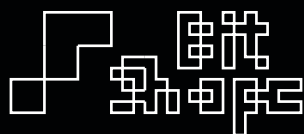
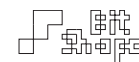


TC-11



User Guide Version 2.0



TC-11

Version 2.0

User Guide

March 20, 2015

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Bit Shape Software



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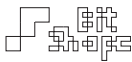
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Getting Started

Introduction

Thank you for purchasing **TC-11**. Your support is greatly appreciated, and it means I can continue developing innovative music apps for iOS and Mac OS X. **TC-11** is the product of countless hours of programming and research into synthesizer controller design.

Your comments, feedback, and news are important to me. If you use **TC-11** in a performance or recording, please let me know through the website [www.bitshapesoftware.com] or email [feedback@bitshapesoftware.com]. Your creative output is one of the reasons making software instruments is rewarding.

TC-11 Overview

TC-11 is a programmable modular synthesizer on the iPad, controlled by multitouch and device motion controllers. All synthesis parameters can be controlled by these two sources, which allows the user to create countless unique patch configurations.

TC-11 does not have on-screen objects to control during performance. Instead, the performer's touches generate the control information. Some controllers are driven by a single touch. For example, the speed of the touch as it moves around the screen is its *Touch Speed*. Other controllers are generated with multiple touches, such as *Distance to Previous Touch*, where the positions of two touches are compared. Finally, the accelerometer, gyroscope, and compass can be assigned to **Parameters** to turn your iPad into a expressive motion controlled synth.

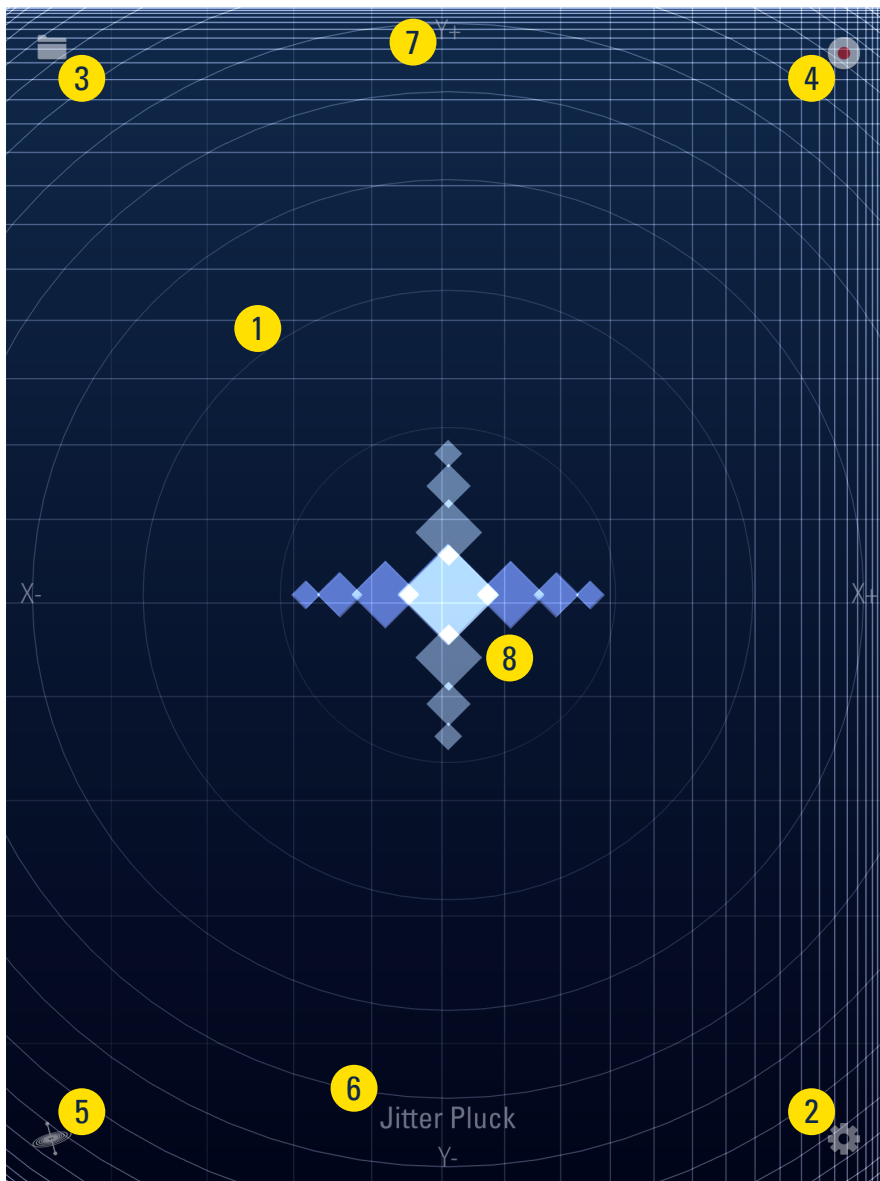
The synthesizer is modular, and uses common **Synth Objects** such as wavetable oscillators, filters, amplifiers, and effects. In addition, there are **AHDSR**, **LFO**, **Table**, and **Sequencer**



Modules that can be used for synth parameter control. Users can activate different **Synth Objects** and **Modules**, then assign multitouch controllers to them to build custom patches.

Interface Overview

1.0 Performance View



1. Performance Area
2. Show Navigation Bar Button
3. Quick Load Button
4. Record Button
5. Orientation Reset Button
6. Patch Title Label
7. Axis Labels
8. Device Motion Position



1.1 Performance Area

The entire screen is used as the performance area. Use multiple simultaneous touches to control your patch's **Parameters**. As you touch the screen, the graphic display will update to show you which types of controllers are active, and what their positions or values are.

1.2 Show Navigation Bar Button



Double-Tap to show the **TC-11 Navigation Bar**.


1.3 Quick Load Button



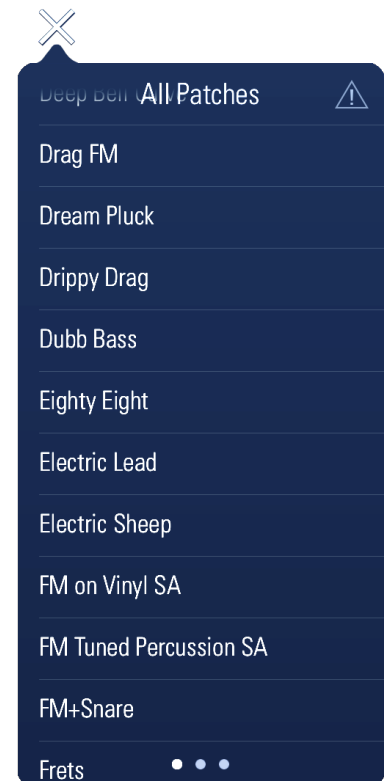
Double-Tap this button to show a list of the current group of patches. The menu popover will stay open while you play. You can dismiss the popover by pressing the **X** button or any of the other buttons in the **Performance View**.

The **Quick Load Popover** allows you to quickly switch to another patch during performance. It takes advantage of **Patch Groups**, which are collections of patches. You can create your own custom patch groups in the **Load / Share** view.

Swipe left and right to show a different group.

Press **All Notes Off**  to release all active touches.

To close the popover, tap the **X** button or any of the other buttons in the **Performance View**.





1.4 Record Button



When this button is showing (it can be toggled to show / hide in **Settings >> Display**), **Double-Tap** it to reveal the recording controls.

1.5 Orientation Reset Button



When the gyroscope is in use, you can reset the ‘natural’ position of the device by **Double-Tapping** this button. The pitch, roll, and yaw positions will all be zeroed.

1.6 Patch Title Label

You can choose to show the current patch name by choosing the **Show Patch Title** setting in **Settings >> Display**.

1.7 Axis Labels

You can show the axis labels X+, X-, Y+, and Y- to help orient yourself to the screen. The x-axis is always the short width of the screen, and the y-axis is always the long height of the screen. The (+) symbol indicates the upper limit of the axis, and the (-) symbol indicates the lower limit. You can flip the axes in **Settings >> Display** to match how you prefer holding the device.

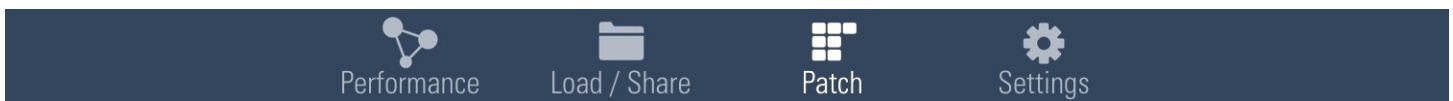
1.8 Device Motion Position

When **Device Motion** controllers are used (accelerometer, gyroscope, compass), the position of the device will be represented by shifting diamonds on the Performance View. Each axis of




movement is represented by its own graphic. The accelerometer measures movement along the x-axis, y-axis, and z-axis of the device. The gyroscope measures the devices position as pitch, roll, and yaw. The compass points to the magnetic north heading. Move or rotate the device along its axes to determine the correct motion to use for each controller.

2.0 Navigation Bar



Navigation Bar

Double-Tap the  button to show the **Navigation Bar**. Here you can switch between views. The Navigation Bar will hide automatically when a touch is played in the Performance View.

Tip: Rotation

While in the Performance View, TC-11 will prevent the device from rotating so you can use device motion controllers. Whenever the Navigation Bar is showing, you can tilt your device to re-orient the screen to landscape or portrait.

2.1 TC-11 Views

The **Performance View** is where you can play the currently loaded patch. The **Load / Share View** is where you can load, save, duplicate, rename, and share patches. In the **Patch View**, you can access the **Synth Objects** and **Modules** to edit the currently loaded patch. The **Settings View** allows you to change the app settings, display style, colors, and has a quick help reference area.



3.0 Load / Share View



- | | |
|----------------------------|---------------------|
| 1. Folders and Patches | 7. Patch Organizer |
| 2. Patch Information | 9. Email Sharing |
| 3. Patch Tags | 10. AirDrop Sharing |
| 4. Comments | |
| 5. File Management Buttons | |
| 6. Patch Overview | |

The **Load / Share View** is your portal to loading, saving, duplicating, importing and exporting **TC-11** patches. It is also a place to organize and share your patches.

When working on your own patches, **TC-11** will keep a working copy saved in a temporary location in case you leave the app. However, it is a good idea to save your work permanently by visiting this view.



3.1 Folders and Patches

This area shows the patches installed on your device, organized by folder. The actual patch files are stored in the **Documents Folder**, and can be found in the **iTunes App File Sharing** section of your iPad.


The **All Patches** folder is always available, and shows every patch installed. The other folders are Tag Searches and Groups and can be created or deleted to suit your needs [see 3.8 Patch Organizer].

When scrolled to either the **Organizer** or **Sharing** areas, tap and drag (or swipe right) a patch or folder to drag that patch into the view for organization or sharing.

3.2 Patch Information

This area shows the currently loaded patch information. The title, tags, and comments for a patch are set here.

3.3 Patch Tags

Add descriptive tags to patches for easy searching and organization later. Choose from a list of common tags by pressing the  button, or type in your own. Some tags are managed by **TC-11**, and cannot be added or removed by the user.

3.4 Comments

Add comments to patches to explain particular setups or useful performance techniques.



3.5 File Management Buttons



Create a **New Patch**. You can choose from a list of standard configurations depending on the kind of patch you wish to create.



Save currently loaded patch. If a patch is not saved before loading another patch, it will lose its changes.



Duplicate currently loaded patch. Pressing this button creates a copy of the current patch, and loads the copy.



Delete the currently loaded patch. This operation is not undoable.

3.6 Patch Overview

See a quick overview of all objects in the loaded patch. Tap the area to switch between a graphic overview and a text list of all objects / parameters / controllers.

3.7 Patch Organizer

Create and edit patch organizing folders in this area. Make a **Tag Search** folder to filter all patches by tag, and a **Group** folder to collect any patches together into a folder. Drag patches from the **Folders and Patches** sidebar to add the patch to a Group, or add the tags in a Tag



Search to that patch. Quickly clear a group by pressing and holding a closed folder and choosing **Clear**. You can also delete groups by pressing and holding a closed folder and choosing **Delete**.

Some tags are managed by **TC-11**. For example, the 'MIDI' tag is added automatically if a patch contains any output that sends MIDI. The user cannot add or remove the 'MIDI' tag manually. For this reason, dragging a patch into a Tag Search that only contains managed tags is not allowed.

Note:

You can tell the difference between managed tags and normal tags by the color of the tag text. White tags are editable by the user, tinted tags are managed by TC-11.

3.8 Email Sharing

Drag a patch or folder onto the **Email Sharing** floating icon to email a patch or folder.

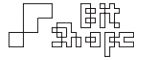
3.9 AirDrop Sharing

If another device is on the same Wi-Fi or Bluetooth network, **TC-11** will recognize the device and the two will appear on each other's screen in the **AirDrop Sharing** area. Drag a patch or folder onto the floating screen to transfer the patches to the other device.

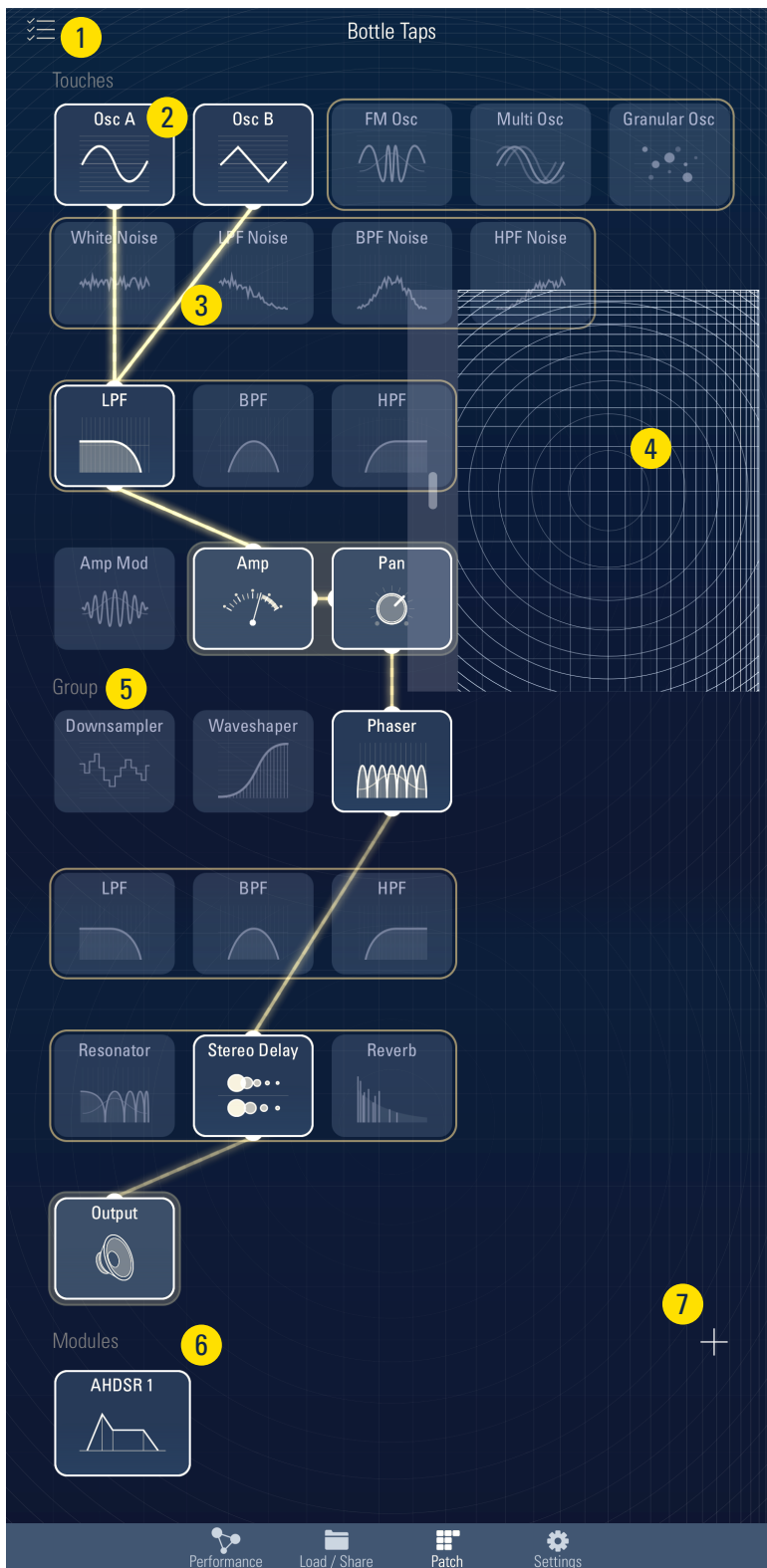
You can disable automatic searching by pressing your screen display in the middle of the AirDrop Sharing area.

If the devices do not appear but are nearby, toggle automatic searching off / on for both devices.





4.0 Patch Overview



1. Utilities Popover Button
2. Synth Objects
3. Live Amplitude Connections
4. Live Preview View
5. Touches / Group Sections
6. Modules Section
7. Add Module Button



The **Patch View** contains the guts of the **TC-11**. It is the editing area. Pictured above is the **Patch Overview**, where you can enable the **Synth Objects** you want for your patch. **Double-Tap** any object to zoom into the **Patch Detail View** to edit **Parameters**.

4.1 Utilities Popover Button

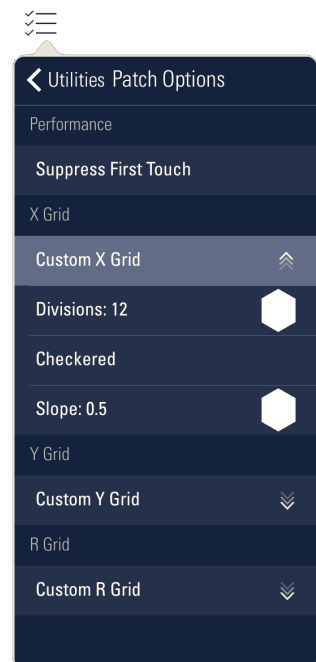


Tap to access options that are specific to the currently open patch. The settings here are stored with the patch when the patch is saved.

The **Patch Options** area contains settings that are tied to a specific patch.

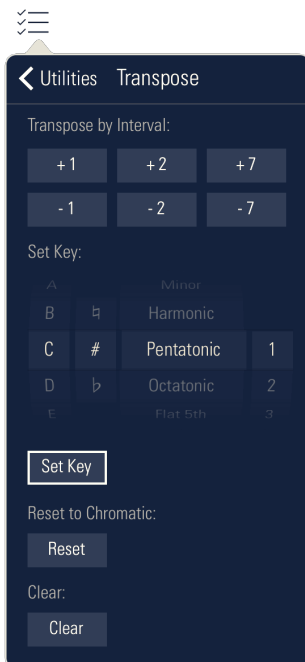
Suppress First Touch mutes the voice that is triggered with the first touch of a group, while still allowing that touch to generate controllers. This allows ‘stretchy’ patches to ignore the first touch, which is often used as a moving origin point for subsequent touches.

The **Custom Grid** options allow the patch to create a specific division of the x-axis, y-axis, and radial area of the performance view. The slope, number of divisions, and ‘checkered’ options change the look of the performance view, but do not actually affect controllers. They are meant as a guide for performance, often when using a **Table** to generate a scale or division of the performance area.



Tip: Grids

Standard grids (not custom) will only show when there is an X / Y / Distance to Center (radial) controller active. Use this as an indicator of what controllers are present in a patch.



Transpose allows for fast transposition and key filtering of a patch.

Oscillators will have their **Note Filter** parameters activated automatically when a key is set in this view.

Transpose by Interval shifts already active note filters by the interval amount shown.

The **Set Key Picker** allows for selection of a key by name, accidental, scale, and index. **Note Filter** parameters can move between 12 keys by index. Select the key, scale, and index you want to change, then press the **Set Key Button**.

Tip: Note Names

You can set note name formats in the Settings view under General. Letter names and solfège names are available.

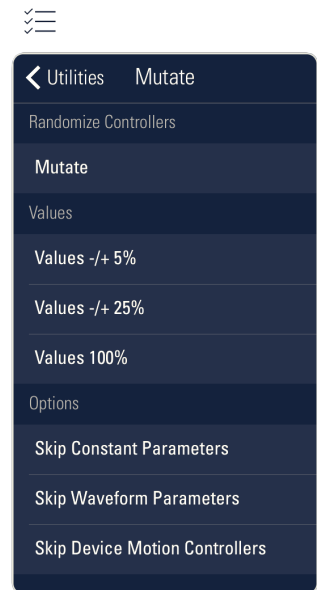
Reset to Chromatic sets all active key filters to chromatic, but does not remove the filter.

Clear removes any active **Note Filter** parameters from their object, returning it to a continuous frequency state.



The **Mutate** section can randomize controllers and values in your patch. Use this to completely transmogrify your existing patch. If you want to mutate a single object, tap and hold that object and choose **Mutate**.

The **Options** section allows you to limit the randomization by skipping parameters set to constant, waveform parameters, and **Device Motion** controllers.



4.2 Synth Objects

Activate and deactivate the active **Synth Objects** in your patch by **Tapping** the object. Some objects (**Amp**, **Pan**, and **Output**) are always active.

Double-Tap an object to zoom into the **Patch Detail View** for editing.

4.3 Live Amplitude Readouts

The glowing lines connecting objects show the signal flow of the synth. On an iPad 4 or newer, the lines will glow according to the actual audio amplitude of its object's output. This gives helpful feedback about which object may be stopping the audio signal.

Tip: Amplitude Control

While Oscillator objects have an optional Amplitude parameter, the main source of amplitude control comes from the Amp object. Typically controlled by an AHDSR, this is where your patch's volume control generally resides.



4.4 Live Preview View

The **Live Preview View** area is a way to hear your patches in real-time as you edit them. The drawer can be docked on the right edge of the screen to get out of the way, or positioned anywhere in the view. The view supports performance of each of the touch controllers, but it does not draw controller animations.

While holding a touch on the view, the iPad will not auto-rotate to new orientations. This is helpful when auditioning **Device Motion** controllers. If no touches are active in the **Live Preview**, the device will rotate normally.

4.5 Touches / Group Sections

Note that the **Patch Overview** divides the **Synth Objects** into two sections: **Touches** and **Group**. In the **Touches** section, each touch in performance gets its own unique copy of the object. This is how one touch can have its own oscillator frequency that differs from the others.

Note: Voicing

The difference between Touch and Group is similar to MIDI, where each note (Touch) has its own note number and velocity, but the whole channel (Group) has only one CC#7 Volume.

Once the signal gets to the **Group** section, the individual touches' signals are combined together and pass through a single global instance of each object.

A clear demonstration of the difference can be seen in the two **LPF** filters. The **Touch LPF** object will filter each touch separately, but the **Group LPF** will filter the combined touches' signal.



4.6 Modules Sections

The **Modules** section is where you can add a number of **Module Controllers**. There are four types of modules: **AHDSR** (envelope generator), **LFO** (low frequency oscillator), **Table** (discrete value array), and **Sequencer** (step value array with playback control).

You can add modules with the **Add Module Button**, and can **Tap-and-Hold** the module to choose **Delete** from the popup menu. You can also **Duplicate** a module in that menu.

4.7 Add Module Button

Tap this button to create a new **Module** from the available models.

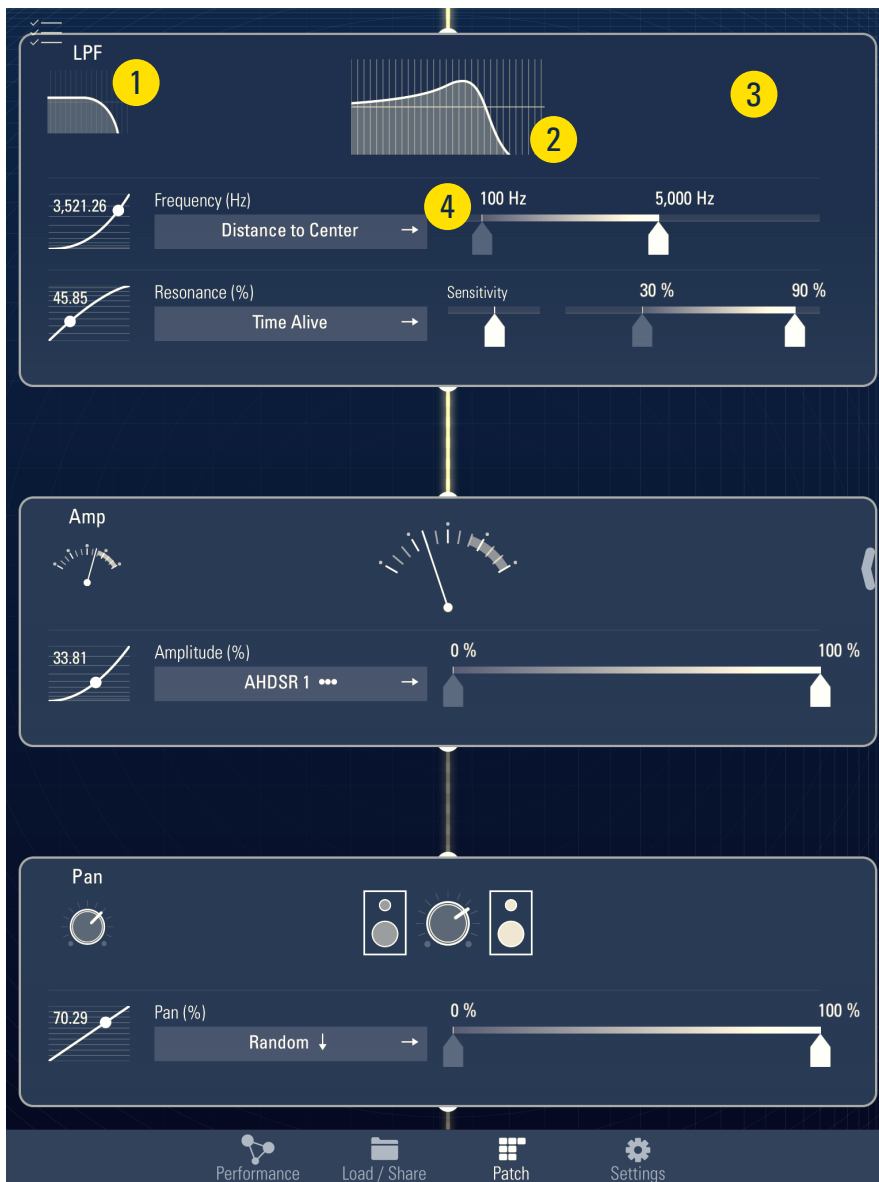
Tip: How many Modules?

You can have a maximum of 8 AHDSRs, 8 LFOs, 16 Tables, and 4 Sequencers.





5.0 Patch Detail View



1. Minimize Button
2. Live Graph Display
3. Active Synth Objects
4. Parameter

The **Patch Detail View** shows the active synth objects in a vertically flowing graph. Each object holds its own **Parameters** and connects to the object below. By setting the **Controller** and value range of each **Parameter**, an unlimited combination of patches can be created.



5.1 Minimize Button

Tap the object's symbol in the upper-left corner to zoom out to the **Patch Overview**.

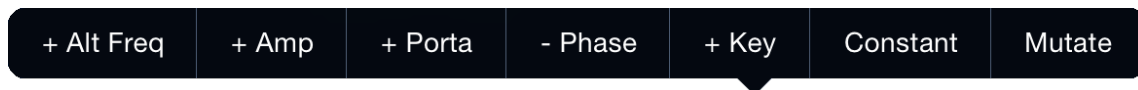
5.2 Live Graph Display

The **Live Graph Display** is a non-interactive display of the current state of a synth object. The filters, amplitude objects, and effects will update a display to show how they are behaving.

Some objects will have a **Waveform Select Button** instead of a live graph display that shows the current waveform. Tap the button or use the arrow buttons to select a new waveform.

5.3 Active Synth Objects

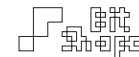
Active synth objects are shown when zoomed into the **Patch Detail View**. **Tap-and-Hold** the object to show its options, including showing / hiding parameters and mutating.



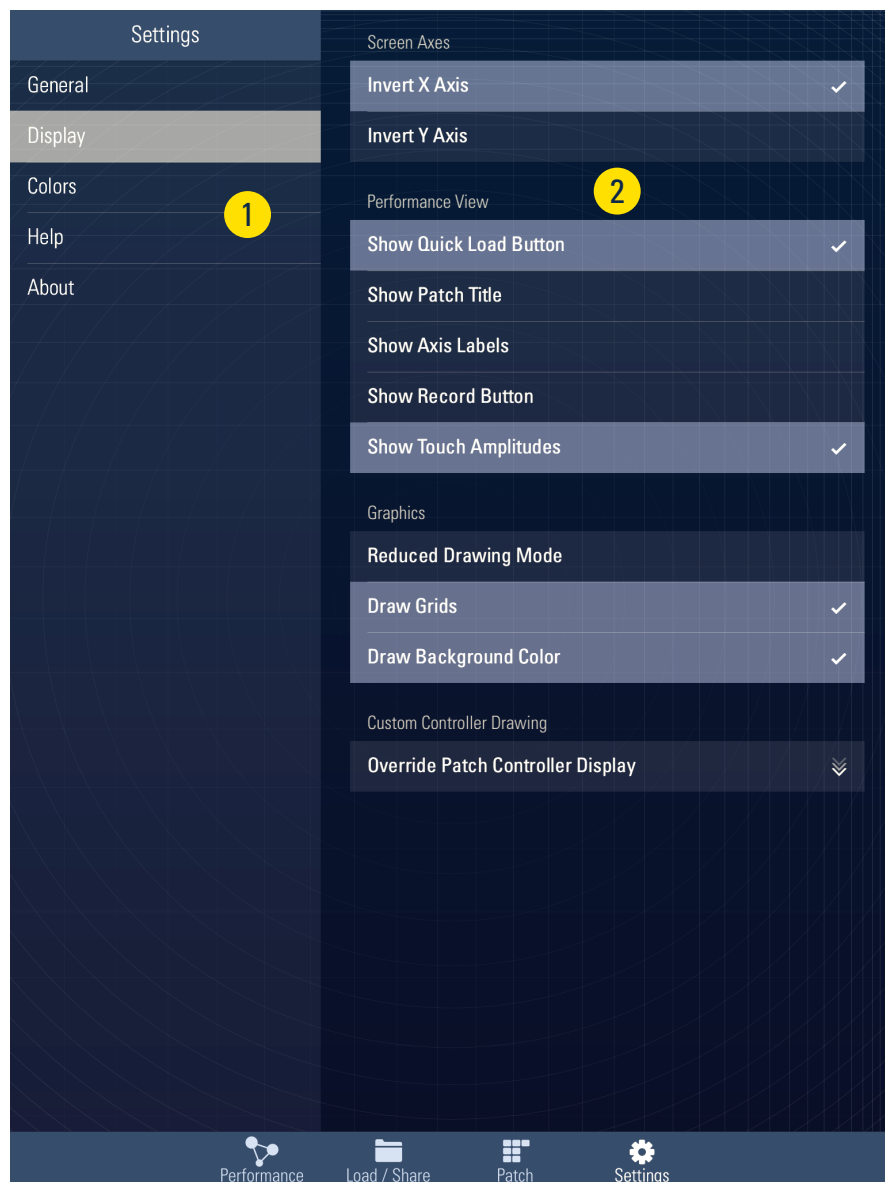
Tap-and-hold a synth object to get its menu options, including hiding and showing optional parameters.

5.4 Parameter

The main portal to programming patches in **TC-11** is the **Parameter**. You can show / hide optional parameters using the popover contextual menu for the **Synth Object**.



6.0 Settings View



1. Settings Sections
2. Settings

6.1 Settings Sections

The **Settings View** is where you can set global options that are not directly related to the current patch or synthesis, such as display settings and color changes. The sections are **General**, **Display**, **Colors**, **Help**, and **About**.



6.2 Settings

6.2.1 General

Run Audio in Background forces **TC-11** to continue to generate audio even when the app is in the background. **Device Motion** will still affect the patch when in the background.

Note: Background Audio and Audiobus

You do not need to turn on Run Audio in Background to use Audiobus. TC-11 will automatically run in the background when connected to Audiobus or Inter-App Audio.

Set the **Max Touches** value to change the maximum polyphony of **TC-11**. **Drag** the **Nub** slider up or down to alter the value.

The **Notes** options allow you to change between note letter names (C, D, E...) and solfège names (Do, Re, Mi...).

The **Restore Patch Presets** button will scan the patches currently in your Documents directory, find and presets that are missing, and copy those presets into your patch collection. It does not overwrite any existing patches.

6.2.2 Display

Invert X Axis and **Invert Y Axis** flip the high (+) and low (-) orientation of the respective axes.

One important aspect about **TC-11's Performance View** is that it does not rotate the performance area when the device is rotated. This means that the x and y-axes will stay locked with the physical screen of the device even if you rotate the device from portrait to landscape.

Because each user may have a preferred way of holding their iPad, you can flip the positive / negative orientation of each axis separately.



It is important to realize that this option is for holding the device in a different way, and should not be used as a way to individually flip a particular controller. Each individual controller can be inverted, including axis-related controllers. If you have a stand or strap that holds your iPad in a particular way, it may be useful to set this permanently.

Example:

Load preset #7 - GrungeKick+Snare. The lower half of the x-axis is used for the kick drum, and the upper half is used for the snare. Then invert the x-axis in the Settings, and the roles are reversed without having to edit the patch.

The **Show** buttons (e.g., **Show Quick Load Button**) switch between showing those interface objects on the Performance view or hiding them.

Reduced Drawing Mode turns off anti-aliasing, and can speed up drawing on the Performance view when many controllers are active.

Draw Grids is an aesthetic graphics preference to hide or show grids on the Performance view.

Draw Background Color switches between drawing the default background color or a black background.

Override Patch Controller Display allows for controllers that are not active in a patch to be drawn to the screen anyway. Each patch uses a set of controllers to drive its synth objects. By default, the only controllers that will draw to screen in the Performance view are those used by the currently loaded patch. This is to assist with performance: you can see exactly what touch movements matter, and which do not.

The **Override Patch Controller Display** option is for performers who want an unrelated set of controllers to display in the Performance view when they play. This is an aesthetic function only: controllers that have not been programmed into the patch will not affect parameters.



You can set **All**, **None**, or generate a **Random** set for fun. You can also individually turn on any of the 300+ controllers' graphics. Remember: this is an aesthetic option only. The controllers that are being displayed are not doing anything (except looking cool).

6.2.3 Colors

The **Colors** section allows you to customize the color set for the Performance view. It is probably the most critical setting in the entire app for a stellar performance.

6.2.4 Help

The **Help** section has a link to this manual, and some animations that explain some of the symbols used throughout the app.

6.2.5 About

The **About** section tells you information 'about' the app. That's where it gets its name! It also has some handy links, like the **Rating Stars** link button. You just haven't experienced **TC-11** to its fullest until you've checked to make sure that link works.



Performance

Performance Basics

TC-11 was designed from the ground up as a multitouch driven synthesizer. That is to say, the multitouch data itself is what controls synthesis. Some synthesizers have buttons, sliders, and other on-screen objects that are controlled with a multitouch interface. In these systems, the multitouch capability is meant to enhance the interface accessibility, but it is not the means of control.

TC-11 takes a different approach. The multiple touches on the screen are examined, and relationships between them are used as controller data streams. Take this example: in a traditional synthesizer, there may be a knob that controls the synth volume. The user touches the screen to move the knob, which changes the volume. With **TC-11**, that job will be given to a touch controller. Perhaps the volume of a synth voice will be controlled by a touch's distance to another touch. The farther the distance between the touches, the louder the volume.

Example:

Load preset M Stretch. With two touches held down, move the touches closer and farther to one another and listen to the volume and modulation rate change. Then, twist the two touches around one another to change the angle, and hear the result.

The power of this system is the ability to create complex synth responses using sets of simple touch controllers. When a patch uses multiple touch controllers, the performative capabilities change dramatically depending on the style of performance. In the same way that a violin's



sound changes based on many variables (bow position, bow speed, finger pressure, vibrato, etc.), **TC-11** patches can draw from many multitouch motions to create complex instruments.

Voice Allocation

Each touch in the **Performance View** is given its own synthesis voice allocation. In essence, each touch produces its own tone.

TC-11 has variable voice polyphony. By default **TC-11** is set to eight [8] simultaneous touches. When a ninth touch is placed, the earliest touch will be dropped in favor of the new touch.

Change the number of available touches in the **Settings** under **General** >> **Max Touches**.

iPad 2, iPad mini, iPad 3	8
iPad 4+	10-11

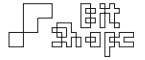
Recommended polyphony settings for various models.

Device Motion

The physical motion of the iPad can be used as a controller. You can turn and twist the device to change filters and effects, or even create vibrato through movement. The screen will display an orientation graphic that will move based on the motion of the device. Follow the graphic carefully to learn how to maneuver the iPad.

Connecting to an Amplifier


TC-11 generates full-frequency audio synthesis. While the iPad speaker is adequate for auditioning patches and casual performance, the full sound and stereo imaging of **TC-11** is best



heard through a set of quality speakers. Connect the headphone jack output of the iPad to an auxiliary input of your home stereo (using an 1/8" to stereo RCA cable), or to any professional mixing board and loudspeaker system for best results.

You may wish to disconnect the USB cable from the iPad, as unwanted bus noise can enter your signal output.

iPad Rotation

Since physically moving the iPad can be part of the synthesis generation, device rotation is disabled while in the **Performance View**. To enable rotation, **Double-Tap** the  button to show the **Navigation Bar**. You can then rotate the device to your current orientation.

The axes of the device are treated statically throughout **TC-11**. The rule is: the x-axis is always the short axis, and the y-axis is always the long one. There is a strong reason for this. When programming, it is significant which axis is assigned to a parameter. If the axes changed arbitrarily, it would be impossible to retain consistency in performance.

Performance Tips

When first performing any patch, try a variety of touch interactions. Some patches are designed to be held down for long durations, others are meant to be ‘plucked’ with short touches. Here are a few common gestures that can trigger complex responses from patches:

- Hold multiple touches down, and move them around the screen
- Change the number of touches on the screen
- Move touches around the screen quickly, or slowly
- ‘Throw’ the touches by moving them quickly, then releasing



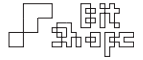
- ‘Pluck’ the screen by tapping and releasing quickly
- ‘Stretch’ a group of touches by moving them farther apart, then closer together
- ‘Twist’ a group of touches like you are turning a knob

Be aware that while some patches may feel as though they are sensitive to touch pressure, the iPad does not respond to touch pressure. Use a light touch when performing **TC-11**. The capacitive touch screen is sensitive to the charge of your finger, not the pressure it exerts on the screen (that is a resistive touch screen). This is particularly important when using *Touch Size* controllers, which measure the amount of your finger in contact with the screen, not the amount of pressure exerted.

If you are performing **TC-11** in a live show, you may wish to turn off your iPad’s automatic sleep function (Auto-Lock). You can turn off this function in the iPad’s Settings, under General.

Prevent accidental Home Button taps in the System Preferences under General >> Accessibility >> Guided Access.

Also, be sure to turn off Multitasking Gestures in the iPad’s Settings, under General. Otherwise, moving groups of touches may close the app, or switch to another open app.



Patch Editing

Controllers Explained

Controllers are the way **TC-11** adjusts **Parameters** in real-time. They are the ‘invisible hands’ that change values like oscillator frequency, filter resonance, delay time, **LFO** rate, or any other value.

The majority of what makes a **TC-11** patch unique is its controller setup. A patch that uses a **Sequencer** to control the frequency of an oscillator will act very differently than one using the touches’ *Distance to First Touch*. When multiple controllers are used to control different areas of the patch, they generate exciting sonic results.

6.0 Touch vs. Group Controllers

Some controllers generate their values by following a single touch voice. These controllers are **Touch** controllers. A simple example of a voiced controller is *Touch X Position*. Each touch has its own position along the x-axis, and the controller reports that position *only* to the voice associated with that touch.

Other controllers may depend on the entire collection of touches to generate their value. These controllers are **Group** controllers. A basic global controller is *Group Count*. This controller sends a value based on the number of currently held touches (between 0-8). This number is not unique to a single touch voice, and so the controller will report the same value to *every* voice that follows it.

When assigning controllers to **Parameters**, it is important to know whether the parameter should follow a voiced or global controller. More information about controllers can be found in the following section.



7.0 Controller Types

TC-11 has a variety of controllers to use when building patches, most of which pull data directly from multitouch relationships. There are three types of **Controllers**:

1. **Touch** controllers
2. **Device Motion** controllers
3. **Module** controllers (**LFO**, **AHDSR**, **Sequencer**)

7.1 Touch Controllers

Touch controllers are created by touching the screen in the Performance view. Multitouch data streams are built by comparing these touches to one another.

There are two types of touch controllers. **Touch ••• Controllers** are voiced controllers. ‘•••’ refers to the fact that the controller is unique for each touch. In some cases more than one touch is needed to generate the data, but it only relates to a single active touch. For example, the *Angle To Previous Touch* checks the position of two touches to find the angle they create on the screen. The latter touch (the one created second) gets sent the *Angle To Previous Touch* controller data.

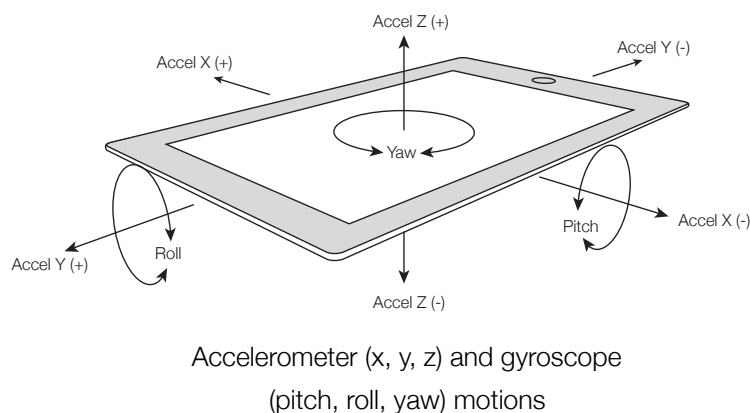
Group • Controllers are global controllers. They examine the entire collection of active touches (the group) to generate their data. One example is *Total Distance To Center*, which sums all of the touches’ distances to the center of the screen.

AHDSR and **Sequencers** need triggers to start and stop them. There are **Touch ••• Triggers** and **Group • Triggers** that can target those parameters.



7.2 Device Motion Controllers

Device Motion controllers are global controllers that pull data from the physical movement of the iPad. There are three [3] device motion sensors: the accelerometer, the gyroscope, and the compass. The accelerometer measures the rate of change in the device's motion through three [3] axes. The gyroscope measures the device's position in space by describing its rotation around three [3] axes. Finally, the compass compares the direction of the device to a fixed heading: magnetic north.



TC-11 uses these data sources as continuous controllers. When the iPad's orientation is reset, gyroscope controllers will output their minimum value. As the device is rotated, controller values will increase in either direction around their axis until they reach the extremity of that movement.

Example:

Load preset #4 - Spyroid. This patch uses Gyroscope Roll to change the FM Depth. Reset the orientation (double-tap the Reset Orientation Button), then roll the device back and forth while holding a few touches to hear the change.

The gyroscope can reset its natural position (orientation). **Double-Tap** the **Reset Orientation Button** to zero the rotation values when you are in a comfortable resting position. The accelerometer is unaffected by orientation reset.



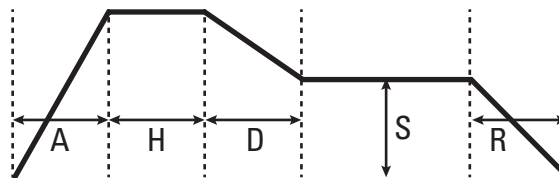
7.3 Module Controllers

TC-11 has four [4] different **Module** controllers: **AHDSRs**, **LFOs**, **Tables**, and **Sequencers**. In this section their functionality will be explained.

7.3.1 AHDSR

AHDSRs are envelope generators. **AHDSR** stands for *attack, hold, decay, sustain, and release*. This **Module** controls a parameter by moving its value smoothly along an envelope shape. It is commonly used to control the *Amp* object parameter. However, **AHDSRs** can be used to control any parameter.

Each part of the **AHDSR** envelope shape can be changed in real-time by another controller. Plus, the output of the **AHDSR** can be scaled, allowing for complex shaping of a parameter.



AHDSR envelope shape

7.3.2 LFO

LFOs are low frequency oscillators. They are generally used to add a slow periodic change to a parameter. Each **LFO** has an assignable waveform that cycles at controllable rate. In addition, the cycling waveform can be scaled (amplitude adjusted), and shifted (center position change).

7.3.3 Table

A **Table** is an array of values whose current index is swept through by an incoming controller. You can think of it as a ‘controller discretizer.’ You can break up a smooth, continuous controller like *Distance to X Edges* into stepwise values by assigning it to control the index of a **Table**.



7.3.4 Sequencer

TC-11 has a powerful step **Sequencer**. The **Sequencer** stores up to 128 values which it can step through to generate a customized stream of values. All **Sequencer** parameters are controllable: playback rate, value adjustment, sequence length, and playback triggers.

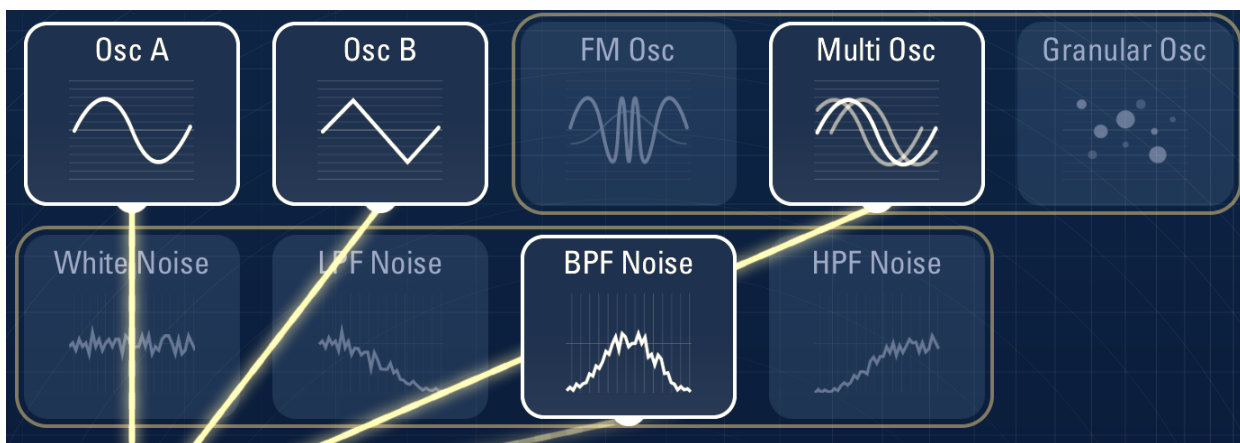
• • •



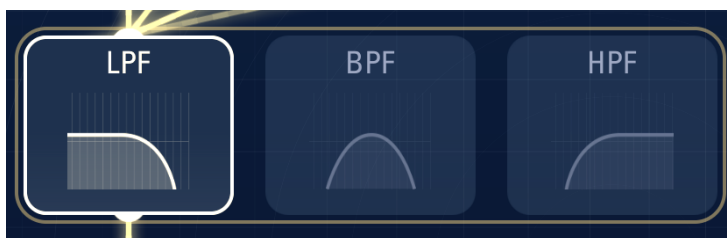
Synth Objects Explained

TC-11's synthesizer design is based on a set of **Synth Objects**. These objects generate or modify the sound in a patch. The number of objects and the connection order are both fixed, but the user decides which objects are active in a patch and which are not.

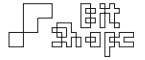
Switch to the **Patch View** to edit the **Synth Objects**.



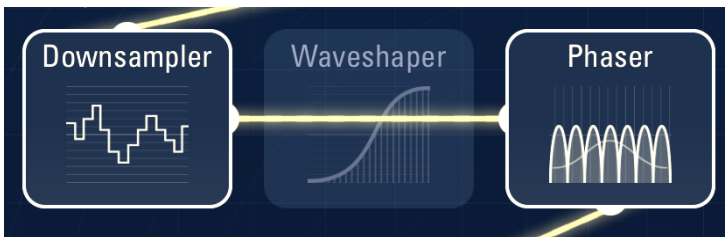
The **Oscillator** contains wavetable oscillators: *Oscillator A*, *Oscillator B*, *FM Oscillator*, *Multi Oscillator*, and *Granular Oscillator*. Also available are filtered noise signals: *White Noise*, *LPF Noise* (low-pass filter), *BPF Noise* (band-pass filter), and *HPF Noise* (high-pass filter).



There are filters: *LPF* (low-pass filter), *BPF* (band-pass filter), and *HPF* (high-pass filter).



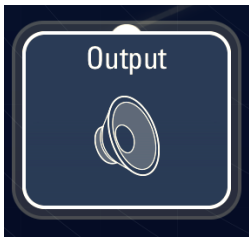
Also included is an *Amp Mod* (amplitude modulator). The *Amp* and *Pan* objects are always enabled, and control the amplitude and panning of the voice respectively.



The *Downsampler*, *Waveshaper*, and *Phaser* are effect objects. They are the first objects that are **Group** objects, meaning they affect every active touch together rather than individually.



The *Resonator*, *Stereo Delay*, and *Reverb* are effects generated using delay.



The *Output* object is the final destination for the signal flow of the synth. It only has one parameter: *amplitude*. It scales the overall amplitude of the patch, and includes a VU meter to help monitor clipping.

8.0 Touch vs. Group Synth Objects

8.1 Touch Synth Objects

The **Synth Objects** in the **Touches** section are the objects that make up the individual polyphonic voices. They are **Touch Synth Objects**. Each touch voice is built with its own instance of these objects, so they can be controlled separately from one another.

Keep this in mind when you are assigning controllers to these objects' **Parameters**. When editing objects in the **Touches** area, you are setting how individual touches will be controlled. Use **Touch ●●●** or **Module ●●●** controllers when you want each touch to get its own value for that parameter. Only choose a **Group ●** or **Module ●** controller if you want all touches to receive exactly the same value.

8.2 Group Synth Objects

The **Synth Objects** in the **Group** section (essentially the **Effects** group) are **Group Synth Objects**. All touch voices are mixed together before running through these objects. This means that **Effects** will act on the entire signal mix, not individual voices.



Programming Parameters

TC-11's uniqueness comes from the ability to control any synthesis parameter with any controller. Do you want to open a filter using a touch-based controller like *Group Total Speed*? Maybe you decide that tilting the device with *Gyroscope Roll* is more expressive. Or you could use an **LFO**, or **Sequencer**, or *Distance to Center*, etc., etc..

This section covers programming **Parameters** in detail.

9.0 Parameters Explained

Each **Synth Object** performs a specific synthesis function. The variables that control those functions are its **Parameters**. One way to think of a parameter is as **TC-11's** replacement for a traditional knob or slider. Each parameter is there to change a single synthesis variable.

For example, *Oscillator A* is a wavetable oscillator that produces a tone. It has up to eight [8] parameters: *Frequency*, *Alternate Frequency*, *Amplitude*, *Portamento*, *Portamento Reset*, *Phase Reset*, and *Note Filter*. Only the *Frequency* parameter is required: the other parameters are optionally controllable components of the synth object.

Get to know what parameters are available, and you will be able to target the specific areas of synthesis that are important for your patch.

10.0 Parameter View

The **Parameter View** is a standardized interface for programming all of the synth objects and modules in **TC-11**. It exposes all of the components of a parameter and its control source in a compact interface.



The Delay Time parameter of the Stereo Delay object.

10.1 Controller Select Button

Tap this button to bring up the **Controller** or **Trigger** select popover. This is where the most exciting programming happens! **TC-11** was built for exploring new control for your synthesis parameters.



The Controllers and Triggers popovers allow any parameter to be controlled by any controller.

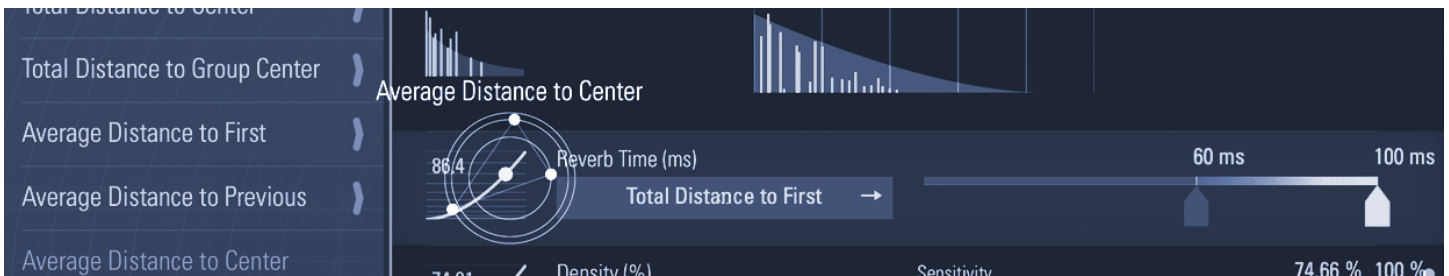
Choosing a novel way of controlling a parameter may open up a new sound or style of performance. Some controllers are driven very directly by the player, like touch controllers. Others, like the **LFO Module**, will run by themselves with as much user interaction as you decide.

Tip: Stop using X / Y Position!

Really! Give it a try. You'll be surprised what kinds of sounds you'll make when you explore some of the other controllers. If you need some inspiration, try mutating an object with the popup menu.



If you hold your device in landscape orientation, you'll see a **Utilities** table on the left side with **Controllers** and **Triggers**. You will find the same controllers and triggers inside, but you can quickly drag them onto a parameter instead of diving through menus.



Drag a controller from the list on the left onto any parameter. Note that controllers can only be assigned to parameters with value ranges, and Triggers to parameters that trigger events.

Above the **Controller Select Button** is a label which shows the parameter name and unit of measurement. Common unit types are:

- Hz - Hertz, cycles per second
- BPM - beats per minute (beat = quarter note)
- % - percentage, with a range of 0-100
- Q - quality factor, resonance

10.2 Jump to Controller Arrow

Each **Controller Button** has a **Jump to Controller Arrow** button. **Tap** this button to open the controller select popover and navigate directly to the currently selected controller.

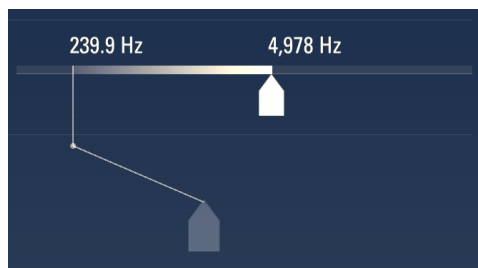
However, when the controller is a **Module**, this button will autoscroll the view to that module so you can quickly adjust that module's parameters.



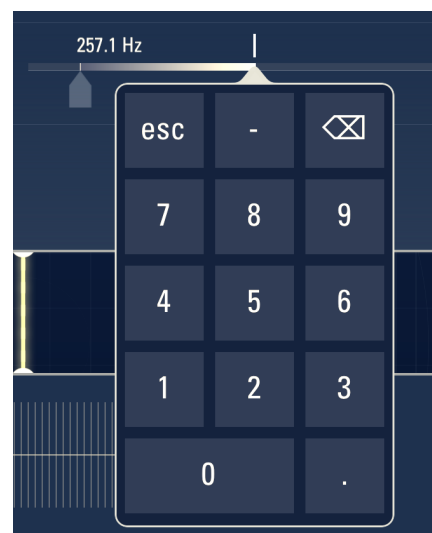
10.3 Value Range Sliders

All parameters have a **Start** and **End** value. The user generates incoming controller data that will be mapped to that range. For example, the *Touch X Position* controller minimum position is 0 points, and the opposite side of the screen is the maximum (768 points). The position of the touch within that range would set the parameter's value, mapped to whatever start / end value range the user has set.

The **Value Range Sliders** allow you to quickly and accurately set the start and end values of your Parameter. Drag the tabs to set the values. You can **Tap** a number or tab to enter a value using a numeric keypad.



If you pull a tab downward, you get fine-precision dragging.



Enter a value with a keypad by tapping on a number or slider tab.

10.4 Sensitivity Slider

Some controllers have a sensitivity adjustment available (for example, *Touch Speed*). The **Sensitivity Slider** will automatically appear for these controllers. The middle of the slider is normal sensitivity, lower values make the controller less sensitive, and upper values make the controller more sensitive.



You can still tap the slider to enter a value numerically. The range is normalized (0.0 - 1.0) with 0.5 being normal sensitivity.

Controller Sensitivity should be considered when using time-related controllers. For example, *Creation Time Since Previous Touch* can be used to simulate chording if the sensitivity is high enough.

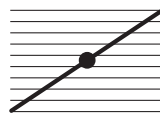
Example:

Load preset #26 - Punch in the Face. Each time you create a touch it uses the time since the last touch to change the strength of the synth voice. Press multiple touches simultaneously for the big punch!

10.5 Live Controller Graph

The graph on the left shows the incoming **Controller** value, scaled to the value range of the **Parameter**. This is a very helpful live readout of the controller data being generated. Here you can see exactly how each controller is behaving.

This is where you set the **Slope** of the converted controller data. **Drag** the graph up and down to change the weighting of the values generated. **Double-Tap** the graph to reset to linear slope.



Linear Weighting is a one-to-one mapping of the controller range to the parameter value range.

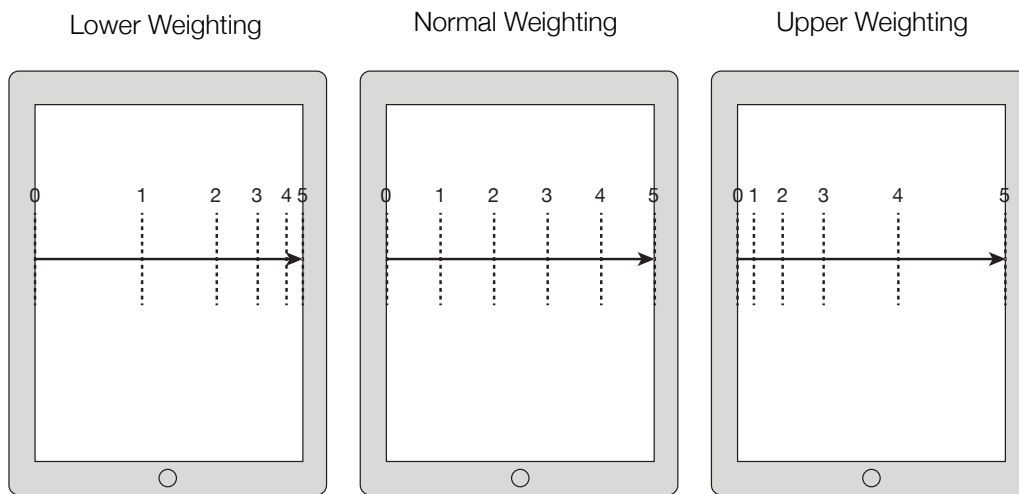


Upper Weighting pushes incoming controller values towards the upper range of the parameter values. This means that incoming controller values will quickly push the parameter values up towards their upper range.



Lower Weighting pulls incoming controller values towards the lower range of the parameter values. This means that incoming controller values will keep parameter values closer to the lower range of until they reach the very top.

Weighting is important for all parameters, but one clear example of its importance is when dealing with frequency. Take the following setup: *Oscillator A Frequency* is controlled by the *Touch X Position* controller, and the min. / max. range is 50 Hz - 5000 Hz. If the weighting is set to **Linear**, the bottom few octaves (50 - 400 Hz) take up only 54 pixels of the screen. With **Upper Weighting**, it's only 28 pixels. With **Lower Weighting**, the same octaves use 204 pixels to sweep through, which acts much closer to the way we perceive frequency ranges.



Differences in weighting, with the *Touch X Position* mapped to a frequency parameter ranged 0-5 kHz





Module Programming

The **Module** controllers in **TC-11** are the **AHDSR**, **LFO**, **Table**, and **Sequencer**.

11.0 AHDSR

AHDSR 1

Start

Touch Began →

End

Touch Ended

614

Attack (ms)

0 ms 1,000 ms

Pitch (Touch) ↓ →

1,645

Decay (ms)

16 ms 1,645 ms

Angle to Group Center →

58.64

Sustain (%)

0 % 100 %

Distance to Previous →

1,407

Release (ms)

0 ms 5,000 ms

Y Position ↓ →

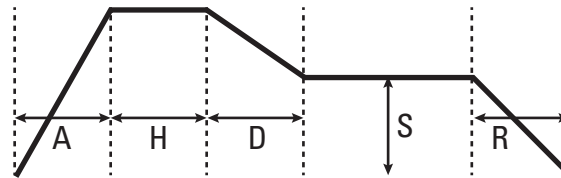
The **AHDSR** is an envelope generator. When triggered, it ramps a control value along a user-defined envelope shape. Like traditional **AHDSRs**, the envelope starts at a 0.0 value, then ramps to its full value before returning to 0.0.



AHDSRs are commonly used to apply an amplitude envelope to individual voices. In **TC-11** you will almost always see the *Amp* object being controlled by a voiced **AHDSR**. **AHDSRs** can target any **Parameter** to shape its value.

11.1 AHDSR Live Graph

This graph shows the live shape of the **AHDSR** envelope, as defined by the current parameter values being generated.



AHDSR envelope shape

11.2 AHDSR Trigger Parameters

There are two [2] trigger parameters for each **AHDSR**: *Start* and *Release*. The *Start* trigger starts the envelope shape in motion. If the **AHDSR** is in the middle of an envelope, the *Start* trigger will reset the envelope to the beginning (0.0). The envelope will generate its values until it reaches the *Sustain Level*, where it will stay until the **AHDSR** receives a *Release* trigger. It then ramps to 0.0 over the *Release* time.

11.3 AHDSR Parameters

There are six [6] parameters for each **AHDSR**: *Attack*, *Hold*, *Decay*, *Sustain*, *Release*, and *Scale*. *Attack*, *Decay*, and *Release* each sets the time (in milliseconds) that its portion of the envelope takes to complete. *Sustain* is the level of the envelope it will output indefinitely when it reaches that portion of the envelope.

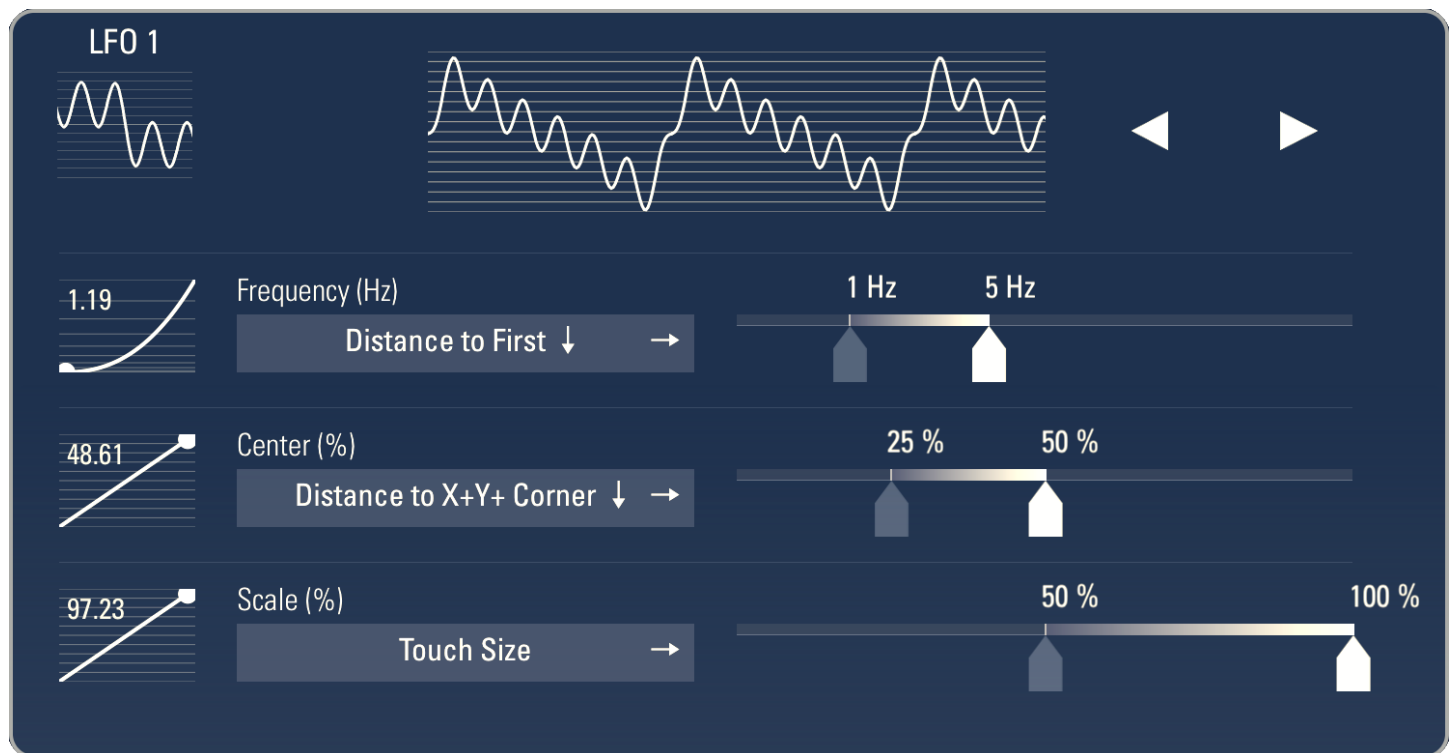


Hold is less common among envelope generators, and warrants explanation. Traditional *Hold* times force the envelope to continue even if the *Release* trigger has been activated. In **TC-11**, the *Hold* value is the time held at maximum value once *Attack* has finished.

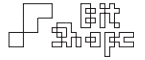
Scale allows the entire envelope shape to be stretched from 100% to flat (0%). Changing the *Scale* will affect any controlled parameters in real-time.

While each parameter can be controlled dynamically, note that the envelope will only set the value at the time of triggering. Once the envelope shape is in motion, changing the time of that parameter will have no effect on the envelope until it has reached the next control point.

12.0 LFO



The **LFO** is a low frequency oscillator. It has a selectable waveform and basic control over the rate of oscillation and amplitude. **LFOs** are generally used for periodic control of parameters, but can also facilitate quasi-random parameter control.

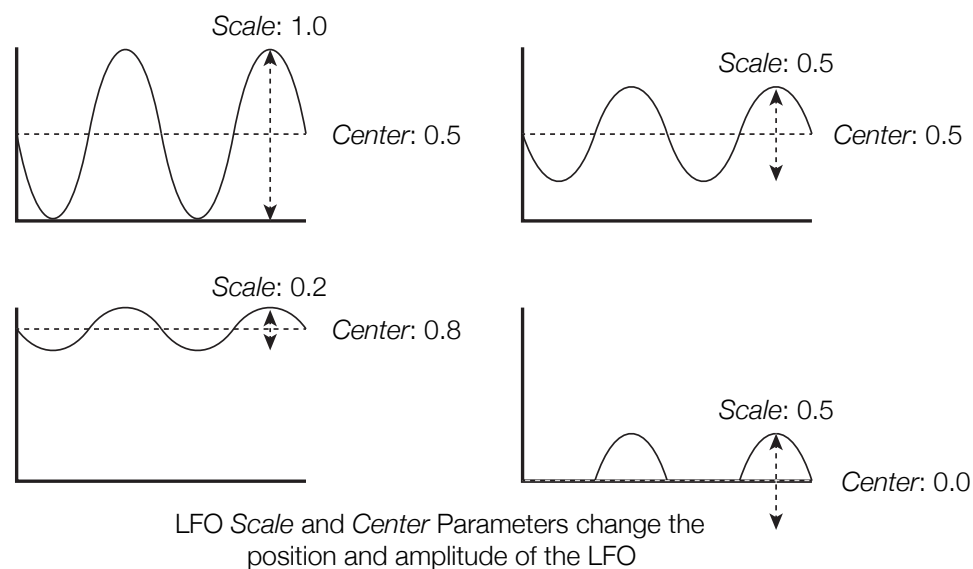


12.1 LFO Waveform Select Button

This button shows the selectable waveforms for the **LFO**. Tap the image of a waveform in the waveform select popover to load it into the **LFO**. You can also use the arrow left / right buttons to cycle through the waveforms.

12.2 LFO Parameters

There are three [3] parameters that adjust the **LFO**: *Rate*, *Scale*, and *Center*. *Rate* sets the frequency of the waveform, and has a range of 0 Hz - 50 Hz. *Scale* adjusts the amplitude of the waveform. *Center* adjusts the mid-point of the waveform's amplitude.



Control values are scaled individually for each parameter they control. If *Scale* is set to 100%, the **LFO** will cycle through the full range of the parameter. When it is set to a lower percentage, it will only cycle through a portion of the parameter range.

Center allows you to offset the **LFO** values within the defined parameter range. When used in conjunction with *Scale*, the **LFO** can be a very flexible controller.

Table 1

1 - 16	17 - 32	33 - 48	49 - 64	65 - 80	81 - 96	97 - 112	113 - 128
19	48	69	33	36	60	78	96

Retrigger

Touch Ended →

Index

Yaw →

1 8

Add

Distance to Y- Edge →

-32 32

4

16.54

Tables perform a powerful function: they take a continuous value controller and break it into discrete values. Think of it as a ‘controller discretizer.’ This is why they are used for the default ‘Scale’ patches: they break the continuous *Y Position* controller into 10 steps, each of which has its own value.



13.1 Rand Button

The **Randomize Values Button** randomly sets all values in the **Table** array.

13.2 Ramp Button

The **Ramp Values Button** pops open a list of scales which will set the array values when selected.

The **Normalize** scale will divide the array into even values from 0.0 to 127.0.

The other scales will begin from the first array index value and step through the scale continuously for the remaining indexes.

13.3 Set Button

The **Set Values Button** pops open a numeric keypad to set all array values to a single value.

13.4 Array

The **Table** array is a series of discrete values. Drag your finger through the array to set the values on the fly, or type in values into the index textfields. The array has a MIDI friendly range of 0-127.

Tip:

Connect a MIDI controller to your iPad and play notes while a Table textfield is active to enter note values via a keyboard.

If you want the sequence values to match MIDI notes, for example when controlling the **Frequency Parameter** of an oscillator set to **Notes**, be sure to set that parameter's **Start** and **End** values to 0-127.



13.5 Retrigger Trigger Parameter

When a **Table** changes to a new index, the value at that index is sent to all listening parameters and a **Trigger** is fired. If the **Table** receives the same index request before moving on, it will not re-send the value and trigger.

The **Retrigger** trigger parameter will clear the current index so that it can re-send the same array position value. This is commonly used with the *Touch Ended* **Trigger** so that new touches that follow can re-send the current **Table** value and trigger if necessary.

13.6 Index Parameter

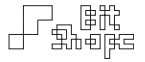
The **Controller** assigned to the **Index Parameter** will scrub the **Table** through its array indexes. Set the **End** value of the parameter to set the **Table** array length.

13.7 Add Parameter

The **Add Parameter** allows for dynamic value shifting while scrubbing through a **Table**.

Tables only calculate their values when a new index is reached. If you want the **Add Parameter** to continuously fire, choose the **+ Add Retrigger** option in the popup menu for the **Module**.

• • •



14.0 Sequencer

Sequencer 1

The Sequencer 1 interface displays a 16-step sequence editor. The steps are grouped into eight sets of two: 1-16, 17-32, 33-48, 49-64, 65-80, 81-96, 97-112, and 113-128. Each step has a corresponding Hz value and a Sync checkbox.

Step	Hz	Sync
1	11	
2	73	
3	30	
4	16	
5	110	
6	104	
7	50	
8	100	
9	49	
10	31	
11	111	
12	46	
13	25	
14	34	
15	26	
16	55	

Controls for Sequencer 1 include:

- Play** button: Starts the sequence.
- Stop** button: Stops the sequence.
- Step** button: Advances to the next step.
- Reset** button: Resets the sequence.
- Rate (Hz)** slider: Controls the playback rate, with markers at 8 Hz and 16 Hz.
- Add** button: Adds a new step.
- Distance to X-Y+ Corner** slider: Controls the distance to the corner.
- Start Position** slider: Controls the start position, with a marker at 6.
- Length** slider: Controls the length, with a marker at 8.

The **Sequencer** is the most powerful **Module** in **TC-11**. It outputs user-set values at a periodic rate, and has controls for playback functions.



14.1 Rand Button

The **Randomize Values Button** randomly sets all values in the sequence.

14.2 Ramp Button

The **Ramp Values Button** pops open a list of scales which will set the sequence values when selected.

The **Normalize** scale will divide the sequence into even values from 0.0 to 127.0.

The other scales will begin from the first sequence index value and step through the scale continuously for the remaining indexes.

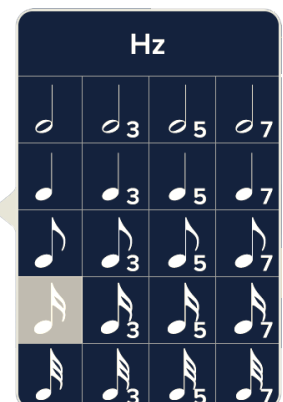
14.3 Set Button

The **Set Values Button** pops open a numeric keypad to set all sequence values to a single value.

14.4 Rate Format Button

Choose the style that the **Rate Parameter** shows the **Sequencer** rate. You can choose Hz (cycles per second), or BPM (beats per minute) with the subdivision of your choosing. In BPM, the quarter note gets the beat. For example, choosing a sixteenth note, and setting the **Rate Parameter** to 60 BPM is equivalent to sending four (4) values per second.

Note that choosing a different subdivision does not change the speed of playback, but rather updates the displayed BPM to reflect the new subdivision.





14.5 Sync Button

The **Sync** button allows one **Sequencer** to have all of its playback, start position, and length parameters synchronized to another **TC-11 Sequencer**. Use this to lock performance of two or more **Sequencers** together.

14.6 Sequence

The sequence is a series of discrete values. Drag your finger through the sequence to set the values on the fly, or type in values into the index textfields. The sequence has a MIDI friendly range of 0-127.

Tip:

Connect a MIDI controller to your iPad and play notes while a Table textfield is active to enter note values via a keyboard.

If you want the sequence values to match MIDI notes, for example when controlling the *Frequency* parameter of an oscillator set to **Notes**, be sure to set that parameter's **Start** and **End** values to 0-127.

14.7 Position Gate Buttons

Position Gates are similar to mute buttons: they determine whether or not a sequence index is allowed to be played. When the **Sequencer** steps to its next index, it checks whether or not the **Position Gate** is active. If it is active, the value is output, and a trigger is sent. If the **Position Gate Button** is unchecked, the **Sequencer** sends nothing. It will be heard as a pause, or rest, in the sequence.



Use **Position Gates** to build a specific rhythm for the sequence. For example, the triggers that are sent by the **Sequencer** can be used to start an **AHDSR**. By toggling **Position Gate Buttons**, you can create a rhythmic cycle for your **AHDSR**.

14.8 Sequencer Trigger Parameters

The **Sequencer** has four [4] **Trigger Parameters**: *Play*, *Step*, *Stop*, and *Reset*. *Play* starts the sequence playing, starting wherever it is currently positioned within the sequence. Sending a second trigger to *Play* while it is playing does nothing. *Step* will instantly move the **Sequencer** to the next sequence value. If *Step* is triggered while the **Sequencer** is currently playing, it will jump to the next value and continue moving forward at the playback rate.

Stop pauses **Sequencer** playback, and holds the current position. *Reset* will jump the playback position to the first value. When this happens, the value is not sent. Triggering *Play* after a *Reset* will start with the first value. If *Reset* is triggered while the **Sequencer** is currently playing, it will jump to the first value and continue moving forward at the playback rate, starting with the first value.

Part of the flexibility of the **Sequencer** is its playback control. Choosing which controllers you want to trigger playback movement is an important part of using the **Sequencer**.

Example:

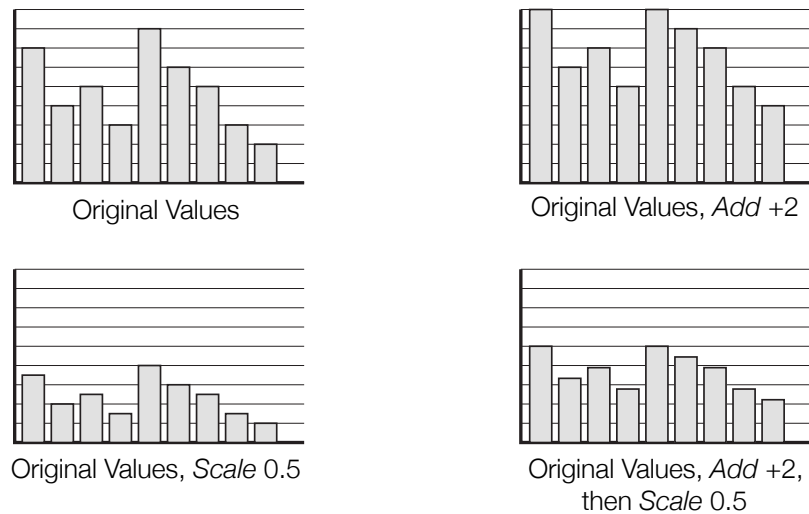
Load preset #50 - Martian Drums. The default setting plays the Sequencer when the patch is loaded. Change SEQ-0's PLAY trigger to None, and STOP to Patch Loaded. Then, the Sequencer steps forward only when you create a new touch.

14.9 Sequencer Parameters

The **Sequencer** has five [5] **Parameters**: *Rate*, *Add*, *Scale*, *Start Position* and *Length*. *Rate* sets the playback rate in Hz. *Add* shifts all values by an equal amount. This value can be positive or



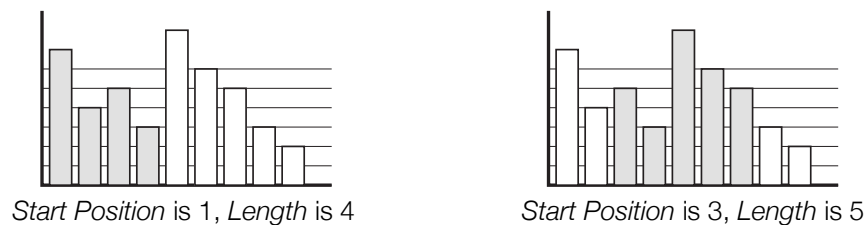
negative to shift sequence values higher or lower. If the minimum or maximum value is reached, the value will be clipped. *Scale* changes values by a proportional amount.



Sequencer *Add* and *Scale* Parameters

Add will be applied before *Scale*. A common use for *Add* is to shift up a melodic sequence, while *Scale* is more commonly used when a non-frequency based parameter is being controlled by a **Sequencer**.

Start Position sets the first sequence index for playback. When the **Sequencer** reaches its end, it will return to whatever the current *Start Position* is. *Length* is the length of the sequence. When playing back, a **Sequencer** will check to see if it is outside the currently defined sequence range as set by the *Start Position* and *Length*. If it is, it will reset to the *Start Position* index.



Start Position and Length Parameters



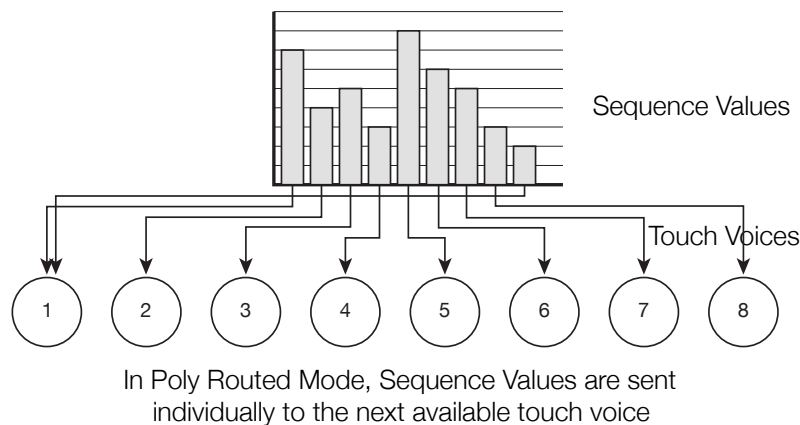
14.10 Voicing and Polyphony

When controlling a **Parameter** with a **Sequencer**, there are three [3] choices for controller voice assignment:

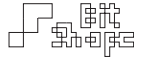
- Sequencer # •
- Sequencer # •••
- Sequencer # •→•

Global • and **Touch ••• Sequencers** act like any other controller: if a parameter is controlled by the Sequencer in global mode, it will receive the a single value for all touches. Voiced mode essentially gives each touch its own Sequencer instance, so that each can have its own *Rate*, *Add*, and other parameters.

Poly Routed •→• mode is a special method of targeting touch voices with **Sequencer** values. Each time the **Sequencer** steps to a new value, that value will be sent only to the next available touch. This way, all of the touches will be controlled by the same **Sequencer** instance (like global mode), but they receive a value only when the polyphony has cycled around to that touch.



It is common to use this mode in conjunction with setting the **Sequencer Step** trigger to *Touch Began*. When a touch begins, the **Sequencer** will send off its new value that is specific for that



voice. This allows for overlap of sequence values; you can hold one voice at a specific sequence value while others are free to grab their own. This mode can yield some interesting performance results, since the length of the sequence may not match the number of active touch voices, and voice parameters that change in other parts of the patch will affect individual sequence values!





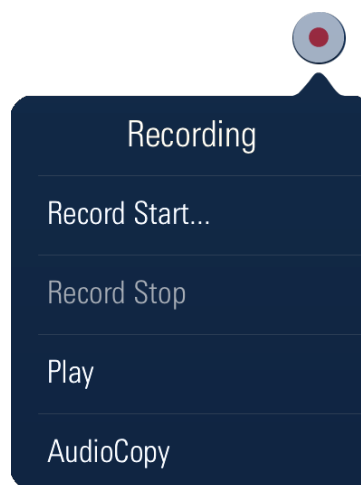
Recording

Recording Capabilities

TC-11 supports complete internal recording of its audio output. The captured audio is a 44.1kHz, 16 bit, stereo (.wav) file. You can record up to ten [10:00] minutes of audio. At the end of the ten minute session, a countdown timer will give you a ten [00:10] second warning before the recording automatically stops.

15.0 Recording Controls

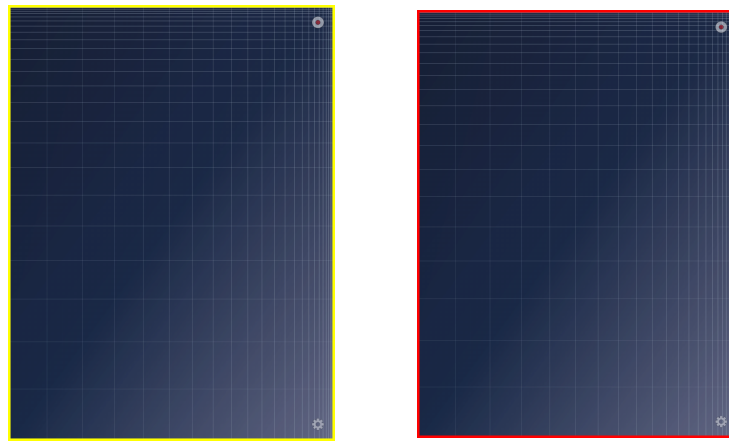
To see the recording controls in the **Performance View**, set the **Show Recording Controls Button** option in the **Settings View**. When you want to see the recording controls, double-tap the **Recording Controls Button**.



The recording controls. Double-tap the Recording Controls Button to access.



Record Start... does not immediately begin recording, but instead puts **TC-11** into a ‘record ready’ or ‘record pause’ mode. Recording begins exactly when the next touch begins in the Performance view. When in the ‘record ready’ mode, the Performance view will have a yellow border indicating that the next touch will begin recording. Once that touch begins, the border will turn red indicating recording is active. Each recording overwrites the previous recording.



‘Record ready’ (left) has a yellow border. ‘Recording active’ (right) has a red border.

To stop the recording, double-tap the **Recording Controls Button** and press **Record Stop**. Recording can stop automatically a few ways:

- If ten [10:00] minutes elapse, a timer will appear giving ten [00:10] seconds notice, then recording will stop.
- If you switch away from the Performance view, recording stops.
- Exiting the app stops recording.

The **Play** option in the recording controls is available as long as a recording is presently available. It will play the currently saved recording so you can audition your performance. When playing, the button will become **Stop**, allowing you to stop the playback. You can play a saved recording even after changing to another patch.



The **AudioCopy** feature is an audio tool set by Sonoma Wire Works that allows seamless copying and pasting of audio files between iOS applications. You can take your recording to any other **AudioCopy** supported app by pressing this button and following the prompt.

AudioCopy and AudioPaste are trademarks and software of Sonoma Wire Works.

You can also access your recorded audio file by connecting your iPad to iTunes and looking in the app's Documents folder in the **File Sharing** section. The recorded audio file is named after the currently loaded patch.

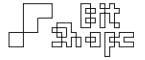
Audiobus

TC-11 supports Audiobus as an Input source. With Audiobus you can run **TC-11** through other applications, such as virtual effect racks and multi-track recording apps. You must download the Audiobus app from the App Store to use this feature.

TC-11 also supports State Saving.

15.1 Running Through Audiobus

Launch Audiobus and tap on the Input source module. Choose **TC-11** from the popover menu. Even if **TC-11** is already running, you will need to tap on the icon again to launch **TC-11** to engage Audiobus mode.

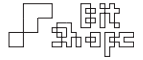


A complete and active Audiobus session.

You do -not- need to turn on **Run Audio in Background** in **TC-11's Settings** area to use Audiobus. In the Audiobus app, make sure you have a valid Output target, such as the Speaker Output or an Output compatible application.

When all apps are correctly loaded, you will see the connections between them light up. You can then return to **TC-11** to perform.





Appendices

Troubleshooting

If you are experiencing odd behavior from **TC-11**, check the following common solutions for assistance. If your issue is not addressed here, please email [\[feedback@bitshapesoftware.com\]](mailto:feedback@bitshapesoftware.com) with a description of the problem. If the issue is an app crash, please include the crash log, located at `~/Library/Logs/CrashReporter/MobileDevice/iPadName/TC-11_iPad.crash`. This will help keep **TC-11** as solid of an app as possible.

Actually, feel free to email [\[feedback@bitshapesoftware.com\]](mailto:feedback@bitshapesoftware.com) for any reason at all. I do like hearing from you.



16.0 Issues / Solutions

<i>No sound</i>	<ul style="list-style-type: none"> • Check the iPad device volume. • Check receiver / amp / speaker volume if using the headphone out jack. • Try tilting the iPad during performance. Some patches require device motion to raise the patch volume. • Try using multiple touches to activate the patch. • Load / reload a different patch. • Quit / relaunch TC-11. Double-tap the home button, then tap and hold the TC-11 icon until the minus sign appears, then tap the minus sign. • If using a hardware DAC, try using the built-in output. If the issue is related to the DAC, please email the make and model to the developer. • If using Audiobus, make sure every app is correctly loaded. Force quit and re-load all apps. • Restart the iPad.
<i>Buzz or electrical noise during performance</i>	<ul style="list-style-type: none"> • Disconnect the USB cable from the iPad.
<i>Graphical slowdown</i>	<ul style="list-style-type: none"> • Turn on Reduced Draw Mode under Settings >> Display. • Reduce the polyphony under Settings >> General >> Polyphony. • Turn off <i>Override Controller Display</i> in the Settings View.
<i>Unwanted clicking in audio</i>	<ul style="list-style-type: none"> • Reduce the polyphony under Settings >> General >> Polyphony.
<i>Microphone is running through the speakers</i>	Reset the iPad's General Settings, under General >> Reset >> Reset All Settings



Appendix A: Symbols

A few symbols are used as shorthand indicators. They often represent common properties of controllers.

17.0 Symbols

● ● ●	A controller or module is a 'Touch' controller. A unique value is sent for each touch.
●	A controller or module is a 'Group' controller. A single value is sent to all touches.
● → ●	A Sequencer that is 'Poly Routed.' Each successive value is sent to the next available active touch index.
↓	Touch or group began. Signifies controllers that only send when a touch / group is created.
↑	Touch or group ended. Signifies controllers that only send when a touch / group finishes.
-/+	A controller that rests at its midpoint, and both pushes towards its maximum and pulls towards its minimum based on direction of movement.
⌋	Drag handle. A cell or drawer can be dragged.



Appendix B: Controllers

The term ‘first touch’ refers to the touch that begins a new group of touches. It will be colored differently than all following touches. The term ‘previous touch’ refers to the last touch created before starting a new touch. The x-axis of the iPad is the narrow axis (768 points wide). The y-axis of the iPad is the long axis (1024 points).

The Min and Max generated values by the controller are mostly inconsequential when programming **TC-11**. They are only listed here for your information.

18.0 Touch ●●● Controllers

Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Creation Time Since First	Time difference between a touch and the first touch.	0	2	Seconds	YES
Creation Time Since Previous	Time difference between a touch and the previous touch.	0	2	Seconds	YES
Time Alive	A running value that reports the time a touch has been active.	0	5	Seconds	YES
Time Alive ↑	A running value that reports the time a touch has been active.	0	5	Seconds	YES
Time Stationary	A running value that reports the time a touch has not moved.	0	5	Seconds	YES
Time Stationary ↑	A running value that reports the time a touch has not moved.	0	5	Seconds	YES
Time Moving	A running value that reports the time a touch has been moving.	0	5	Seconds	YES



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Time Moving ↑	A running value that reports the time a touch has been moving.	0	5	Seconds	YES
X Position	The x-axis position of the touch.	0	767	Points	NO
Y Position	The y-axis position of the touch.	0	1023	Points	NO
X Position ↓	The x-axis position of the touch.	0	767	Points	NO
Y Position ↓	The y-axis position of the touch.	0	1023	Points	NO
X Position ↑	The x-axis position of the touch.	0	767	Points	NO
Y Position ↑	The y-axis position of the touch.	0	1023	Points	NO
Speed	The speed of the touch.	0	10000	Points per second	YES
X Velocity	The x-velocity of the touch.	0	10000	Points per second	YES
X Velocity -/+	The x-velocity of the touch.	-10000	10000	Points per second	YES
Y Velocity	The y-velocity of the touch.	0	10000	Points per second	YES
Y Velocity -/+	The y-velocity of the touch.	-10000	10000	Points per second	YES
Velocity to Center	The velocity towards / away from the center of the screen.	0	10000	Points per second	YES
Velocity to Center -/+	The velocity towards / away from the center of the screen.	-10000	10000	Points per second	YES
Rotation Speed Around First	The rate of rotation around the first touch.	0	5	Degrees per second	YES
Rotation Speed Around Center	The rate of rotation around the center of the screen.	0	5	Degrees per second	YES



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Rotation Speed Around Group Center	The rate of rotation around the center of the group.	0	5	Degrees per second	YES
Distance to First	The distance between a touch and the first touch.	0	1280	Points	NO
Distance to First ↓	The distance between a touch and the first touch.	0	1280	Points	NO
Distance to First ↑	The distance between a touch and the first touch.	0	1280	Points	NO
Distance to Previous	The distance between a touch and the previous touch.	0	1280	Points	NO
Distance to Previous ↓	The distance between a touch and the previous touch.	0	1280	Points	NO
Distance to Previous ↑	The distance between a touch and the previous touch.	0	1280	Points	NO
Distance to Center	The distance between a touch and the center of the screen.	0	640	Points	NO
Distance to Center ↓	The distance between a touch and the center of the screen.	0	640	Points	NO
Distance to Center ↑	The distance between a touch and the center of the screen.	0	640	Points	NO
Distance to Group Center	The distance between a touch and the center of the group.	0	1024	Points	NO
Distance Traveled	The distance between a touch and the center of the group.	0	10000	Points	YES
Distance Traveled ↑	The distance between a touch and the center of the group.	0	10000	Points	YES



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Distance to Start	The distance between a touch's position and its starting position.	0	1280	Points	NO
Distance to Start ↑	The distance between a touch's position and its starting position.	0	1280	Points	NO
Distance to Start X	The distance between a touch's x-position and its starting x-position.	0	768	Points	NO
Distance to Start X -/+	The distance between a touch's x-position and its starting x-position.	-768	768	Points	NO
Distance to Start X ↑	The distance between a touch's x-position and its starting x-position.	0	768	Points	NO
Distance to Start X -/+ ↑	The distance between a touch's x-position and its starting x-position.	-768	768	Points	NO
Distance to Start Y	The distance between a touch's y-position and its starting y-position.	0	1024	Points	NO
Distance to Start Y -/+	The distance between a touch's y-position and its starting y-position.	-1024	1024	Points	NO
Distance to Start Y ↑	The distance between a touch's y-position and its starting y-position.	0	1024	Points	NO
Distance to Start Y -/+ ↑	The distance between a touch's y-position and its starting y-position.	-1024	1024	Points	NO
Distance to X-Edge	The amount of distance covered from a touch's starting position and the X-screen edge.	0	1	N/A	NO



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Distance to X+ Edge	The amount of distance covered from a touch's starting position and the X+ screen edge.	0	1	N/A	NO
Distance to X Edges	The amount of distance covered from a touch's starting position and a X screen edge.	0	1	N/A	NO
Distance to X Edges -/+	The amount of distance covered from a touch's starting position and a X screen edge.	-1	1	N/A	NO
Distance to Y- Edge	The amount of distance covered from a touch's starting position and the Y- screen edge.	0	1	N/A	NO
Distance to Y+ Edge	The amount of distance covered from a touch's starting position and the Y+ screen edge.	0	1	N/A	NO
Distance to Y Edges	The amount of distance covered from a touch's starting position and a Y screen edge.	0	1	N/A	NO
Distance to Y Edges -/+	The amount of distance covered from a touch's starting position and a Y screen edge.	-1	1	N/A	NO
Distance to X-Y- Corner	The distance between a touch and the (X-,Y-) corner.	0	1279	Points	NO
Distance to X-Y- Corner ↓	The distance between a touch and the (X-,Y-) corner.	0	1279	Points	NO
Distance to X-Y- Corner ↑	The distance between a touch and the (X-,Y-) corner.	0	1279	Points	NO



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Distance to X-Y+ Corner	The distance between a touch and the (X-,Y+) corner.	0	1279	Points	NO
Distance to X-Y+ Corner ↓	The distance between a touch and the (X-,Y+) corner.	0	1279	Points	NO
Distance to X-Y+ Corner ↑	The distance between a touch and the (X-,Y+) corner.	0	1279	Points	NO
Distance to X+Y- Corner	The distance between a touch and the (X+,Y-) corner.	0	1279	Points	NO
Distance to X+Y- Corner ↓	The distance between a touch and the (X+,Y-) corner.	0	1279	Points	NO
Distance to X+Y- Corner ↑	The distance between a touch and the (X+,Y-) corner.	0	1279	Points	NO
Distance to X+Y+ Corner	The distance between a touch and the (X+,Y+) corner.	0	1279	Points	NO
Distance to X+Y+ Corner ↓	The distance between a touch and the (X+,Y+) corner.	0	1279	Points	NO
Distance to X+Y+ Corner ↑	The distance between a touch and the (X+,Y+) corner.	0	1279	Points	NO
Angle to First	The angle between a touch and the first touch.	0	360	Degrees	NO
Angle to First ↓	The angle between a touch and the first touch.	0	360	Degrees	NO
Angle to First ↑	The angle between a touch and the first touch.	0	360	Degrees	NO
Angle to Previous	The angle between a touch and the previous touch.	0	360	Degrees	NO
Angle to Previous ↓	The angle between a touch and the previous touch.	0	360	Degrees	NO
Angle to Previous ↑	The angle between a touch and the previous touch.	0	360	Degrees	NO



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Angle to Center	The angle between a touch and the center of the screen.	0	360	Degrees	NO
Angle to Center ↓	The angle between a touch and the center of the screen.	0	360	Degrees	NO
Angle to Center ↑	The angle between a touch and the center of the screen.	0	360	Degrees	NO
Angle to Group Center	The angle between a touch and the center of the group.	0	360	Degrees	NO
Rotation Around First	Angular rotation around the first touch.	0	720	Degrees	YES
Rotation Around Center	Angular rotation around the center of the screen.	0	720	Degrees	YES
Rotation Around Group Center	Angular rotation around the center of the group.	0	360	Degrees	YES
Random ↓	Random number generated when the touch begins.	0	99999	N/A	NO
Random ↑	Random number generated when the touch ends.	0	99999	N/A	NO
Random when Starts Moving	Random number generated whenever the touch starts moving.	0	99999	N/A	NO
Random when Stops Moving	Random number generated whenever the touch stops moving.	0	99999	N/A	NO
Random when Starts or Stops Moving	Random number generated whenever the touch starts or stops moving.	0	99999	N/A	NO
Random when Dragged (Long)	Random number generated when the touch drags a long distance.	0	99999	N/A	NO



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Random when Dragged (Medium)	Random number generated when the touch drags a medium distance.	0	99999	N/A	NO
Random when Dragged (Short)	Random number generated when the touch drags a short distance.	0	99999	N/A	NO
Touch is Alive	Max value sent while the touch is alive.	0	1	N/A	NO
Touch Size	The amount of contact a finger has with the screen.	21	73	Points	NO
Touch Size ↓	The amount of contact a finger has with the screen.	21	73	Points	NO
Touch Size ↑	The amount of contact a finger has with the screen.	21	73	Points	NO

18.1 Group • Controllers

Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Creation Time Since Previous Group	The time since the last group began when a group begins.	0	5	Seconds	YES
Group Time Alive	A running value that reports the time a group is active.	0	5	Seconds	YES
Group Time Stationary	A running value that reports the time a group is stationary.	0	5	Seconds	YES
Group Time Moving	A running value that reports the time a group is moving.	0	5	Seconds	YES
Group Time Alive ↑	A value that reports the time a group is active.	0	5	Seconds	YES
Group is Alive	Max value sent while the group is alive.	0	1	N/A	NO



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Group Count	The number of active touches out of the user set maximum polyphony.	0	8	N/A	NO
Group Count Absolute	The number of active touches out of 11.	0	11	N/A	NO
Touches Created Per Second	The number of touches created per second.	0	100	N/A	YES
Touches Ended Per Second	The number of touches released per second.	0	100	N/A	YES
Group Center X	The average x-position of all touches.	0	767	Points	NO
Group Center Y	The average y-position of all touches.	0	1023	Points	NO
Group Total Speed	The sum of all touch speeds.	0	80000	Points per second	YES
Group Center Speed	The speed of the group center position.	0	10000	Points per second	YES
Total Rotation Speed Around Center	The rate of all rotation around the center of the screen.	0	40	Degrees per second	YES
Total Rotation Speed Around Group Center	The rate of all rotation around the center of the group.	0	40	Degrees per second	YES
Total Distance to First	The sum of all distances to the first touch.	0	4000	Points	NO
Total Distance to Previous	The sum of all distances to previous touches.	0	4000	Points	NO
Total Distance to Center	The sum of all distances to the center of the screen.	0	5000	Points	NO
Total Distance to Group Center	The sum of all distances to the center of the group.	0	2880	Points	NO



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Average Distance to First	The average distance to the first touch.	0	1280	Points	NO
Average Distance to Previous	The average distance to previous touches.	0	1280	Points	NO
Average Distance to Center	The average distance to the center of the screen.	0	640	Points	NO
Average Distance to Group Center	The average distance to the center of the group.	0	384	Points	NO
Group Center Distance Traveled	The cumulative distance the center of the group moves.	0	10000	Points	YES
Closest to Center	The smallest active distance to center.	0	640	Points	NO
Farthest From Center	The largest active distance to center.	0	640	Points	NO
Total Angle to First	The sum of all angles to the first touch.	0	2880	Degrees	NO
Total Angle to Previous	The sum of all angles to previous touches.	0	2880	Degrees	NO
Total Angle to Center	The sum of all angles to the center of the screen.	0	2880	Degrees	NO
Average Angle to First	The average angle to the first touch.	0	360	Degrees	NO
Average Angle to Previous	The average angle to previous touches.	0	360	Degrees	NO
Average Angle to Center	The average angle to the center of the screen.	0	360	Degrees	NO
Total Rotation Around Center	The sum of all touches' rotation around the center of the screen.	0	1440	Degrees	YES
Total Rotation Around Center Running	The cumulative sum of all touches' rotation around the center of the screen.	0	720	Degrees	NO



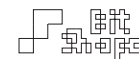
Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Total Rotation Around Group Center	The sum of all touches' rotation around the center of the group.	0	720	Degrees	YES
Total Rotation Around Group Center Running	The cumulative sum of all touches' rotation around the center of the group.	0	720	Degrees	NO
Random (Group) ↓	Random number generated when the group begins.	0	99999	N/A	NO
Random (Group) ↑	Random number generated when the group ends.	0	99999	N/A	NO
Random when Group Starts Moving	Random number generated whenever the group starts moving.	0	99999	N/A	NO
Random when Group Stops Moving	Random number generated whenever the group stops moving.	0	99999	N/A	NO
Random when Group Starts or Stops Moving	Random number generated whenever the group starts or stops moving.	0	99999	N/A	NO
Random when Group Dragged (Long)	Random number generated when the group center drags a long distance.	0	99999	N/A	NO
Random when Group Dragged (Medium)	Random number generated when the group center drags a medium distance.	0	99999	N/A	NO
Random when Group Dragged (Short)	Random number generated when the group center drags a short distance.	0	99999	N/A	NO
Fastest Speed	The fastest active touch speed.	0	10000	Points per second	YES



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Slowest Speed	The slowest active touch speed.	0	10000	Points per second	YES
Min X	The lowest active touch x-position.	0	767	Points	NO
Max X	The highest active touch x-position.	0	767	Points	NO
Min Y	The lowest active touch y-position.	0	1023	Points	NO
Max Y	The highest active touch y-position.	0	1023	Points	NO
Group Center X ↓	The x-position of the group center when it is first created.	0	767	Points	NO
Group Center X ↑	The x-position of the group center when it is ended.	0	767	Points	NO
Group Center Y ↓	The y-position of the group center when it is first created.	0	1023	Points	NO
Group Center Y ↑	The y-position of the group center when it is ended.	0	1023	Points	NO
Total X Velocity	The sum of all touch x-velocities.	0	80000	Points per second	YES
Total X Velocity -/+	The sum of all touch x-velocities.	-80000	80000	Points per second	YES
Total Y Velocity	The sum of all touch y-velocities.	0	80000	Points per second	YES
Total Y Velocity -/+	The sum of all touch y-velocities.	-80000	80000	Points per second	YES



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Total Velocity to Center	The sum of all touch velocities towards / away from the center of the screen.	0	10000	Points per second	YES
Total Velocity to Center -/+	The sum of all touch velocities towards / away from the center of the screen.	-10000	10000	Points per second	YES
Group Center X Velocity	The group center x-velocity.	0	10000	Points per second	YES
Group Center X Velocity -/+	The group center x-velocity.	-10000	10000	Points per second	YES
Group Center Y Velocity	The group center y-velocity.	0	10000	Points per second	YES
Group Center Y Velocity -/+	The group center y-velocity.	-10000	10000	Points per second	YES
Group Center Velocity to Center	The group center velocity towards / away from the center of the screen.	0	10000	Points per second	YES
Group Center Velocity to Center -/+	The group center velocity towards / away from the center of the screen.	-10000	10000	Points per second	YES
Total Rotation Around Center -/+	The sum of all touches' rotation around the center of the screen.	-1440	1440	Degrees	YES
Total Rotation Around Center Running -/+	The cumulative sum of all touches' rotation around the center of the screen.	-1440	1440	Degrees	NO
Total Rotation Around Group Center -/+	The sum of all touches' rotation around the center of the group.	-720	720	Degrees	YES



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Rotation Around Group Center Running -/+	The cumulative sum of all touches' rotation around the center of the group.	-720	720	Degrees	NO
Total Touch Size	The sum of the amount of contact the fingers have with the screen.	21	803	Points	NO
Average Touch Size	The average amount of contact the fingers have with the screen.	21	73	Points	NO
Max Touch Size	The largest amount of contact the fingers have with the screen.	21	73	Points	NO
Min Touch Size	The smallest amount of contact the fingers have with the screen.	21	73	Points	NO

• • •



18.2 Device Motion Controllers

Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Accelerometer X	Acceleration minus gravity on the (short) x-axis.	0	π	Radians	NO
Accelerometer X -/+	Acceleration minus gravity on the (short) x-axis.	$-\pi$	π	Radians	NO
Accelerometer Y	Acceleration minus gravity on the (long) y-axis.	0	π	Radians	NO
Accelerometer Y -/+	Acceleration minus gravity on the (long) y-axis.	$-\pi$	π	Radians	NO
Accelerometer Z	Acceleration minus gravity on the (through) z-axis.	0	π	Radians	NO
Accelerometer Z -/+	Acceleration minus gravity on the (through) z-axis.	$-\pi$	π	Radians	NO
Pitch	Rotation around the x-axis.	0	$\pi/2.0$	Radians	NO
Pitch -/+	Rotation around the x-axis.	$-\pi/2.0$	$\pi/2.0$	Radians	NO
Pitch (Touch) ↓	Rotation around the x-axis.	0	$\pi/2.0$	Radians	NO
Pitch (Touch) ↓ -/+	Rotation around the x-axis.	$-\pi/2.0$	$\pi/2.0$	Radians	NO
Pitch (Touch) ↑	Rotation around the x-axis.	0	$\pi/2.0$	Radians	NO
Pitch (Touch) ↑ -/+	Rotation around the x-axis.	$-\pi/2.0$	$\pi/2.0$	Radians	NO
Pitch During Touch	Rotation around the x-axis, changing only during touch.	0	$\pi/2.0$	Radians	NO
Pitch During Touch -/+	Rotation around the x-axis, changing only during touch.	$-\pi/2.0$	$\pi/2.0$	Radians	NO
Pitch (Group) ↓	Rotation around the x-axis.	0	$\pi/2.0$	Radians	NO
Pitch (Group) ↓ -/+	Rotation around the x-axis.	$-\pi/2.0$	$\pi/2.0$	Radians	NO
Pitch (Group) ↑	Rotation around the x-axis.	0	$\pi/2.0$	Radians	NO
Pitch (Group) ↑ -/+	Rotation around the x-axis.	$-\pi/2.0$	$\pi/2.0$	Radians	NO
Pitch During Group	Rotation around the x-axis, changing only during group.	0	$\pi/2.0$	Radians	NO



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Pitch During Group -/+	Rotation around the x-axis, changing only during group.	$-\pi/2.0$	$\pi/2.0$	Radians	NO
Pitch During Group Running	Rotation around the x-axis, cumulative changing only during group.	0	$\pi/2.0$	Radians	NO
Pitch During Group Running -/+	Rotation around the x-axis, cumulative changing only during group.	$-\pi/2.0$	$\pi/2.0$	Radians	NO
Roll	Rotation around the y-axis.	0	π	Radians	NO
Roll -/+	Rotation around the y-axis.	$-\pi$	π	Radians	NO
Roll (Touch) ↓	Rotation around the y-axis.	0	π	Radians	NO
Roll (Touch) ↓ -/+	Rotation around the y-axis.	$-\pi$	π	Radians	NO
Roll (Touch) ↑	Rotation around the y-axis.	0	π	Radians	NO
Roll (Touch) ↑ -/+	Rotation around the y-axis.	$-\pi$	π	Radians	NO
Roll During Touch	Rotation around the y-axis, changing only during touch.	0	π	Radians	NO
Roll During Touch -/+	Rotation around the y-axis, changing only during touch.	$-\pi$	π	Radians	NO
Roll (Group) ↓	Rotation around the y-axis.	0	π	Radians	NO
Roll (Group) ↓ -/+	Rotation around the y-axis.	$-\pi$	π	Radians	NO
Roll (Group) ↑	Rotation around the y-axis.	0	π	Radians	NO
Roll (Group) ↑ -/+	Rotation around the y-axis.	$-\pi$	π	Radians	NO
Roll During Group	Rotation around the y-axis, changing only during group.	0	π	Radians	NO
Roll During Group -/+	Rotation around the y-axis, changing only during group.	$-\pi$	π	Radians	NO
Roll During Group Running	Rotation around the y-axis, cumulative changing only during group.	0	π	Radians	NO



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Roll During Group Running -/+	Rotation around the y-axis, cumulative changing only during group.	$-\pi$	π	Radians	NO
Yaw	Rotation around the z-axis.	0	π	Radians	NO
Yaw -/+	Rotation around the z-axis.	$-\pi$	π	Radians	NO
Yaw (Touch) ↓	Rotation around the z-axis.	0	π	Radians	NO
Yaw (Touch) ↓ -/+	Rotation around the z-axis.	$-\pi$	π	Radians	NO
Yaw (Touch) ↑	Rotation around the z-axis.	0	π	Radians	NO
Yaw (Touch) ↑ -/+	Rotation around the z-axis.	$-\pi$	π	Radians	NO
Yaw During Touch	Rotation around the z-axis, changing only during touch.	0	π	Radians	NO
Yaw During Touch -/+	Rotation around the z-axis, changing only during touch.	$-\pi$	π	Radians	NO
Yaw (Group) ↓	Rotation around the z-axis.	0	π	Radians	NO
Yaw (Group) ↓ -/+	Rotation around the z-axis.	$-\pi$	π	Radians	NO
Yaw (Group) ↑	Rotation around the z-axis.	0	π	Radians	NO
Yaw (Group) ↑ -/+	Rotation around the z-axis.	$-\pi$	π	Radians	NO
Yaw During Group	Rotation around the z-axis, changing only during group.	0	π	Radians	NO
Yaw During Group -/+	Rotation around the z-axis, changing only during group.	$-\pi$	π	Radians	NO
Yaw During Group Running	Rotation around the z-axis, cumulative changing only during group.	0	π	Radians	NO
Yaw During Group Running -/+	Rotation around the z-axis, cumulative changing only during group.	$-\pi$	π	Radians	NO
Total Motion	Sum of pitch, roll, and yaw.	0	$\pi*2.5$	Radians	NO



Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Total Motion (Touch) ↓	Sum of pitch, roll, and yaw.	0	$\pi*2.5$	Radians	NO
Total Motion (Touch) ↑	Sum of pitch, roll, and yaw.	0	$\pi*2.5$	Radians	NO
Total Motion During Touch	Sum of pitch, roll, and yaw, changing only during touch.	0	$\pi*2.5$	Radians	NO
Total Motion (Group) ↓	Sum of pitch, roll, and yaw.	0	$\pi*2.5$	Radians	NO
Total Motion (Group) ↑	Sum of pitch, roll, and yaw.	0	$\pi*2.5$	Radians	NO
Total Motion During Group	Sum of pitch, roll, and yaw, changing only during group.	0	$\pi*2.5$	Radians	NO
Compass Heading	Magnetic heading.	0	360	Degrees	NO

18.3 Miscellaneous Controllers

Controller:	Description:	Min:	Max:	Units:	Sensitivity:
Constant	Single unchanging value.	N/A	N/A	N/A	NO

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Appendix C: Triggers

The term ‘trigger’ is used to describe a command to start a synth process. The **AHDSR** and **Sequencer** modules use triggers to control playback. **Sequencers** and **Tables** can also generate triggers.

19.0 Touch ●●● Triggers

Trigger:	Description:
Touch Began	Sent when a touch begins contact with the screen.
Touch Ended	Sent when a touch ends contact with the screen.
Touch Began or Ended	Sent both when the touch begins and ends contact with the screen.
Started Moving	Sent whenever a touch begins moving from a stationary position.
Stopped Moving	Sent whenever a touch stops moving.
Started or Stopped Moving	Sent both when the touch begins or stops moving.
Drag (Long)	Sent whenever a touch has moved 200 points.
Drag (Medium)	Sent whenever a touch has moved 100 points.
Drag (Short)	Sent whenever a touch has moved 50 points.



19.1 Group • Triggers

Trigger:	Description:
Group Began	Sent when a group begins contact with the screen.
Group Ended	Sent when a group ends contact with the screen.
Group Started Moving	Sent whenever a group begins moving from a stationary position.
Group Stopped Moving	Sent whenever a group stops moving.
Group Center Drag (Long)	Sent whenever the group center has moved 200 points.
Group Center Drag (Medium)	Sent whenever the group center has moved 100 points.
Group Center Drag (Short)	Sent whenever the group center has moved 50 points.
Touch 1 ↓	Touch 1 began contact with the screen.
Touch 1 ↑	Touch 1 ended contact with the screen.
Touch 2 ↓	Touch 2 began contact with the screen.
Touch 2 ↑	Touch 2 ended contact with the screen.
Touch 3 ↓	Touch 3 began contact with the screen.
Touch 3 ↑	Touch 3 ended contact with the screen.
Touch 4 ↓	Touch 4 began contact with the screen.
Touch 4 ↑	Touch 4 ended contact with the screen.
Touch 5 ↓	Touch 5 began contact with the screen.
Touch 5 ↑	Touch 5 ended contact with the screen.
Touch 6 ↓	Touch 6 began contact with the screen.
Touch 6 ↑	Touch 6 ended contact with the screen.
Touch 7 ↓	Touch 7 began contact with the screen.
Touch 7 ↑	Touch 7 ended contact with the screen.
Touch 8 ↓	Touch 8 began contact with the screen.



Trigger:	Description:
Touch 8 ↑	Touch 8 ended contact with the screen.
Touch 9 ↓	Touch 9 began contact with the screen.
Touch 9 ↑	Touch 9 ended contact with the screen.
Touch 10 ↓	Touch 10 began contact with the screen.
Touch 10 ↑	Touch 10 ended contact with the screen.
Touch 11 ↓	Touch 11 began contact with the screen.
Touch 11 ↑	Touch 11 ended contact with the screen.
1 Touch Chord ↓	Any time 1 touch contacts the screen.
2 Touch Chord ↓	2 touches contact the screen simultaneously.
3 Touch Chord ↓	3 touches contact the screen simultaneously.
4 Touch Chord ↓	4 touches contact the screen simultaneously.
5 Touch Chord ↓	5 touches contact the screen simultaneously.
6 Touch Chord ↓	6 touches contact the screen simultaneously.
7 Touch Chord ↓	7 touches contact the screen simultaneously.
8 Touch Chord ↓	8 touches contact the screen simultaneously.
9 Touch Chord ↓	9 touches contact the screen simultaneously.
10 Touch Chord ↓	10 touches contact the screen simultaneously.
11 Touch Chord ↓	11 touches contact the screen simultaneously.
≥ 1 Touch Chord ↓	Any time 1 touch or more simultaneously contacts the screen.
≥ 2 Touch Chord ↓	2 touches or more contact the screen simultaneously.
≥ 3 Touch Chord ↓	3 touches or more contact the screen simultaneously.
≥ 4 Touch Chord ↓	4 touches or more contact the screen simultaneously.
≥ 5 Touch Chord ↓	5 touches or more contact the screen simultaneously.



Trigger:	Description:
≥ 6 Touch Chord ↓	6 touches or more contact the screen simultaneously.
≥ 7 Touch Chord ↓	7 touches or more contact the screen simultaneously.
≥ 8 Touch Chord ↓	8 touches or more contact the screen simultaneously.
≥ 9 Touch Chord ↓	9 touches or more contact the screen simultaneously.
≥ 10 Touch Chord ↓	10 touches or more contact the screen simultaneously.
1 Touch Chord ↑	Any time 1 touch ends contact with the screen.
2 Touch Chord ↑	2 touches end contact with the screen simultaneously.
3 Touch Chord ↑	3 touches end contact with the screen simultaneously.
4 Touch Chord ↑	4 touches end contact with the screen simultaneously.
5 Touch Chord ↑	5 touches end contact with the screen simultaneously.
6 Touch Chord ↑	6 touches end contact with the screen simultaneously.
7 Touch Chord ↑	7 touches end contact with the screen simultaneously.
8 Touch Chord ↑	8 touches end contact with the screen simultaneously.
9 Touch Chord ↑	9 touches end contact with the screen simultaneously.
10 Touch Chord ↑	10 touches end contact with the screen simultaneously.
11 Touch Chord ↑	11 touches end contact with the screen simultaneously.
≥ 1 Touch Chord ↑	Any time 1 touch or more simultaneously ends contact with the screen.



Trigger:	Description:
≥ 2 Touch Chord ↑	2 touches or more end contact with the screen simultaneously.
≥ 3 Touch Chord ↑	3 touches or more end contact with the screen simultaneously.
≥ 4 Touch Chord ↑	4 touches or more end contact with the screen simultaneously.
≥ 5 Touch Chord ↑	5 touches or more end contact with the screen simultaneously.
≥ 6 Touch Chord ↑	6 touches or more end contact with the screen simultaneously.
≥ 7 Touch Chord ↑	7 touches or more end contact with the screen simultaneously.
≥ 8 Touch Chord ↑	8 touches or more end contact with the screen simultaneously.
≥ 9 Touch Chord ↑	9 touches or more end contact with the screen simultaneously.
≥ 10 Touch Chord ↑	10 touches or more end contact with the screen simultaneously.

19.2 Device Motion Triggers

Trigger:	Description:
Pitch Crossed Center	Sent when the device tilts across the center point of its pitch.
Roll Crossed Center	Sent when the device tilts across the center point of its roll.
Yaw Crossed Center	Sent when the device rotates across the center point of its yaw.
Pitch Drag (Long)	Sent whenever pitch has moved a large amount.



Trigger:	Description:
Pitch Drag (Medium)	Sent whenever pitch has moved a medium amount.
Pitch Drag (Short)	Sent whenever pitch has moved a small amount.
Roll Drag (Long)	Sent whenever roll has moved a large amount.
Roll Drag (Medium)	Sent whenever roll has moved a medium amount.
Roll Drag (Short)	Sent whenever roll has moved a small amount.
Yaw Drag (Long)	Sent whenever yaw has moved a large amount.
Yaw Drag (Medium)	Sent whenever yaw has moved a medium amount.
Yaw Drag (Short)	Sent whenever yaw has moved a small amount.

19.3 Sequencer Triggers

Trigger:	Description:
Sequencer # ●	Trigger sent when a Sequencer steps to its next value. Every touch receives the same trigger simultaneously.
Sequencer # ●●●	Trigger sent when a Sequencer steps to its next value. Each touch gets its own trigger based on the touch's current sequence parameters.



Trigger:	Description:
Sequencer # ●→●	Trigger sent when a Sequencer steps to its next value. Cycles through to the next available touch voice.
Sequencer # Reset ●	Trigger sent when a Sequencer steps back to its first value. Every touch receives the same trigger simultaneously.
Sequencer # Reset ●●●	Trigger sent when a Sequencer steps back to its first value. Each touch gets its own trigger based on the touch's current sequence parameters.

19.4 Miscellaneous Triggers

Trigger:	Description:
None	No trigger.
Patch Loaded	Trigger sent once when the user switches to the Performance view.

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Appendix D: Synth Objects

Each of the objects in the **Touches** area is uniquely instantiated for each individual touch. The values generated are sent directly to their respective touch voice index.

The objects in the **Group** area are fed all of the combined touch signals, acting on the mix as a whole.

20.0 Touch Synth Objects

Object:	Description:
Oscillator A	Single wavetable oscillator. Can be paired with OSC B to have two simultaneous separate oscillators.
Oscillator B	Single wavetable oscillator. Can be paired with OSC A to have two simultaneous separate oscillators.
FM Oscillator	Frequency modulated wavetable oscillator.
Multi Oscillator	Stacked wavetable oscillators. Up to five [5] oscillators, each transposed equally above the previous.
Granular Oscillator	Granular synthesis oscillator. Each touch has a monophonic grain generator with controllable frequency, rate, and grain length.
White Noise	Random energy, equal energy per frequency band.
LPF Noise	Random energy, equal energy per frequency band, filtered through a low-pass filter.
BPF Noise	Random energy, equal energy per frequency band, filtered through a band-pass filter.
HPF Noise	Random energy, equal energy per frequency band, filtered through a high-pass filter.
LPF	Low-pass filter with resonance.



Object:	Description:
BPF	Band-pass filter with resonance.
HPF	High-pass filter with resonance.
Amp Mod	Amplitude modulation using a selectable wavetable.
Amp	Amplitude control.
Pan	Panning control.

20.1 Group Synth Objects

Object:	Description:
Downsampler	Sample and hold filter with adjustable sample rate.
Waveshaper	Distortion through mapping incoming signal to a selectable wavetable.
Phaser	Rate variable allpass filter.
LPF	Low-pass filter with resonance.
BPF	Band-pass filter with resonance.
HPF	High-pass filter with resonance.
Resonator	Time-shifting variable delay line.
Stereo Delay	Variable delay lines for left and right channels.
Reverb	Recirculating delay reverb simulator.