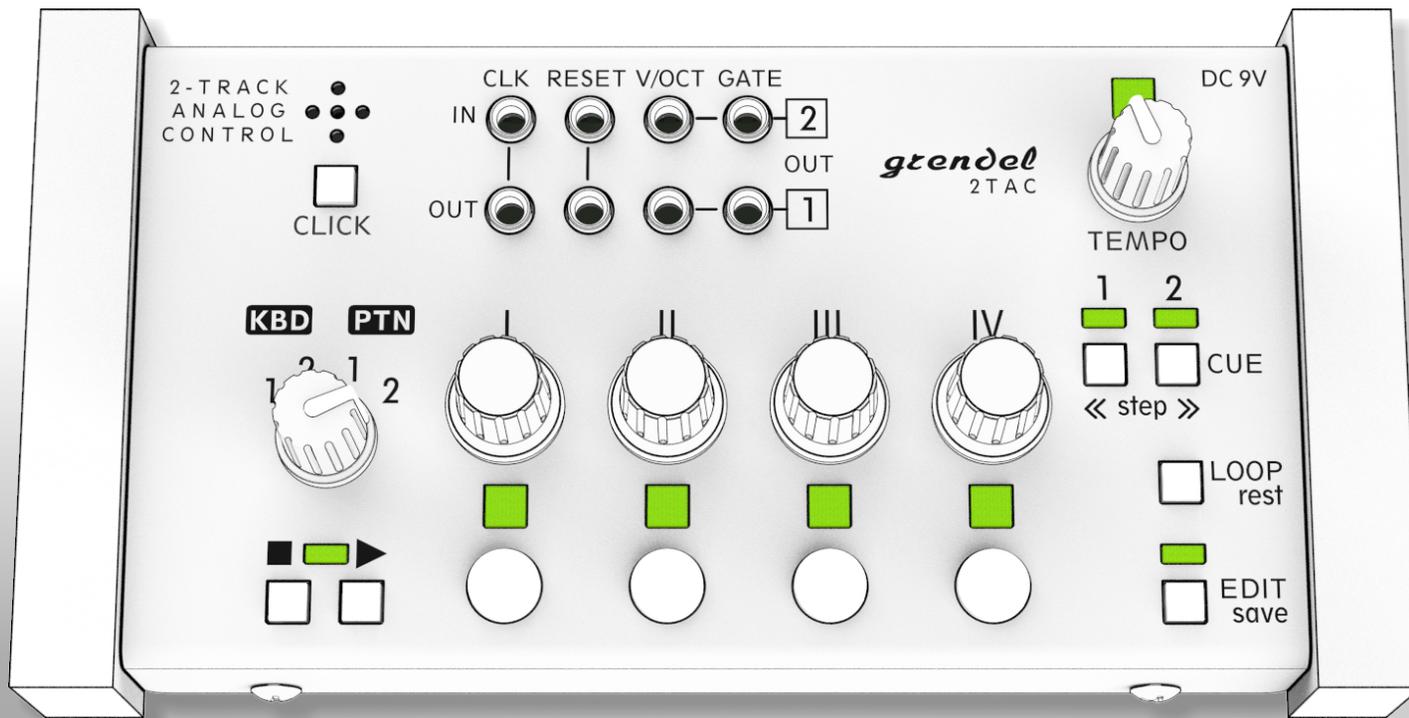


grendel 2TAC



Rare Waves LLC
RAREWAVES.NET

2-Track Analog Control
For CV-Gate Music Synthesizers

General Information

The Grendel 2TAC is a controller for music synthesizers that use the V/octave CV-Gate standard. It requires patch cables with 3.5mm mono phone plugs, commonly used for Eurorack type systems.

Sequencer Standards

2TAC uses the pulse-per-step clock standard. One clock pulse advances the sequencer by one grid step. Each clock pulse typically represents a 16th note or 8th note.

The sequencer has patchable Reset In / Reset Out connections to maintain a common reference point when other sequencers are synchronized to it. A Reset Out pulse is transmitted when Stop is pressed. While Reset In is activated, such as by patching a Gate signal to it, the transport is paused.

2TAC can serve as the master clock for other compatible sequencers, or it can be a slave unit to expand your production setup when you've "maxed out" your other sequencers.

Pattern Data

2TAC's patterns are limited to 4 different pitches. The 4 keys on the keypad can be considered as a 4-note mini keyboard. You can tune the keys independently with the rotary encoders above each key.

The restriction of only having 4 pitches per pattern lends itself to a minimal compositional style. However, it is possible to layer several patterns during playback with the Sticky Patterns feature. In this case, you can produce sequences that contain more than 4 pitches.

Sequencing

You can easily create chains of patterns that play as a loop, allowing simple song structures.

But, 2TAC does not have extensive memory for lots of patterns, multiple song programming, or other advanced DAW-like features. It is intended more as a scratch pad for developing musical ideas, and performing minimal compositions which don't involve a lot of pattern changes.

Controls One or Two Synthesizers

You can use 2TAC's Track 1 and Track 2 outputs to play two different analog synthesizers, or use Track 2 as an auxiliary CV channel to control a single synth's sound parameters like Filter CV, Velocity CV, etc. 2TAC is not explicitly designed with the ACC GATE function, but you could use Track 2's Gate Out for that purpose.

Power Supply

Standard power supply is 9VDC, tip positive.

It is OK to use a daisy-chain cable to share power with other gear from a single AC adapter.

It is safe to connect any DC power source from 7.5 volts to 12 volts.

Polarity of the power source is irrelevant. This unit accommodates both tip-positive and tip-negative AC adapters.

The unit is protected against over-voltage with a built-in fuse (self-resetting fuse).

Connections

V/OCT & Gate Out : 2 each
Clock In, Clock Out (5V pulse per step)
Reset In, Reset Out (5V pulse)

DIN Sync: Not supported

MIDI: Not supported

Manufacturer

Made by Rare Waves LLC
(Texas, USA)

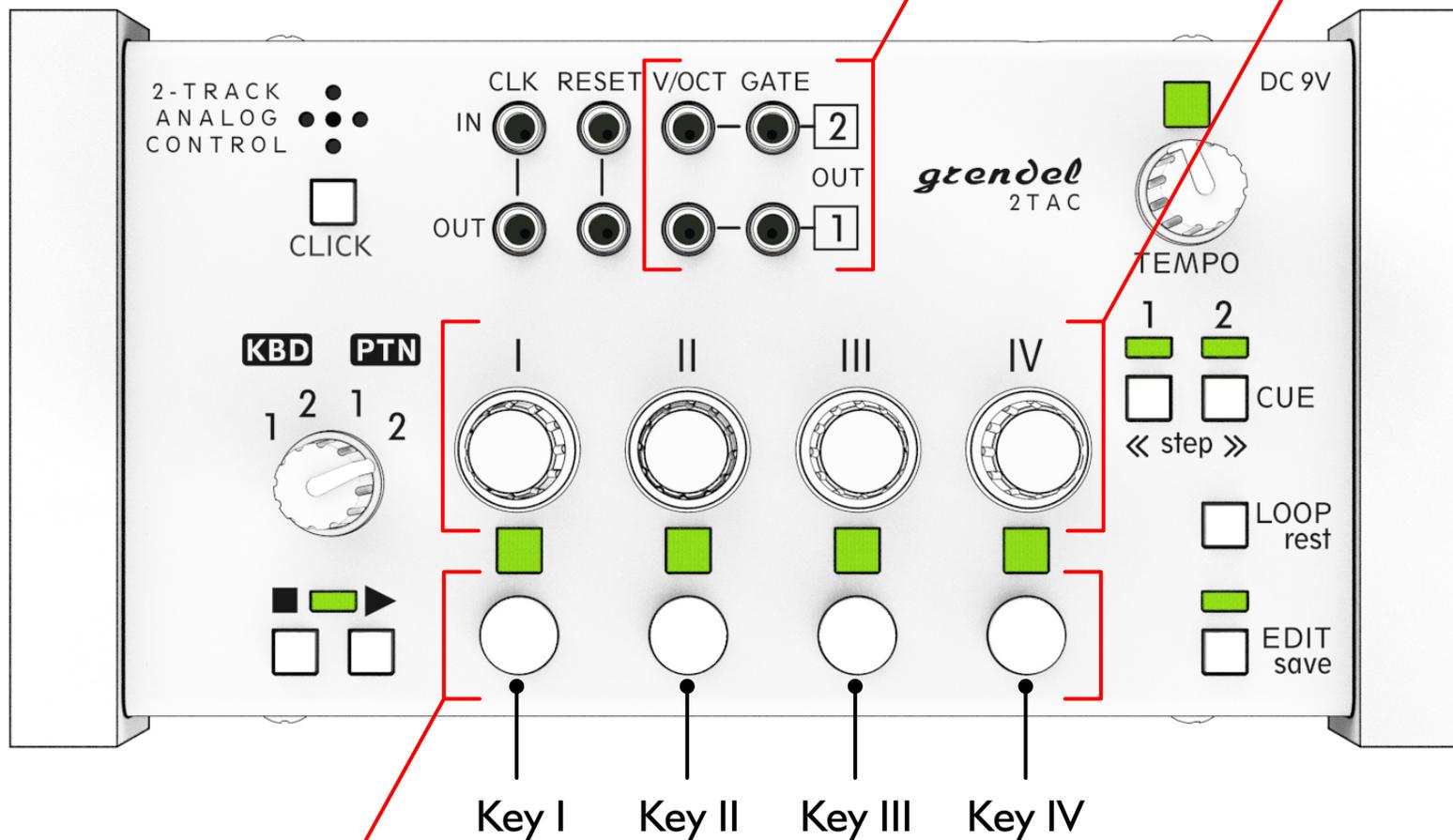
RAREWAVES.NET

Design and Support:
Eric Archer

V/Oct Out **Gate Out**
 1V / octave 0V : Gate Off
 0 .. +5V Range +5V : Gate On

CV-Gate Outputs

Tuners



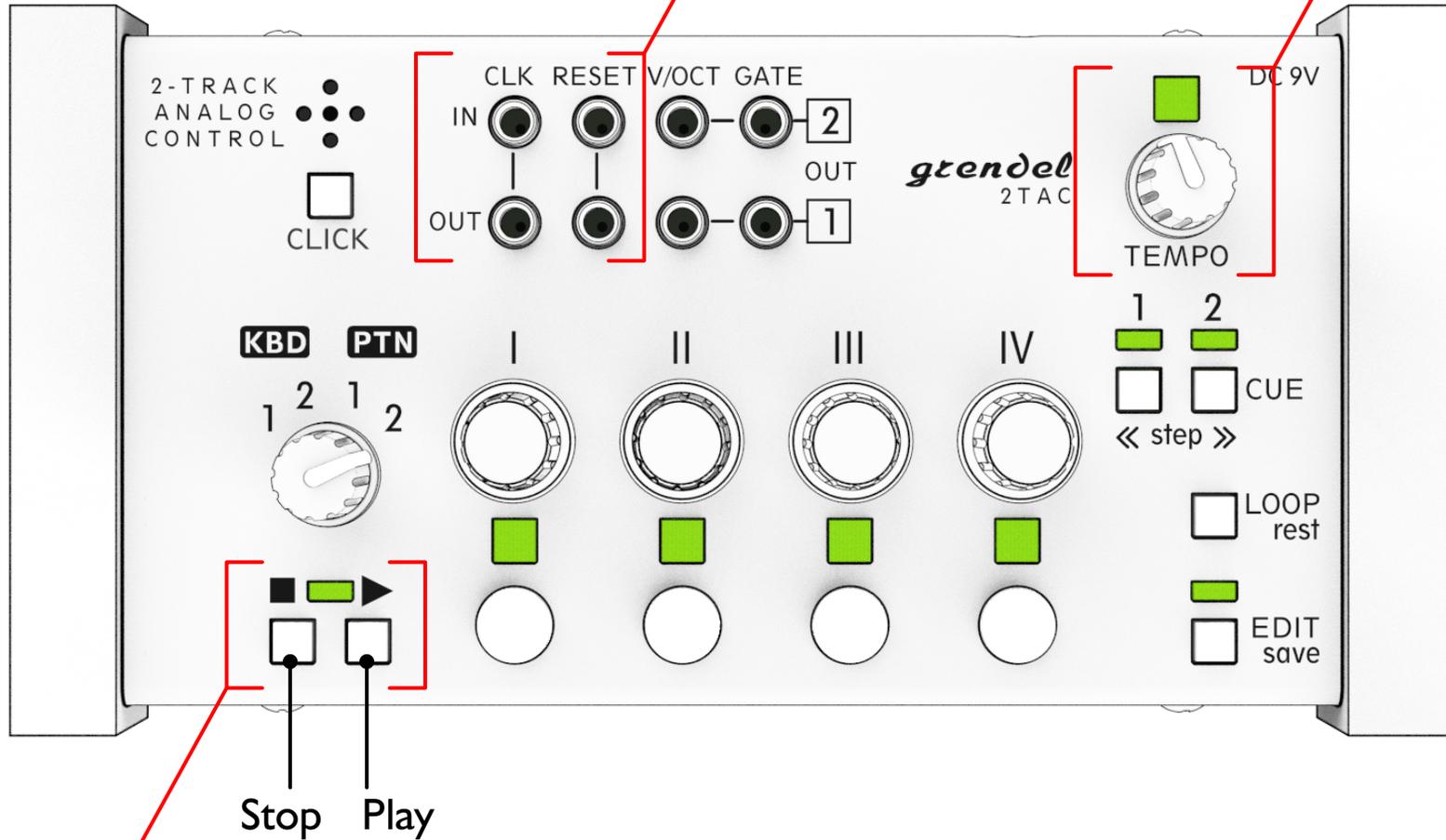
Keypad

CLK IN 1 pulse per step (+5V, rising edge triggered)
CLK OUT Only when Transport is Playing. Also acts as Clock Thru.
RESET IN +5V Gate or Pulse. Pauses transport and resets sequencer
RESET OUT Transmitted when Stop is pressed

Active unless
CLK IN is patched

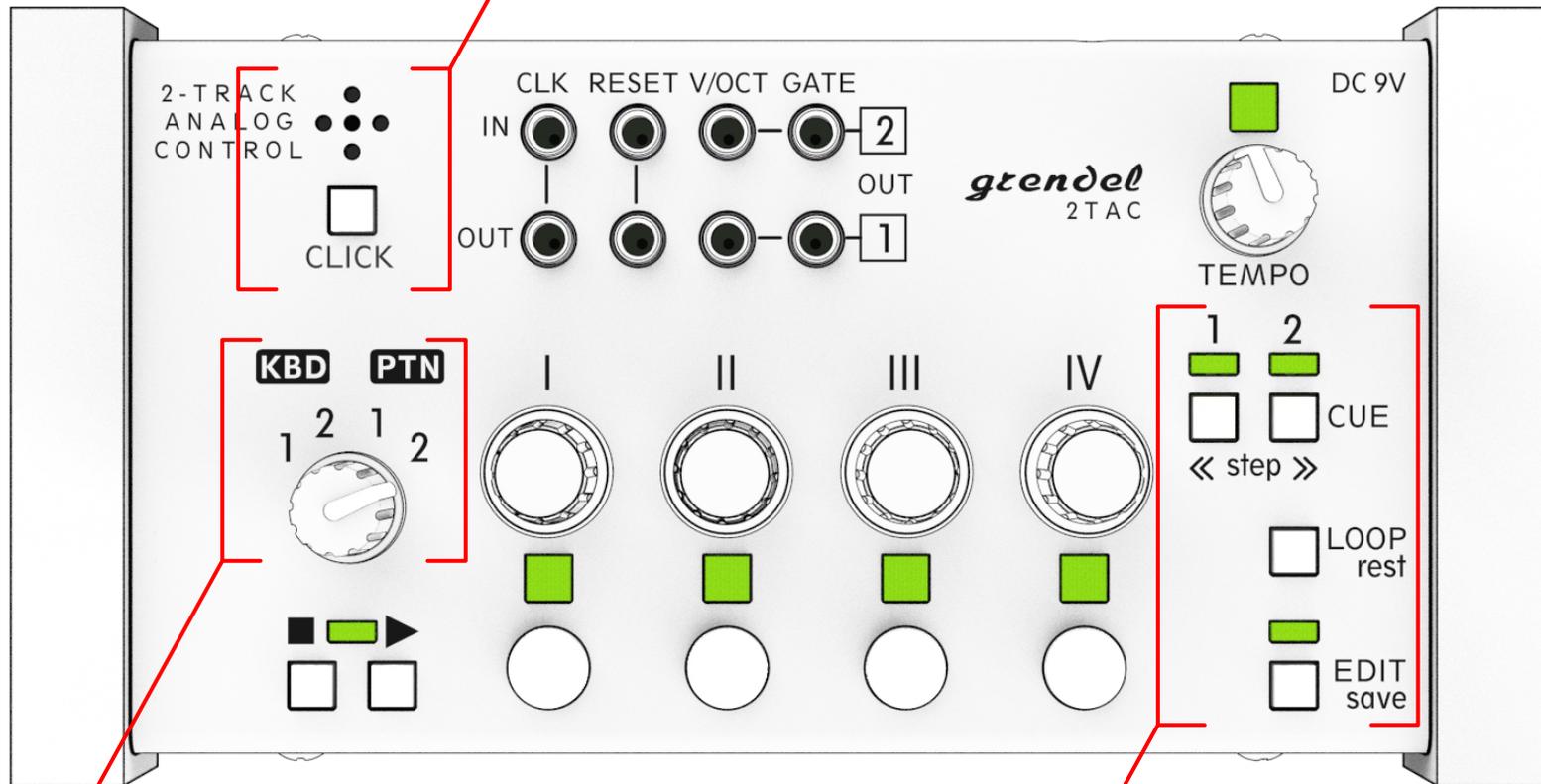
Sync I/O

**Internal
Clock**



Transport

Metronome (Click Track)



Mode Switch

Function Buttons

Mode Switch

The Mode Switch is the master control. Use it to choose what the Keypad and Tuners do.

The Mode Switch also works as an Undo for edits. While the EDIT LED is flashing, simply turn the Mode Switch to any other position, and any edits in progress will be discarded. This also restores the tuning settings of all patterns to their last saved values.

KBD **PTN**



KBD 1

The Keypad and Tuners control CV-Gate output on Track 1. The Key LEDs light up with the sequenced notes on Track 1. Press the Keys to play Track 1's CV-Gate outputs in real time. Use the Tuners to adjust the pitches of Track 1's Keys

KBD **PTN**



KBD 2

The Keypad and Tuners control CV-Gate output on Track 2. The Key LEDs light up with the sequenced notes on Track 2. Press the Keys to play Track 2's CV-Gate outputs in real time. Use the Tuners to adjust the pitches of Track 2's Keys

KBD **PTN**



PTN 1

The Keypad and Tuners control patterns for Track 1. The Key LED lights up above Track 1's actively selected pattern. Press the Keys to switch between patterns on Track 1. Use the Tuners to pitch transpose the the patterns on Track 1.

KBD **PTN**



PTN 2

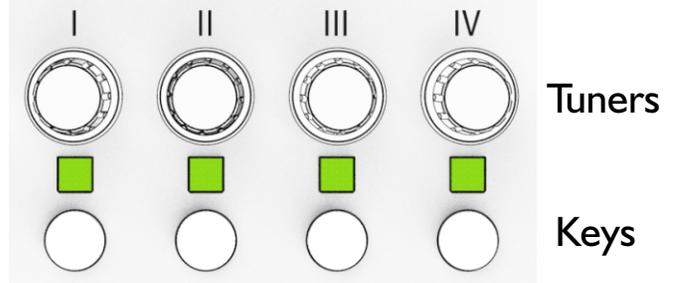
The Keypad and Tuners control patterns for Track 2. The Key LED lights up above Track 2's actively selected pattern. Press the Keys to switch between patterns on Track 2. Use the Tuners to pitch transpose the patterns on Track 2.

Tuning the Keys

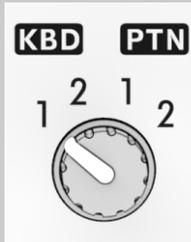
2TAC's V/OCT outputs are quantized in steps of 1 semitone equal temperament, or 0.083 volts. The pitches of the notes in your sequenced patterns can be adjusted with the Tuners (rotary encoders) above the Keys.

2TAC has a tuning range of about 5 octaves. The voltages at its V/OCT outputs can cover the range of 0 to +5 volts.

2TAC does not have provision for fine-tuning its V/OCT outputs. To make small corrections to pitch, use the Fine Tune knob on the synthesizer you're controlling.



In **KBD** mode, the tuners change the pitches of the Keys



**Change a key's pitch by semitones
(0.083 volt per click)**

Turn the tuner 1 click.

If you've reached the limit, the audible indicator sound changes.

**Change a key's pitch by octaves
(1.00 volt per click)**

Hold the tuner down while turning it 1 click.

If you've hit the limit, the audible indicator sound changes.

Copy a key's pitch to another key

Press and hold the tuner of the source key while double-tapping the tuner of the destination key

**Reset a key's pitch to mid-range
(~ 2.5 volts)**

Press and hold the tuner while tapping STOP

Save tuning changes to memory

Hold EDIT so its LED flashes. Then hold EDIT again so the LED goes dark. All tuning settings are saved to memory.

Restore saved tuning settings

Hold EDIT so its LED flashes. Then turn the Mode Switch to any different position. Previously saved tuning settings will be restored.



After you've made some tuning changes, and you're happy with the results, remember to save them to memory by holding EDIT twice. Otherwise, next time you undo any edits, the tuning changes will be lost also.

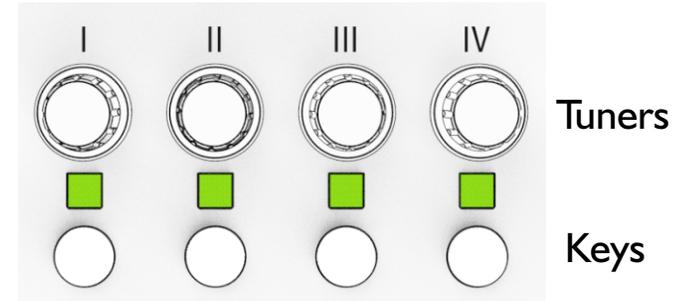
Transposing Patterns

To make melodic composition more facile, you can easily transpose patterns.

Each pattern key has its own tuner, so you can transpose patterns in the background while another pattern is playing.

2TAC's transpose function can't make its V/OCT outputs go beyond the range of 0 to +5 volts, so if you apply large transpositions to a pattern, the melodic relationship between its notes will be affected. Normally, it's suggested to keep the transpose amount within +/- 1 octave.

Use the Coarse Tuning adjustment on the synthesizer you're controlling to optimize its pitch range.



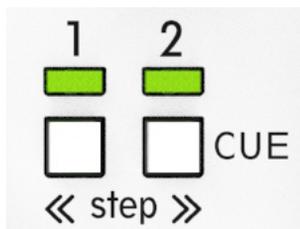
In **PTN** mode, the Tuners change all notes in a pattern by an equal amount.

	Transpose a pattern by 1 semitone	Turn the tuner 1 click
	Transpose a pattern by 1 octave	Hold the tuner down while turning it 1 click.
	Copy a pattern's Key tunings to another pattern	Press and hold the tuner of the source pattern, while double-tapping the tuner of the destination.
	Reset a pattern's transpose amount to zero	Hold the tuner down while tapping STOP
	Save tuning changes to memory	Hold EDIT so its LED flashes. Then hold EDIT again so the LED goes dark. All tuning settings are saved to memory.
	Restore last saved tuning	Hold EDIT so its LED flashes. Then turn the Mode Switch to any different position. Previously saved tuning settings will be restored.



After you've made some transpositions, and you're happy with the results, remember to save it to memory by holding EDIT twice. Otherwise, next time you undo any edits, the transposed patterns will revert to their last saved values also.

Track Cue



The CUE buttons are used to mute / un-mute the tracks during playback.

When a track is muted, its CUE LED is dark. But its patterns continue to count in the background, preserving the position of the downbeat.

Use the CUE buttons to insert drop-outs, fills, or to add white space or silent sections to your compositions.

While a track is muted, you can hold the Keys to make its patterns play momentarily.

Pattern Playback

Each track has memory for 4 patterns of 32 steps maximum. There are 3 memory banks - read on to learn how to switch memory banks.

You can use the Tuners to transpose the pitch of a pattern at any time, even if the pattern is not actively playing.

All of the patterns are counting in the background, so you can jump cut between them without losing the position of the down beat.

In **PTN** mode, the Keys switch between stored patterns, with options:



Jump cut

Tap a Key while the sequencer is playing. It immediately switches to the newly selected pattern.

Cued transition

Hold LOOP while tapping a Key. The sequencer will play to the end of the currently active pattern, then switch automatically at the end of the bar.

Momentary play

Mute a track by pressing its CUE button so its CUE LED goes dark. Now you can tap the Keys to play the patterns, but playback will only be heard while a Key is held down.

Sticky patterns (Pattern layering)

Hold PLAY while tapping a Key. The LED above it flickers while it is Sticky. You can toggle Sticky status On/Off for each Key.
Notes of Sticky patterns are sounded in the blank steps of the active pattern. Sticky patterns remain selected even if you switch active patterns or use Pattern Chain.

Sticky patterns cancel

All Sticky patterns are cancelled when you press STOP. To cancel them without stopping the transport, hold PLAY and tap STOP.

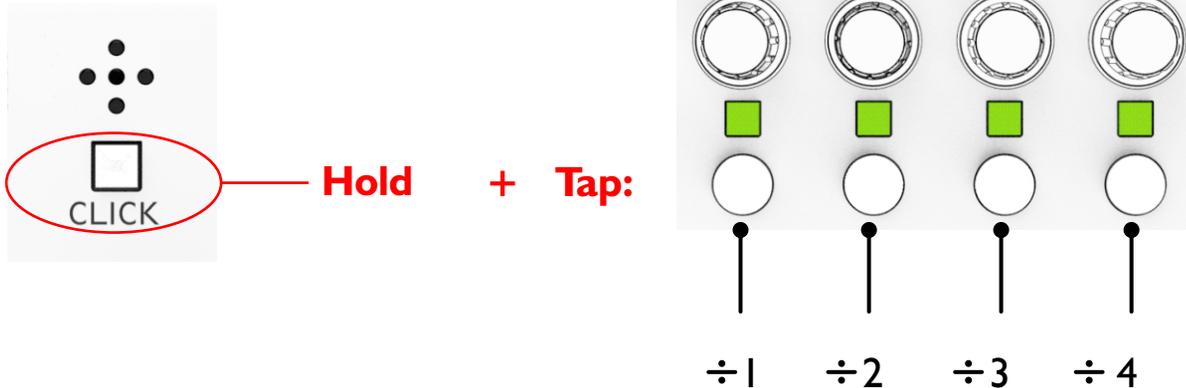
Click Track (Metronome)

2TAC has a built-in audible metronome function. Tap **CLICK** to toggle the metronome On and Off.

The metronome automatically shuts off when you press the Stop button.

The metronome's rate can be set to divide the clock by 1, 2, 3, or 4. The default on power-up is divide-by-4, or quarter note beats if the clock input is considered 1/6th-notes.

To adjust the Metronome's clock divider factor, hold **CLICK** while tapping **Key I - Key IV**



Audible Indicator

The unit's built-in speaker makes a variety of click sounds as confirmation of user input. The tone of the click changes to indicate context.

* There is no way to turn off the audible indicator.

Pattern Chains

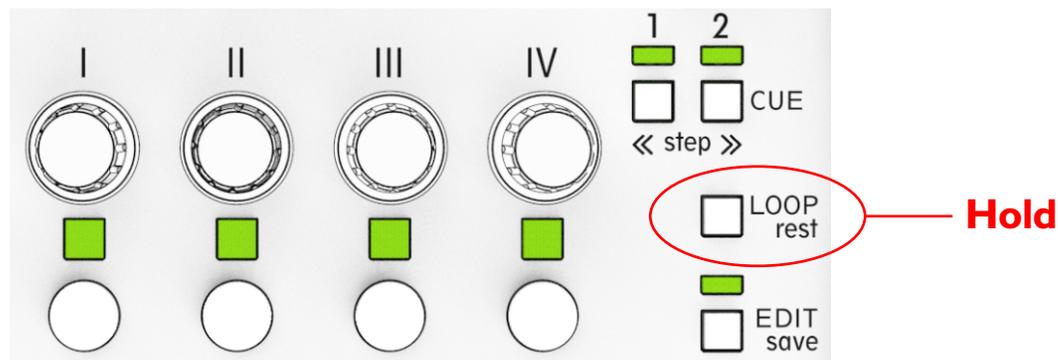
Patterns can be linked together into chains up to 32 patterns length.

A Pattern Chain can play through only once and remain on the last pattern in the chain. Or, you can make it repeat as an endless loop.

Pattern Chains can be programmed any time, whether the transport is playing or stopped.

The Transport LED flickers whenever a Pattern Chain is active.

“Greyed-out” Key LEDs indicate the patterns which are contained in the chain.



In **PTN** mode, hold the **LOOP** button while tapping the **Keys** to create a pattern chain. Here are all the options:

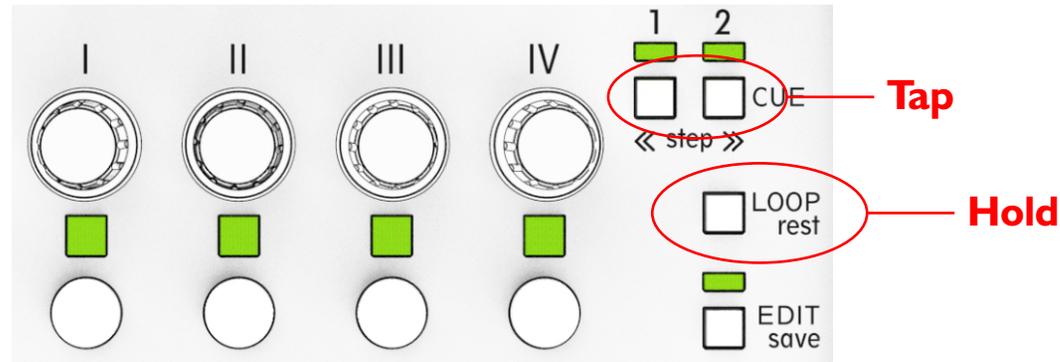
	<p>Cued transition</p>	<p>Hold LOOP while tapping one Key, then release. The sequencer will play to the end of the currently active pattern, then switch automatically at the end of the bar.</p>
	<p>Pattern Chain - Single play</p>	<p>Hold LOOP while tapping a sequence of Keys. When LOOP is released, the Pattern Chain begins. The Transport LED flickers until the Pattern Chain has played out.</p>
	<p>Pattern Chain - Endless loop</p>	<p>Hold LOOP while tapping a sequence of Keys, then tap EDIT before releasing LOOP</p>
	<p>Chain Cancel</p>	<p>Hold LOOP, then release it without tapping any other keys. Returns to normal playback</p>
	<p>Chain Restore</p>	<p>Hold LOOP and turn Mode Switch before releasing LOOP. The last chain is restored.</p>
	<p>Momentary Override of Pattern Chain</p>	<p>While a Pattern Chain is running, press any Key to jump to a different pattern. As soon as you release the Key, the sequencer returns to the Pattern Chain.</p>
	<p>Write Pattern Chain to Both Tracks</p>	<p>While holding LOOP, input a pattern chain by tapping the Keys. Then, tap the CUE button of the other Track before releasing LOOP. The Chain is applied to both Tracks.</p>

Temporary Loop Points

You can change the loop point of a pattern to make it shorter with Temporary Loop Points. Clearing a Temporary Loop Point restores the pattern to its original programmed loop length. This feature lets you add variation to your patterns without having to edit them.

This function is only accessible with the Mode Switch on KBD1 or KBD2, and while the transport is playing. Temporary Loop Points can be set for either Track 1 or Track 2, regardless of whether the Mode Switch is on KBD1 or KBD2.

The LED over the CUE button blinks dark when a Temporary Loop Point is reached.



In **KBD** mode, while the transport is playing, use the **LOOP** and **CUE** buttons to control Temporary Loop Points.

KBD **PTN**



Set Temp. Loop Point on Track 1

While the transport is playing, hold LOOP while tapping CUE1 once. A temporary loop point is added to Track 1 in real time.

Set Temp. Loop Point on Track 2

While the transport is playing, hold LOOP while tapping CUE2 once. A temporary loop point is added to Track 2 in real time.

KBD **PTN**



Clear Temp. Loop Point on Track 1

While the transport is playing, hold LOOP and STOP while tapping CUE1. Track 1's pattern returns to its original programmed loop length.

Clear Temp. Loop Point on Track 2

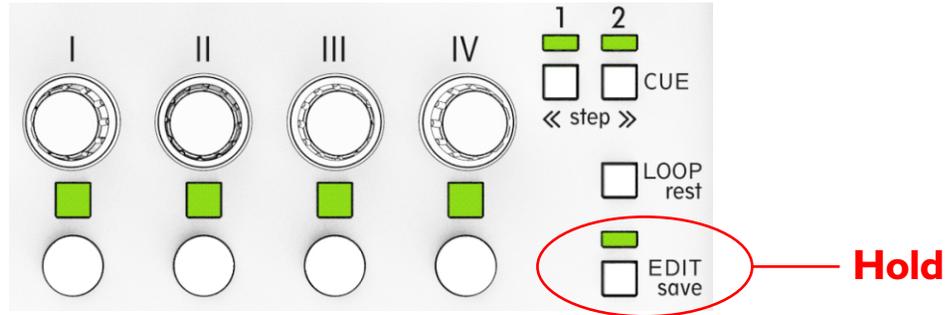
While the transport is playing, hold LOOP and STOP while tapping CUE2. Track 2's pattern returns to its original programmed loop length.

Pattern Tools

2TAC includes useful functions for copying, time stretching, rotating, and modifying patterns.

Turn the Mode Switch to PTN 1 to modify Track 1's patterns. When the Mode Switch is set to PTN 2, you can affect Track 2's patterns.

* The Stop button has alternate functions in Pattern Tools mode. Pressing Stop while the EDIT LED is flickering will not stop the transport.



In **PTN** mode, hold the **EDIT** button once. Its **LED will flicker to indicate Pattern Tools is in use. Here are all the options:**



Pattern Copy	Hold the Key of the source pattern while double-tapping the Key of the destination
Pattern Copy + Timestretch	While holding the Key of the source pattern, turn its Tuner knob to change the time stretch factor, then double-tap the Key of the destination. The copy will have a different time scale.
Pattern Rotate	While holding a Key, tapping the CUE1 (<<) button shifts all events in the pattern to the left. Each tap of the CUE2 (>>) button shifts all events in the pattern to the right by one step. This is useful if you want to re-align a pattern to the rhythm down beat. A nice trick is to create a rotated copy of a pattern, then jump-cut between it and the original.
Pattern Erase	Transport must be stopped. Hold STOP and double-tap the Key of the pattern to erase. Any note events will be cleared, but the loop length and tuning are preserved.
Over-write Pattern with Random Data	Hold STOP + PLAY simultaneously, while double-tapping a Key. The pattern will be replaced with random events, random loop length, and random tuning settings.
Copy Pattern to Other Track	Hold Key of source pattern + LOOP while double tapping CUE1 or CUE2. The pattern will be copied to same Key on the other track. (Can't undo this operation)
Undo	Turn the Mode Switch to a different position. Changes will be discarded.
Save and Exit	Hold the EDIT button again, so its LED goes dark

Pattern Write - Real Time Edit

You can record a pattern in real time by performing the events on the Keys. Your live input is quantized to the grid of the clock input.

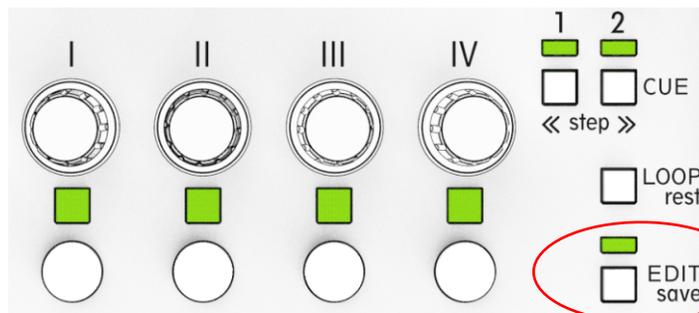
To write a pattern on Track I, follow these steps:

First, select the pattern you want to edit. Turn the Mode Switch to PTNI and look at the Key LEDs. The bright LED is the pattern that will be edited. To choose a different pattern for editing, tap a different Key. Audition the patterns with the Play and Stop buttons.

Then, turn the Mode Switch to KBD I and press Play to start the transport. Now hold the EDIT button to enter Real Time Edit.

If the Click track is enabled, it sounds a double-click every time the pattern's loop point is reached, providing an audible reference point.

* If a Pattern Chain is active, Real Time Edit will affect all the patterns in the chain as they appear during playback. Results can be unpredictable.



Hold while transport is playing

In **KBD** mode, while the transport is playing, hold the **EDIT** button to enter **Real Time Edit**.

KBD **PTN**



Add Note Events

Play the Keys in real time to over-write existing note events

Erase Notes

Hold LOOP(rest) while pressing a Key to erase events on that Key in real time

Set Loop Point

Double-tap LOOP to set the pattern's loop point in real time

Nudge Loop Point

Hold LOOP and tap CUE1 (<<) to shorten loop by 1 step, CUE2 (>>) to lengthen

Reset Loop Point

Hold LOOP while tapping STOP to reset pattern length to 32 steps

Undo Changes

Turn the Mode Switch to another position. Any edits will be discarded.

Save and Exit

Hold the EDIT button again so its LED goes dark. Any changes are saved to memory.

Switch to Step Edit

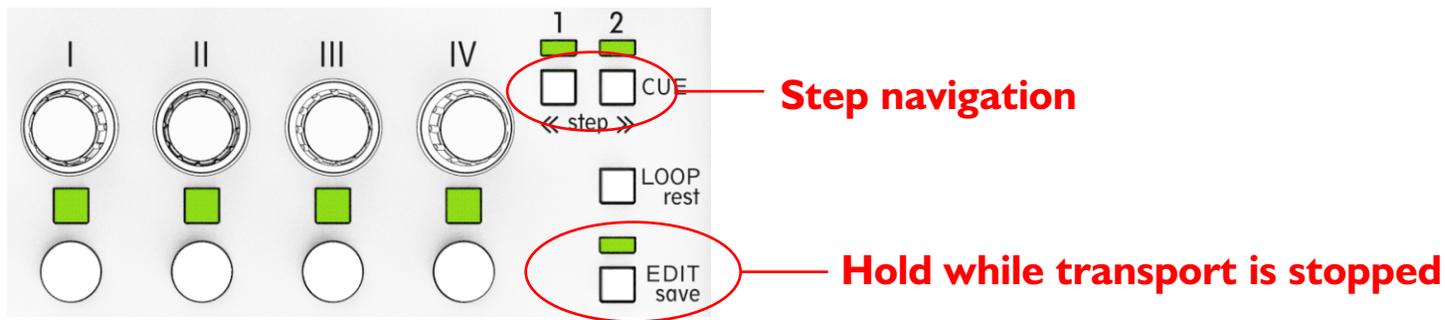
Press Stop. Playback stops, and you are now in Step Edit mode at Step 1 of the pattern.

Pattern Write - Step Edit

This feature lets you edit a pattern step-by-step for finer control of the note data. There are two types of note events: Trigger and Gate (Tie).

Trigger - Back-to-back Trigger events make a series of On-Off pulses at Gate Out, re-triggering the synth's envelope generator.

Gate (Tie) - Gate Out remains on steadily during back-to-back Gate events. The synthesizer's envelope generator will not re-trigger.



In **KBD** mode, while the transport is stopped, hold the **EDIT** button to enter Step Edit.

	Jump to Step I	Press Stop
	Navigation	Tap CUE1 (<<) to move back one step. Tap CUE2 (>>) to move forward one step. Trigger events are shown by a momentary LED. Gate events have a steady LED. The Audible Indicator makes a double click sound when you pass Step I.
	Add Trigger Event	Tap a Key
	Add Gate (Tie) Event	Hold a Key
	Erase Event	Double-tap the Key whose LED is lit
	Set Loop Point	Double-tap LOOP to set the pattern's loop point at the current step
	Nudge Loop Point	Hold LOOP and tap CUE1 (<<) to shorten loop by 1 step, CUE2 (>>) to lengthen.
	Reset Loop Point	Hold LOOP while tapping STOP to reset pattern length to 32 steps
	Undo Changes	Turn the Mode Switch to another position. Any edits will be discarded.
	Save and Exit	Hold the EDIT button again so its LED goes dark. Any changes are saved to memory.
Switch to Real Time Edit	Press Play. Playback begins and you can listen to your changes, and edit in real time.	

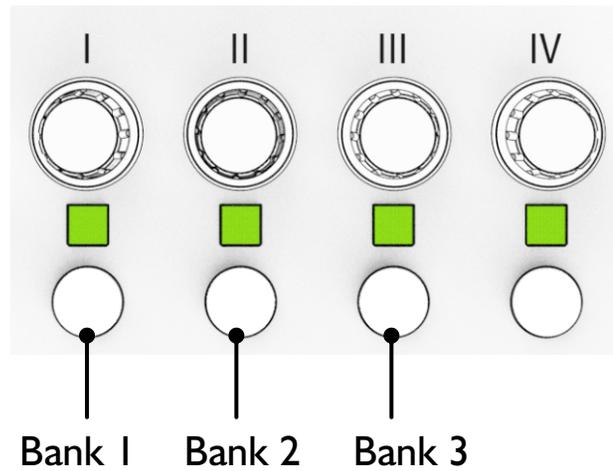
Memory Bank Select

2TAC has three memory banks for pattern storage.

The actively selected memory bank is indicated at power-up by a flashing LED over Key I, Key II, or Key III.

After switching memory banks, any Pattern Chains will be lost.

To power cycle the unit, unplug the DC Input from the back of the unit for several seconds, then plug it back in.



Immediately after powering up the unit, use Key I - Key III to select the active Memory Bank.

Select Memory Bank

Hold Key I, Key II, or Key III for 2 seconds after applying power to the unit, as soon as you see its LEDs light up.

Over-write Memory Bank with Random Data

Power cycle the unit. As soon as the LEDs come on, hold STOP + PLAY and Key I, Key II, or Key III simultaneously. The display flickers, and all data in the selected bank is replaced with randomly generated note events, random pattern lengths, and random tuning settings.

How Can I ... ?

Set a pattern's loop length exactly:

1. To adjust a Track 1 pattern, set the Mode Switch to KBD 1
2. If the transport is playing, press STOP
3. Hold EDIT to enter Step Edit mode
4. Reset the pattern's loop length to 32 steps by holding LOOP while tapping STOP
5. Think of the number of steps you want your pattern to have. For example, let's say it is 8
6. Tap STOP while thinking the number "1". You'll hear the audible indicator click
7. Now tap CUE2(>>) while counting up "2, 3, 4 ..." as you go. After you get to "8", double-tap the LOOP button.
8. The pattern length is now set to 8 steps. Hold EDIT again to exit and save

Start a new pattern from a blank:

1. To erase and over-write a Track 1 pattern, set the Mode Switch to PTN 1
2. Hold EDIT to enter Pattern Tools mode
3. Hold STOP while double-tapping a Key to erase its pattern
4. Cancel any transpose settings by holding the key's Tuner down while tapping STOP.
5. Hold EDIT again to exit Pattern Tools and save the changes.
6. Now turn the Mode Switch to KBD 1.
7. Audition the pitches of the Keys by playing the keypad and adjusting the tuners according to the melody you have in mind.
8. Next, set the pattern's loop length (see above) to match your new idea
9. Use Real Time edit or Step Edit to program your new pattern. If you're using Real Time edit, turn on the click track to help keep rhythm.
10. Be sure to hold EDIT again to exit and save - if you turn the Mode Switch before doing this, you'll undo your changes!

Make Track 2's patterns match Track 1's:

When you're using Track 2 as the auxiliary CV channel for a synth that's controlled by Track 1, you may want to keep Track 2's patterns in sync with Track 1's.

1. For all 4 patterns, copy Track 1's data to Track 2 using the **Copy Pattern to Other Track** procedure in Pattern Tools.
2. Now Track 2's patterns will have the same events and loop length as Track 1's.
3. Transpose and Re-tune Track 2's patterns as desired to produce the auxiliary CV output.
4. If you're using Track 2's Gate Out as ACC Gate for your synth, edit the Track 2 patterns to delete note events wherever you don't want an ACC.
5. When you program a Pattern Chain, use the **Write Pattern Chain to Both Tracks** procedure in Pattern Chain.

Keypad and Tuners

Mode Switch

Edit and Loop Buttons

Memory

KEY TUNERS



Tune the keys (adjust V/oct voltage)

Default: 1 semitone per click
Hold & turn: 1 octave per click

Pitch Copy:

Hold tuner of source, double-tap destination tuner

Pitch Reset: (middle of range)
Hold tuner and tap Stop

LIVE KEYS



Play the V/oct & Gate outputs in real time like a 4-note keyboard

KEYS

KBD PTN



Track 1 Keys

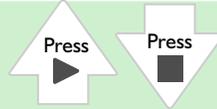
KBD PTN



Track 2 Keys

Real Time Edit

Event Write: Play keys to write notes in real time
Event Erase: Hold LOOP(rest) while pressing keys
Nudge Loop Point: Hold LOOP and tap CUE1 (<<) or CUE2(>>)
Reset Loop Point: Hold LOOP and tap STOP to reset pattern length to 32 steps



Step Edit

Navigation: Use CUE1 (<) and CUE2 (>) to navigate forward and backward
Jump to Step 1: Tap STOP
Note Write: Tap Key to add a Trigger event. Hold Key to add a Gate event
Note Erase: Double-tap Key to erase an event on the current step
Make Loop Point: Double-tap LOOP to set the loop point at the current step
Nudge Loop Point: Hold LOOP and tap CUE1 (<<) or CUE2(>>)
Reset Loop Point: Hold LOOP and tap STOP to reset pattern length to 32 steps

Temporary Loop Points

While transport is playing, hold the LOOP button down, then...

Set temporary loop point: Tap CUE1 or CUE2 to loop the track's pattern
Clear temporary loop point: Hold STOP while tapping CUE1 or CUE2

Pattern Tools

Pattern Copy:
Hold Key of source while double-tapping Key of destination
Pattern Copy + Timestretch:
While holding Key of source, turn its tuner to change the time stretch factor, then double-tap key of destination
Pattern Rotate:
While holding Key, tap CUE1 (<) or CUE2 (>) to shift pattern events.
Pattern Erase: (only when transport is stopped)
Hold STOP while double-tapping a Key
Overwrite Pattern with Random Data:
Hold STOP + PLAY while double-tapping a Key
Copy Pattern to Other Track: (can't undo this)
Hold Key of source + LOOP while double-tapping either CUE1 or CUE2.

Pattern Chain

While holding LOOP button down...
Change patterns at the end of the measure: Tap one Key then release LOOP
Add multiple patterns to the chain: Tap Keys I-IV in order, up to 32
Song Loop (endless chain): Tap EDIT before releasing LOOP
Apply chain to both tracks: Tap the Cue button of the other Track
Chain Cancel: Release LOOP without tapping any other buttons
Restore Last Chain (undo): Turn Mode switch before releasing LOOP

PATTERNS

TRANSCOPE



Pitch shift all the notes in a pattern

Default: 1 semitone per click
Hold & turn: 1 octave per click

Tuning copy:

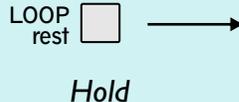
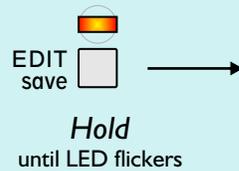
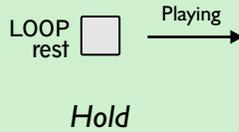
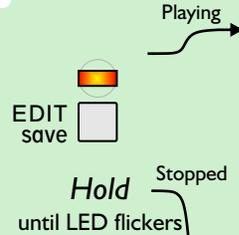
Hold tuner of source pattern, double-tap tuner of destination

Transpose Reset:
Hold tuner and tap Stop

PATTERN SELECT



Tap a Key to select pattern I - IV
Immediate jump cut while playing



Exiting Edit Mode

Save changes:
Hold EDIT again

Undo Edits:
Turn Mode switch

Exiting Pattern Tools

Save changes:
Hold EDIT again

Undo Edits:
Turn Mode switch

Memory Banks I-III

Current Memory Bank is indicated at power-up by flashing LED over Key I-III

Switch Bank:
Unplug power, then hold Key I-III while re-applying power.

Overwrite a Bank with Random Data:
At start-up, hold STOP + PLAY + Key I, Key II or Key III

Hold Play + Tap Key I-IV to make

Sticky patterns (they play in white space of active pattern)

Hold Play + Tap Stop to clear Sticky patterns