level and push-reset settings are used.

15.5 Default CC maps

The default maps use 7-bit absolute CC (values 0 to 127), read linearly onto each parameter. Set your controller's encoders to absolute 7-bit mode. Field's 14-bit code path exists but no shipping profile uses it.

OXI E16

All encoders on channel 5, 7-bit absolute CC. Encoder-click (push) is on channel 6 and resets the pushed encoder's parameter to its default.

CC	Parameter
0	Position
1	Size
2	Density
3	Spread
4	Speed
5	Jitter
6	Pitch
7	Morph
8	Pitch Random
9	Reverse
10	Wet Mix
11	Scan Depth
12	Reverb Mix
13	Reverb Space
14	Cutoff
15	Resonance
16	Grain Shape
17	Freeze
18	Level

MIDI Fighter Twister

Bank 1, all encoders on channel 1, 7-bit absolute CC.

CC	Parameter
0	Size
1	Density
2	Jitter
3	Spread
4	Position
5	Speed
6	Pitch
7	Pitch Random
8	Reverse
9	Scan Depth
10	Wet Mix
11	Cutoff
12	Resonance
13	Reverb Mix
14	Reverb Space
15	Morph

Melbourne Roto-Control

The Roto-Control default map and its four buttons are on the [Roto-Control](#) page.

15.6 Transport and performance buttons

Beyond the parameter knobs, a controller can drive four app actions from buttons:

Action	What it does
Play / Stop	Toggles the transport
Freeze	Toggles Freeze
Grain Shape	Cycles the grain shape Soft → Round → Sharp
Record	Toggles recording

A button fires its action once on the press, when the CC crosses from below 64 to 64 or above. A momentary button is the intended mode, and a latching button also works because each press to 127 is a fresh trigger. Of the built-in profiles, only the Roto-Control map ships button bindings; see the [Roto-Control](#) page for the CC numbers.

15.7 CC feedback to controllers

Field echoes parameter changes back out on the mapped CCs, so a controller's LED rings or motorized faders track edits you make on screen. Values are sent at up to 60 Hz, and an unchanged value is not resent.

When a controller connects, it often blasts its current encoder positions. Field opens a 500 ms window on connect during which incoming CC is ignored, so a controller's startup burst does not overwrite your current sound.

16. Roto-Control

Grainsmith Field ships a ready-made map for the Melbourne Instruments Roto-Control. It covers the full continuous parameter surface across the Roto's knob pages, plus four buttons for transport and performance. This applies to the standalone app; as an AUv3 plugin, MIDI comes from the host.

The quickest way in is the bundled `Grainsmith.json`. Import it into the Roto Control app and it sets up all 18 knobs in one step. The four buttons are not in the file, so you map those by hand from the table below.

16.1 The bundled profile

`Grainsmith.json` is a Roto-Setup import file. It defines 18 knobs across three pages, each on MIDI channel 1 in absolute 7-bit CC mode. Import it into the Roto Control app, then assign it to a slot on the unit.

The file contains knobs only. The Roto-Control export it was built from had no buttons mapped, so the four button actions are not written into the file. Map them by hand after importing (see Buttons below).

16.2 Knobs

All knobs on MIDI channel 1, absolute 7-bit CC. The pages below match the CC layout Field expects.

Page 1, CC 1 to 8:

Knob	CC	Parameter
1	1	Size
2	2	Density
3	3	Jitter
4	4	Position
5	5	Reverb Mix
6	6	Reverb Space
7	7	Cutoff
8	8	Pitch Random

Page 2, CC 9 to 16:

Knob	CC	Parameter
1	9	Spread
2	10	Speed
3	11	Pitch
4	12	Morph
5	13	Reverse
6	14	Wet Mix
7	15	Scan Depth
8	16	Resonance

Page 3, CC 17 to 18:

Knob	CC	Parameter
1	17	Grain Shape
2	18	Level

Set the encoders to absolute CC, 7-bit, range 0 to 127. Field reads these as absolute values. Relative mode or 14-bit hi-res mode makes the values jump or wrap.

16.3 Buttons

Assign four Page-1 buttons, all on MIDI channel 1, set to Momentary so they send 127 on press and 0 on release:

Button	CC	Action
1	40	Play / Stop
2	41	Freeze (toggle)
3	42	Grain Shape (cycle Soft → Round → Sharp)
4	43	Record (toggle)

The button CCs (40 to 43) sit clear of the knob CCs, so they never collide with a knob. Each button fires its action once on the press, when the value crosses from below 64 to 64 or above. Momentary is the intended mode; a latching button also works, since each press to 127 is a fresh trigger.

Grain Shape is reachable two ways. The Grain Shape knob (CC 17) sweeps across all three shapes, and Button 3 (CC 42) steps through them one at a time. Freeze lives on Button 2 as a toggle rather than on a knob.

16.4 Selecting the profile in Field

Field lists Roto-Control as one of the Controller Profiles in Settings (standalone only). Field merges all built-in controller maps into its live table, so the Roto's 17 parameter knobs and 4 buttons work whether or not Roto-Control is the selected profile.

Select Roto-Control as the profile to use the Level knob (CC 18). Level is recognized on the channel of the selected profile, so with a different profile selected the Roto's Level knob is not read as Level. The other knobs and the buttons are matched by their own channel and CC and are not affected.

16.5 Notes

- There is no push-reset. The Roto map defines no encoder-click channel, so pressing a knob does nothing in Field.
- Field echoes parameter changes back out on the mapped CCs, so the Roto's motorized knobs may track edits you make on screen. This is untested on hardware.

17. Performance

Granular synthesis is CPU-hungry. Field spawns a stream of short grains, and each one is separate work for the processor. This page explains what drives that load and how to bring it down when your device struggles.

17.1 What drives CPU

The cost of the grain engine tracks how many grains are sounding at once and how much each one has to do.

Grain density. Density sets how often new grains fire. More grains per second means more simultaneous voices to read, window, and pitch-shift. This is the largest single driver of CPU on the grain engine. If the audio starts to crackle, lower **Density** first.

Grain size. Size sets how long each grain lasts. Longer grains overlap more, so at a given density more grains are alive at the same moment. Larger sizes therefore raise the number of simultaneous grains and the cost with it. Pulling **Size** down shortens each grain and thins the overlap.

Density and Size interact. You can reach the same "thick" sound from high density with short grains or lower density with long grains; the second costs less. When you need to save CPU, favour fewer, shorter grains.

You can drive both from the same places in the UI: the **MAIN** panel has dedicated **Density** and **Size** dials, and the **GRAINS X/Y** box maps Density against Size for two-thumb performance. Either surface changes the same engine parameters.

17.2 Heads, Stretch and the open window

Every extra playhead adds its own grain stream, so two or three heads cost more than one. See [Playheads](#). [Stretch](#) also costs more than plain grains.

If several heads are too much for your device, turn on **Eco multi-head** in Settings, under Performance. It splits the grain rate across the heads. It is a device setting, so presets do not save it.

Drawing the plugin window costs CPU too. In a host, close Field's window when you do not need to see it.

17.3 The grain-cloud display

The live grain cloud on the play surface is drawn with a Metal renderer. Every grain is one instanced quad, additively blended, and the whole cloud is a single draw call per frame. It reads a lock-free snapshot of the grains on the UI thread and never touches the audio thread, so the visualization does not compete with the audio for the real-time render path.

The renderer scales with the number of grains it draws, which is the same thing that drives audio cost: a denser cloud is more instances to draw and more grains to synthesize. Lowering Density and Size lightens both at once.

17.4 Sample rate and buffer

The standalone engine runs at 44.1 kHz with a 512-sample block size by default. In an AUv3 host, the host owns the audio configuration, so buffer size and sample rate come from the host's audio settings rather than from Field. Larger host buffers lower CPU load at the cost of more latency; raise the host buffer if you hear dropouts during dense passages.

17.5 Practical tuning

When the audio glitches or the device runs hot, work through these in order:

1. Lower **Density** on the MAIN panel or the GRAINS box.
2. Lower **Size** so grains overlap less.
3. Use fewer heads, or turn on Eco multi-head.
4. In an AUv3 host, close Field's window.
5. In an AUv3 host, raise the host's audio buffer size.

Each step reduces the number of grains alive at once, which is what the engine and the grain-cloud renderer both pay for.

18. Troubleshooting

Common issues with Grainsmith Field on iPhone and iPad, each as symptom, cause, and fix.

I can't find Field in my host's instrument list

Symptom. You added a plug-in in AUM, Logic, or another AUv3 host, opened the instrument list, and Grainsmith isn't there.

Cause. Field is an audio-effect plug-in, not an instrument. Its audio component registers as type `aumf` (Audio Unit music effect). Hosts list it under audio effects, not instruments.

Fix. Open your host's list of **audio effects** (sometimes labelled FX or "Audio Unit Effects") and load Field there, in an FX slot. See [Install](#) for the full component identity.

Live mode or recording is greyed out or silent

Symptom. The record button is dimmed, or tapping it shows "Recording unavailable on Bluetooth audio," or Live mode produces no sound.

Cause — no input. Field's Live and record features capture an audio input. In an AUv3 host, Field is an audio effect: if nothing is routed into the FX slot that holds it, there's no input to capture. In the standalone app, recording uses the microphone or line input, so it needs microphone permission.

Cause — Bluetooth output. When the output route is Bluetooth (AirPods or any A2DP device), the standalone app switches to playback-only on purpose. Recording over Bluetooth would force iOS into its hands-free profile, which collapses the sample rate and breaks the engine. So while a Bluetooth output is connected, the mic is turned off, the record button dims, and Field stops any recording already in progress.

Fix. In a host, route an audio source into Field's FX slot. In standalone, grant microphone access under **Settings → Grainsmith → Microphone**. To record, switch output off Bluetooth — use the built-in speaker or wired output. Playback keeps working over Bluetooth at full quality; only recording is held back. Disconnect the Bluetooth device and the mic and record button come back automatically.

No sound at all

Symptom. Field is loaded but you hear nothing.

Cause. Usually one of: the transport is stopped, Level is down, or no sample is loaded.

Fix. Check three things.

1. **Transport.** Make sure playback is running from the transport control in the top bar.
2. **Level.** The Level ribbon sets grain level; 0 dB is the top. If it's pulled down, raise it. On iPhone, Level is a dial in the ADV sheet.
3. **Sample.** Field granulates a loaded buffer. If no sample is loaded, load one from Files or record into the buffer, then start the transport.

In an AUv3 host, also confirm the host track carrying Field isn't muted and its output reaches the master.

The delay does nothing

Symptom. You turned Time and Fdbk and hear no delay.

Cause. Delay Mix starts at 0, which is silent.

Fix. Turn Mix up on the Delay panel. On iPhone, open the ADV sheet.

I can't find the Level ribbon on iPhone

Cause. The iPhone layout has no Level ribbon.

Fix. Level is a dial in the ADV sheet.

The record button does nothing over Bluetooth

This is expected. Recording is turned off while the output is Bluetooth, and the button dims. See [Bluetooth output disables recording](#).

Live REC is silent in Loopy Pro

Symptom. Recording in Live mode inside Loopy Pro captured nothing.

Fix. Fixed in 1.6.1. Update Field to the latest version.

AUv3 shows default settings after I reopen it

Symptom. You close and reopen Field's plug-in window in a host and it looks like your tweaks are gone.

Cause. AUv3 hosts destroy and recreate the plug-in UI every time you reopen the window, while the engine keeps running underneath with your recorded audio and parameter values intact. On reopen, Field reads the live engine state back into the UI. If that read is bypassed, the UI can briefly show its compiled-in defaults even though the engine still holds your sound.

Fix. The engine keeps playing your settings regardless of what the reopened window shows first; the UI pulls the current engine values on reopen so it catches up. If the display still looks stale, nudge any control to force a refresh. Your audio and parameters were never lost — only the freshly recreated view had to re-read them.

19. What is granular synthesis?

19.1 Opening hook

Imagine you have a vinyl record playing a single piano note. The note holds steady for thirty seconds. Now imagine you pick up the needle, drop it back on the same groove, wait a few milliseconds, and repeat — ten times a second. You'll hear a rapid stutter. The original piano note is in there, but the sound itself is something new: a buzzing, textured drone stitched together from tiny snippets of the original.

That's granular synthesis. The technique takes any recorded sound, slices it into fragments shorter than a human ear can resolve individually, and resynthesizes a new sound out of the overlap.

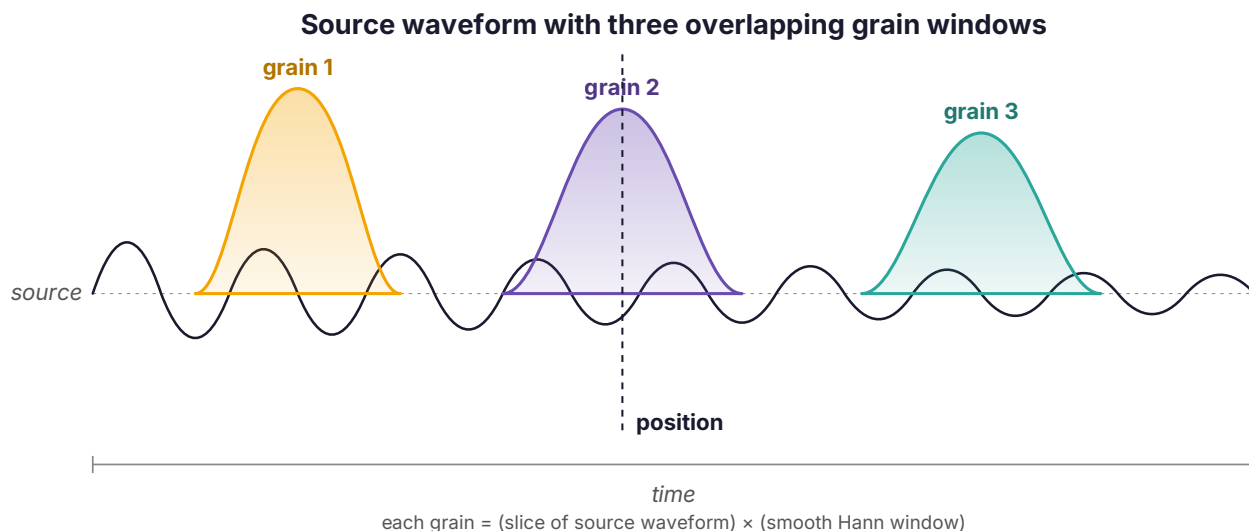
19.2 The core idea

A **grain** is a short audio fragment — typically between one millisecond and half a second long — taken from a source recording and shaped by a smooth amplitude envelope at both ends so it doesn't click when it starts or stops. By itself a single grain sounds like what it is: a tiny snippet of sound. The interesting part starts when you spawn many grains in rapid succession, each from a slightly different position in the source buffer, and let them overlap. Your ear can't resolve individual grains below about twenty per second, so above that rate the grains fuse into a continuous texture.

Four variables define how that texture sounds. **Grain size** — how long each grain is — controls whether you hear something pad-like (longer grains, more of the original sample audible in each) or percussive (shorter grains, each heard as a pointillistic click or pluck). **Density** — how many grains spawn per second — controls whether the result sounds sparse and rhythmic (low density, grains heard as discrete events) or smooth and continuous (high density, grains overlapping into a wash). **Position** — where in the source audio each grain is sliced from — lets you hold a single moment of the source or scan through it at any speed you like, including backwards. **Pitch** — the per-grain transposition — lets you shift the perceived pitch of the resynthesized sound without changing how fast the position scans, because each grain is short enough that the pitch-shift is effectively instantaneous.

Those four knobs are the heart of every granular patch ever made. Every other granular control — jitter, spread, window shape, trigger patterns, modulation — is a variation or a decoration on top of them.

The technique was first theorized by the physicist Dennis Gabor in 1947, in a paper called *Theory of Communication*. Gabor wasn't a composer; he was working on a mathematical decomposition of signals into elementary time-frequency atoms. Musically, the technique was first put into practice by Iannis Xenakis in the late 1950s — he assembled grain sequences by hand, cutting and splicing magnetic tape, because no computer of the era could do it in real time. Curtis Roads wrote the software implementations that made granular synthesis practical on computers in the 1970s and 1980s, and his book *Microsound* (2001) remains the canonical reference.



The diagram above shows a source waveform (the piano note) with three grain windows overlaid at different positions. Each grain takes a small slice of the source and multiplies it by a smooth envelope that fades in and out. The grains overlap each other, and the listener's ear blends them into a continuous texture.

19.3 In Grainsmith

Everything above maps to the same handful of core controls, in both the desktop plugin and Grainsmith Field on iPad:

- **Size** sets the grain length, from a few milliseconds (so short you hear each grain as a click or as its own pitch) up past a second (so long it sounds almost like the original sample playing). Most musical pad textures live in the 30-200 ms range.
- **Density** sets how many grains spawn per second. At low values (below about 10 Hz) you hear discrete grain events, useful for rhythmic, pointillistic patches. Above about 20 Hz the grains fuse into a continuous wash; above about 100 Hz the spawn rate itself starts to be heard as pitch.
- **Pitch** transposes each grain up or down at the moment it spawns. Because grains are short, you can pitch-shift them a long way without the time-stretching artifacts you'd hear from pitch-shifting the whole sample in real time.
- The read position on the waveform sets where in the source each grain is sliced from. Hold it still and you get a frozen sound at one moment of the source; sweep it and you scan through the source in time.

The window shape each grain plays through, and the per-grain pitch and reverse variation layered on top, build on these core controls. Where each control lives is covered in your edition's reference: the tab pages for the desktop plugin, the panel and pad pages for Grainsmith Field.

**The math, for the curious**

A grain is a finite-length signal $g(n)$ formed by multiplying a source signal $s(n)$ by an envelope window $w(n)$:

$$g(n) = s(n_0 + n) \cdot w(n), \quad 0 \leq n < L$$

where L is the grain length in samples and n_0 is the read position in the source buffer. The window function $w(n)$ is typically a Hann or Tukey window — smooth at both ends so that the product of source-times-window fades in and out without an audible click. The output of the granular synthesizer is the sum of many overlapping grains, each spawned at its own start time t_i :

$$y(n) = \sum_i g_i(n - t_i)$$

Density is the rate λ at which spawn times t_i are scheduled — either uniformly (every $1/\lambda$ seconds) or stochastically (Poisson-distributed around a mean rate of λ). **Pitch shifting** is implemented by reading the source buffer at a different speed inside each grain: a per-grain resampling that doesn't affect the overall playback rate, because each grain is short enough that the resampling is inaudible as a time stretch.

Curtis Roads' *Microsound* (MIT Press, 2001) derives all of this formally, connects it to the Fourier-style time-frequency decomposition Gabor originally proposed, and is the canonical reference for anyone who wants to dig further.

19.4 Further reading

- **Microsound**, Curtis Roads (MIT Press, 2001) — the definitive book on granular synthesis theory and practice.
- **Theory of Communication**, Dennis Gabor (Journal of the Institution of Electrical Engineers, 1946) — the original mathematical paper that introduced the grain concept.
- **Formalized Music**, Iannis Xenakis (Indiana University Press, 1971) — the first composer to put the theory to musical use writes about it in his own words.

19.5 See also

The controls that put this theory to work are on [Screen at a glance](#), [The panels](#) and [The XY pads](#). The desktop plug-in has its own manual at docs.plasticfactory.com/grainsmith.

20. What's New

User-visible changes per Grainsmith Field release for iPhone and iPad. The current shipping version is **1.6.1**.

20.1 v1.6.1 — Loopy Pro input fix

- Fixes silent Live-mode recording in Loopy Pro.

20.2 v1.6.0 — Performance strip

- A strip of chips in the top bar: PLAY, RIBBON, SCALE·KEY, PROB and HEADS.
- A REC chip replaces the record button's long-press and the mode badge. See [Recording](#).

20.3 v1.5.1 — AUM preset crash fix

- Fixes a crash when loading a user preset in AUM.

20.4 v1.5.0 — Stretch, Key and Note Mode

- Stretch mode. See [Stretch](#).
- Key and Note Mode (Experimental).
- Heads trigger together, with a Stagger dial.
- Chord buttons for the playheads.
- Pitch and Position are now modulation targets.
- New Grain Hocking factory preset.

20.5 v1.4.3 — Live mode crossfade

- In Live mode the buffer crossfades under the grains as the record head passes. Grains stay put.

20.6 v1.4.2 — Usability

- Usability fixes.

20.7 v1.4.1 — Synced LFO fix

- Fixes synced LFOs.

20.8 v1.4.0 — Modulation, MOVE and Delay

- Modulation: six slots, LFO and Euclid sources, per-route depth, tempo sync, and rings on the dials. See [Modulation and MOVE](#).
- MOVE, which sets how Morph moves by itself.
- Delay.
- Per-head PAN.

- All of the above is saved in presets.

20.9 v1.3.2 — Per-head Size and Spread

- Heads 2 and 3 get their own Size and Spread.

20.10 v1.3.1 — Playheads panel fix

- Fixes the Playheads panel on iOS 16 and 17.

20.11 v1.3.0 — Record Performance

- Record Performance. See [Recording](#).
- Smoother attacks with multiple heads.
- Fixes Live mode and Area Select coverage.

20.12 v1.2.3 — Audio export fix

- Fixes audio export.

20.13 v1.2.2 — Longer recording

- Recording up to 2 minutes.

20.14 v1.2.1 and v1.2.0 — Multiple playheads and a new preset browser

- Up to three playheads, each with its own speed, pitch and level. Drag the heads on the waveform. See [Playheads](#).
- A new preset browser, grouped by character, with descriptions and favorites.
- Head setup and pitch mode are saved in host sessions.