BeetTweek
User Manual

Version 1.9

subMatrix LLC

June 18, 2025

Contents

1 Introduction

BeetTweek is a unique controller module, opening up the possibilities of haptic feedback to music-making. The module features 1 custom-made haptic force-feedback knob that can apply forces to your hand, twist/turn on it's own, and wiggle in response to external control voltage (CV).

The module can be used to take musical signals and translate them into forces that can be felt in your hand, and in tandem, generate interesting outputs that correspond to your interaction with the knob.

There are 8 different MODES offering many different ways to patch and interface with BeetTweek. The module is designed to work with both Audio-Rate signals and Low frequency Modulation signals (CV) and features Audio-rate processing on all its INPUTS and OUTPUTS. BeetTweek can also Record and Playback sequences and gestures on any of it's 8 MODES in sync to external clock signals.

We hope you enjoy using BeetTweek! In the following sections you will find more details on how to use the Module.

Thank You,
subMatrix LLC

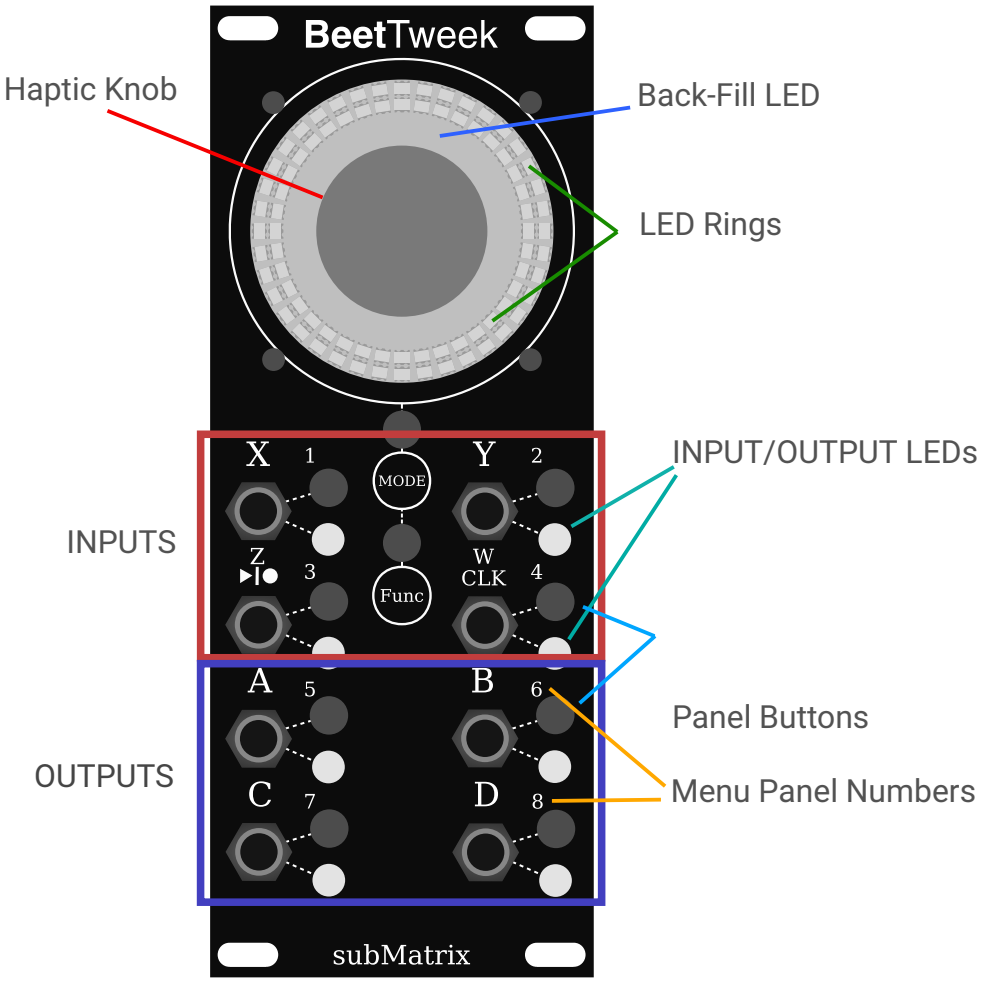
2 Navigating The Interface

The module features 4 multipurpose *CV*/*VOCT*/*GATE* inputs and 4 *CV*/*VOCT*/*GATE* outputs.
On the front panel, The INPUTS are labeled **X,Y,Z,W** and the OUTPUTS are labelled **A,B,C,D**. Each INPUT and OUTPUT has a corresponding Button and Color LED indicated by the connecting dotted lines on the front panel. The Color LED's indicate the state of the input or output by displaying *CV* voltage level with an Intensity proportional to the voltage level. similarly they will indicate *V*/*OCT* pitch by Pitch-Color Depending on the selected MODE.

Around the Haptic Knob there are 88 Color LED's. These are to give visual feedback for the MODE that is currently selected. They are placed in a configuration of 2 rings. These rings usually show the current angle of the knob as well as other indicators depending on the selected MODE.

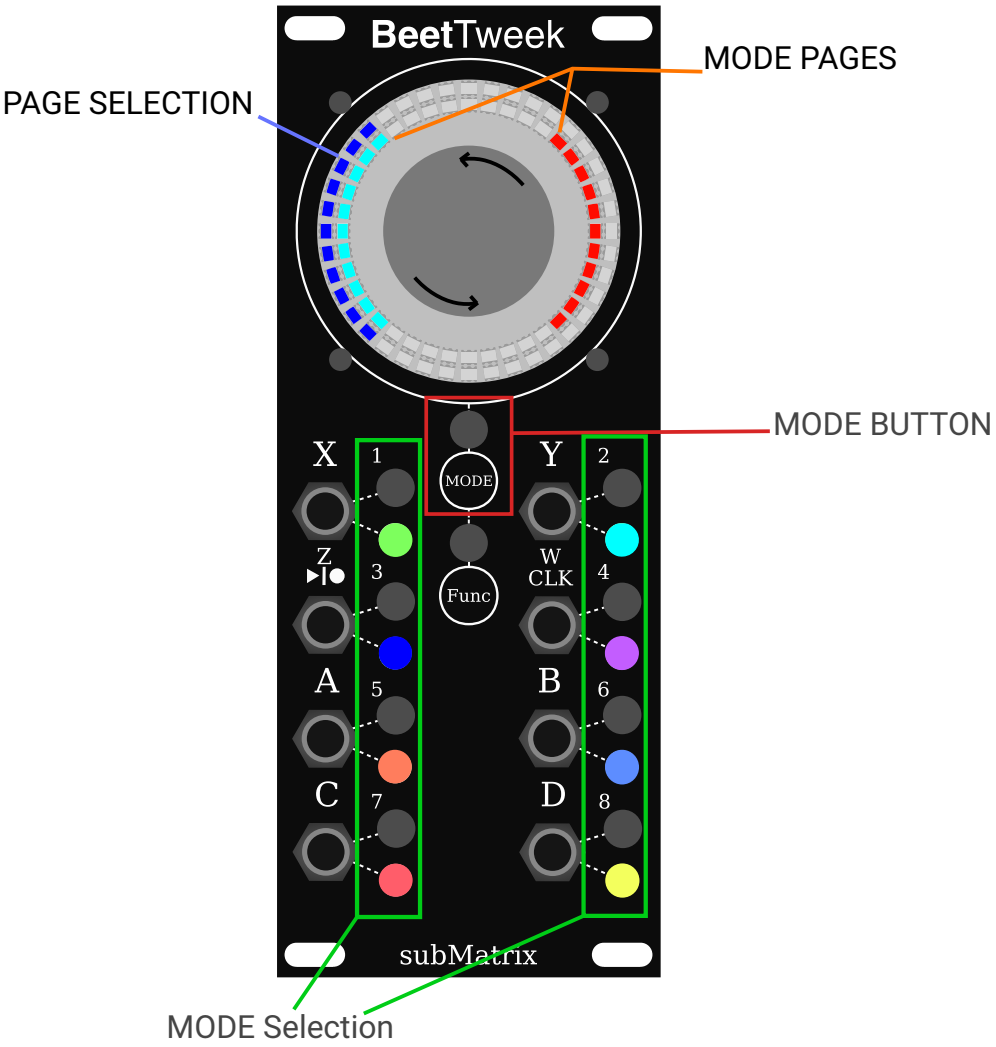
Behind and between the Haptic Knob and the LED Rings is the WHITE Back-Fill LED section. This is for indicating Gesture recording state. Described in detail later in this manual

There are also MENU Panel Numbers adjacent to each Panel Button. These are for MENU selection and identify unique selections that do not correspond to the INPUT/OUTPUT Jack.


BeetTweek
Haptic Knob
Back-Fill LED
LED Rings
INPUT/OUTPUT LEDs
INPUTS
OUTPUTS
Panel Buttons
Menu Panel Numbers
X
1
MODE
Y
2
Z
3
Func
W
CLK
4
A
5
B
6
C
7
D
8
subMatrix

2.1 MODES

To change the operating mode press the MODE Button. This will enter the MODE selection menu. You will see the LED's flash while indicating the module is waiting for a button press. The LEDs around the Haptic Knob indicate the current PAGE of MODE Selection, each PAGE has up to 8 Modes. Rotate the Haptic Knob to change the current PAGE. Press any of the 8 Buttons on the main panel of the module to select a mode. Each mode is identified by a unique color (within the current PAGE). Once a button is pressed the module will change to the corresponding mode. If you want to exit the mode selection menu without changing the current mode you can press MODE again and the module will exit the menu.

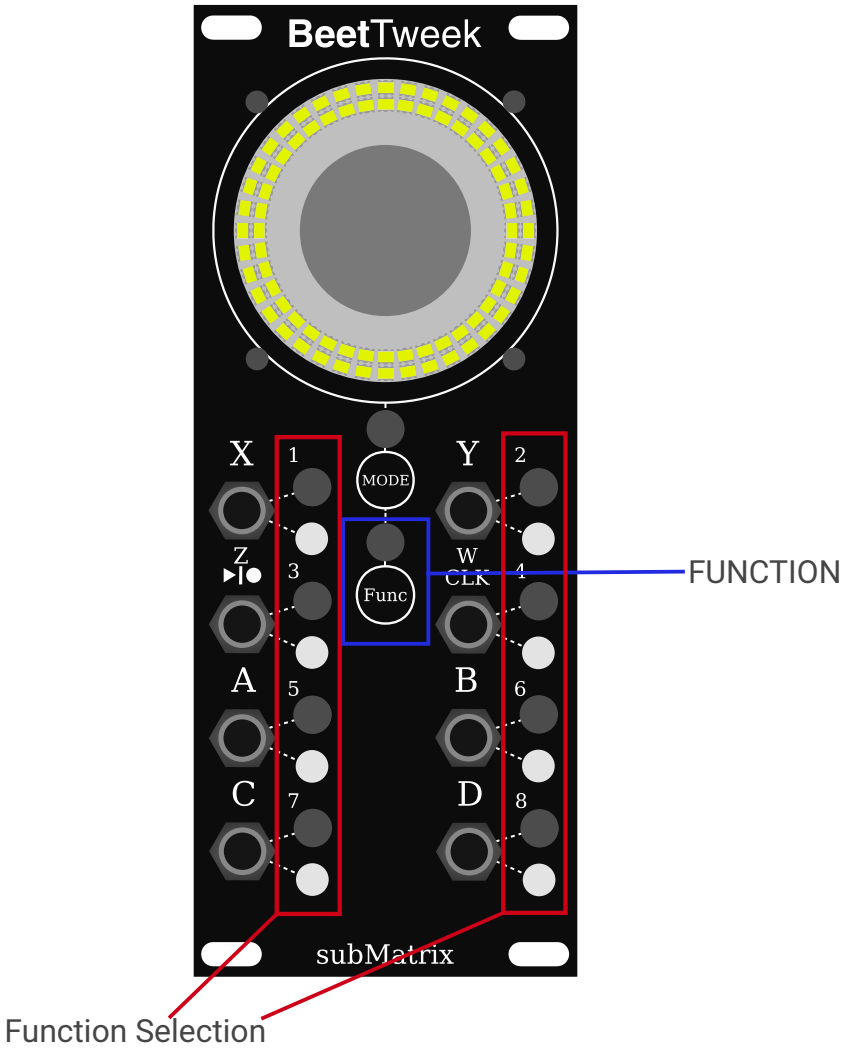


2.2 QUICK ACTIONS

Some MODES have QUICK ACTIONS assigned to buttons on the main panel. These are actions that happen immediately upon pressing the button. These are immediate interactive actions like TAP-TEMPO etc, and are related to the INPUT/OUTPUT adjacent to the button.

2.3 FUNCTIONS

MODES can also have extra settings that can be changed or actions to be performed. Changing these settings is possible by using the FUNC button and then pressing a corresponding button on the main panel. If the INPUT/OUTPUT of the button has no QUICK ACTIONS or AUGMENTS, simply pressing the button without using FUNC will also work.



To activate a FUNCTION:

1. Press the FUNC button.
2. The module will then flash all the RING LEDs indicating the module is in the FUNCTION menu. On the main panel, if a FUNCTION is available for an INPUT/OUTPUT button - it will flash along with the RING LED's.

3. Press a flashing button to activate the corresponding function.

If you are in the FUNCTION menu and decide you wish not to activate a function, pressing FUNC again to exit the FUNCTION menu.

2.4 INPUT/OUTPUT AUGMENTS

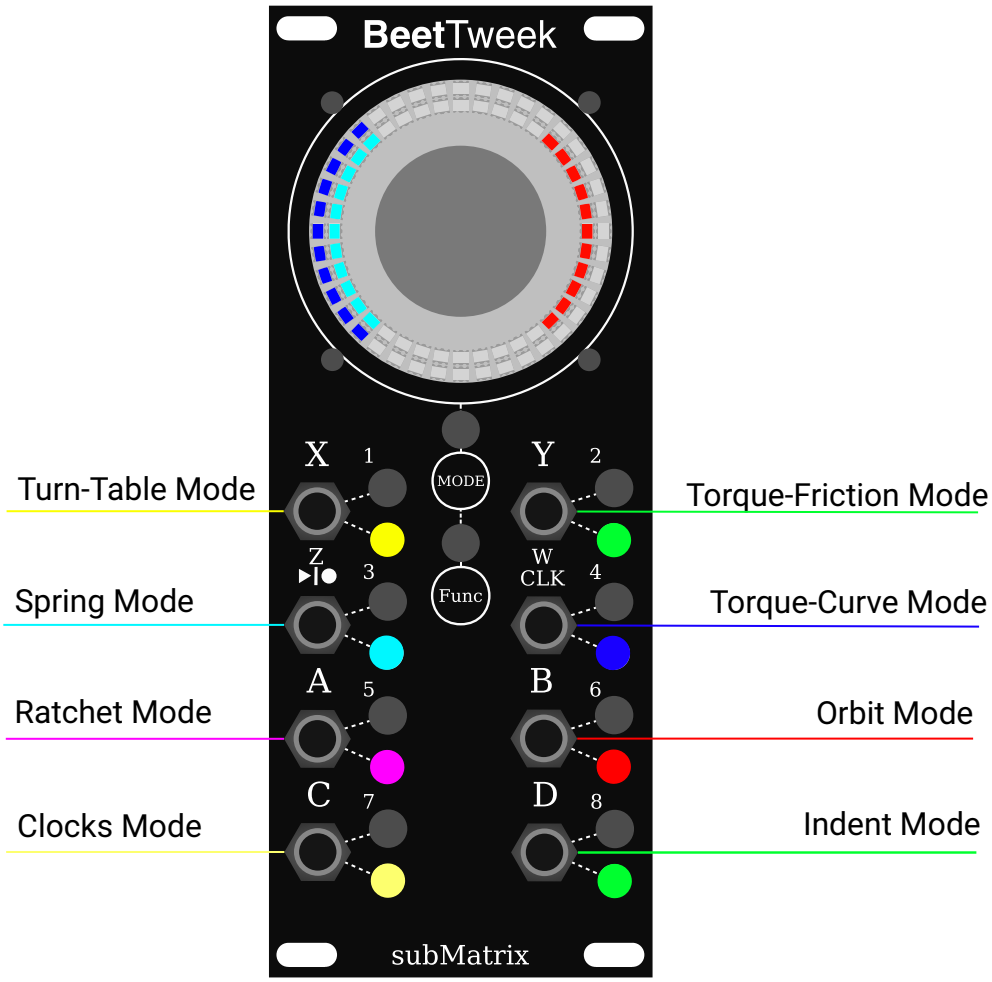
Depending on the selected MODE, sometimes INPUTS and OUTPUTS have a number of AUGMENTS that can be cycled through. For example an OUTPUT may function as an oscillator, Changing it's AUGMENT would change it's waveform from *SINWAVE* $\rightarrow$ *RAMP* $\rightarrow$ *SQUARE* $\rightarrow$ *ETC*...

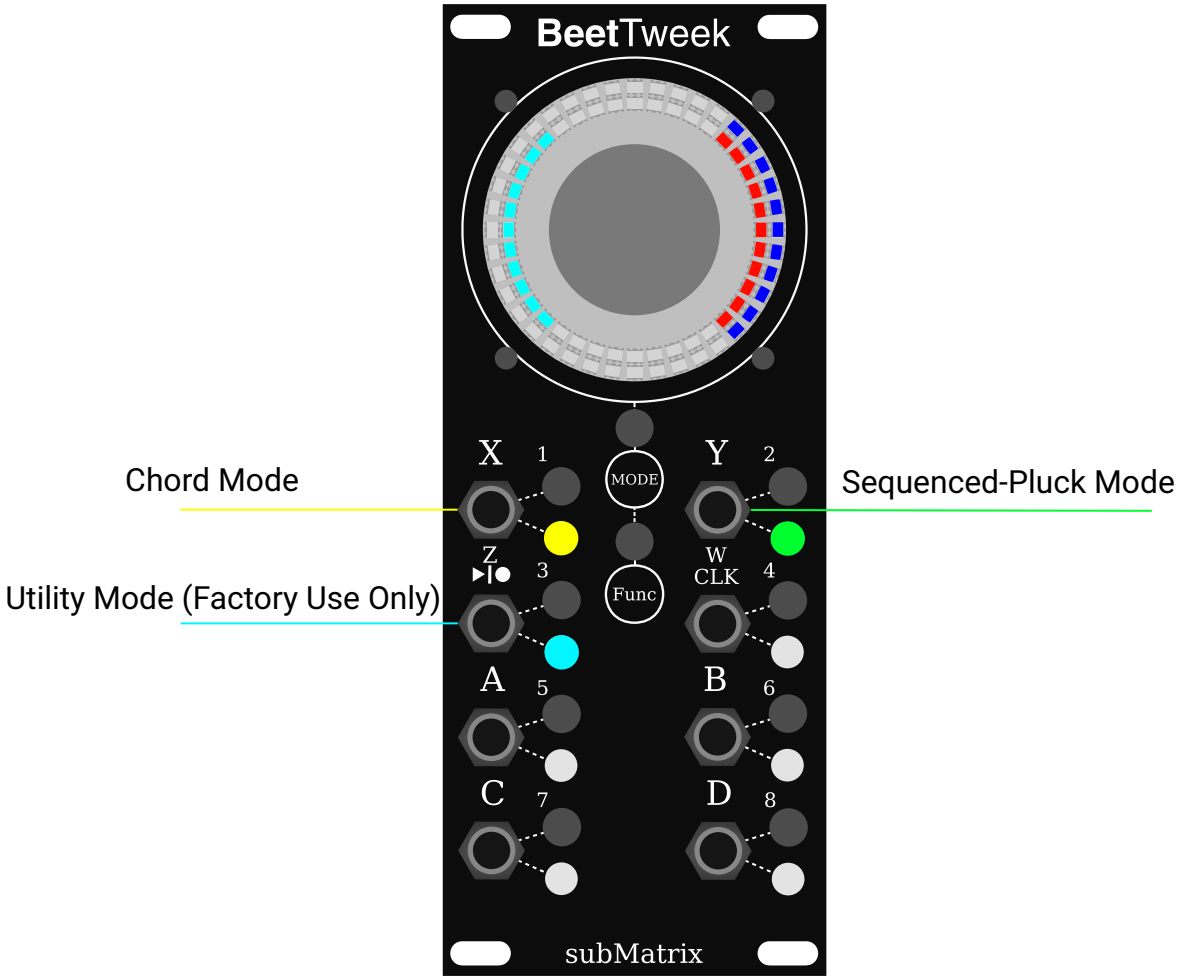
Similarly an INPUT might be changed to expect a high-frequency signal or a DC V/OCT signal as different ways to track frequency.

To change an INPUT/OUTPUT's AUGMENT, press it's corresponding button. The INPUT/OUTPUT will then cycle through it's AUGMENTS if there are any available. If the Input has a QUICK ACTION and you want to access It's AUGMENTS. Press FUNC + BUTTON to cycle its AUGMENTS.
A button will not have both a FUNCTION and an AUGMENT.

3 Modes

Below is an access diagram of all the MODES currently available on BeetTweek on pages 1 and 2. Pages can be selected by rotating the Haptic Knob to select the left(1) or right(2) page. With each MODE you will find a description, diagram, and a list of available AUGMENTS, QUICK ACTIONS and FUNCTIONS:




Chord Mode
Utility Mode (Factory Use Only)
Sequenced-Pluck Mode
BeetTweek
X
1
MODE
Y
2
Z
3
Func
W
CLK
4
A
5
B
6
C
7
D
8
subMatrix

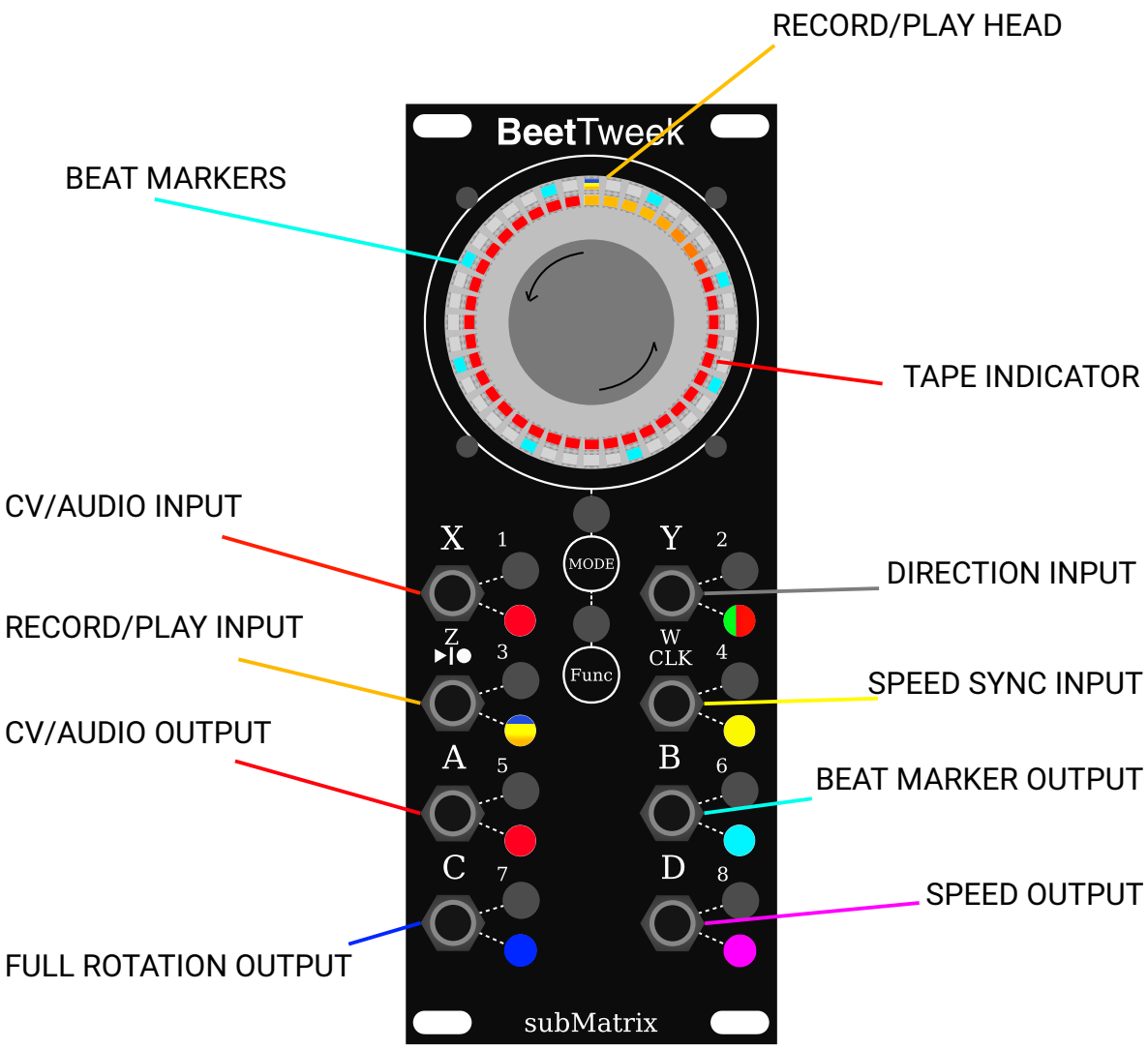
3.1 Turn Table Mode (DJ Mode)

Turn Table mode changes BeetTweek into a small DJ Turn Table.

The Table has a virtual TAPE surface indicated by the RED inner circle on the LED RINGS. The TAPE is directly connected to the KNOB/Table and can be used to RECORD and PLAYBACK AUDIO/CV signals.

The Table can be spun forward and backward and it will retain it's speed. There are 8 beat markers around the table and a HEAD marker on the very top. When the HEAD reaches a beat marker, a pulse is emitted on the BEAT MARKER OUTPUT.

The Turn-Table can also spin in synchronization to a external BPM. The RECORD/PLAYBACK INPUT dictates RECORD or PLAYBACK mode. In PLAY-BACK mode the table can be turned with your hand to create DJ scratching effects. OUTPUTS can be used to synchronize with external modules and samplers.



The RECORD/PLAY INPUT ($\frac{Z}{\blacktriangleright|\bullet}$) is used to RECORD or PLAYBACK signals from the CV/AUDIO INPUT (**X**). The RECORD/PLAY INPUT is a GATE signal that is in RECORD Mode when the SIGNAL is Less than 2.5V and PLAY mode when the signal is greater than 2.5V.

NOTE: The ($\frac{Z}{\blacktriangleright|\bullet}$) used by this mode is also used for the Gesture Interface as a separate Augment. To use the Gesture Interface, press *FUNC* $\rightarrow$ 3 $\frac{Z}{\blacktriangleright|\bullet}$ for gesture control. To switch back to RECORD/PLAY INPUT for this mode, press *FUNC* $\rightarrow$ 3 again.

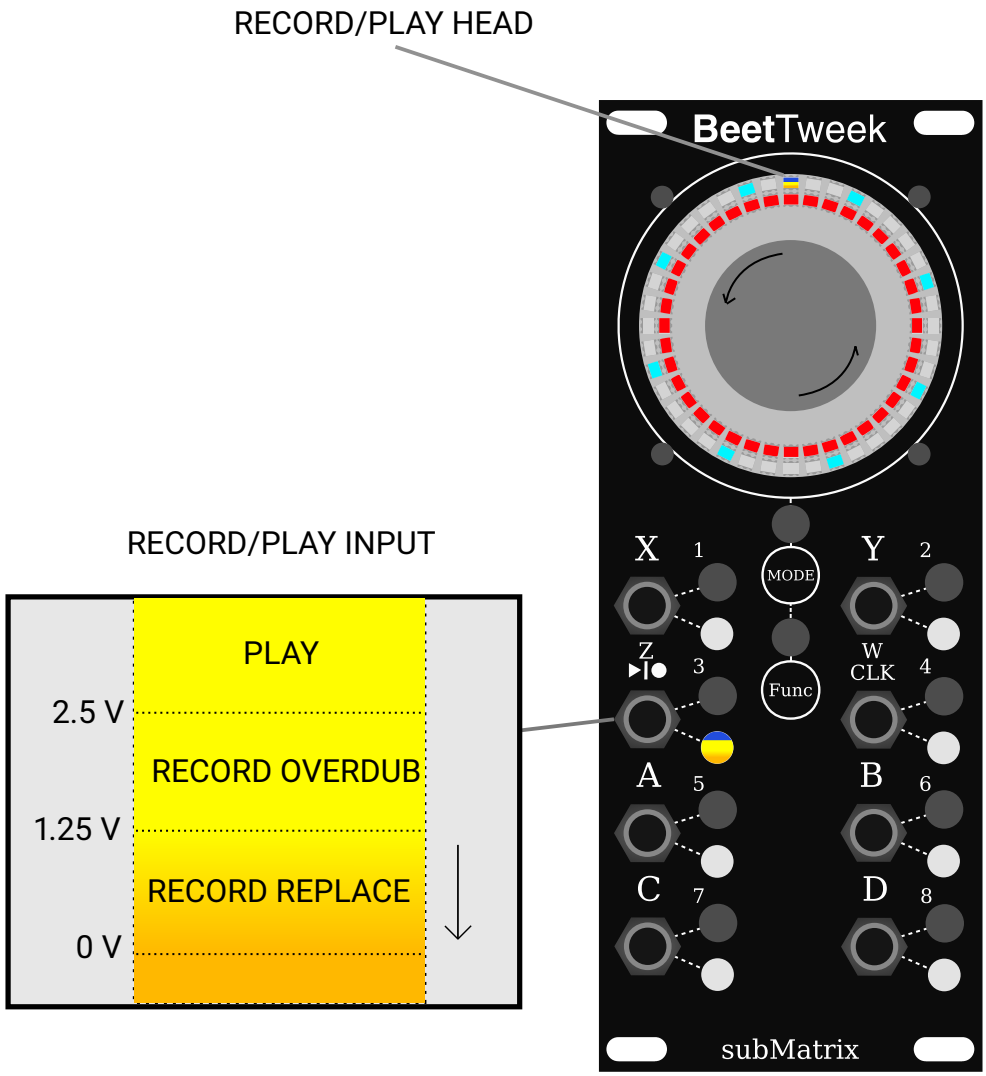
In RECORD Mode $\frac{Z}{\blacktriangleright|\bullet}$ and RECORD/PLAY HEAD will show YELLOW and

ORANGE . Signals Incoming on **X** are recorded to the TAPE from the TAPE HEAD and additionally passed to the **A** OUTPUT.

When $\frac{Z}{\blacktriangleright|\bullet}$ is between 1.25V and 2.5V, the indicator will show YELLOW indicating that recording signals are mixed in with previously recorded signals. This is good for adding sound layers to the tape.

When $\frac{Z}{\blacktriangleright|\bullet}$ is below 1.25V, the indicator will transition from YELLOW to ORANGE. ORANGE indicating that recording signals completely overwrite (replace) existing recordings. This can also be used to clear the tape by recording nothing on **X**. recordings are completely overridden when $\frac{Z}{\blacktriangleright|\bullet}$ is 0V or below. When $\frac{Z}{\blacktriangleright|\bullet}$ is between 1.25V and 0V, existing recordings are mixed in at a diminishing mix level.

In PLAY Mode $\frac{Z}{\blacktriangleright|\bullet}$ and RECORD/PLAY HEAD will show BLUE. The CV/AUDIO OUTPUT (**A**) Outputs the signal that was previously recorded at the current TAPE position.



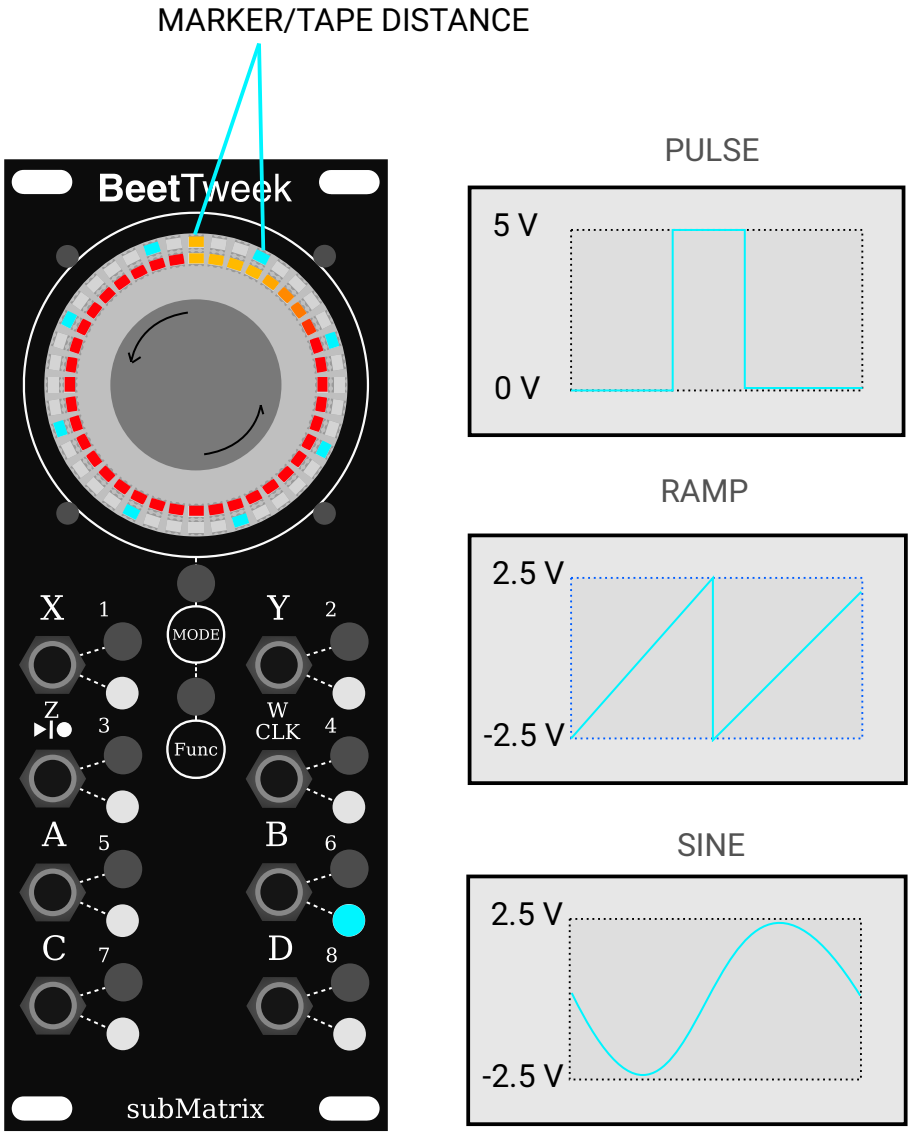
The BEAT MARKER OUTPUT (**B**) is used to synchronize other modules to the current position of the rotating TAPE. Its output directly correlates with the CYAN BEAT MARKERS on the LED RING.

There are 3 AUGMENTS for the BEAT MARKER OUTPUT:

1. **GATE SIGNAL**
   When the BEAT MARKER is near the TAPE HEAD, a HIGH (5 Volt) Signal is emitted. This appears as a pulse if the table is turning.

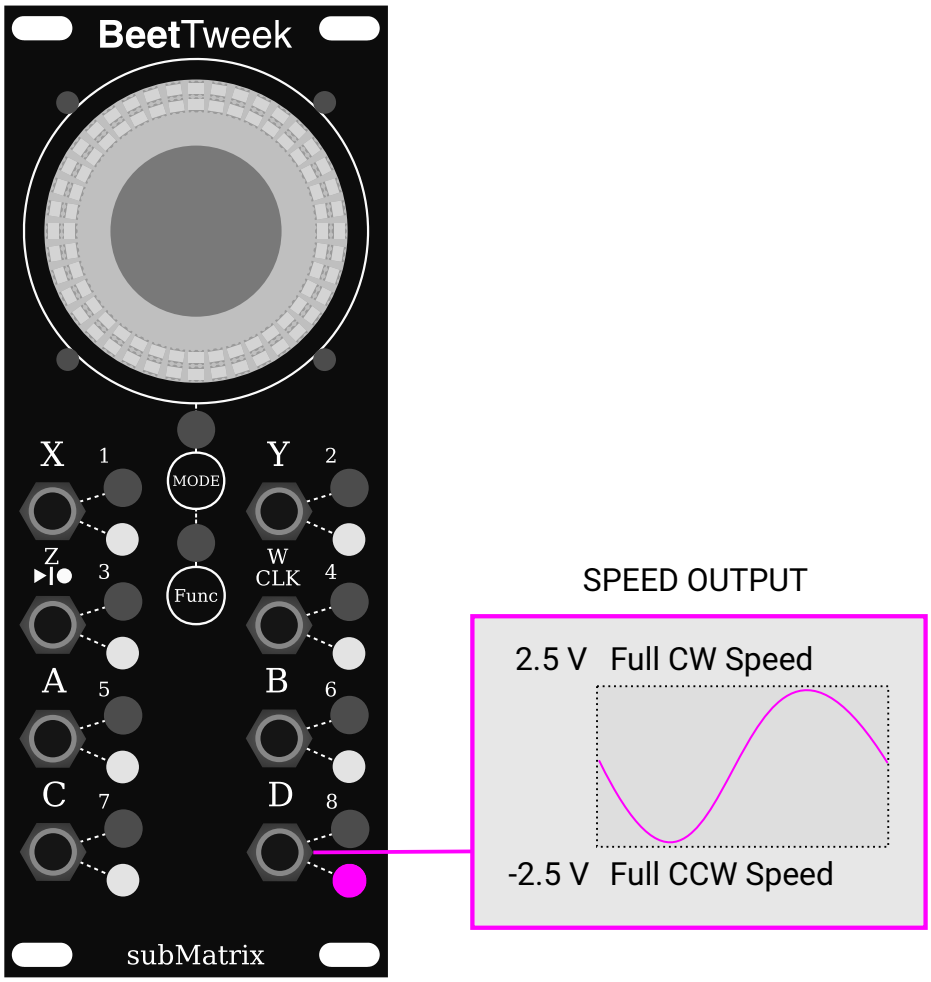
2. **RAMP WAVE**
   A RAMP wave with output proportional to the distance the BEAT MARKER is to the TAPE HEAD.

3. **SINE WAVE**
   A SINE wave with ANGLE proportional to the distance the BEAT MARKER is to the TAPE HEAD.



Similarly to the BEAT MARKER OUTPUT (**B**), The FULL ROTATION OUTPUT (**C**) Also has the same 3 AUGMENTS as above. Wave-forms instead of cycling Every BEAT MARKER, are cycled every full rotation of the HAPTIC KNOB.

The SPEED OUTPUT (**D**) Outputs the current SPEED of the HAPTIC KNOB. The Voltage Level Indicates the KNOB's speed and direction:



The Turn Table can be set to rotate at a desired speed using the SPEED SYNC INPUT ($\frac{W}{CLK}$). If an input is connected to $\frac{W}{CLK}$ and it contains a GATE signal running at a certain BPM (Beats Per Minute), The Table will start turning at the speed of that BPM Signal.

SPEED SYNC INPUT ($\frac{W}{CLK}$) Has 2 Augments:

1. **BPM (YELLOW)**
   Table Turn Speed is matched to the input GATE signal's BPM.

2. **VOLT SPEED (PURPLE)**
   Table Turn Speed is proportional to Voltage Level of $\frac{W}{CLK}$.

If the Turn Table is rotating from an external signal on $\frac{W}{CLK}$, the direction of the spin can be changed using the DIRECTION INPUT (**Y**). The Direction can be FORWARD, BACKWARD, or STOPPED. The Voltage Level of DIRECTION INPUT (**Y**) directly determines the direction. Button 2 (**Y**) can also be tapped

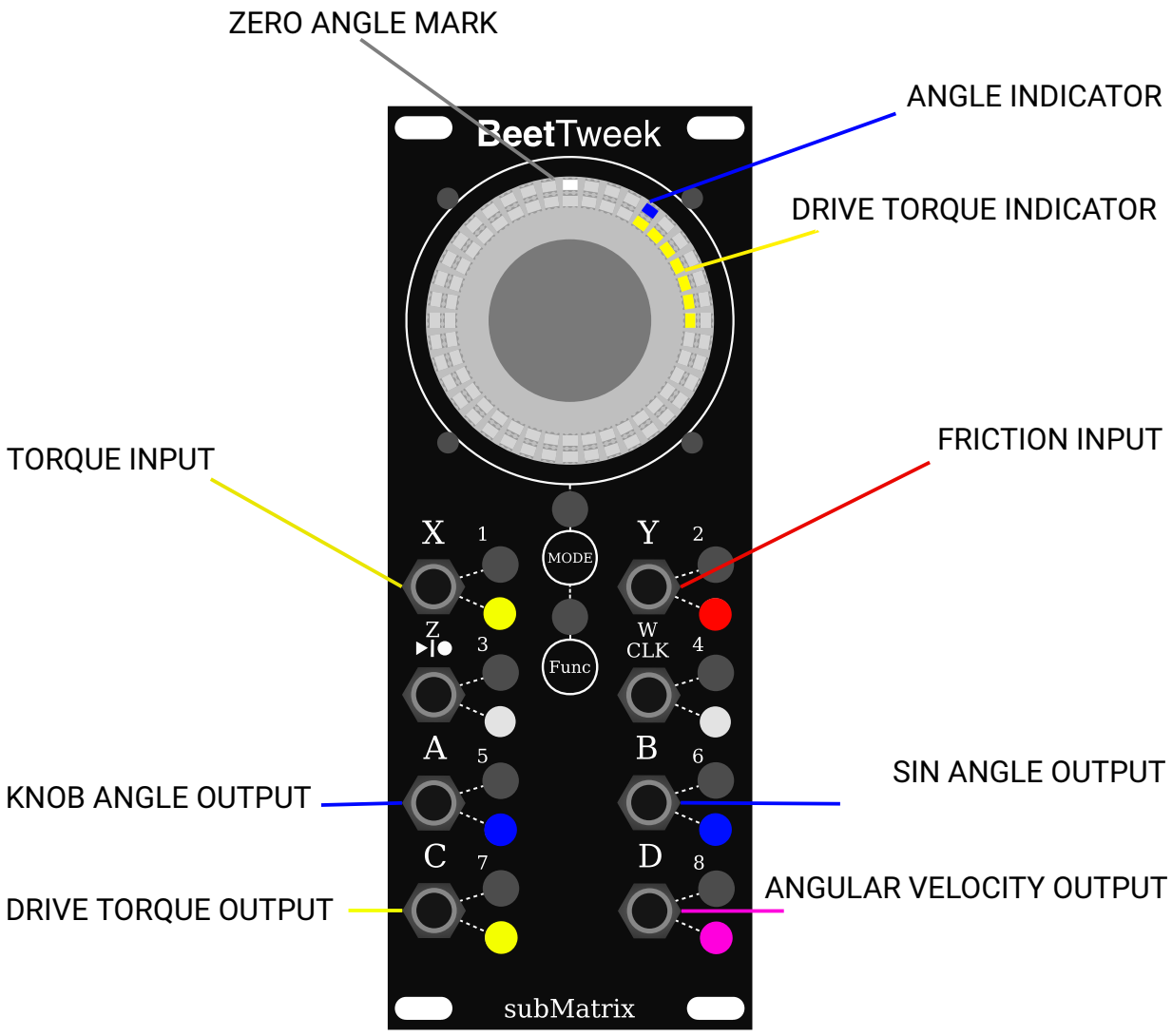
using its QUICK ACTION to Cycle through the directions without a cable connected.

To disable speed tracking of the table: remove any cables from $\frac{W}{CLK}$, and press and hold BUTTON 4 to until the color turns WHITE. This will release the TAP TEMPO and allow the table to spin freely.

While the table is in playback mode, Button 1 can be pressed to save a separate recording of the buffer to the SD-Card. The file will be labeled "SAVED_SCRUB_X" where X is the number of times you press the button. Once finished - you can save the files off of the SD Card or rename a SAVED_SCRUB to "Scrub" to use a specific SAVED_SCRUB on next power on.

3.2 Torque-Friction Mode

In this mode, the HAPTIC KNOB is free to spin, while the input CV signals control how much torque and friction is applied to the knob, when a positive INPUT signal is used, the knob will rotate in a clockwise direction, when a negative signal is used, the knob will rotate in a negative direction. Friction input creates friction against movement. Complex input signals can be used to generate complex forces on the knob. OUTPUTS correspond to rotational state of the knob.



The TORQUE INPUT (**X**) drives the HAPTIC KNOB CLOCKWISE and COUNTER-CLOCKWISE with torque proportional to the input voltage. The DRIVE TORQUE INDICATOR indicates the direction of this torque around the knob as well as

the magnitude as shown by the its length. The Indicator starts at the ANGLE INDICATOR and extends in the direction of torque.

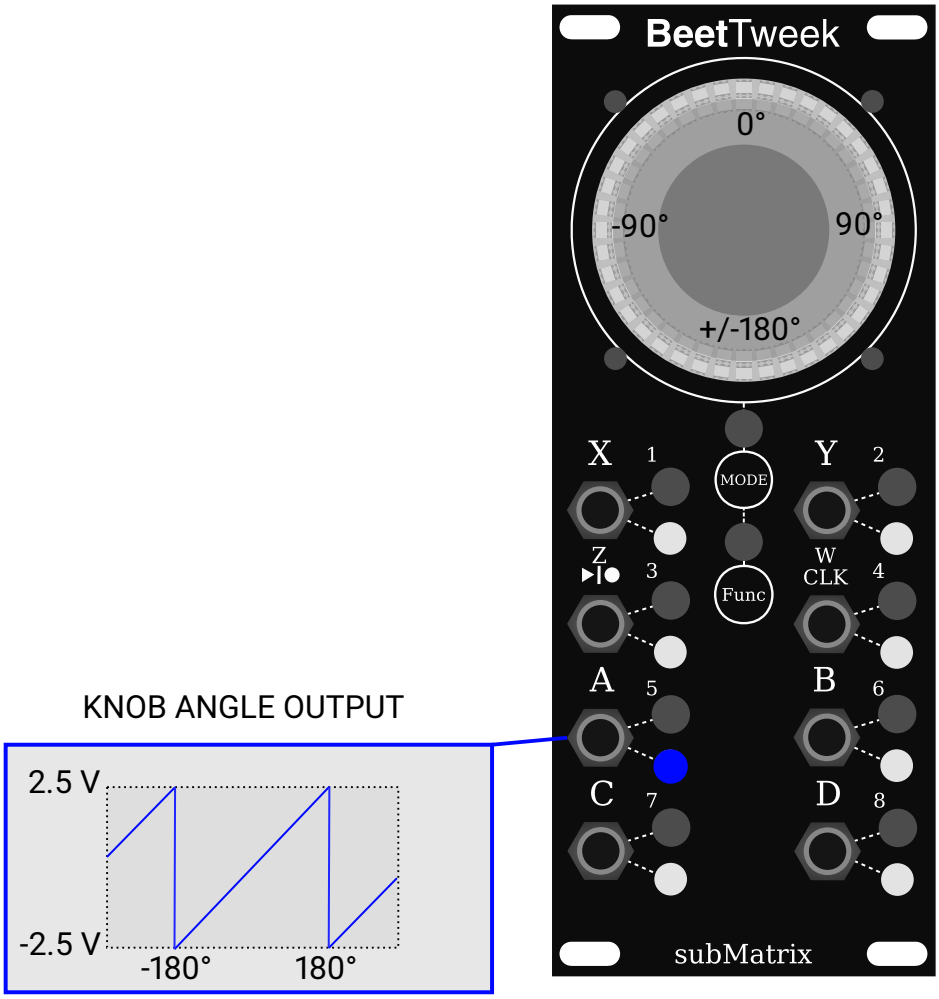
The **X** INPUT has 2 AUGMENTS for configuring accepted voltage ranges:

- TORQUE (CV Range): Torque Input in the CV range
- TORQUE (Small Signal Range): Torque Input in the small signal range (-0.25V to 0.25v). Useful for sensing quiet audio signals.

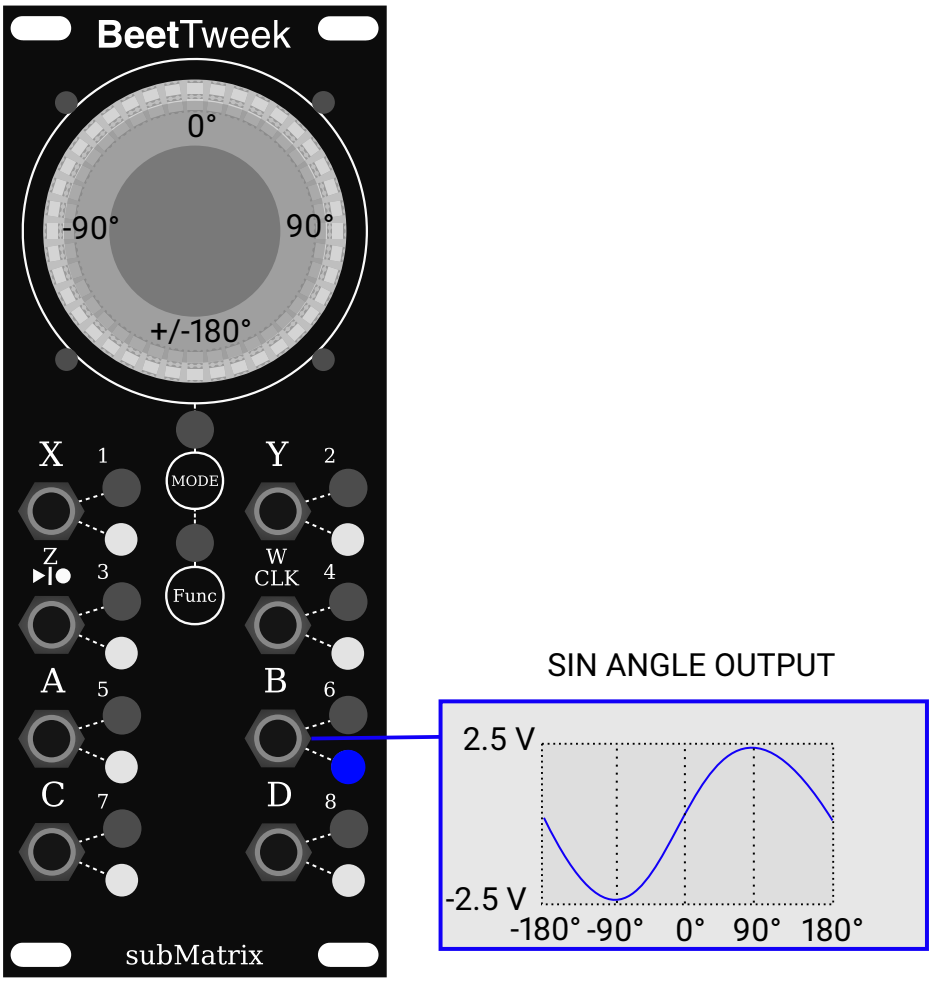
The **Y** INPUT has 2 AUGMENTS:

- FRICTION: An addition friction as a torque force proportional to the current ANGULAR VELOCITY. The amount of friction added is proportional to the input voltage. The larger the voltage value the harder the HAPTIC KNOB will be to turn from user twisting force or TORQUE INPUT.
- TORQUE ADDITION: An additional Torque force added to the TORQUE INPUT (**X**). The final torque added to the knob will be the SUM of both inputs.

The KNOB ANGLE OUTPUT (**A**) Outputs a voltage proportional to the current angle of the HAPTIC KNOB, and will reset its value every 360 degrees:



The SIN ANGLE OUTPUT (**B**) Outputs a voltage proportional to the sin of the current angle of the HAPTIC KNOB, and will cycle every 360 degrees:

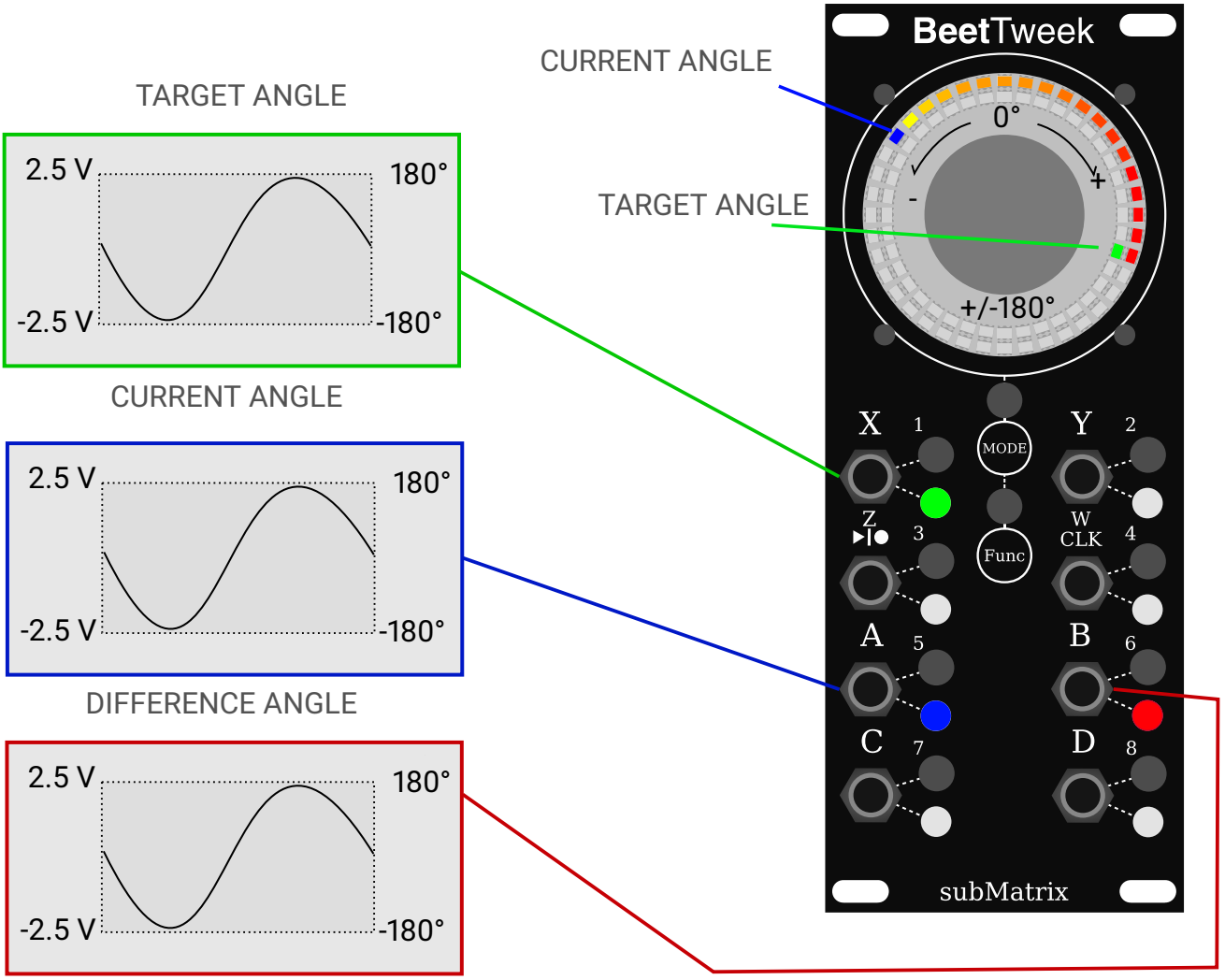


The DRIVE TORQUE OUTPUT(**C**) Outputs a voltage proportional to the current DRIVE TORQUE of the knob. This is the combination of the TORQUE INPUT (**X**) and FRICTION INPUT (**Y**) and is the resulting TORQUE that is currently applied to the HAPTIC KNOB.

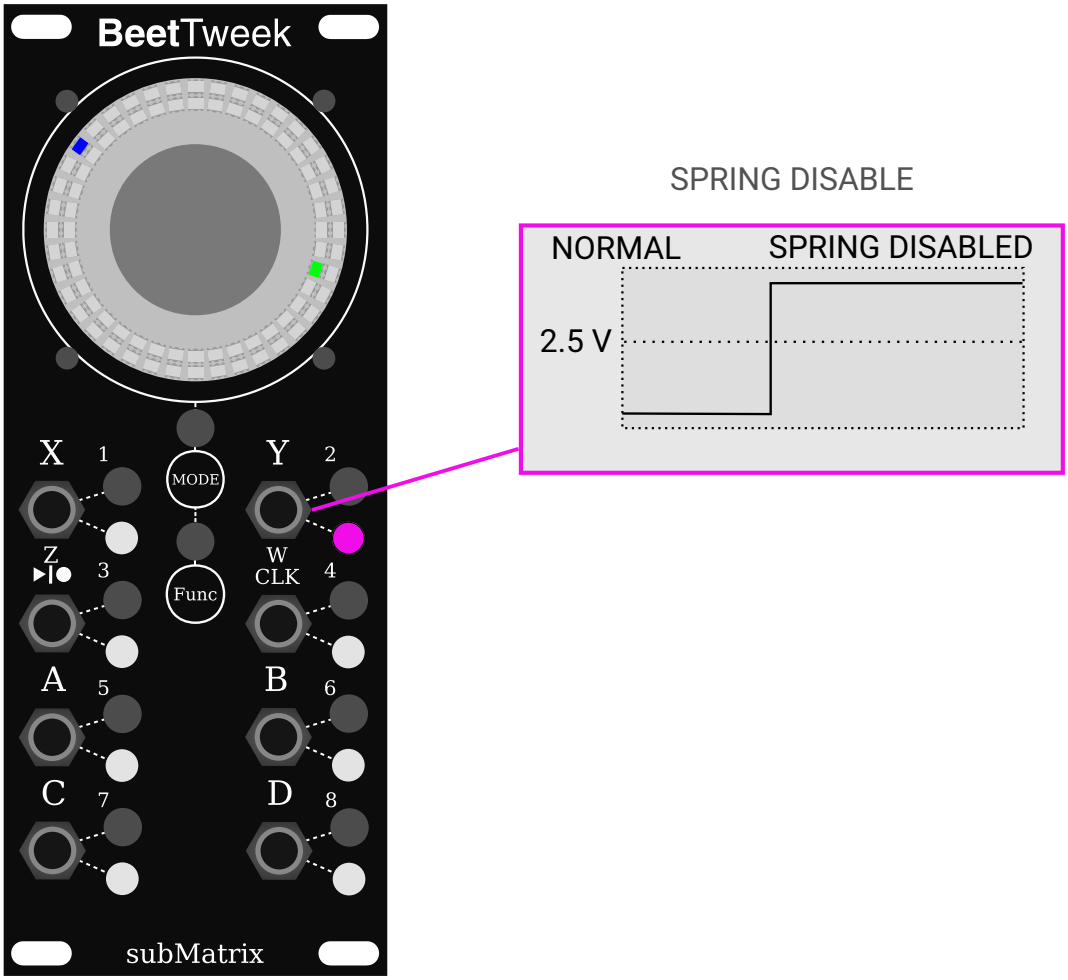
The ANGULAR VELOCITY OUTPUT(**D**) Outputs a voltage proportional to the angular velocity of the HAPTIC KNOB.

3.3 Spring Mode

In this mode, the HAPTIC KNOB will always spring back the **TARGET** angle. OUTPUTS correspond to the **current** knob angle, and **Angle Difference**. All angle INPUTS/OUTPUTS are mapped to +/-180 degrees rotation.



The Spring can be freed (disabled) with a HIGH Gate signal on the SPRING BYPASS Input. This will allow the knob to spin freely until the BYPASS is turned off again. when SPRING BYPASS is activated, the knob will no longer be under spring force:



The **X** INPUT has 2 AUGMENTS for configuring accepted voltage ranges:

- TARGET ANGLE (CV Range): TARGET ANGLE in the CV range.
- TARGET ANGLE (Large Signal Range): TARGET ANGLE in the Large Signal Range (-8V to 8v).

The **Y** INPUT has 3 AUGMENTS for configuring accepted voltage ranges:

- SPRING DISABLE (GATE): Spring is disabled if GATE is triggered (Voltage exceeds 2.5v)
- SPRING TORQUE SUBTRACT (Large Signal Range): The input signal is subtracted from the total SPRING TORQUE. Good for extra CV haptic-feedback use cases in addition to the spring.

- SPRING TORQUE SUBTRACT (Small Signal Range): The input signal is subtracted from the total SPRING TORQUE. Good for extra Audio haptic-feedback use cases in addition to the spring.

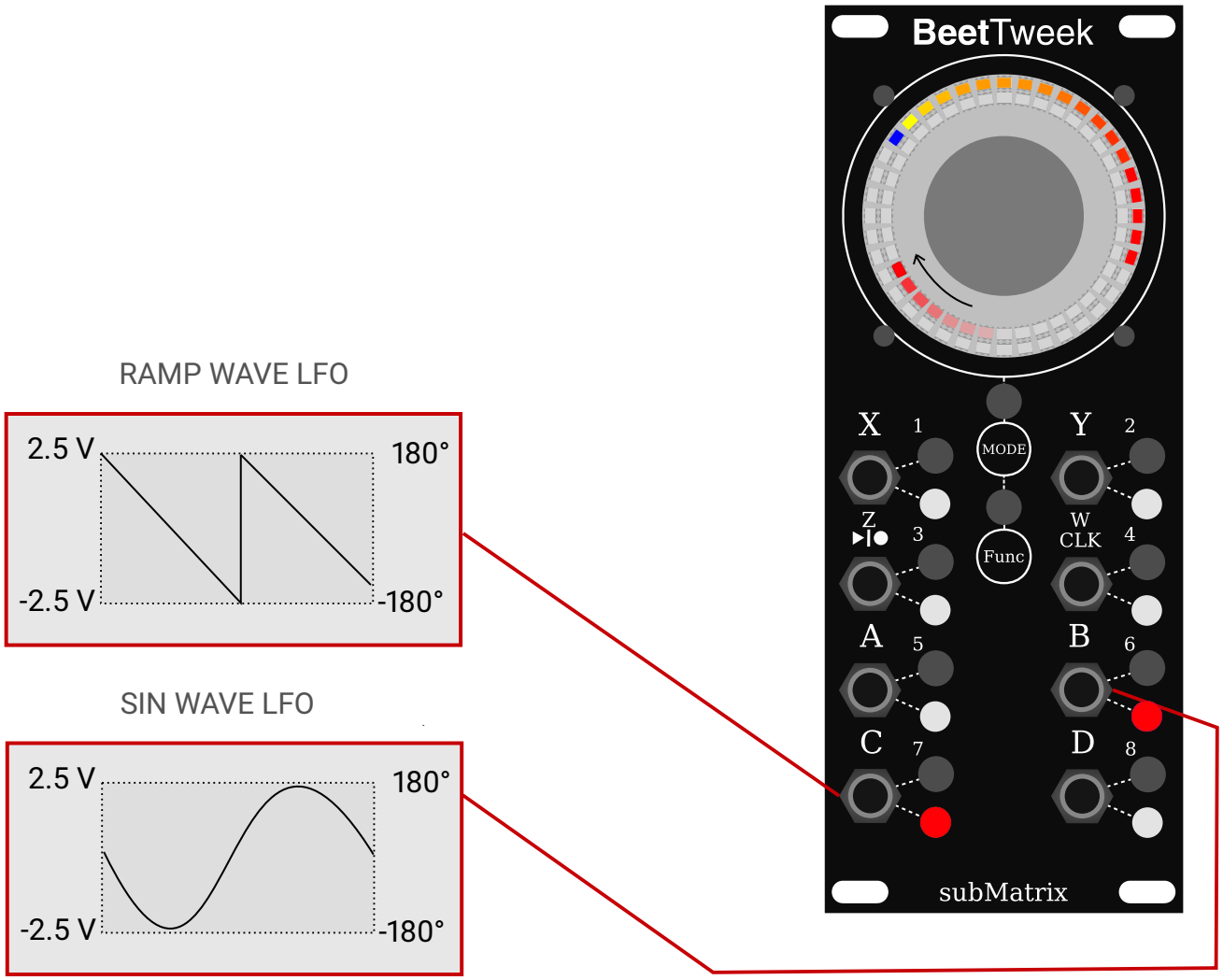
OUTPUT **B** can be configured in 3 AUGMENTS:

1. **DIFFERENCE ANGLE**
   Outputs a signal that is the difference between the CURRENT ANGLE and TARGET ANGLE as described above.

2. **PROPORTIONAL DIFFERENCE LFO**
   Acts as a low frequency oscillator that has a frequency proportional to the difference between the CURRENT ANGLE and TARGET ANGLE. When this augment is enabled the INNER LED RING with show the rotation of the LFO.

3. **INCREMENTAL PROPORTIONAL DIFFERENCE LFO**
   Similar to PROPORTIONAL DIFFERENCE LFO, with a difference in that the LFO speed is incremented and decremented by the difference between the CURRENT ANGLE and TARGET ANGLE. The LFO will retain it's frequency even when the knob is not under spring force. The Frequency of the LFO can be reset to 0Hz by Pressing *FUNC* $\rightarrow$ 6

OUTPUT **B** is a SIN WAVE. OUTPUT **C** is a RAMP WAVE with corresponding Frequency. While turning the knob - a small haptic torque is applied the the Haptic Knob so you can feel the frequency of the LFO:



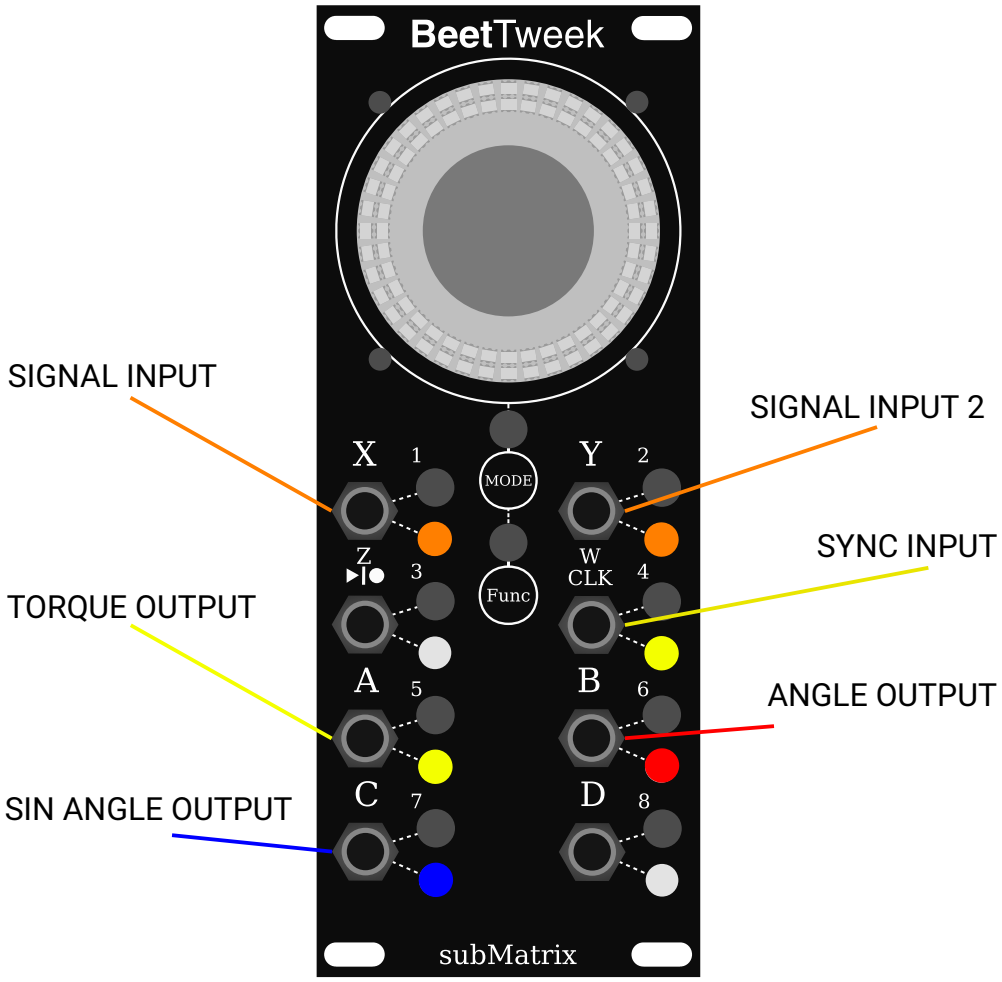
3.3.1 Some Suggested Uses

- Feed in a rhythmic GATE signal that you can feel in hand while performing.
- As a Low Pass modulation Filter that you can alter with your hand.
- As a standard CV knob that changes its current value from some outside modulation source.
- As a LFO with Feedback Frequency Modulation.

- As a modulator with interesting self Feedback Effects By Patching OUTPUT B into INPUT X with the 3 AUGMENTS.

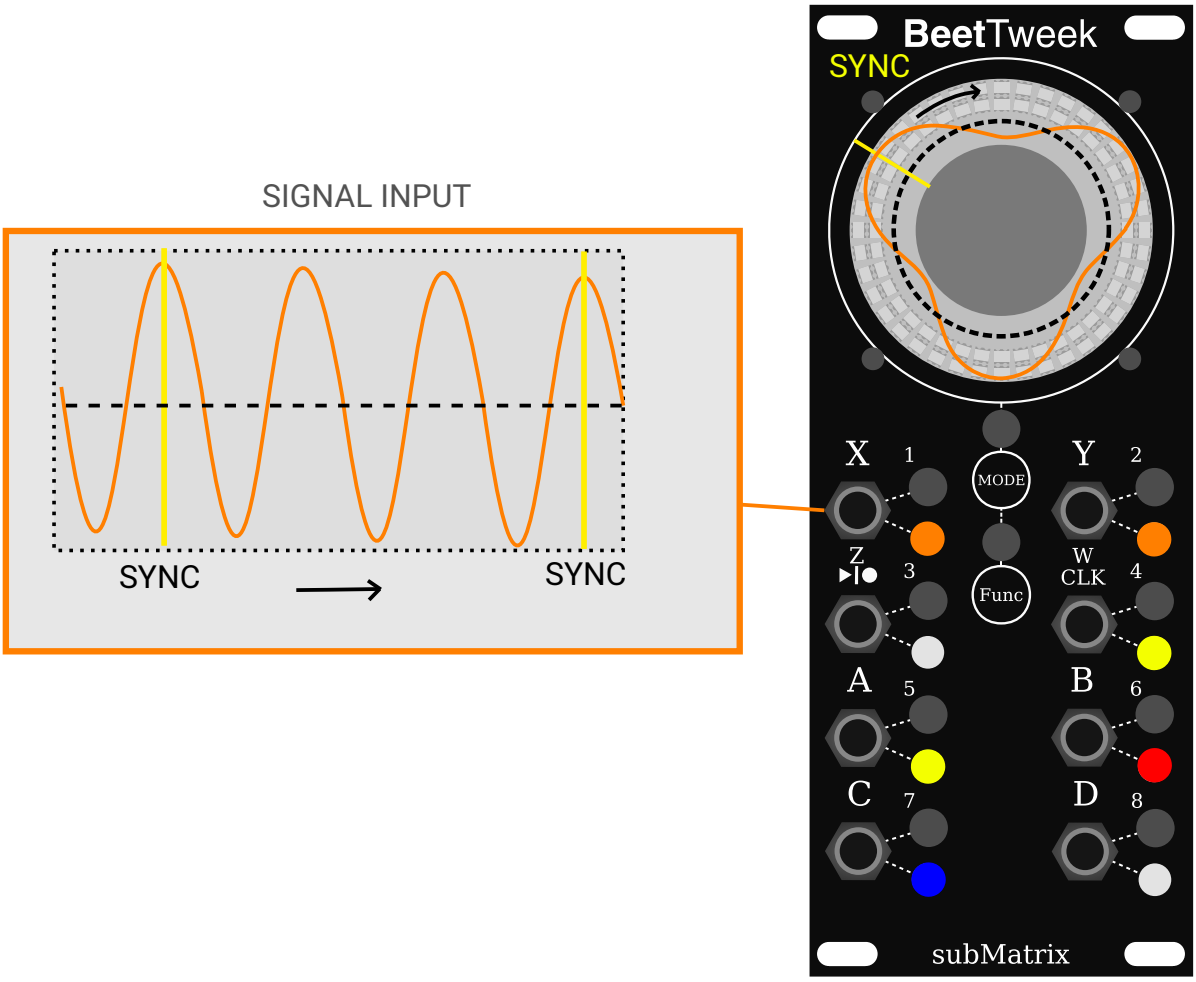
3.4 Torque-Curve Mode

Torque-Friction Mode is designed to allow custom profiles generated by other waveform-shaping modules to be used as force-feedback or torque curves around the Haptic Knob. This allows custom torque values to be assigned to every angle around the knob, providing a way to interact with the waveform shape of an incoming signal.



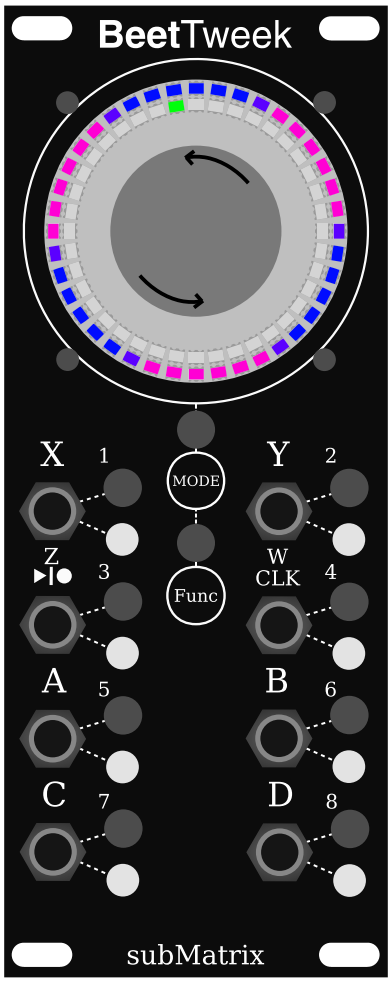
In this mode, a waveform from another module is fed into the SIGNAL INPUT (**X+ Y**). The wave form is then captured in a manner similar to an oscilloscope, where the SYNC INPUT ($\frac{\mathbf{W}}{\mathbf{CLK}}$) is used to capture a synchronized window of time from the SIGNAL INPUT. The SYNC INPUT is a GATE signal that starts capturing the SIGNAL when the voltage goes from 0v to 5v. For repeating wave-forms, the SYNC INPUT should be in sync (within some multiple) of the SIGNAL INPUT.

As an example, A simple SIN-WAVE SIGNAL INPUT is captured continuously and wrapped around the HAPTIC KNOB as visualized below:



Regions where the SIGNAL INPUT is further away from the HAPTIC KNOB are regions where the TORQUE applied to the knob will be POSITIVE. Regions where the SIGNAL INPUT is closer to the HAPTIC KNOB are regions where the TORQUE applied is NEGATIVE. Regions where the SIGNAL is near the dotted line are regions where ZERO TORQUE will be applied.

The OUTER INDICATOR LED's around the HAPTIC KNOB use Color to indicate the SIGNAL at different regions. The KNOB angle is indicated by the GREEN LED on the INNER LED RING. In the figure below, the knob has COUNTER CLOCKWISE TORQUE at the current angle:



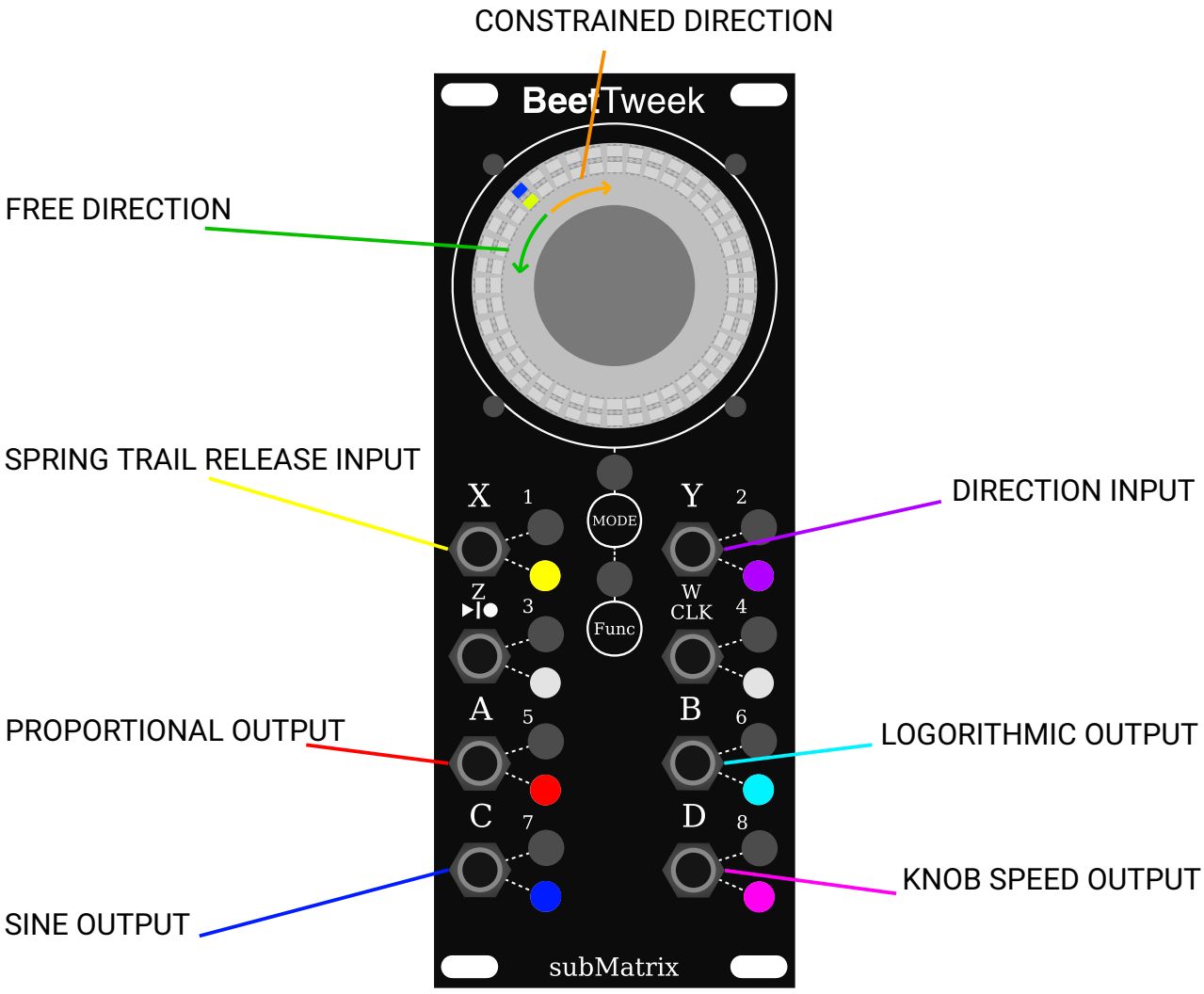
The current TORQUE is available on output **A**, while the current ANGLE is available on OUTPUTS (**B** and **C**). The SIGNAL INPUT is a summation of inputs (**X** and **Y**). The SUM is passed through an internal HIGH-PASS filter to remove DC bias, the AMPLITUDE of the signal is tracked continuously and then scaled to compensate internally.

3.4.1 Some Suggested Uses

- Feed in a audio signal to Haptically sense the contour of a waveform.
- Shape a custom waveform based on RAMP functions to create well defined TORQUE regions.
- Slowly change an input waveform to ROTATE the knob under the changing TORQUE.
- Feed noise signals to create "Texture" Haptics.

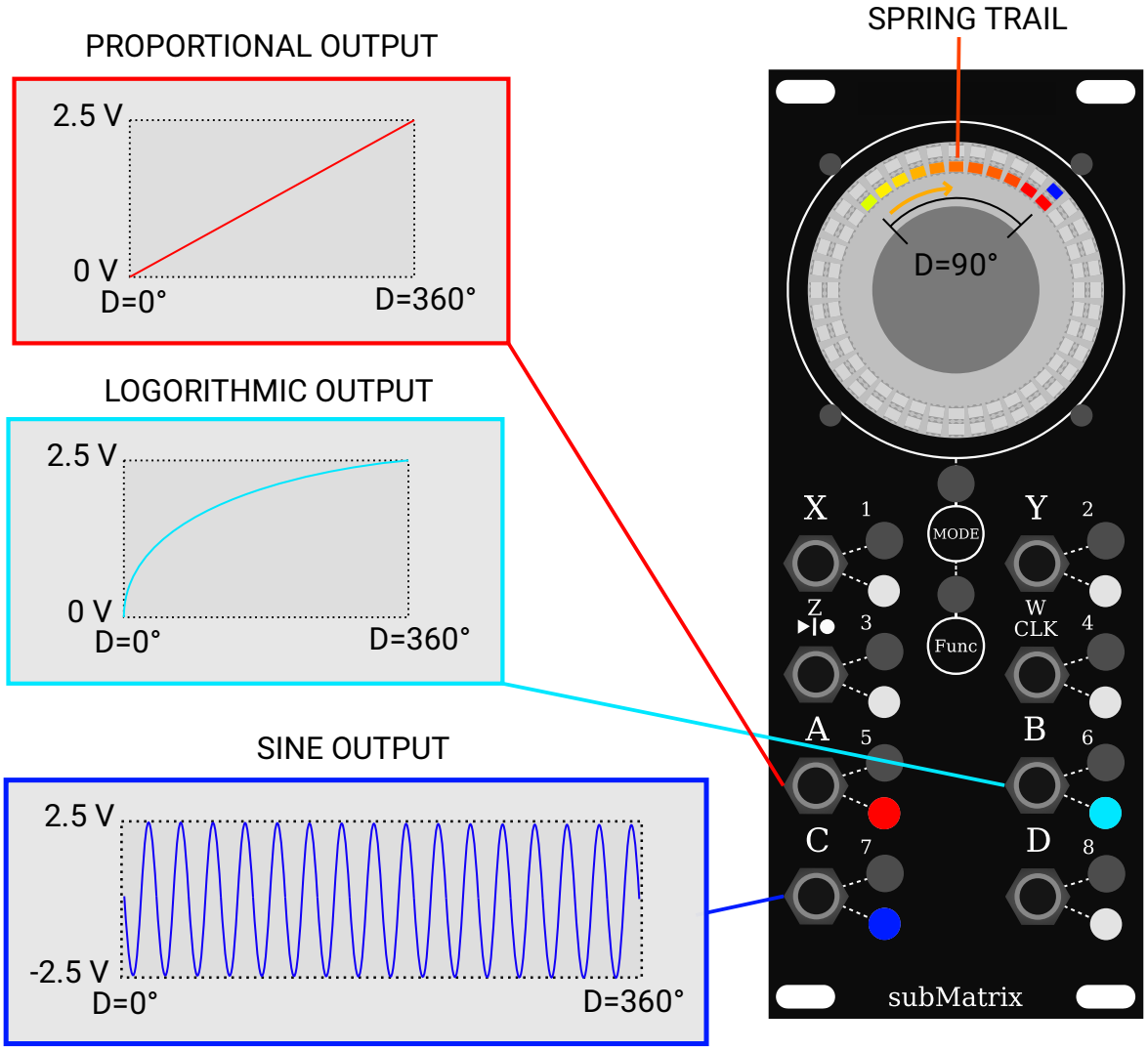
3.5 Ratchet Mode

In this Mode, The HAPTIC KNOB is free to in one direction freely while exerting spring force in the other direction, resisting rotation. The knob will spring back to the angle at which the direction changed. This difference in angle is called the SPRING TRAIL. Output CV's correspond to how much force you exert on the knob that is in the opposite of the ratchet direction. Input CV's adjust the ratchet follow trail, and rotation direction.



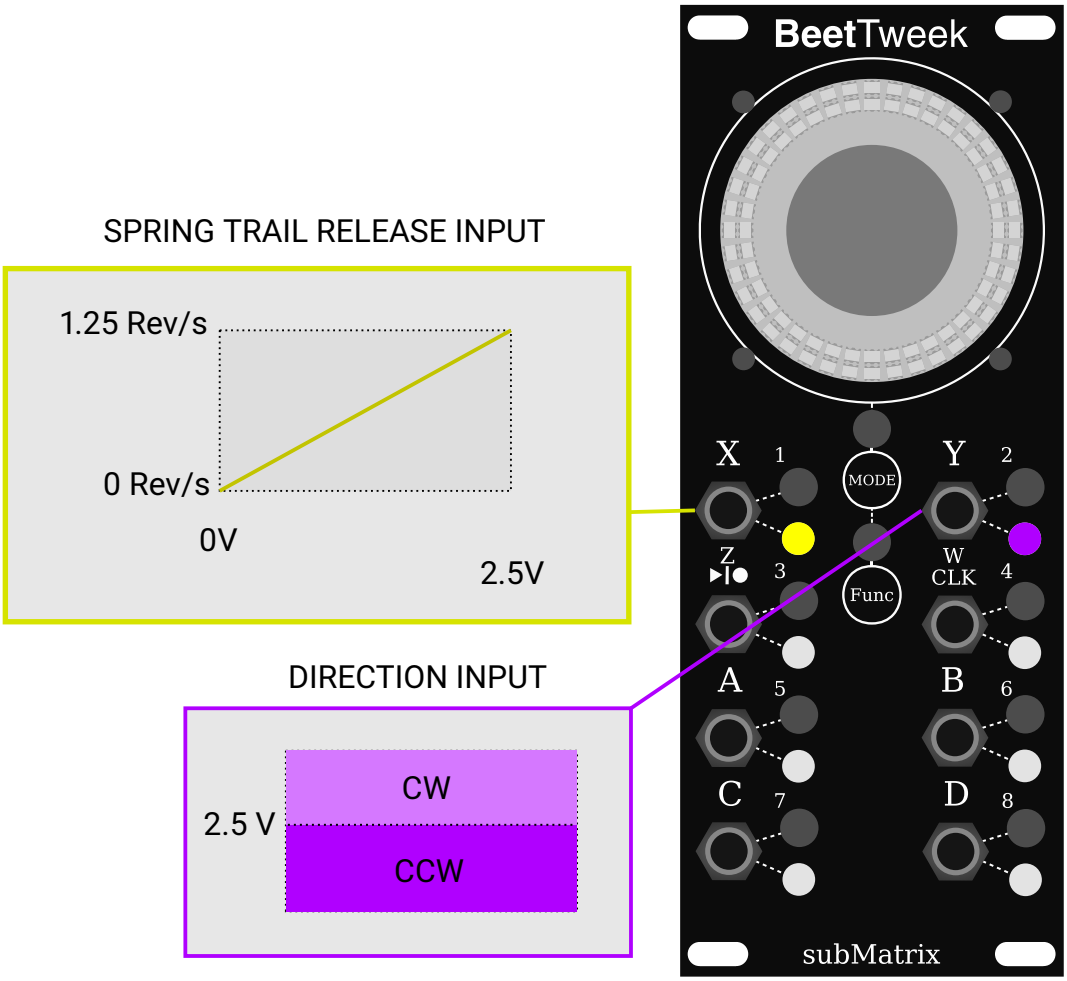
When the HAPTIC KNOB is rotated in the CONTRAINED DIRECTION. A SPRING TRAIL begins to form on the inner LED RING indicator. A COUNTER-TORQUE is applied to the HAPTIC KNOB as the SPRING TRAIL extends in length. The Length of this trail (Donated *D*) controls the OUTPUTS (**A**,**B** and **C**).

1. **A** Outputs a voltage proportional to the SPRING TRAIL length (D).
2. **B** Outputs a voltage logorithmic to the SPRING TRAIL length (D).
3. **C** Outputs a SINE waveform with angle proportional to SPRING TRAIL length (D) with 16 cycles per 360 degrees of rotation.



The SPRING TRAIL can be dynamically shortened in length by using the **X** INPUT. The Higher the Voltage value the faster the SPRING TRAIL will retract back to length 0.

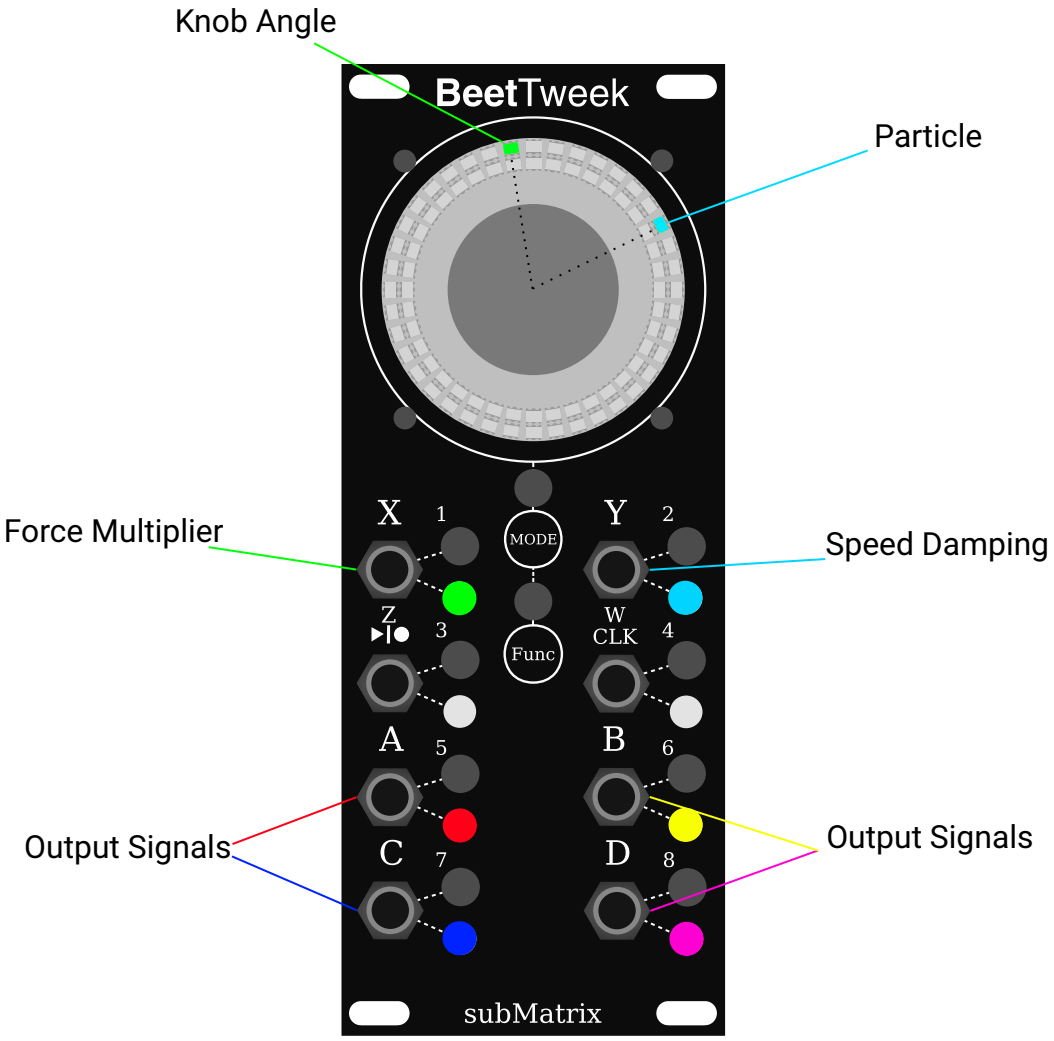
The DIRECTION INPUT (**Y**) switches CONSTRAINED DIRECTION Depending on Voltage Level to CW or CCW around the HAPTIC KNOB:



The DIRECTION can also be changed by pressing BUTTON 2.

3.6 Orbit Mode

In this mode, there is a particle with mass orbiting around the knob with gravitational attraction towards the current angle of the knob. Equal and opposite forces and simulated on the particle as well as the knob. The results is a natural force feedback effect that enables the user to feel the forces and "catch and throw" the particle around the the knob.



Outputs **A**, **B**, **C** and **D** provide output signals based on the physics of the particle orbit and forces as augments:

1. RED Outputs a voltage proportional to the Sin of the angle difference from the knob to the particle.
2. YELLOW Outputs a voltage proportional to the velocity of the particle.

3. BLUE Outputs a voltage proportional to the angle difference from the knob to the particle resulting in a ramp wave on high velocities.

4. MAGENTA Outputs a voltage proportional to the attraction force between the knob and the particle resulting in non-linear dynamics.

Input **X** changes the force multiplier. Positive voltages increase the Force Between the Knob and the Particle, Negative forces result in repelling of the Knob and the Particle. Zero voltage disables all Force interaction, keeping the Particle moving at constant velocity. This input can come from another controller or modulation source for added dynamics.

Input **Y** adds dampening to the speed of the Orbit, positive voltage slows the particle down. Pressing the corresponding button (Button 2) also will slow the particle down if it is Orbiting at high velocity.

3.6.1 Some Suggested Uses

- Use the Force (YELLOW) output to drive the cut-off frequency of a filter.
- Use the Angle output (RED or BLUE) as a gate to trigger external sound sources.
- Use Velocity to track speed and get signal movement when the Particle changes directions.
- Use Angle output (RED or BLUE) an LFO.

3.7 Clocks Mode

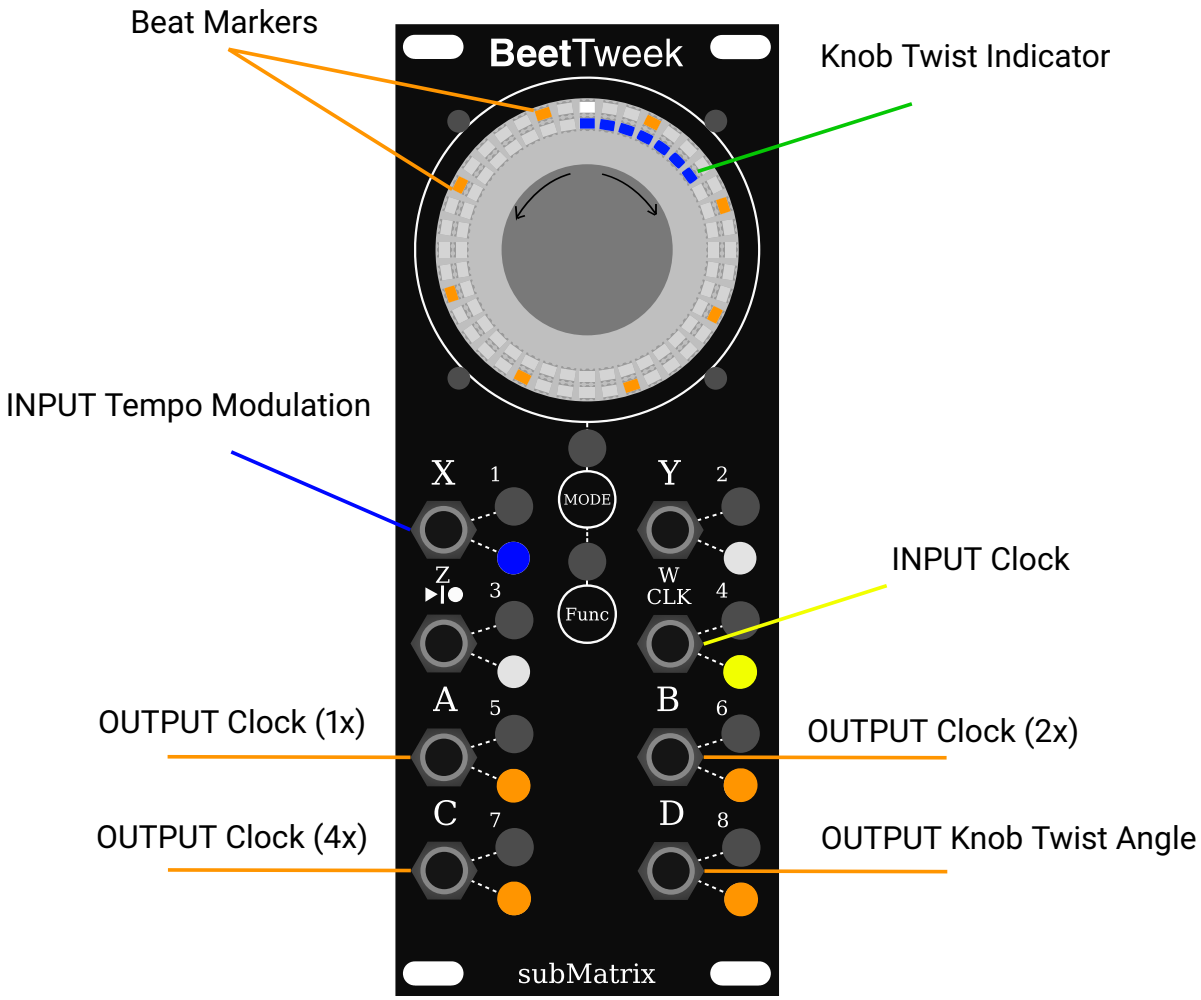
In this mode, the module acts as a clock modulator. Output clocks are generated from the INPUT clock ($\frac{W}{CLK}$), and timing is warped by twisting the HAPTIC KNOB.

Turning the knob to the right increases the clock speed, turning the knob to the left decreases the clock speed.

The rhythm from the output clock can be felt as pulses when the knob is turned right, and the source clock pulses can be felt when the HAPTIC KNOB is turned left.

Releasing the HAPTIC KNOB to center, will synchronize the OUTPUT clocks with the INPUT clock.

The output clock is visualized around the INDICATOR LED's as rotating ORANGE dots. Synchronized with the output.



Outputs **A**, **B**, and **C** provide OUTPUT clocks at different multiples of the base modulated tempo (1x, 2x, 4x), each output has 2 augments:

1. ORANGE Outputs a GATE signal as a clock signal.
2. RED Outputs a RAMP wave signal with the same timing(PERIOD) as the clock signal.

Output **D** provides a CV signal mapped to the rotation (TWIST) of the HAPTIC KNOB.

Input **X** (CV) can also be used to change the speed of the output clocks the same way as turning the HAPTIC KNOB. The Knob rotation and **X** signal

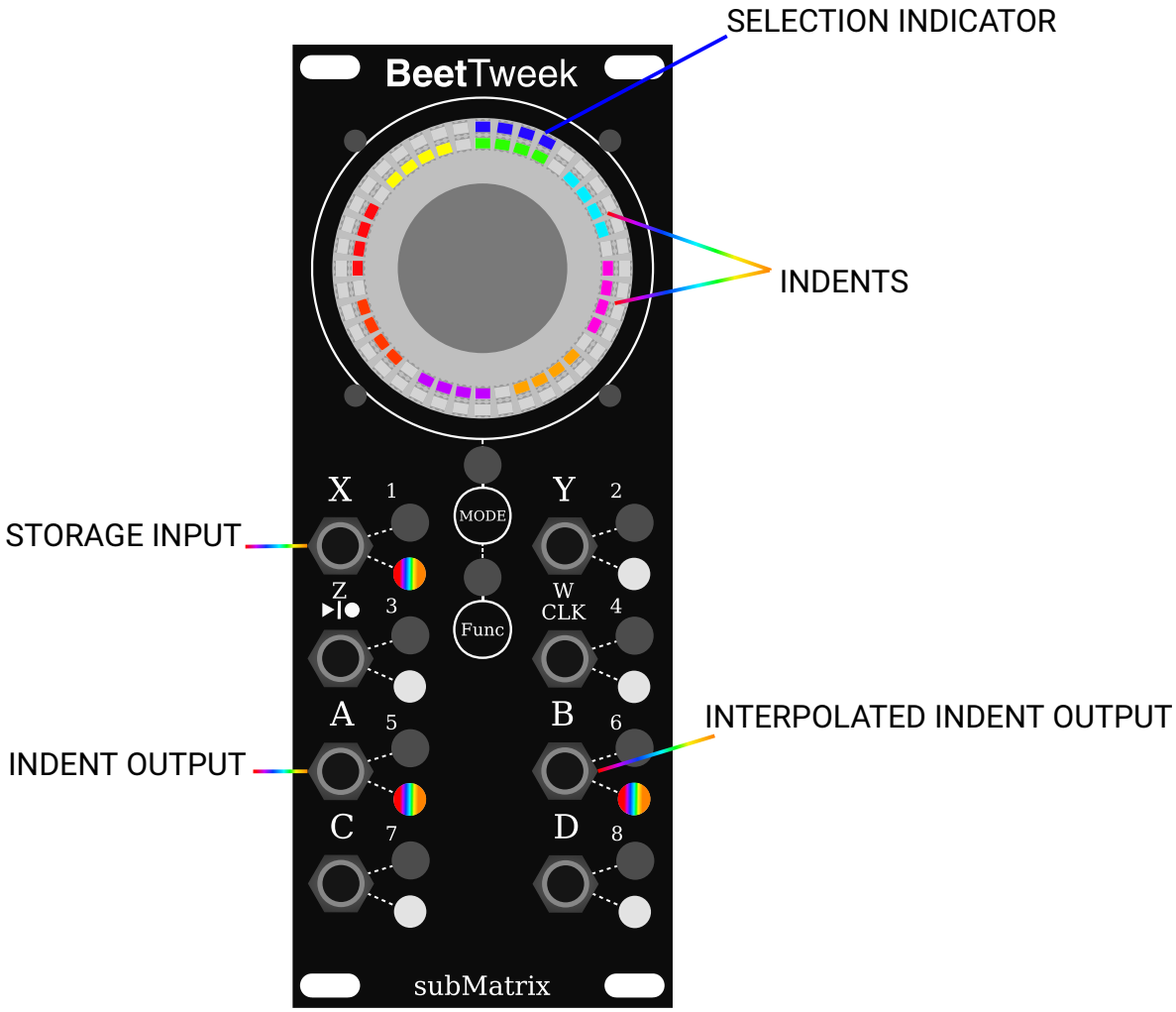
are added together so both can be used simultaneously.

3.7.1 Some Suggested Uses

- Patch the main clock of your patch into $\frac{W}{CLK}$, use the OUTPUT clocks as GROOVE/SWING clock sources for voices/sequencers. Turn the knob during live performance to introduce swing. Best if a voice is driven from the main clock as well.
- As above and also use a external CV patched into the $\frac{W}{CLK}$ to add swing modulation from other modules.
- As above and use the RED 2nd augment on the clock outputs for RAMP wave signals patched to external voices for performing Dubstep style "WUBWUB" grooves.
- As above and use OUTPUT **D** for extra signal from the TWIST of the HAPTIC KNOB. Use as a trigger to know when the KNOB is twisting or not, or use as an extra modulation into voices/filters.

3.8 Indent Mode

In this mode, the HAPTIC KNOB will snap to 8 INDENT locations around the circle. Each INDENT can hold a unique CV or V/OCT voltage value. The values stored in each INDENT can be retrieved using the OUTPUTS when a particular INDENT is selected.



The SELECTION INDICATOR indicates which INDENT the HAPTIC KNOB is Currently Snapped To. Turning the knob will rotate the SELECTION INDICATOR around the circle. As the knob rotation from INDENT to indent, HAPTIC Forces will snap the knob to the INDENT angle locations.

Once a desired INDENT is SELECTED. The indent will be waiting for a new value from the STORAGE INPUT (**X**). To capture the value, the STORAGE

INPUT needs to be adjusted by +/- 1 volt of its current value before the INDENT will start capturing the new voltage.

The INDENT OUTPUT(**A**) and INTERPOLATED INDENT OUTPUT (**B**) will Output the current value stored in the SELECTED INDENT and will dynamically UPDATE as the STORAGE INPUT is adjusted as well.

Once the SELECTION INDICATOR is moved to a different INDENT, the current INDENT will retain the last captured voltage from the STORAGE INPUT.

The INTERPOLATED INDENT OUTPUT(**B**) will output a linearly interpolated value between the 2 closest INDENTS that the SELECTION INDICATOR is selecting. For example If the HAPTIC KNOB is halfway between 2 INDENTS, then the resulting voltage will be the midpoint between the 2 voltages.

3.8.1 Some Suggested Uses

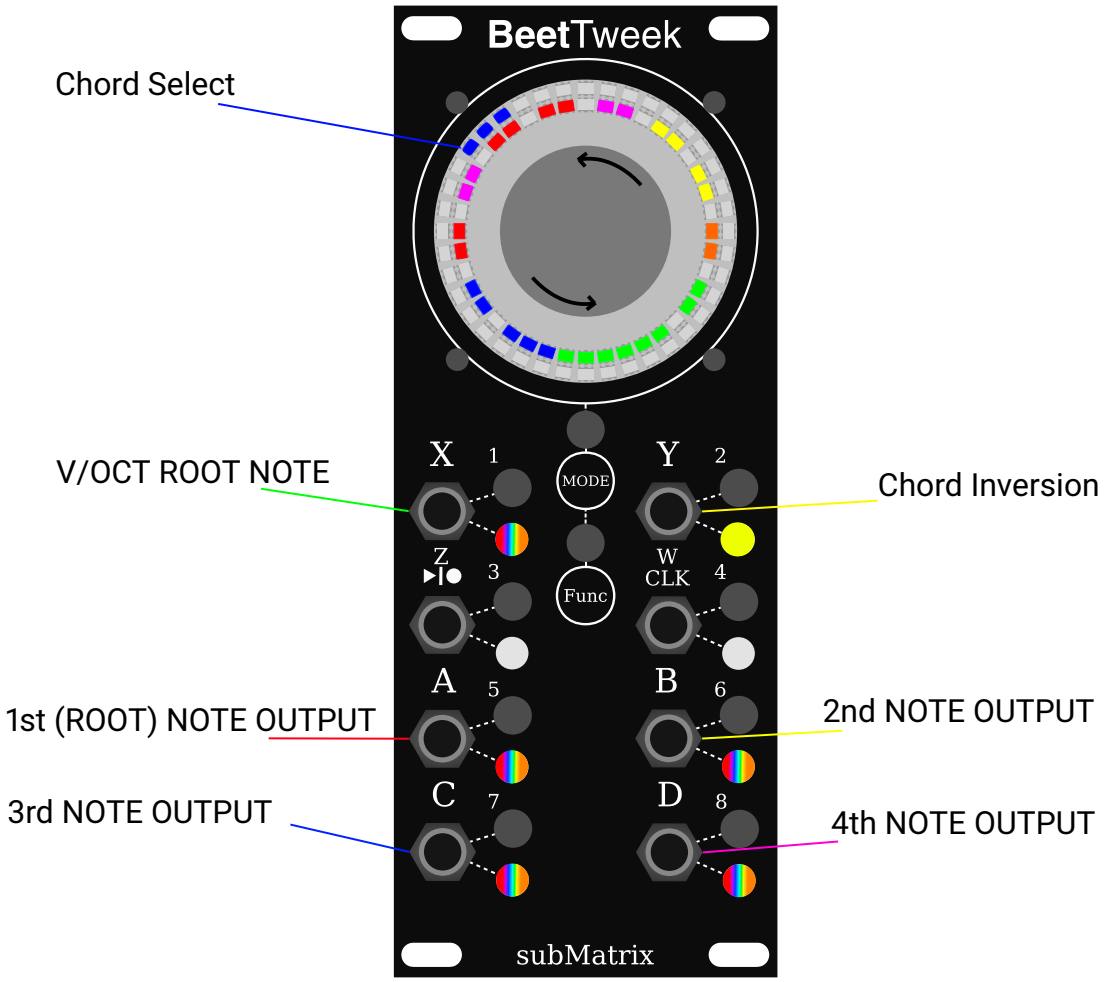
- Connect a simple external CV voltage adjuster (knob/slider, etc) to the STORAGE INPUT. Use the Indents as a quick voltage recall for other external module parameters.
- Use Along with the GESTURE RECORDING INTERFACE to record and playback short melodic sequences.

3.9 Chord Mode

In this mode, V/OCT Signals can be used to create 4 Note musical chords in V/OCT format. There are 13 Primary Chord Types to choose from:

- Major triad
- Major Sixth
- Dominant Seventh
- Major Senventh
- Augmented Triad
- Augmented Seventh
- Minor Triad
- Minor Sixth
- Minor Seventh
- Minor-Major Seventh
- Diminished Triad
- Diminished Seventh
- Half Diminished Seventh

Each note of the chord is given on outputs **A**, **B**, **C** as a V/OCT signal. The notes are all relative to the root note provided on input **X**.



Outputs **A**, **B**, **C** and **D** provide output V/OCT signals based on the currently selected Chord type. The Chord Type can be selected by moving the haptic knob to the different chord types.

Output **A** has a second AUGMENT that can be used as a VCO that oscillates at the same frequency as the Root Note.

Input **Y** Is used to choose inversions of the chord - modulating this input from -2.5v to 2.5v will change the octaves of the chord notes.

Input **Y** has a second AUGMENT that can be used to offset the currently selected Chord - for changing the chord type as a modulation.

3.9.1 Some Suggested Uses

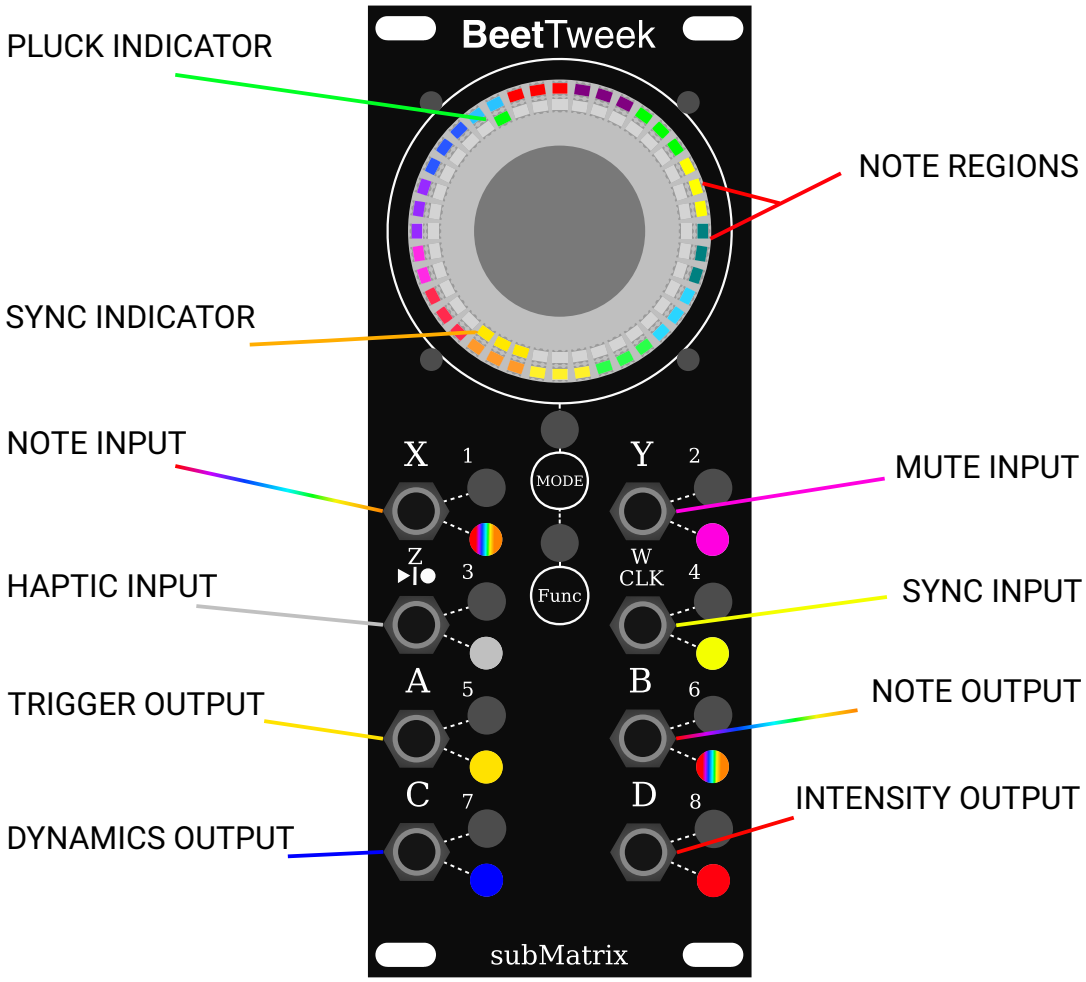
- Chord Generator With changing chords in sync with other modules by using the gesture recording interface.
- A simple high frequency range VCO.

3.10 Sequenced-Pluck Mode

Sequenced-Pluck Mode Aims to provide a means for integrated haptic control over an external synth or drum module. When used in association with a sequencer and synth/drum module. Sequenced-Pluck Mode can give a unique String-Based feel for interacting with the instrument setup. As each string is "Plucked" the player can feel not only the force of the string but also the vibrations from the instrument.

In this mode, the module is fed a series of V/OCT note data, as the notes stream in, they appear as dots on the LED ring.

The HAPTIC KNOB can then be used to “Pluck” virtual strings in each NOTE REGION. Each Pluck action can be felt in your hand as each string has a haptic torque curve associated with it. As each note is plucked an output GATE and V/OCT note is generated for driving other audio generation modules. Additional audio haptic forces can be fed from the Audio source back into the module to give additional haptics from the audio that is being generated. The pluck action can be dynamically muted using another input. The notes can also be rotated around the knob in sync to an external BPM INPUT as well.



In order to feed in note data, a V/OCT note value must be fed into the NOTE INPUT, the note will then be added to the LED RING at the SYNC INDICATOR location on the next RISING EDGE of the SYNC INPUT, the SYNC INDICATOR will then advance to the next NOTE REGION. If no SYNC INPUT is plugged in, the module will use the TAP-TEMPO. If the TAP-TEMPO is Deactivated, the Module will find note transitions from changing V/OCT values and use that as synchronization. An external Sequencer can be used to provide note data if the same CLOCK/GATE signal is used to drive both the SYNC INPUT and the external sequencer's CLOCK/GATE/SYNC input. For this to work best, the external sequencer should be setup to have the same number of steps (or an even multiple) of the number of NOTE REGIONS. By default this is 16.

When rotating the location of the PLUCK INDICATOR using the HAPTIC KNOB, there will be a virtual string in each NOTE REGION. When the forces of the string are overcome, the TRIGGER OUTPUT will emit a short PULSE wave.

The NOTE OUTPUT will output the same V/OCT note as is currently stored in the NOTE REGION. It is recommended to use the TRIGGER OUTPUT to drive a external drum/synth module and use the NOTE OUTPUT to adjust the pitch of the external module.

In order to give a more integrated haptic experience, the sound from an external module can be passed into the HAPTIC INPUT. This will apply subtle forces to the HAPTIC KNOB that can be felt as each note is plucked. The HAPTIC KNOB responds best to lower frequency content (< 80Hz) in the audio signal.

The DYNAMICS OUTPUT contains a sinusoidal function based off the PLUCK INDICATORS position in a NOTE REGION. It can be used as a CV signal to provide extra expression corresponding to the AFTER-PLUCK action. After a note is plucked, the knob can be wiggled in the space between strings. This signal can be used to drive a cut-off filter on the external sound generation module or modulate a similar parameter giving extra expression capabilities.

The INTENSITY OUTPUT gives a signal inversely proportional to the speed at which a PLUCK action occurs. The signal is updated on each PLUCK. Can be useful to attach to a dynamics input on a the external sound generation module, filter cutoff, volume control, etc.

3.10.1 Function Combos

1. FUNC + Button 1: Change NOTE REGION Rotation Direction
2. FUNC + Button 2: CYCLE NOTE REGION Rotation Speed
3. FUNC + Button 5: INCREASE Number of NOTE REGIONS
4. FUNC + Button 7: DECREASE Number of NOTE REGIONS
5. FUNC + Button 6: Enable/Disable Dual Direction NOTE Plucking.

4 Tap Tempo

For convenience, an internal clock signal can be tap-tempo'd and used in place of an external signal on the ($\frac{\mathbf{W}}{\mathbf{CLK}}$) input, To set a tempo, press button 4 at an interval/tempo you wish to set. The YELLOW light will begin to blink at the tempo that you have entered. The tempo is calculated based off of the time difference between the last 2 button presses. If you wish to clear the entered tempo, press and hold button 4 for 1 second until the YELLOW light turns WHITE indicating the tempo has been deactivated. If a very slow tempo is entered the YELLOW light will be a dim yellow indicating the tap-tempo is active.

5 Gesture Interface

BeetTweek Features Gesture Recording and Playback that can be used with any mode. The Interface for using Gestures is accessed by using Z ▶|●.

The Z ▶|● button controls the Performance/Recording/Playback state of the haptic knob and is indicated by the color of the Z ▶|● led and the Back-Fill LED indicators behind the Haptic-Knob. The color indicates the state as follows:

- PURPLE - PERFORMANCE (Default)
- RED - RECORDING
- GREEN- PLAYING

Pressing the Z ▶|● button will toggle between PLAYING and PERFORMANCE. Holding the button down and then releasing, will begin RECORDING.

To **stop** RECORDING, press the button to switch back to PERFORMANCE mode and then press **again** to start PLAYING. The recorded gesture will playback and loop until the button is pressed to put the gesture state back into PERFORMANCE mode.

If an external CLOCK or GATE signal is attached to W CLK (or Tap-Tempo is active), the gesture state will change only on a rising clock edge, for rhythmic synchronization. RECORDING start and end are synchronized to the clock, as well as PLAYBACK looping.

NOTE: Some MODES make use of Z ▶|● for other uses by adding AUGMENTS. If a MODE has use of Z ▶|●, the mode will use it by default. If you want use Z ▶|● to control gesture as above, you must switch the Z ▶|● augment back by pressing FUNC->**3**

6 Updating the Firmware

Firmware Updates are performed by placing a firmware file onto the SDCard located on the back of the module. To update firmware:

- Power-Off your EuroRack.
- Un-screw the BeetTweek module from the rack.
- Remove the SD-Card carefully from the back of the module.
- Insert the SD-Card into your computer, using the included adapter if nessecary.
- Place the "FIRMWARE.bin" file downloaded from the website onto the SD-Card.
- Safely Eject the SD-Card.
- Carefully Re-Insert the SD-Card into the back of the module.
- Re-Screw the module into your EuroRack.
- Power-On the EuroRack.
- Wait for approximately 2 minutes until the firmware is uploaded and you can interact with the module again.

7 Resetting the Module

To reset the Module while avoiding turning off and on the rest of your Rack, press and hold Buttons **7** and **8** and then subsequently release both buttons. This will reset the Module the same as turning off and on your rack.

To reset the Module to factory settings, press and hold Buttons **7** and **8** as above, and continue to hold down Button **8** until the module fully turns on. **WARNING:** This will restore factory settings clearing Current Mode, Augments, Recordings, etc.

8 Flipped Front Plate Installation

To Replace the standard Front Plate with the Flipped Front Plate Version, Follow the following steps carefully:

You will need:

- A size 3/16 wrench.

1. First turn off power to your rack, remove the Module, and disconnect all cables from the back of the unit.
2. Remove the 8 Nuts from the input output jacks using a set of pliers. The back of the module should then become loose and hang while being attached to the motor unit.
3. Using the 3mm wrench, remove the 4 nuts on the front of the module that attach the motor unit to the front plate.
4. The module should then be disconnected from the front plate.
5. Take the new front plate and align the holes with the 8 jacks on the main module PCB, sliding the plate on carefully.
6. Screw all 8 Nuts on the 8 Jacks to secure the front plate to the main PCB.
7. Slide the motor unit's 4 rods into the new front plate.
8. Screw the 4 nuts onto the rods securely using the 3/16 wrench (but not super tight).
9. Re-install the module into your rack.

10. Press the FUNC button 5 times until the LED ring turns WHITE. Then Press button 1 to tell the module that the front plate has been flipped.