Last update October 22nd 2024

WELCOME & THANKS!

Thank you and congratulations on acquiring TWISTfm, the ultimate FM polysynth!

TWISTfm is a powerful and versatile polyphonic synthesizer that combines vintage FM synthesis with classic analog filtering and modern control capabilities. At the heart of TWISTfm are two vintage Yamaha OPL-3 YMF262 FM chips, each paired with dual vintage YAC512 stereo DACs. This setup offers 8 discrete voices, each equipped with its own analog multimode filter, providing rich and dynamic sound possibilities.

Brief History of the YMF262 by Yamaha

The YMF262, also known as the OPL3, is an FM synthesis sound chip developed by Yamaha in the late 1980s. It was primarily used in PC sound cards during the early 1990s, such as the Sound Blaster Pro 2.0 and Sound Blaster 16. The YMF262 featured an advanced FM sound engine capable of producing rich and complex tones, despite its sophisticated capabilities, the chip was often underutilized by game developers, who typically employed simple preset sounds and basic music composition techniques, leaving much of its potential untapped.

TWISTfm: Unlocking the Full Potential of the YMF262

TWISTfm aims to harness the full potential of the YMF262 by combining its powerful FM synthesis capabilities with advanced analog filters. This approach allows TWISTfm to create a wide range of sounds, from classic FM tones to entirely new, richly textured audio.

I/O (INPUT/OUTPUT)

TWISTfm features a variety of ports to accommodate different connectivity needs, providing versatile options for MIDI, audio, and power connections. Here is a detailed overview of the available ports and their functionalities:

USB

Used exclusively for MIDI over USB.
TWISTfm features a class-compliant, driverless USB MIDI interface, ensuring seamless integration with your computer or other USB MIDI devices.

MIDI DIN5 INPUT

Used to transmit MIDI to TWISTfm. Connects using a traditional DIN5 male-to-male MIDI cable.

MIDI DIN5 OUTPUT

Used to transfer MIDI messages from TWISTfm to a DAW for two way fader modulation.

AUDIO OUT1 & OUT2

Unbalanced TS 1/4" jacks.
Output 1: Transmits voices 1, 3, 5, 7.
Output 2: Transmits voices 2, 4, 6, 8.

PHONES/

Stereo TRS 1/4" jack. Provides an output for headphones, allowing you to monitor your sound directly from TWISTfm.

INPUTS 1 & 2

These Mono TS 1/4" jacks allow you to feed audio into filters 7 and 8 of TWISTfm, providing additional sound processing options.

DC POWER INPUT

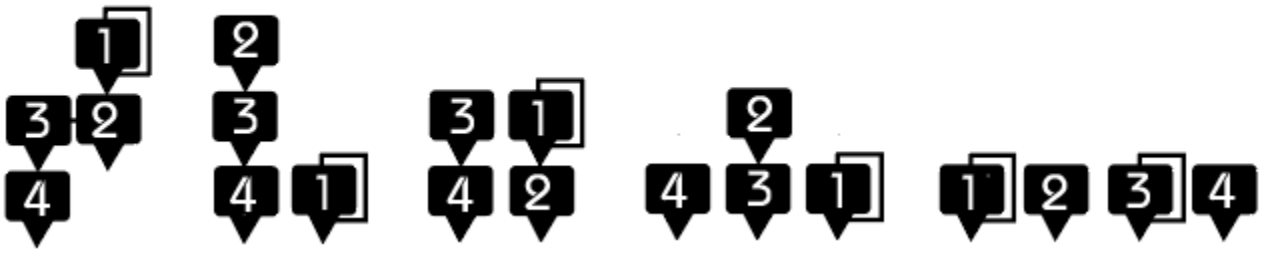
Used to supply power to TWISTfm.Connect using the included 9V 1A DC center-positive power supply. Only use the included power supply to avoid potential damage to the unit. Using other power supplies can cause irreparable damage and void the warranty.

SD CARD SLOT

Used for firmware updates and to load and save presets. Works in conjunction with the included SD card reader for easy data management and software updates.

LAYERS & FM ALGORITHMS

TWISTfm consists of two layers for sound shaping: a primary 4-operator layer and a secondary 2-operator layer. Let's first look at the 4-operator layers, which are crucial for creating complex and diverse sounds. The YMF-262 sound chip, also known as the OPL3, provides five distinct algorithms within this layer to manipulate how the operators are connected and modulate each other.



Algorithm 1

- Configuration: 1 → 2 → 3 → 4
- Description: This algorithm connects operators in a linear series where each operator modulates the next one in line.
- Modulation Details:
    - Operator 4 generates the initial signal.
    - Operator 3 modulates the signal from Operator 4, adding the first of complexity.
    - Operator 2 further modulates the output of Operator 3, creating a more intricate waveform.
    - Finally, Operator 1 modulates the output of Operator 2, producing a highly complex and evolving sound.
- Usage: Ideal for creating complex, evolving sounds with deep modulation effects. Each operator adds a progressively detailed layer of modulation to the previous one.

Algorithm 2

- Configuration: 1, 2 → 3 → 4
- Description: Operator 2 modulates both Operator 3 and Operator 4, with Operator 1 in parallel
- Modulation Details:
    - Operator 4 generates the initial signal.
    - Operator 3 modulates the signal from Operator 4, adding the first layer of complexity.
    - Operator 2 further modulates the output of Operator 3, creating a more intricate waveform.
    - Operator 1 is independent and parallel to 2-3-4
- Usage: This algorithm provides a combination of parallel and series modulation, offering a more complex and layered sound. It's suitable for sounds that require a mix of independent and interdependent modulations.

Algorithm 3

- Configuration: 1 → 2, 3 → 4
- Description: This algorithm sets up two parallel series connections: Operator 1 modulates Operator 2, and Operator 3 modulates Operator 4.
- Modulation Details:
    - Operator 2 generates a signal and Operator 1 modulates it, creating a modulated waveform.
    - Simultaneously, Operator 4 generates a separate signal, which is modulated by Operator 3.
    - The two modulated signals can be combined, providing a richer and more textured output.
- Usage: Use this for creating two distinct modulated sounds that can be mixed together for a richer, more textured sound.

Algorithm 4

- Configuration: 2 → 3, 1,4
- Description: Operator 2 modulates operator 3. Operators 1 and 4 are independent in parallel
- Modulation Details:
    - Operator 1 modulates the signal generated by Operator 3.
    - Operator 3's output, which has already been modulated by Operator 1, is then modulated by Operator 4.
    - Additionally, Operator 2 directly modulates Operator 4, adding another layer of modulation.
- Usage: Suitable for achieving unique modulation depths by combining both direct and indirect modulation on the final operator. This setup allows for complex and dynamic sound variations.

Algorithm 5

- Configuration: 1, 2, 3,4
- Description: All operators are in parallel, independent from one another
- Usage: This algorithm functions like an organ where you can mix tones

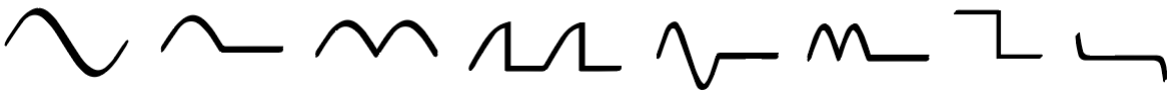
Layer 2: Operators 5 and 6

The secondary 2-operator layer in TWISTfm features Operators 5 and 6. These operators can be arranged either in series or parallel. In series mode, Operator 6 produces the sound, and Operator 5 modulates it for added complexity. In parallel mode, both operators function independently, akin to stacked oscillators in a traditional synthesizer, allowing for straightforward, layered sound generation.

Operator 1 & 5 Feedback

Operators 1 and 5 in TWISTfm can feed back into themselves using the feedback fader. This self-feedback allows the output of the operator to be routed back into its input, creating a loop that enhances the harmonic complexity of the sound ranging from subtle to intense, distorted textures.

WAVEFORMS



The YMF-262 (OPL3) chip provides eight unique waveforms, each with distinct characteristics that contribute to a wide range of sounds in musical contexts. The waveform is selected for each operator using the wav fader, and it can be modulated by the LFOs and envelope to add further complexity and variation to the sound.

1. Sine: A smooth, pure tone with no harmonics, ideal for creating clean, mellow sounds like basses and simple leads.
2. Half-Sine: A softer and more muted tone, useful for subtle harmonic content and gentle sound textures.
3. Abs-Sine: A brighter tone with a unique timbre, adding harmonic richness to the sound.
4. Pulse-Sine: A percussive and rhythmic tone comparable to a saw wave, suitable for adding punch to leads and basses.
5. Even-Sine: An even, intermittent tone that is great for creating rhythmic, pulsating sounds.
6. Even-Abs-Sine: A steady, pulsating sound with a smooth texture, ideal for pads and ambient effects.
7. Square: Produces a rich, edgy sound with strong harmonic content, perfect for leads, basses, and chiptune sounds.
8. Derived Square: A variation of the square wave, useful for creating distinct, harmonically rich tones.

OPERATOR ENVELOPES

The OPL3 YMF262 chip features ADSR (Attack, Decay, Sustain, Release) envelopes to shape the amplitude of each operator's sound over time.
In TWISTfm, the interface provides four faders for controlling the ADSR envelope of each operator, allowing fine-tuned control over how the sound evolves.

The Attack (A) fader sets the time it takes for the sound to reach its maximum volume after a note is triggered. The Decay (D) fader adjusts how long it takes for the volume to drop to the Sustain level after the Attack phase. The Sustain (S) fader controls the level at which the sound holds while the note is sustained. Finally, the Release (R) fader determines how long it takes for the sound to fade away after the note is released. By manipulating these faders, users can craft dynamic sound envelopes for each operator, leading to a wide range of tonal possibilities.

ALL ENVELOPE EDIT TRICK

If you hold down the encoder while adjusting any of the ADSR envelope faders, the change will be applied to all operator envelopes within the same layer (either operators 1 to 4, or operators 5 + 6, respectively). This allows for quick and synchronized editing across multiple operators in the selected layer.

TUNING CONTROLS

In TWISTfm, the tuning controls offer various ways to manipulate pitch and create dynamic, expressive sounds. These controls include the layer 2 Tune, Fat Fader, Glide Fader, Rise Fader, and Fall Fader, each providing unique pitch-related functionalities.

Layer 2 TUNE

The tune fader for layer 2 allows you to detune layer 2 against layer 1 within the span of an octave. When you hold the menu button while adjusting the tune fader, you can tune layer 2 within a range of +/-24 semitones in precise semitone increments.

FAT

The Fat fader detunes the eight voices of TWISTfm away from one another, simulating the tuning issues found in vintage analog synthesizers. This adds a bit of warmth to the sound or can be used for deep experimental effects by increasing the detuning amount.

Hold menu and move the fat fader to set the range of the fat effect.

GLIDE

The Glide fader controls the portamento effect, allowing smooth gliding between notes. This is useful for creating legato passages and expressive pitch transitions, adding a fluid, connected feel to your playing.

RISE & FALL

The Rise fader makes notes rise from a lower pitch as the fader increases, creating a sweeping upward pitch effect. In contrast, the Fall fader causes the pitch to fall further down after the note is released, creating a trailing, downward pitch shift.

USER INTERFACE

The UI includes a 4-character display, a rotary encoder, and a menu button.

ROTARY ENCODER

When navigating the menu, turn the encoder to select items or change their values. The encoder can also be pressed, referred to in this manual as "clicking the encoder." Clicking the encoder is used to enter a submenu or confirm a value, functioning as a "YES" action.

MENU BUTTON

The button serves multiple purposes based on the status of TWISFM:

Preset / menu access / up a level

Press once to open the preset navigation menu. Press again to access the main menu. When editing parameters, this button functions as a "back/exit" button, allowing you to return to the previous submenu or main menu.

Panic

Press and hold the button for several seconds to silence all voices

MENU

We designed the menu to minimize deep menu diving. We call this "menu snorkeling."
The Menu is divided into two sections:
Main Menu: Displays all themes.
Themed Submenus: Edit items by theme

Recent Fader Menu

If you press the menu button shortly after adjusting a fader—before the preset name reappears—TWISTfm will automatically display the menu items related to that specific fader.
Press the Menu button to open the menu. At the top level, the screen will briefly display "HOME." Press back once from "HOME" to enter the preset browser. To exit the browser and return to "HOME," press the Menu button twice.
Tip: You can increase the delay before the preset name reappears by adjusting the settings in the DISP submenu of the preset menu.

Menu Navigation

2. Roll the encoder to select a theme.
3. Press the encoder to enter the selected theme.
4. Roll the encoder to select items within the theme.
5. Press the encoder to interact with the selected items.
6. Press the menu button below the encoder to return to the main menu.

PRESET MENU (PSET)

The Preset menu in TWISTfm provides comprehensive options for managing your sound presets. This menu allows you to load, save, initialize, and manipulate your presets in various ways, making it easy to organize and experiment with your sound creations.

Load
This is the preset navigator. Roll the encoder to select and load a preset. Hold menu at the same time to select and open a folder. When TWISTfm is displaying a fader value you can jump to the preset load menu simply by pressing the encoder or menu.

Save
Clicking the encoder with the save submenu selected saves your preset.
To quickly save your preset from the load menu, tap the encoder twice.

Init
Loads the default/template preset named `init.tfm` located at the root of the SD card. This is useful for starting a new preset from a known state. Hold menu and press the encoder to quickly load init.

Panel
This function updates all fader-controlled parameters to match the current positions of the faders on the panel.

Copy
This allows you to save a copy of the current preset to a new file. Clicking this item lets you select the four characters for the new file name. Use the encoder to select and confirm each character, then the file will be saved.

Folder
Allows you to navigate to a different folder of your SD card.

BPM
Enables you to set the BPM of the internal clock. This is essential for synchronizing your presets when using the internal clock, providing precise control over the tempo of your sound. You can increase the BPM in increments of 10 by holding menu while turning the encoder. The BPM ranges from 1 to 500 BPM.

Randomize Preset
This function allows you to randomize the parameters of your preset to achieve interesting, unexpected effects. Use the encoder to set a randomization percentage from 0 (preset unchanged) to 100 (totally random). Each time the encoder is pressed with this submenu item selected, the preset is randomized based on the set percentage. Randomizations are not cumulative; each randomization starts from the original preset. Therefore, setting the randomization to 0 will restore the original preset, even after a 100% randomization.
Note:
Both morph states of the preset are randomized. This means that both the initial and destination states of the morph parameters will be affected by the randomization process, providing a comprehensive and dynamic alteration of your sound.

Tune

This option allows you to fine-tune the overall preset from 50% up to 150%. Turning the encoder changes the tune in single percent increments, while holding menu changes it in 5 percent increments. This feature helps in achieving precise tuning adjustments for your sound.

ETSD (Equal Temperament Scale Division)

This experimental feature changes the Equal Division of the Octave (EDO), of the preset.
There are three available options:

- **12ED**: The traditional 12 semitones per octave, which is the standard tuning for most synthesizers and musical instruments.
- **6ED**: Divides the octave into 6 equal parts, offering larger intervals between notes, which can be used for unique harmonic structures.
- **24ED**: Divides the octave into 24 equal parts, allowing microtonal increments for exploring new musical territories and microtonal music..

Menu + Encoder (preset quick reload and init)

Hold menu and press the encoder to perform different actions: On the first press, the current preset reloads from the SD card, refreshing it with the saved settings. On the second press, the preset initializes to the "init.tfm" file found in the root of the SD card, resetting it to the default settings.

Backup Restore (RSTR)

Every time you save a preset, TWISTfm automatically creates a backup with the same name as your preset, but with ".bak" added to the end of the filename (e.g., "mypreset.tfm.bak"). To recall the previously saved state of your preset, select the "RSTR" menu and tap the encoder, which will load the backup file. If you want to update the preset after restoring it, remember to save it again to ensure the changes are kept.

VOICE MENU (VOCE)

This submenu allows you to select the voicing mode.
This affects how voices are allocated & triggered

POL8 (8 voice polyphonic)
All voices are available to play individually

UNIS (Unison)
All voices trigger at the same time (monophonic)

4x2
4 voice polyphony triggered in stereo pairs

2x4
Duophonic voices triggered in two groups of 4

MONO
In MONO mode, TWISTfm operates in a monophonic configuration, with only one voice available per chip—one for the left channel and one for the right channel.

WIDE 8
Similar to POL8 mode, where all voices are available to play individually, but they are triggered in a specific order, alternating between outputs 1 and 2 (left and right) to create a ping-pong effect.

ROUND ROBIN
All 8 voices are triggered consecutively in a fixed sequence: 1, 2, 3, 4, 5, 6, 7, 8.

FILTERS

Analog Multi Mode Filter Per Voice

The 4 pole analog filters in TWISTfm are inspired by the beautiful designs of Mutable Instruments, which in turn are influenced by the legendary Oberheim filters.
These filters use the pole mixing technique offering a rich and versatile sonic palette, enabling users to create a wide range of sounds with precision and character.

There are 8 filters in TWISTfm, one for each voice, providing individual control and processing for each voice. Additionally, two external signals can be fed into the filters of voices 7 and 8 with drive control.

Filter Modes: The following 15 filter modes are available:

- **LP4**: 4-pole low-pass.
- **LP3**: 3-pole low-pass.
- **LP2**: 2-pole low-pass.
- **LP1**: 1-pole low-pass.
- **BP4**: 4-pole band-pass.
- **BP2**: 2-pole band-pass.
- **NOTCH**: Notch filter.
- **PHASE**: Phaser.
- **HP1**: 1-pole high-pass.
- **HP2**: 2-pole high-pass.
- **HP3**: 3-pole high-pass.
- **H2+L**: 2-pole high-pass and 1-pole low-pass (band-pass-like).
- **H3+L**: 3-pole high-pass and 1-pole low-pass (band-pass-like).
- **NO+L**: Notch and 1-pole low-pass.
- **PH+L**: All-pass and 1-pole low-pass.

These modes can be changed and even modulated with minimal audible artifacts, thanks to high-quality analog volume control components with zero crossing technology.

Digital Control: Resonance and cutoff are digitally controlled by high-resolution DACs, offering flexible modulation and the ability to store presets.

The design and functionality of these filters are deeply rooted in the innovative work of Mutable Instruments. We extend our gratitude to Émilie Gillet for her invaluable resources and papers on the subject, which have significantly contributed to the development of these exceptional filters. For more information, you can explore her work here.

CHANGING FILTER TYPE

To change the filter type, simply move the Type fader. The display will indicate the currently selected filter type.

FILTER MENU

The filter submenu on TWISTfm includes several parameters that allow you to shape and modify your sound. Here are the details for each parameter:

HEAT
This parameter sets the amount of drive into the filter, allowing the signal to range from clean to hot with analog drive.
Heat can be set directly with the res fader if menu is pressed.

Flavour (FLAV)

This parameter reconfigures the resonance circuitry of the filter.

- **LIQUID (LIQD)**: A smooth filter with gentle resonance.
- **MS20**: A highly resonant filter with zener diodes.

You can also change the flavor by moving the filter type fader if menu is pressed.

Wobble (WOBL)
This parameter feeds part of the first filter pole into the frequency modulation of the filter, creating a wobbly effect that is particularly noticeable at lower filter cutoff frequencies.

Slew
This parameter adds slew to the filter cutoff response, helping to maintain a gentle modulation, especially when multiple LFOs are modulating the cutoff simultaneously.

Input Volume (IN V)
This parameter sets the drive of the two input jacks::

- **NORMAL (NORM)**: Standard input volume.
- **WARM**: Slight analog warmth.
- **HOT**: High input volume with beautiful analog distortion applied to the incoming signal.

Keyboard Tracking
This parameter adjusts how the filter cutoff frequency responds as you play higher notes. You can set it between 0 and 10:

- 0: The filter cutoff remains constant, regardless of the note you play.
- 10: The cutoff frequency is multiplied by X octaves as you play each octave above C0.

Use this setting to make the filter "track" the pitch, increasing the brightness of the sound in higher registers.

VOLUME CONTROL

FM synthesis can be highly dynamic in volume, especially when paired with filters that can be overdriven. This dynamism allows for a wide range of expressive sounds but also means that managing volume levels is crucial to maintain a balanced and controlled output.

To adjust the overall preset volume:

- Hold the Menu button and move any volume fader. This combination allows you to attenuate the overall volume of the preset, ensuring that your sound remains balanced and within desired levels.

The volume settings are saved with presets, allowing you to maintain consistent volume levels across different sounds.

MOD WHEEL (MODW)

This parameter enables TWISTfm to learn the behavior of the modulation wheel by moving a fader. This allows you to automate a fader via the mod wheel (MIDI CC1).

When the encoder is pressed with MODW (modwheel) selected, the screen will blink **MODW** and **LEARN** alternately. This indicates that TWISTfm is in learning mode. Now, move a fader to assign it to the modwheel. The fader's movement will be linked to the modwheel, allowing you to control modulation effects directly from the fader.

Press the encoder to exit the learning mode if needed

MIDI

This submenu allows you to set parameters related to MIDI.

Channel

Channel Select the MIDI channel that will trigger TWISTfm. You can choose any channel from 1 to 16, or use MPE mode. This setting is saved globally and does not change with presets.

About MPE mode

MIDI Polyphonic Expression (MPE) is an extension of the MIDI protocol that allows for more expressive control over individual notes in a performance. In MPE, each note can be played with its own pitch bend, timbre, and pressure, providing an additional level of detail and dynamic expression.

TWISTfm takes full advantage of MPE by using the three dimensions of control provided by MPE-compatible controllers: pitch (horizontal movement), timbre (vertical movement), and pressure (aftertouch).

When TWISTfm is set to MPE mode, it automatically responds to MIDI channels 2 through 9, with channel 1 serving as the master for global controls like CC messages. This setup aligns with the default channel configuration of most MPE controllers.

For seamless integration, TWISTfm sets the pitch bend range to 48 semitones, matching the standard range used by many MPE controllers. This allows precise control over pitch bending, spanning 24 semitones up and down from the base pitch.

The Y-axis control (vertical movement) is expected to be assigned to MIDI CC74 on the MPE controller. In TWISTfm, this vertical movement can be routed to take over any of the LFOs by assigning the "MPEY" waveform to the LFO. This feature lets you modulate parameters using smooth vertical slides on your controller, adding a new layer of creative flexibility to your sound design.

Bend - / +

Select the pitch bend ranges in semitones for MIDI. You can set individual ranges for both upward and downward bends.
These parameters are individually stored per preset.

Clock (CLOK)

Choose between internal clock or external MIDI clock. When set to internal, you can change the BPM in the preset menu, providing precise control over your timing and synchronization needs.
This parameter is stored globally (not changing with presets).
Note: if external MIDI clock is selected, the clock will run internally until a MIDI clock start message is received.

No Aftertouch (NoAT) Mode

TwistFM is optimized for use with a MIDI controller that supports polyphonic aftertouch, allowing individual note pressure modulation for each voice. If you're using a keyboard with channel aftertouch, it will still work, but the aftertouch will affect all voices simultaneously instead of each note individually, as with polyphonic aftertouch.

If your controller does not support aftertouch at all, you can activate the NoAT mode. In this mode, TwistFM will use the incoming velocity data and treat it as polyphonic aftertouch, enabling per note expression without aftertouch functionality.

MODULATION

TWISTfm offers multiple ways to modulate its faders, providing a versatile toolkit for dynamic sound shaping. It includes three Low-Frequency Oscillators (LFOs), a Pressure Modulator, and an Envelope. The LFOs can be used to create rhythmic or cyclical changes in the sound, adding motion and depth to your patches. The Pressure Modulator, as controlled by incoming MIDI aftertouch, allows for real-time expressive control, responding to the nuances of your playing. Additionally, the Envelope modulator provides detailed control over the attack, decay, sustain, and release (ADSR) parameters.

LFO

TWISTfm's LFO (Low-Frequency Oscillator) is a powerful modulation tool that can be assigned to any fader to enhance your sound design. Here's how it works:

Assigning a Fader to the LFO

1. Select the Fader: Move the fader you wish to modulate with the LFO.
2. Link the Fader: Press the LFO chain button to attach the fader to the LFO. The light above the chain button will illuminate, indicating that the fader is linked.
3. Identify Linked Faders: Any other fader that you move, if it is attached to the LFO, will light its chain LED accordingly.
4. Detach the Fader: Press the chain button again to detach the fader from the LFO.

Setting the LFO assignment depth

TWISTfm allows you to set the modulation depth for each individual fader linked to the LFO, including the option to assign a negative depth value. To adjust the modulation depth, hold the Chain button while moving the depth fader. The depth range spans from -20 to 20.

Clearing LFO Assignments

- Clear All Assignments: Hold any of the LFO chain buttons for 3 seconds to detach all faders linked to that LFO.

Recording User LFO Waveforms

You can record up to three custom waveforms per preset using the ribbon controller.

Start Recording: To begin, hold the menu button and press one of the three Chain Link buttons to record user waveforms 1, 2, or 3.

Recording Process:

- **Prep (Count-in):** The display will count down from 4, indicating the start of the recording. During the countdown, the LFO Link LEDs will blink in time with each beat to provide visual feedback.
- **Recording:** After the count-in, the display will count down from 4 again as you record your waveform. You have four beats, divided into 16 blinks of the Chain Link LEDs, to complete the recording.

Each custom LFO waveform is saved individually within the preset.

LFO MENU

LFO Waveforms

TWISTfm offers a variety of waveforms that can be assigned to the three LFOs for modulating various parameters. You can select the desired waveform by adjusting the WAV fader, the waveform fader can be further modulated via MIDI CC (check the MIDI implementation chart for specific CC numbers) or other internal modulators.

Here's a description of the available waveforms:

1. Triangle (TRI): A smooth and symmetrical waveform that rises and falls evenly, perfect for creating gradual, cyclical modulations.
2. Sawtooth (SAW): A waveform that rises gradually and drops sharply, ideal for creating more pronounced, rhythmic modulations.
3. Reverse Sawtooth (RAMP): This is the inverse of the sawtooth wave, offering a sharp rise followed by a smooth fall, giving a different flavor of modulation.
4. Rectangle (RECT): A waveform that alternates sharply between two levels, commonly used for tremolo or on-off style modulation.
5. Noise (NOIZ): A random, non-repeating waveform, adding unpredictability and chaotic textures to your modulation.
6. User-Defined (USR1, USR2, USR3): Custom waveforms that you can draw with the ribbon controller, giving you the flexibility to create unique modulation shapes.
7. Velocity (VEL): Modulates parameters based on note velocity, allowing dynamics in your playing to influence the LFO.
8. Mod Wheel (MOD): The LFO can be controlled directly by the modulation wheel (typically CC1), offering real-time, hands-on control over modulation depth or speed.
9. MPE Y-Axis (MPEY): This waveform uses the vertical (Y-axis) movement from an MPE controller to control the LFO, providing expressive modulation linked to your touch. For this to function correctly, MPE Mode must be selected in the MIDI Channel menu, and the Y-axis control should be set to **CC74** on your MPE controller. This allows you to take full advantage of MPE's vertical modulation for enhanced expressivity.

The LFO submenus are used to adjust parameters for the three low-frequency oscillators. The menus are identical for all three LFOs

Mode

Select the output behavior of the LFO in relation to its waveform:

- BIPO (Bipolar): The LFO modulates the fader up and down, centered around its current position.
- UNI+ (Unipolar Positive): The LFO modulates the fader upwards from its current position.
- UNI- (Unipolar Negative): The LFO modulates the fader downwards from its current position.
- REC+ (Rectified Positive): The lower half of the LFO waveform is flipped vertically, resulting in only upward modulation.
- REC- (Rectified Negative): The upper half of the LFO waveform is flipped vertically, resulting in only downward modulation.

Hold menu and move the LFO depth fader to quickly set the mode.

Sync
Choose whether the LFO will sync to the incoming MIDI clock.

When SYNC is enabled, the display will show the time division in bars relative to the master clock as you adjust the rate fader. The available divisions are:
- 4BAR
- 2BAR
- 1BAR
- 1/15
- 1/2
- 1/3
- 1/4
- 1/6
- 1/8
- 1/12
- 1/16
- 1/32

Loop
Set the LFO to either loop endlessly or cycle once (one shot).

Retrig
Enable the LFO to retrigger with each new voice.

SRR (sample rate reduction)
Increasing SRR introduces discrete steps in the LFO waveform, effectively creating a sample and hold effect.

Key Tracking
Increasing this will cause the LFO to cycle faster as the notes move toward the upper register of the keyboard. When set to 10, each octave above C0 will double the LFO rate. Key Tracking can be either global or per voice, depending on the LFO's global setting.

Warp
As the warp value increases, add more noise to the LFO output, introducing greater unpredictability to the waveform.

Display Visual Animation
You can optionally enable a visual animation to represent the LFO cycle, helping you gauge the LFO speed. Choose from three options:
- OFF
- Spinning Star
- VCR Tape

AFTERTOUCH

TWISTfm features a Pressure Modulator section controlled by incoming MIDI aftertouch, offering both polyphonic and channel-based support. If the connected MIDI keyboard supports polyphonic aftertouch, the system addresses and modulates each note individually, allowing for nuanced expression across multiple notes. In contrast, if the keyboard only supports channel aftertouch, the modulation applies uniformly across all notes.
The Pressure Attack and Release faders are essential for adding slew to the attack and release times, smoothing out the performance. The Depth control adjusts the overall response depth to the incoming MIDI aftertouch, providing more control over the modulation intensity.

The Aftertouch menu (AFTR) also offers two modes: 'Up' and 'Down'. In 'Up' mode, linked faders increase as key pressure increases, while in 'Down' mode, the faders decrease with increased key pressure, allowing for versatile expression tailored to the performer's touch.

ENVELOPES (FILTER and MODULATION)

The Envelope section of TWISTfm is equipped with Depth, Attack, Decay, Sustain, and Release (ADSR) faders, providing comprehensive control over the modulation envelope applied to your sounds. The Depth fader determines the overall influence of the envelope on the sound, allowing you to adjust how prominent the envelope modulation is. The Attack fader sets the time it takes for the envelope to reach its maximum level after a note is played, while the Decay fader controls how quickly the envelope falls to the Sustain level. The Sustain fader sets the level at which the envelope holds as long as the note is sustained. Finally, the Release fader defines the time it takes for the envelope to fade out after the note is released.

Filter Envelope and Modulation Envelope menus have the same options:

Mode
Specifies the direction in which the envelope moves the filter or attached faders.
Positive: Moves up.
Negative: Moves down.

Loop
determines whether the envelope restarts at the attack phase after completing the decay phase.

Sync
determines whether the envelope is **Tempo-Synced** or **Free-Running**.

Tempo-Synced Envelopes
A tempo-synced envelope locks its timing phases (attack, decay, etc.) to the tempo of your project via internal or external clock. In this mode, the duration of each phase is predetermined based on clock divisions, such as quarter notes or eighth notes. This ensures that no matter how you adjust the sustain level or other parameters, the envelope’s attack and decay will always align with the beat of the music.

Free-Running Envelopes
In contrast, a free-running envelope operates independently of the internal or external clock. Its phases, such as decay, are governed by the rate at which they travel between levels, like from the peak (after attack) to the sustain. The duration of these phases is flexible and can change depending on parameter settings. For example, lowering the sustain level will extend the decay time, as the envelope has further to fall. This provides a more dynamic and expressive behavior, where the timing is not locked to the beat but varies according to your settings.

These two modes offer different approaches: tempo-synced for rhythmic consistency, and free-running for more fluid, expressive sound shaping.

RIBBON

The TWISTfm synthesizer includes several parameters for controlling the ribbon, a touch-sensitive strip that allows for expressive control over various aspects of your sound. This sub menu defines the ribbon controller's overall behavior.

To quickly access the ribbon menu, hold the menu button and touch the ribbon.

Mode
This parameter determines the overall behavior of the ribbon controller.
Available modes include:

- BEND (BEND ALL): Bends the pitch of all voices at once.
- LAST (BEND LAST): Bends the pitch of the last played voice.
- LEARN (ANY FADER): Press the encoder with LERN selected and move any fader you wish to modulate with the ribbon. Press the encoder to exit the learning mode if needed
- MORF (MORPH): Enables the ribbon to blend between two preset states.
  See “how morph works” below for more details about morphing.

Up/Down
The Up/Down parameters set the range of the ribbon’s pitch bend or modulation:

- UP (1 to 48 semitone): Determines the range of upward modulation when sliding your finger up the ribbon.
- DOWN (1 to 48 semitones): Determines the range of downward modulation when sliding your finger down the ribbon.

CS80 Mode
The CS80 mode for the ribbon controller emulates the pitch bending behavior of the classic Yamaha CS-80 synthesizer. In this mode, the pitch bends upwards by 5 semitones and down to zero, allowing for expressive and smooth pitch modulation that mirrors the iconic sound of the CS-80.

Slew
This parameter controls the rate of change when moving your finger along the ribbon. Higher slew values result in a smoother, more gradual change, while lower values provide a faster, more immediate response. This allows for controlling the glide or smoothness of the ribbon's effect.

HOLD
This menu item can be set to either ON or OFF. When set to OFF, releasing the ribbon (lifting your finger) will cause the pitch to return to the center frequency (the original note). When set to ON, the pitch bend will remain active even after your finger has been lifted off the ribbon, allowing the pitch bend effect to continue until manually reset.

Play
This parameter allows you to use the ribbon to trigger notes, similar to pressing a key on a keyboard. The play parameter includes different range settings:

- **OFF**: Disables note triggering.
- **12**: Triggers notes within a one-octave range.
- **24**: Triggers notes within a two-octave range.
- **36**: Triggers notes within a three-octave range.
- **48**: Triggers notes within a four-octave range.

Ribbon Calibration Tool
The Ribbon Calibration Tool allows you to fine-tune TWISTfm's ribbon controller for more accurate and personalized performance. To begin calibration, go to the Ribbon menu and select **CALI**. The calibration process has three simple phases: **UP**, **BOTTOM**, and **TOP**.

- **UP Phase**: In this phase, remove your finger from the ribbon. The screen will count down from 4, calibrating the ribbon in its untouched position.
- **BOTTOM Phase**: When the screen displays **BOT** (bottom) and counts down from 4, place your finger at the bottom of the ribbon and hold it until the screen says "Done."
- **TOP Phase**: When the screen displays **TOP** and counts down from 4, place your finger at the top of the ribbon and hold it until the screen says "Done."

This calibration process is stored globally, allowing TWISTfm to adapt to the size of your finger for a customized and more responsive experience with the ribbon.

HOW MORPH WORKS

The *Morph* parameter allows the ribbon to blend between different sound settings or patches. By sliding your finger along the ribbon, you can smoothly transition between various tonal characteristics or effects, creating dynamic changes in your sound.

The *Morph* submenu has three options: **COPY**, **PASTE**, and **INIT**.

- **COPY** allows you to duplicate the current state of any preset. The copied state will be lost when the unit is powered off, and any new copy will replace the previous one. Importantly, the copy function only duplicates the initial morph parameters, not the destination ones. This can be useful when you want to transfer the original preset state to an unknown destination.
- **PASTE** lets you apply the copied preset state as the morph destination. You can paste parameters from one preset into another, allowing for flexibility when creating transitions between sounds.
- **INIT** acts like a copy/paste within the same preset. It enables you to erase the morph destination data and replace it with the current state of the preset, allowing you to start a new morph from scratch or undo a previous paste. This function is automatically applied to presets that don't yet have morph information.

  Note: performing a Paste or INIT will automatically set the ribbon mode to morph to avoid confusion.

Editing Morph Parameters

Every preset has two sets of parameters: the initial morph state and the destination state.
You don't have to use the copy/paste method to set the two states of a preset. You can also do so simply by moving the faders.

However it's important to understand which state you are editing, as it is determined by the latest touch of the ribbon when the ribbon mode is set to morph.

- **Initial State Editing**: If the ribbon was touched before halfway, all edits affect the initial state.
- **Destination State Editing**: If the ribbon was touched beyond halfway, all edits affect the morph destination.

As a reminder, when the ribbon is not in morph mode, you are always editing the preset's initial state.

Example: Morphing Between Filter Cutoff States

1. **Set Ribbon to Morph Mode**:
    - Select the ribbon mode and set it to **MORF**.
2. **Set Initial State**:
    - Touch the left edge of the ribbon.
    - Move the cutoff fader to minimum. This sets the initial state with the filter cutoff closed.
3. **Set Morph Destination**:
    - Touch the right edge of the ribbon.
    - Move the cutoff fader to maximum. This sets the morph destination with the filter cutoff open.

Now, as your finger travels to the right of the ribbon, the filter will open, and as your finger travels to the left, the filter will close.

This process allows you to create dynamic and expressive changes in your sound using the ribbon controller, enhancing your performance and sound design capabilities.

ARPEGGIATOR

TWISTfm's arpeggiator offers versatile modes allowing you to create dynamic patterns and textures. With features like RANGE for octave span, LINK for layer assignment, SYNC for timing, and RATE for speed control, it provides flexible and powerful arpeggiation capabilities.

ARP MODES

UP
The arpeggiator will play the notes in ascending order from the lowest to the highest note.

DOWN
The arpeggiator will play the notes in descending order from the highest to the lowest note**.**

UP/DOWN
The arpeggiator will play the notes in ascending order, then reverse and play them in descending order (like a pendulum).

RANDOM
The arpeggiator will play the notes in a completely random order.

WALK
The arpeggiator will play notes in a random sequence, but each note will be adjacent to the previous note, creating a "walking" effect.

CONVERGE
The arpeggiator will start playing notes from the outer edges of the note range and move towards the center, playing pairs of notes that converge inwards.

DIVERGE
The arpeggiator will start playing notes from the center of the note range and move towards the outer edges, playing pairs of notes that diverge outwards.

PLAY (ORDER OF PLAY)
The arpeggiator will play the notes in the exact order they were added.

STUTTER
The arpeggiator will repeat each note twice before moving to the next note in ascending order.

ALL
The arpeggiator will play all notes simultaneously.

RANGE

The RANGE parameter defines the number of octaves the arpeggio will span, ranging from 1 to 6 octaves. By setting the range, you determine how many octaves the arpeggio will repeat across, which directly influences the musicality and breadth of the arpeggio sequence. Adjusting the RANGE value provides flexibility in the arpeggio’s complexity and tonal depth, allowing for a simple one-octave repetition or a more expansive six-octave arpeggio.

LINK

The LINK feature allows you to assign the arpeggiator to different operator layers within the TWISTfm. You can choose to apply the arpeggio to either the first layer, the second layer, or both layers.

SYNC

When SYNC is enabled, the arpeggiator locks its timing to either an internal clock or an external MIDI clock. This ensures that the arpeggio notes are played in perfect synchronization with other devices. Alternatively, the SYNC function can be set to free timing, allowing the arpeggio to play independently of any external clock.

RATE

The RATE parameter controls the speed at which the arpeggio notes are played. By adjusting the RATE, you can set the tempo of the arpeggio, allowing it to play notes faster or slower.

When SYNC is disabled you can set the arp to an arbitrary speed.

When SYNC is enabled, the display will show the time division in bars relative to the master clock. The available divisions are:

- 4BAR
- 2BAR
- 1BAR
- 1/15
- 1/2
- 1/3
- 1/4
- 1/6
- 1/8
- 1/12
- 1/16
- 1/32

SCALES

TWISTfm offers a variety of scales to suit different musical styles and preferences.
Each scale has its unique pattern of intervals, providing a distinct tonal quality.
When transposing layer 2 over layer 1 in semitone increments, scales are taken into consideration so the transposition is diatonic and not chromatic. This means that the notes in layer 2 are harmonized with layer 1 according to the selected scale, ensuring that the resulting intervals are musically cohesive and harmonious.
Below is a brief description of each scale along with its screen abbreviation.
These are available in the MODE submenu of the scales menu.

Chromatic (CHRO) - A scale consisting of twelve semitones, encompassing all possible notes within an octave.

Major (MAJR) - Also known as Ionian, this scale is characterized by a pattern of whole and half steps, giving it a bright and happy sound.

Minor (MINR) - Also known as Aeolian, this scale has a darker and more melancholic feel compared to the major scale.

Dorian (DORI) - A minor-type scale with a raised sixth, offering a jazzy and soulful sound.

Lydian (LYDI) - A major-type scale with a raised fourth, providing a dreamy and ethereal quality.

Mixolydian (MIXO) - A major-type scale with a lowered seventh, often used in blues and rock music.

Blues (BLUE) - A scale with distinctive blues notes, creating a soulful and expressive sound.

Melodic Minor (MELm) - A minor scale with raised sixth and seventh notes when ascending, used in jazz and classical music.

Harmonic Minor (HARm) - A minor scale with a raised seventh, creating a distinctive Middle Eastern or classical sound.

Gypsy (GYPS) - A scale with augmented seconds, providing a dramatic and exotic sound.

Whole Tone (DEBU) - A scale consisting entirely of whole steps, giving a very ambiguous and impressionistic feel.

Pentatonic Major (PNTM) - A five-note scale with a bright and open sound, commonly used in folk and rock music.

Pentatonic Minor (PNTm) - A five-note scale with a bluesy and soulful sound, widely used in blues and rock music.

Phrygian (PHRY) - A minor-type scale with a lowered second, offering a Spanish or Middle Eastern flavor.

Locrian (LOCR) - A minor-type scale with a lowered second and fifth, providing a very tense and unresolved sound.

Diminished (DIMI) - A scale with alternating whole and half steps, creating a very dissonant and suspenseful sound.

Hungarian Minor (HUNG) - A minor scale with raised fourth and seventh notes, providing a distinctively Eastern European sound.

Neapolitan Minor (NEAP) - A minor scale with a lowered second and raised seventh, offering a rich and dramatic feel.

Double Harmonic (DBLH) - A scale with two augmented seconds, creating a very exotic and intense sound.

Altered (ALTR) - A scale used in jazz, with many altered notes, providing a highly dissonant and complex sound.

Persian (PERS) - A scale with exotic intervals, creating a Middle Eastern sound.

Enigmatic (ENIG) - A scale with unusual intervals, providing a mysterious and ambiguous sound.

Root Setting

The root setting is used to select the root or tonic of the scale, which defines the central note around which the scale is built. To change the root, turn the encoder, and the note name (A, B, C, etc.) will be displayed on the screen, indicating the selected root note.

Keyboard Split Setting

Additionally, TWISTfm allows you to use the lower part of the keyboard to define the scale root on the fly.

To enable the split function, navigate to the Split submenu and turn the encoder to change the setting from "No" to "Yes."

TWISTfm can also learn the split zone, which is determined by the first key of the upper half of the split keyboard. To define the split key, select "Yes" in the split submenu, then press the encoder. The screen will alternate between "SPLT" and "LERN" until you press a piano key. All keys below this key will be used to change the root (or tonic) of the scale. This feature provides real-time flexibility, allowing you to dynamically adjust the tonal center of your music during performance.
The zone setting is global to all presets. Press the encoder to exit the learning mode if needed.

CHORD

The Chord menu on TWISTfm provides various chord modes to enhance your sound design with rich harmonic textures. Here's a breakdown of its features:

Mode (MODE)

The MODE parameter allows you to select from several chord types, each offering a distinct harmonic structure:

- OFF: Disables chord mode.
- minT: Minor triad.
- MajT: Major triad.
- Debu: Debussy-inspired chords.
- Noir: Noir-style chords.
- Hous: House music chords.
- 7alt: Altered seventh chords.
- 7sus: Suspended seventh chords.
- dim7: Diminished seventh chords.
- agM7: Augmented major seventh chords.

Tip: you can combine chords with scales and even the arpeggiator!

Note: Chords only work in POLY8, 4x2, WIDE8 and Round Robin voice modes

VIBRATO

The vibrato functionality in TWISTfm allows for dynamic modulation of pitch, adding expressive depth to your sound. The vibrato parameters include mode, sample rate reduction (SRR), waveform selection, link, and sync. Adjust the vibrato speed using the rate fader and control the intensity with the depth fader. The depth is mapped non-linearly to the fader, enabling both subtle vibrato at the low end and extreme vibrato at the top end of the fader's range.

Mode

The mode parameter offers four modes of pitch modulation:

- **BIPO (Bipolar)** - Bends the pitch both up and down, creating a traditional vibrato effect.
- **UP** - Bends the pitch only upwards, adding a rising pitch modulation.
- **DOWN** - Bends the pitch only downwards, adding a falling pitch modulation.
- **MANU (Manual)** - Allows you to manually control the pitch bend using the depth fader. This mode can be assigned to an LFO for further flexibility, providing intricate and dynamic pitch modulation.

Sample Rate Reduction (SRR)

The `vibr_srr` parameter controls the sample rate reduction, applying a sample and hold effect to the vibrato. As you increase the SRR value, the vibrato pitch change jumps, updating less frequently. This creates a more choppy and stepped pitch modulation, which can add a unique texture to your sound.

Waveform Selection (WAVE)

Thisparameter allows you to choose from five different waveforms, each offering a distinct character:
- SINE - Smooth, continuous wave for gentle pitch modulation.
- RECT - Square wave for sharp, abrupt pitch changes.
- SAW - Sawtooth wave for a rising pitch modulation.
- RAMP - Inverse sawtooth wave for a falling pitch modulation.
- NOIZ - Noise waveform for random pitch modulation.

Link

This parameter enables you to assign the vibrato effect to either layer 1 or layer 2 of the synth. This allows for targeted vibrato application, adding modulation to specific parts of your sound design.

Sync

This ` parameter allows you to lock the vibrato to a division of the clock (internal or external MIDI). This ensures the vibrato is in time with the overall tempo of your piece. The available divisions are the same as those used for the arpeggiator:
- 4BAR
- 2BAR
- 1BAR
- 1/15
- 1/2
- 1/3
- 1/4
- 1/6
- 1/8
- 1/12
- 1/16
- 1/32

TREMOLO

TWISTfm's stereo tremolo effect allows for smooth, slow modulations or super-fast gate effects, offering a versatile range of dynamic control. The tremolo includes a variety of waveforms, and the left and right channels can be set out of phase to create wide auto-pan effects. Thanks to a high-end stereo volume control IC with zero-crossing technology, the tremolo ensures precise and seamless modulation.

Rate

The RATE parameter controls the speed of the tremolo effect, allowing you to adjust how quickly the volume oscillates. This can range from smooth, slow modulations to rapid, pulsating effects. You can also use the vibrato rate fader combined with the menu button to set this parameter.

Depth

The DEPTH parameter determines the intensity of the tremolo effect. You can set it for subtle volume variations or for dramatic, deep modulations that significantly alter the sound dynamics. You can also use the vibrato depth fader combined with the menu button to set this parameter.

Waveform Selection (WAVE)

This parameter allows you to choose from several different waveforms for the tremolo effect:

- SINE: Provides a smooth and continuous volume modulation.
- RECT: Creates sharp, abrupt changes in volume.
- SAW: Produces a rapid increase and slow decrease in volume.
- RAMP: Inversely, creates a slow increase and rapid decrease in volume.
- NOIZ: Generates random volume modulation for a more chaotic effect.

Phase (PHAS)

This parameter adjusts the phase offset between the left and right channels of the tremolo effect. This can create wide auto-pan effects by setting the channels out of phase, giving a sense of movement and space to your sound.

Sync

This parameter allows you to synchronize the tremolo rate to the internal clock or an external MIDI clock. This ensures that the tremolo effect is perfectly timed with the overall tempo of your music. You can also set the tremolo to free timing if you prefer independent modulation. The available divisions are the same as those used for the arpeggiator:

- 4BAR
- 2BAR
- 1BAR
- 1/15
- 1/2
- 1/3
- 1/4
- 1/6
- 1/8
- 1/12
- 1/16
- 1/32

SEQUENCER

TWISTfm's internal polyphonic sequencer allows you to create intricate and dynamic patterns. Below is a detailed description of each parameter available in the sequencer.

Stop/Start
To stop or start the sequencer, hold the menu button and press the play button. Note that the play button also functions as the envelope link button.

Edit
Allows you to enter the sequencer edit mode, where you can modify individual steps, notes, and other sequence attributes. Refer to the **Sequencer Edit Process** section below for more details.

Rate
Controls the tempo of the sequencer. When the sync parameter is enabled, this rate can be set to specific time divisions relative to the master clock (internal or external MIDI), such as 4BAR, 2BAR, 1BAR, 1/15, 1/2, 1/3, 1/4, 1/6, 1/8, 1/12, 1/16, and 1/32. Alternatively, it can be set to free timing.

You can also adjust the sequencer rate by holding the play button and turning the encoder.

Note
The note parameter determines how the sequencer interacts with the notes you play on your MIDI keyboard. It has three modes:

- **OFF**: Disables note sequencing. The sequencer will not affect the pitch of the notes played.
- **ABS (Absolute)**: In this mode, the sequencer sets the voice to absolute notes, ignoring the key you are playing on the MIDI keyboard. Each step in the sequence will output the exact note value programmed, regardless of the incoming MIDI note.
- **RELA (Relative)**: In relative mode, the sequencer changes the note relative to the note you are playing on the MIDI keyboard. The steps in the sequence will transpose based on the key you press, allowing for dynamic and musical interaction between your playing and the sequence.

Fader (On or Off)
When the fader is on, the sequencer will play back pre-recorded fader positions. Turn it off if you only wish to sequence notes.

Clear
Clears the current sequence, resetting all steps to their default values.

Length
Sets the length of the sequence (1 to 128), determining how many steps the sequencer will play before looping. Hold menu to increase or decrease the length by 10 step increments.

Loop
Enables or disables looping of the sequence. When enabled, the sequence will continuously loop based on the set length.

Retrigger
Determines if the sequence should retrigger with the voice..

Latch
When enabled, the sequence will continue to play even after the key is released, until it is manually stopped.

Sync
Synchronizes the sequencer to the master clock (internal or external MIDI), ensuring the sequence plays in time with other synchronized devices. When sync is enabled, the rate parameter divisions (4BAR, 2BAR, 1BAR, 1/15, 1/2, 1/3, 1/4, 1/6, 1/8, 1/12, 1/16, 1/32) are used.

Direction
Sets the direction of the sequence playback. Options include:

- Forward: Plays the sequence from the first step to the last.
- Reverse: Plays the sequence from the last step to the first.
- Ping-pong: Plays the sequence forward and then in reverse.
- Random: Plays the sequence steps in a random order.

SEQUENCER EDIT

Follow this step-by-step guide to edit sequences on your TWISTfm synthesizer.

Entering and Exiting the Sequencer Editor

1. Entering the Editor:
    - Press the encoder with **EDIT** selected to enter the sequencer editor mode.
    - The display will alternate between showing the note name of the current step (e.g., C-1) and the current target step.
2. Exiting the Editor:
    - Press **menu** at any time to exit the sequencer editor.

Editing Steps

1. Selecting a Step:
    - Turn the encoder to select the step number you wish to edit.
    - The display will briefly show the current step number immediately after turning the encoder.
    - After a moment, the display will revert back to showing the note and octave of the selected step.
2. Setting the Note:
    - To set the note for the selected step, simply play a note on your MIDI keyboard.
    - TWISTfm will learn from the incoming note and set the step to this note.

Gate (Triggering) Behavior

For each step, you can determine the gate behavior using the three LFO link buttons:

1. Key Down (Downward Arrow):
    - Indicates a trigger (like pressing a key).
    - The step will play the note and trigger the synthesizer's envelopes.
2. Tie (Solid Horizontal Line):
    - Makes the sequencer step tie to the next one.
    - The synth isn’t triggered nor killed; it simply holds from the previous step.
    - You can still change the note during a tie, as it only affects the gate behavior.
3. Key Up (Upward Arrow):
    - Closes the gate (like lifting your finger off the key).
    - The step will end the note.

Fader Automation

1. Recording Fader Positions:
    - When in step edit mode, you can record up to 10 fader positions.
    - Move a fader to record its position.
    - The fader position will be recalled (modulated) on that step, provided that **FADER** parameter is set to **ON**..

MIDI IMPLEMENTATION

You can control TWISTfm via MIDI by sending it the following control change (CC) messages. Using MIDI CC allows you to dynamically adjust various parameters of the synth in real-time and seamlessly integrate TWISTfm into your MIDI setup for a more interactive and responsive performance experience.

Below is the chart of CC messages and the corresponding parameters they control:

CC	Parameter	CC	Parameter	CC	Parameter	CC	Parameter	CC	Parameter	CC	Parameter
10	ALGO_1	49	DECAY_2	62	DECAY_4	14	WAV_6	56	GLIDE	65	PRESSURE_ATTACK
13	VOL_1	52	SUSTAIN_2	36	SUSTAIN_4	17	MULT_6	59	RISE	67	PRESSURE_DEPTH
16	FEED_1	55	RELEASE_2	33	RELEASE_4	20	ATTACK_6	64	FALL	69	PRESSURE_RELEASE
19	WAV_1	58	VOL_3	9	ALGO_5	23	DECAY_6	66	VIBRATO_RATE	71	ENV_DEPTH
85	FAT_1	61	WAV_3	12	VOL_5	26	SUSTAIN_6	68	VIBRATO_DEPTH	73	ENV_ATTACK
22	MULT_1	48	MULT_3	15	FEED_5	29	RELEASE_6	72	LFO_DEPTH_1	75	ENV_DECAY
25	ATTACK_1	51	ATTACK_3	18	WAV_5	32	FILTER_CUT	70	LFO_RATE_1	81	ENV_SUSTAIN
28	DECAY_1	54	DECAY_3	86	TUNE_5	35	FILTER_RES	94	LFO_SHAPE_1	76	ENV_RELEASE
31	SUSTAIN_1	57	SUSTAIN_3	21	MULT_5	38	FILTER_TYPE	82	LFO_DEPTH_2		
34	RELEASE_1	60	RELEASE_3	24	ATTACK_5	41	FILTER_ENV	78	LFO_RATE_2		
37	VOL_2	63	VOL_4	27	DECAY_5	44	FILTER_ATTACK	77	LFO_SHAPE_2		
40	WAV_2	45	WAV_4	30	SUSTAIN_5	47	FILTER_DECAY	79	LFO_DEPTH_3		
43	MULT_2	42	MULT_4	8	RELEASE_5	50	FILTER_SUSTAIN	80	LFO_RATE_3		
46	ATTACK_2	39	ATTACK_4	11	VOL_6	53	FILTER_RELEASE	83	LFO_SHAPE_3		

Note on MIDI Over Traditional DIN and Its Limitations

During extensive testing, we observed that MIDI over traditional DIN connections can exhibit some limitations, particularly under heavy data loads. When transmitting many notes simultaneously, combined with high-resolution data such as polyphonic aftertouch and clock signals, some clock irregularities can occur. This is due to the inherent limitations of the traditional MIDI baud rate.

We noticed similar issues with other high-end synthesizers from reputable manufacturers, leading us to conclude that these irregularities are a consequence of the actual limitations of the traditional MIDI protocol's baud rate.

Recommendations:

- **Use USB Over MIDI**: For the most reliable performance and to avoid clock inconsistencies, we recommend using USB over MIDI. TWISTfm's class-compliant USB MIDI interface offers a more robust and higher bandwidth connection, ensuring smoother and more accurate data transmission.
- **Internal Clock**: Alternatively, consider using TWISTfm's internal clock to maintain precise timing and synchronization, especially in scenarios involving dense MIDI data.

FIRMWARE UPDATES

Updating the firmware of your TWISTfm is a straightforward process performed exclusively with the included micro SD card and its USB SD card reader. Follow these steps to update your firmware:

1. **Prepare the Firmware File**: Copy the `FirmwareXX.bin` file, where `XX` indicates the version number, onto the micro SD card.
2. **Insert the SD Card**: Insert the micro SD card into the slot on your TWISTfm.
3. **Automatic Detection**: TWISTfm will automatically detect the firmware file. If multiple `FirmwareXX.bin` files are present, TWISTfm will use the highest version and delete all others.

Important Notes:

- **Non-Sequential Updates**: Firmware updates do not need to be sequential. You can update or downgrade to any version regardless of the previous version installed.
- **Alternate SD Card Readers**: You don't have to use the supplied USB SD card reader. If another reader is more convenient, feel free to use it.
- **Firmware Version Display**: The current firmware version will always be displayed at startup, confirming that the update was applied.
- **Extended Boot Time**: Note that the boot process can take several seconds longer than normal when a firmware file is detected on the card.

FREQUENTLY ASKED QUESTIONS

- **What's the included USB memory stick for?**

  The included device is actually a microSD card reader. It's useful for transferring firmware updates to the microSD card and managing presets. To use it, insert the microSD card into the small slot above the USB connector, with the printed side of the card facing away from the USB connector.