TAKE 5

COMPACT 5-VOICE POLY SYNTH

SEQUENTIAL®

TAKE 5

User's Guide

Version 1.0
August, 2021

**FCC** Tested to Comply
With FCC Standards
CLASS B $C\epsilon$

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le materiel brouilleur du Canada.

For pluggable equipment, the socket-outlet must be installed near the equipment and must be easily accessible.

For Technical Support, email: support@sequential.com

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
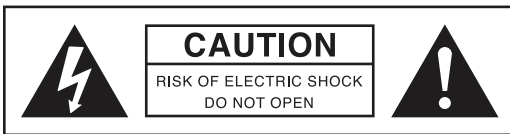
This device is to be serviced by a Sequential-qualified technician only. Service technician must exercise due caution when opening the device to avoid electric shock and the device being unsecured when open.

CALIFORNIA PROP 65 WARNING
This product may expose you to chemicals including BPA, which is known to the State of California to cause cancer and birth defects or other reproductive harm. Though independent laboratory testing has certified that our products are several orders of magnitude below safe limits, it is our responsibility to alert you to this fact and direct you to: https://www.p65warnings.ca.gov for more information.

A Few Words of Thanks

Thank you for purchasing the Take 5. Our goal with this awesome little synth was to give you a very compact, very powerful instrument that you could take pretty much anywhere and sound great. Whether it's your first synth, your gigging synth, or just the right synth to fit your studio space, we think you're going to love it. Yes, it's compact, but it's pure Sequential and it sounds huge.

So hook it up, turn it up, and start making music!

Cheers,

Dave Smith

Table of Contents

Chapter 1: Getting Started

The Take 5 is a compact and powerful 5-voice poly synth. It combines the warmth and punch of two analog, voltage-controlled oscillators and a Prophet-5 Rev4-lineage analog filter with an array of digital effects and a host of modulation capabilities. The result is a classic, warm, organic-sounding subtractive synth with a modern voice.

This chapter of your user's guide provides an overview of essential tasks such as how to make basic audio connections and how to edit and save sounds. Later chapters explain each of the parameters of the Take 5, as well as how to program sounds and how to use the GLOBAL menu to manage its overall behavior.

We've designed the Take 5 to be as easy to use as possible. Its essential controls are within easy reach on its front panel, so don't hesitate to dive in and start turning knobs and pressing buttons. Then, when you're ready, dig into this user's guide to explore the deeper parts of the synth.
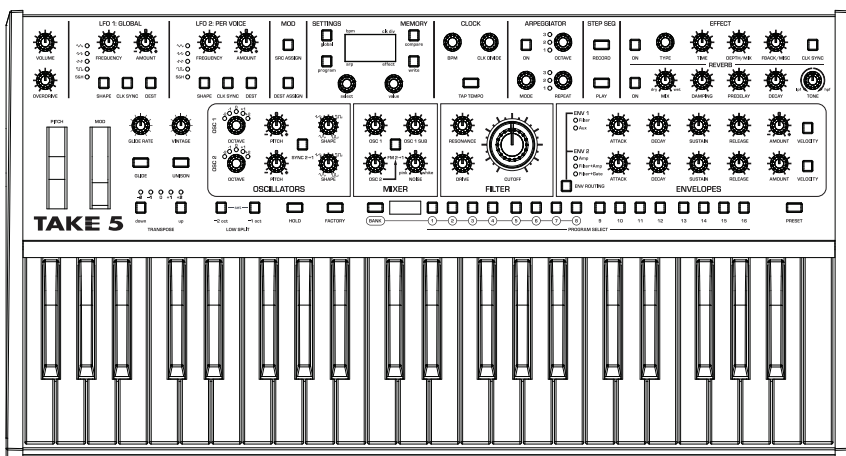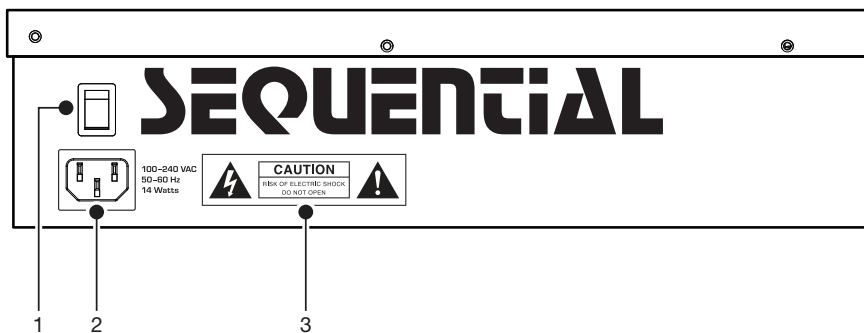
Rear Panel Connections

The rear panel of the Take 5 has connectors for power, USB, MIDI, audio, and pedals.

1. Power On/Off—This rocker switch controls power on and off to the Take 5.

2. AC Power Connector—Accepts a standard, grounded IEC power cord. Operates over a range of 100 to 240 volts, 50 to 60 Hz, and 14W.

3. Electric Shock Hazard Warning—These symbols warn that you risk electrical shock if you open the Take 5 enclosure. Please do not open.

4. USB—For bidirectional MIDI communication with a computer. The Take 5 is a Class Compliant USB device and does not require additional drivers when used with Mac OS or Windows.

5. MIDI In, Out, Thru—Standard 5-pin MIDI DIN connectors for communicating with MIDI-equipped devices.

6. Footswitch—Accepts a momentary, normally open or normally closed footswitch to control sustain or to latch the Arpeggiator on when keys are held.

7. Pedal—Accepts a standard expression pedal that has a variable resistor on a TRS (tip-ring-sleeve) ¼ inch phone plug. Once connected, you can use the modulation matrix to route the pedal to control a variety of things such as volume or filter cutoff frequency to add expressiveness to live performance.
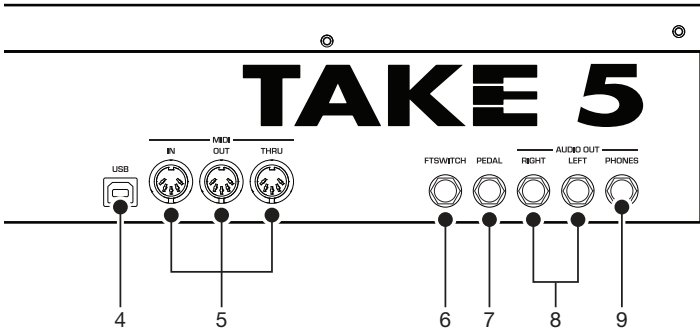
8. Audio Outputs—Unbalanced, ¼ inch audio outputs. The Take 5 sounds great in stereo, but can be switched to mono if needed. See "Global Settings" on page 10.

9. Headphones — ¼ inch stereo headphone jack. Headphone volume is controlled by the MASTER VOLUME knob on the front panel.

Setting Up the Take 5

Here's how to get your Take 5 up and running:

1. Plug the power cable into the power connector on the back of the Take 5.

2. If you have an expression pedal, connect it to the PEDAL jack on the back of the Take 5. You can use it to control volume, filter cutoff, and other aspects of a sound. If you have a sustain pedal, connect it to the FTSWITCH jack on the back of the Take 5.

3. Turn on the Take 5.

4. Connect the LEFT and RIGHT AUDIO OUT connectors on the back of the Take 5 to your amp/mixer/powered speakers using unbalanced, ¼ inch audio cables.

5. Turn up the volume on your amp/mixer/powered speakers.

6. Turn up the volume on the Take 5.

Tune the Oscillators and Filters

The first time you use the Take 5, run its built-in oscillator and filter calibration procedure. Repeat the calibration procedure if needed over the next few days. The Take 5 learns the range of temperatures and will keep itself in tune over this range.

To calibrate the oscillators and filters:

1. Press the GLOBAL settings button.

2. With the SELECT knob, choose the CAL VOICES command.

3. Press the WRITE button.

4. The Take 5 performs its auto-calibration procedure. Don't turn off the power while it's doing this.

5. When finished, the front panel controls return to normal and you can play the Take 5.

Listen to the Factory Sounds

The Take 5 contains 256 programs. These are divided into two sets of 128 programs — a Factory set and a User set.

- When the FACTORY button is lit, the 128 permanent Factory programs are active. These cannot be overwritten.

- When the FACTORY button is *not* lit, the 128 User programs are active. you can freely edit and resave these. As shipped from the factory, the Factory and User presets are identical.

Most factory programs have a sequence associated with them. A quick and easy way to audition programs is to press the Sequencer's PLAY button to hear its associated sequence.
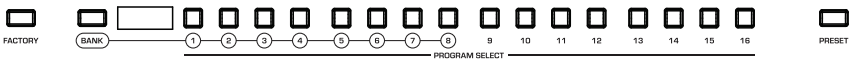
The Bank and Program Select controls

To choose a program:

1. Hold down the BANK button then press a PROGRAM SELECTOR (1-8) button to specify the "hundreds" bank of the program.

2. Release the BANK button and press a PROGRAM SELECTOR button (1-16) to select one of the 16 presets in the chosen bank.

To choose program 512, for example:

1. Hold BANK and press 5. Release the BANK button.

2. Press PROGRAM SELECTOR button 12.

Using the Main Display

The most frequently used controls on the Take 5 are on its front panel. But there are additional Global settings and Program-specific settings accessible in its main display.

For example, pressing the PROGRAM settings button gives you access to several program-related parameters such as pitch bend wheel range, unison detuning, envelope delay time, and more. You can select and edit these additional parameters using SELECT and VALUE knobs located below the display.

The SELECT knob is for scrolling through the list of available parameters and commands. The VALUE knob is for setting values.
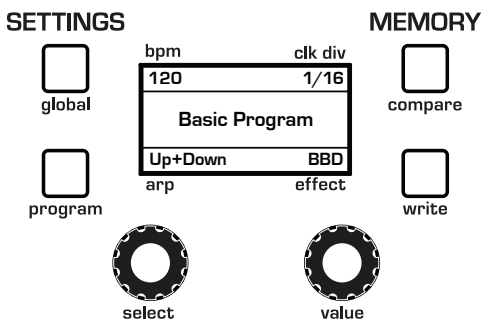
The main display

Editing Programs

All of the sound-shaping controls of the Take 5 appear on its front panel. To edit an existing program, just turn a knob and listen to its effect. Keep turning knobs and pressing buttons and if you like what you've created, save the program (see "Saving a Program" on page 6).

Creating a Program from Scratch

The Take 5 makes it easy to create a new sound from scratch by providing a "basic program" that you can quickly recall at any time. This provides a simple starting point that you can quickly build on. It consists of a single oscillator (sawtooth), basic filter settings, basic envelope settings, and simple mod and pitch wheel setups.

To recall the Basic Program:

1. Press the GLOBAL settings button.

2. With the SELECT knob, choose the BASIC PROGRAM command.

3. Press the WRITE button.

4. The Take 5 resets its parameters to the Basic Program.

Shortcut for creating the Basic Program: Hold down the TRANSPOSE DOWN button then press the LOW SPLIT -2 button.

Saving a Program

To save a program, you have to save it to the User bank. If you edit a Factory program, saving the sound will save it to the User bank.

To save a User program to the same preset location:

1. Press the WRITE button. The LED begins blinking.

2. Press the WRITE button a second time. The LED stops blinking and the program is saved to its current location.

To save a program to a different location:

1. Press the WRITE button. Its LED begins blinking.

2. Hold down the BANK button then press a PROGRAM SELECTOR button to specify the "hundreds" bank of the program.

3. Release the BANK button and press a PROGRAM SELECTOR button (1-16)

4. Press the WRITE button again. The LED stops blinking and the program is saved.

Canceling Save

To cancel the Save process:

- If the WRITE button LED is flashing, press the PROGRAM settings button. The LED stops flashing and saving is canceled. You can return to editing if you want.

Live Panel Mode

The Take 5 also features a "live panel" mode in which its sound switches to the current settings of its knobs and switches. In other words, the current preset is ignored and what you see on the front panel is what you hear. This is a great mode for learning, experimentation, and instant gratification.

To enter live panel mode:

- Press the PRESET button to toggle it off. Changing Banks or Programs with Preset off won't affect the sound.

To return to preset mode:

- Press the PRESET button again to toggle it on.

Using Low Split

The Take 5 has a useful feature called LOW SPLIT that allows you to make wider use of its 44-note keyboard by dividing the keyboard into two separate key ranges. You can set the split point to your preference.

In essence it enables you to transpose the lower half of the keyboard either 1 or 2 octaves lower than normal.

By default the split point is set to middle C in the Basic Program, but you can set it to a different point according to your preference. This makes it possible to play lower-register bass parts with your left hand while playing chords or lead parts with your right hand. The program is the same for both key ranges.

To use Low Split:

1. Chose an appropriate sound.

2. Press the -1 OCT button to activate the Low Split point feature and transpose the pitch of notes below middle C down by 1 octave.

3. Alternatively, press the -2 OCT button to activate the Low Split point feature and transpose the pitch of notes below middle C down by 2 octaves.

To set a custom Low Split point:

1. Chose an appropriate sound.

2. Press and hold both the LOW SPLIT -1 OCT button and -2 OCT button. The Low Split parameters appear in the display.

3. Either press the desired key/split point on the Take 5 keyboard, or use the VALUE knob to set the split point to your preference.

4. Release the -1 OCT button and -2 OCT buttons.

```
bpm              clk div
┌─────────────────────────┐
│ 120    LOW SPLIT   1/16  │
│                          │
│        Note G1           │
│                          │
│ Up+Down             BBD  │
└─────────────────────────┘
  arp              effect
```

Setting the Low Split point

Exploring the Take 5 in More Depth

Before you explore the sound creation possibilities of the Take 5, we'd like to point you toward a few things that will help you tailor it to your needs. The better you know it, the more you'll get out of it.

First, read "Global Settings" on page 10. There are many useful settings and functions found in the Global menu that will affect the overall behavior of your Take 5, including tuning, MIDI connections, calibration, and more. In particular, read about Pot Modes and determine which works best for you when you're editing sounds.

Also, in "Rear Panel Connections" on page 2 read about the various connectors on the back of your Take 5 and how you can use its various pedal, audio, MIDI, and USB inputs and outputs.

Finally, be on the lookout for tips and notes scattered throughout this manual to gain a better working knowledge of the Take 5. We wish you many hours of musical exploration!

Chapter 2: Take 5 Controls

This chapter explains all of the front-panel controls of the Take 5, section by section and the role each plays in synthesizing sounds. If you're just getting started with synthesis, take a look at *Chapter 4, Creating Sounds*, for step-by-step tutorials on how to program some classic sounds such as synth bass, brass, strings, and more.

Global Settings

Global settings are parameters that affect all programs. These include settings such as MIDI Channel, Velocity and Aftertouch curves, and others. Press the GLOBAL button to access them.
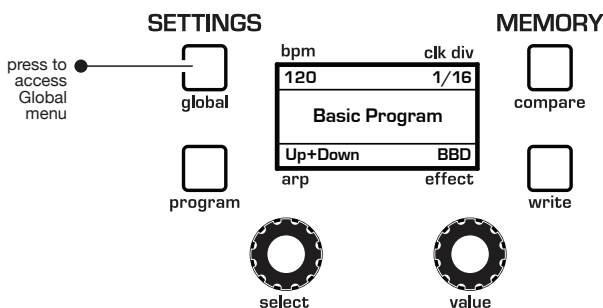
Accessing Global settings

To set a Global parameter:

1. Press the GLOBALS button.

2. Use the SELECT knob to scroll through the list of parameters.

3. Use the VALUE knob to set a selected parameter.

Here are descriptions of all of the GLOBAL menu parameters:

1. Master Coarse: -12…+12—Master Transpose control; a setting of 0 is the equivalent of concert pitch. This control steps in semitones one octave up (+12) or down (-12).

2. Master Fine: -50…+50—Master Fine Tune control; 0 centered. Steps in cents as much as a quarter-tone up (+50) or down (-50).

3. Local Control: All Off, Key/Wheels Off, On—When on (the default), the keyboard and front panel controls directly affect the Take 5. When off, the controls are transmitted via MIDI but do not directly affect the "local" synth (that is, the Take 5). This is primarily useful for avoiding MIDI data loops that can occur with some external sequencers. When KEY/WHEELS OFF is selected, the front controls are enabled (so that you can edit them) but the keyboard and Pitch/Mod wheels are off.

4. Mono/Stereo: Stereo, Mono—The Take 5 defaults to stereo operation. When set to Mono, this parameter defeats all pan settings and modulation, effectively making each of the outputs a mono output.

5. Pot Mode: Relative, Passthru, Jump—The rotary controls on the Take 5's front panel are a mixture of "endless" rotary encoders and potentiometers or "pots." The pots are identifiable by their lined knobs and limited amount of travel. There are three pot modes to determine how the synth reacts when the programmable parameters are edited. (Master volume is not programmable, so these modes don't apply.)

When set to RELATIVE, changes are relative to the stored setting. In Relative mode, the full value range is not available until either the minimum or maximum value and the respective lower or upper limit of the pot's travel is reached.

For example, the Resonance parameter has a value range of 0 to 254. Let's say the physical position of the Resonance pot is 12 o'clock. If you switch to a program that has a different Resonance setting and turn the pot all the way up, it may not go to its maximum value. To get to the maximum value, you first have to turn down until the value is at the other extreme and the pot is at the limit of its travel (in this case, 0 and fully counter-clockwise, respectively).

In PASSTHRU mode, turning the pot has no effect until after the edited value equals the preset value (that is, until the edited value "passes through" the stored value).

JUMP mode uses an absolute value based upon the position of the pot when edited: turn a pot and the value jumps immediately from the stored value to the edited value.

6. Foot Function: Sustain, Arp Hold, Arp Hold Momentary—Sets the function for the Sustain pedal input at the rear of the synthesizer. Selecting SUSTAIN chooses normal sustain pedal operation. Selecting ARP HOLD and pressing the sustain pedal causes the Arpeggiator to hold the current arpeggio as if you had pressed the hold button on the front panel. Selecting HOLD MOM (momentary) causes the Arpeggiator to sustain (even when you release the notes on the keyboard) for as long as you hold down the pedal. Releasing the Sustain pedal stops the Arpeggiator.

7. Pedal Polarity: Normal, Reversed—There are two types of pedals, normally open and normally closed. Either type can be used with the Sustain switch input. This setting allows you to accommodate both models in case yours behaves in a way that is the opposite of what you expect due to its polarity. Connect your pedal and choose the appropriate setting based on its behavior.

8. Pedal Function: Breath CC2, Foot CC4, Exp CC11, LPF Full, LPF Half—When you use an expression pedal connected to the PEDAL jack to control filter cutoff, this sets the range of modulation sent. With LPF FULL selected, an expression pedal connected to the FILTER jack will control filter cutoff frequency within its full range of 0-1024 (fully closed to fully open). With LPF HALF selected, an expression pedal connected to the FILTER jack will control filter cutoff frequency within half of its range (fully closed to half open).

9. Aftertouch On: On, Off—Selects whether aftertouch (key pressure) is enabled or disabled. If disabled, the Take 5 will neither respond to nor transmit aftertouch/key pressure data.

10. Aftertouch Curve: Curve 1... Curve 8—Sets one of eight pressure curves for the keyboard to adjust the aftertouch to your playing style.

11. Velocity Curve: Curve 1... Curve 7—Sets one of the seven velocity curves for the keyboard to adjust the velocity response to your playing style.

12. Scale (Alt Tuning): Equal Temperment, 1…65—Selects one of the Take 5's 65 built-in tunings. Set to 1. EQUAL TEMPERMENT, the tuning is standard, chromatic tuning. Choosing 2 through 65 selects an alternative, non-chromatic, non-Western scale that can be used to emulate ethnic instruments or in other creative ways. See "Appendix F: Alternative Tunings" on page 78 for a description of each tuning. Additional tunings can be imported as a SysEx message.

13. Screen Saver: On, Off—The Take 5 display has a built-in screen saver that puts it to sleep when not in use. This feature is designed to prolong the life of the display and we recommend using it. If, however, you want to disable this feature you can do so by setting it to OFF.

14. MIDI Channel: All, 1…16—Selects which MIDI channel to send and receive data, 1 to 16. Choosing ALL receives on all 16 channels.

15. Clock Mode Out: Sets the synthesizer's ability to send and receive MIDI clock messages:

- OFF: MIDI Clock is neither sent nor received
- OUT: MIDI Clock is sent, but not received.
- OUT NO S/S (no start and stop): Sends MIDI Clock but does not send MIDI Start or Stop commands.
- IN: MIDI Clock is received, but not sent.
- IN THRU: MIDI Clock is received and passed to MIDI Out
- IN NO S/S (no start and stop): Receives MIDI Clock but does not respond to MIDI Start or Stop command.

With IN and IN THRU modes, if no MIDI clock is present at the selected input, the Arpeggiator and Sequencer will not function.

16. Clock Cable In: MIDI, USB—Sets the port (MIDI or USB) by which MIDI clock is received.

17. Clock Cable Out: MIDI, USB, ALL—Sets the port by which MIDI clock is sent.

18. MIDI Param Send: Off, CC, NRPN—Changes to the values of front panel controls are transmitted via MIDI as Non-registered Parameter Number (NRPN) controllers or as Continuous Controllers (CC). Transmission of parameters can also be turned off.

> NRPNs are the preferred method of parameter transmission, since they cover the complete range of all parameters, while CCs are limited to a range of 128.

19. MIDI Param Receive: Off, CC, NRPN—Sets the method by which parameter changes are received via MIDI. As with transmission, NRPNs are the preferred method.

20. MIDI Control On: Off, On—When On, the synth will respond to MIDI controllers, including Pitch Wheel, Mod Wheel, Pedal, Breath, Volume, and Expression.

21. MIDI Sysex On: On, Off—Sets whether MIDI System Exclusive data will be received or ignored.

22. MIDI Sysex Cable: MIDI, USB—Sets the port, MIDI or USB, by which System Exclusive data will be transmitted and received.

23. MIDI Out Select: Off, MIDI, USB, All—Sets the port(s) by which MIDI data will be transmitted.

24. MIDI Program Send: Off, On—When On, the synth will transmit MIDI Program Change and other SysEx messages to the MIDI Out.

25. MIDI Program Receive: Off, On—When On, the synth will respond to received MIDI Program Change and other SysEx messages.

26. MIDI Arp Notes: Off, On—When On, the synth's Arpeggiator outputs MIDI note numbers. You can use this feature to drive other MIDI-equipped devices such as synthesizers and drum machines.

27. Arp Beat Sync: Off, Quantize—When set to QUANTIZE, Arpeggiator note playback occurs only on the beat (relative to the current clock divide setting) regardless of when you press a key on the keyboard.

28. Basic Program—Press WRITE to load a basic, template program into the edit buffer. Press the WRITE button again to save it to memory. As a shortcut, press the TRANSPOSE DOWN and LATCH buttons simultaneously.

29. Cal Wheels—Calibrates the Pitch and Mod wheels.

30. Cal Voices—Calibrates the voltage controlled oscillators and filters.

31. Reset Globals—Sets the global parameters to the factory default settings.

32. Dump Preset—Transmits the current program in SysEx format via the selected MIDI port. Dumped programs will load back into the same location in memory when imported back into the synth via MIDI.

33. Dump Bank—Transmits the current bank in SysEx format via the selected MIDI port. (See "MIDI SysEx Cable: on page 14.) Dumped banks will load back into the same location in memory when imported back into the synth via MIDI.

34. Dump All Banks—Transmits all User Banks in SysEx format via the selected MIDI port. (See "MIDI SysEx Cable: on page 14.) Dumped banks will load back into the same location in memory when imported back into the synth via MIDI.

Oscillators

Oscillators generate the raw building blocks of the Take 5's sound by producing *waveforms*, each of which has its own sound character based on its harmonic content. The Take 5 has two analog, voltage-controlled oscillators and a sub-oscillator.

Oscillators 1 and 2 generate sine, sawtooth, and pulse waves. You can vary the shape of these waveshapes from one to another using the SHAPE knob. This allows for a variety of different waveshapes and timbres.

Pulse wave wide   Pulse wave narrow

Oscillator pulse width (pulse wave)

The Oscillators section

To listen to the oscillators:

1. Press the GLOBAL button.

2. Use the SELECT knob to navigate to the BASIC PROGRAM command, then press the WRITE button to set the synth to the Basic Program.

3. In the basic program, only Oscillator 1 is audible. (The levels of Oscillator 2 and the Sub Oscillator and Noise are set to zero in the Mixer by default.)

4. Hold down a note on the keyboard and in the OSCILLATORS section, turn the SHAPE knob left and right to hear the waveshape change from sine to sawtooth to pulse. (Sawtooth is selected by default in the basic program.) Note that when using SHAPE with the pulse wave, it's possible to make the pulse width so narrow that the sound "disappears."

5. Turn up the level of Oscillator 2 in the Mixer and experiment with setting each oscillator to a different waveshape. Experiment with the PITCH knob on the oscillators and notice how slightly detuning the oscillators in relation to each other creates movement and thickness in their combined sound. Try tuning one oscillator to an interval such as a third, a fifth, or a sixth.

6. Experiment with the OCTAVE knob on the oscillators and notice how setting each oscillator to a different octave influences their combined sound.

7. Rotate the filter's CUTOFF and RESONANCE knobs to see how this affects the sound of the oscillators.

8. With Oscillator 1 and 2 on, press the SYNC button on Oscillator 1, and set it's OCTAVE to +2. Then rotate the PITCH knob on Oscillator 1 while you hold a note. This is the classic *hard sync* sound that you've probably heard before. Instead of rotating the PITCH knob by hand, you can use the modulation matrix to route an envelope to Oscillator 1 to sweep the oscillator's pitch and create this effect each time you play a note. You'll learn more about the mod matrix in "Modulation" on page 34.

Oscillator Parameters

Octave: Sets the base frequency of an oscillator over a 5-octave range. The global MASTER COARSE and MASTER FINE settings affect the pitch of the oscillators. See "Global Settings" on page 10 for more information.

Pitch: Fine tune control with a range of 7 semitones (a major 5th) up or down. The 12 o'clock position is detented.

Shape: Selects the waveshape generated by the oscillator. Oscillators 1 and 2 produce sine, sawtooth, and pulse analog waveshapes. These waveshapes are continuously variable.

In the modulation matrix you can use a modulator such as an LFO waveshape or one of the Take 5 envelopes to modulate the waveshape of Oscillator 1 or 2 or both simultaneously, this changes the "pulse" width of the selected waveform, which modifies its harmonic content and timbre. To learn more about about how to use modulation, see "Modulation" on page 34.

Sync 2-1: Off, On—Turns on oscillator hard sync. When an oscillator is hard synced, its wave cycle is forced to conform to another oscillator's wave cycle and is forced to reset each time the master oscillator's wave cycle restarts. This causes the synced oscillator to create harmonically complex waveforms — particularly when the synced oscillator's pitch is set higher than the master oscillator's pitch. See "Creating a Hard-Sync Lead" on page 65 to learn how to set up a classic oscillator hard sync sound.
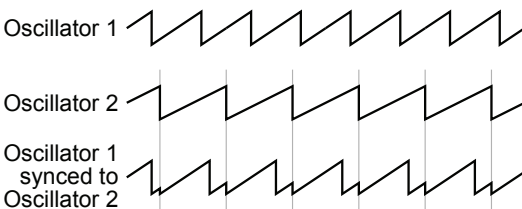
Oscillator hard sync

Additional Oscillator Parameters (Program Menu)

Additional oscillator parameters are accessible by pressing the front-panel PROGRAM button and scrolling through the list that appears.

Osc 1 Key Follow: Off, On—When on, oscillator 1 tracks the keyboard or note data received via MIDI. When off, the oscillator plays at its base frequency setting, though its pitch may be affected by modulation from other sources.

Osc 2 Key Follow: Off, On—When on, oscillator 2 tracks the keyboard or note data received via MIDI. When off, the oscillator plays at its base frequency setting, though its pitch may be affected by modulation from other sources.

Osc 1 Glide: 0...127—Sets oscillator 1 glide (*portamento*) amount. Glide causes the pitch of a note to glide smoothly up or down from the pitch of the previously played note. It can be set independently for each oscillator. Low values are shorter/faster. The GLIDE switch must be on to hear the effect of GLIDE RATE. For a detailed explanation, see "Glide" on page 52.

Osc 2 Glide: 0...127—Sets oscillator 2 glide (*portamento*) amount. Glide causes the pitch of a note to glide smoothly up or down from the pitch of the previously played note. It can be set independently for each oscillator. Low values are shorter/faster. The GLIDE switch must be on to hear the effect of GLIDE RATE. For a detailed explanation, see "Glide" on page 52

Osc 1 Fine Freq: Fine tune control with a range of 7 semitones (a major 5th) up or down. The 12 o'clock position is centered.

Osc 2 Fine Freq: Fine tune control with a range of 7 semitones (a major 5th) up or down. The 12 o'clock position is centered.

Mixer

The Mixer section is where you set the levels of the various sound generators on the Take 5. These include oscillators 1 and 2, the sub oscillator and the noise generator. You must turn up at least one of these sources in order to make sound with the Take 5. Alternatively, you can make the filter generate its own sine wave by turning up RESONANCE all the way so that it self-oscillates.
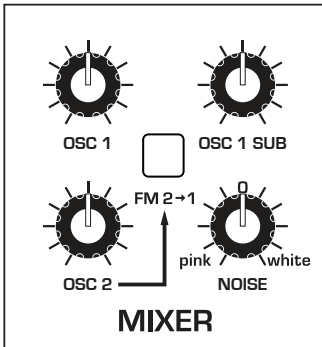
The Mixer section

Mixer Parameters

Osc 1: Sets the output level of oscillator 1.

Osc 1 Sub: Sets the output level of the sub oscillator.

Osc 2: Sets the output level of oscillator 2.

FM 2 -1: When on, applies frequency modulation from Oscillator 2 to Oscillator 1. The Oscillator 2 LEVEL knob controls the amount. Use frequency modulation to create complex harmonics and metallic textures by tuning Oscillator 2 to different intervals.

Noise: Sets the output level of the white/pink noise generator. Rotating the knob clockwise from 0 increases the level of white noise. Rotating the knob counter-clockwise from 0 increases the level of pink noise.

Filter

The function of the filter is to subtract frequencies from the sound produced by the oscillators and noise generator, thereby changing the overall harmonic content of the synth's sound. This change is varied over time using the Filter Envelope to produce more dynamic timbres.
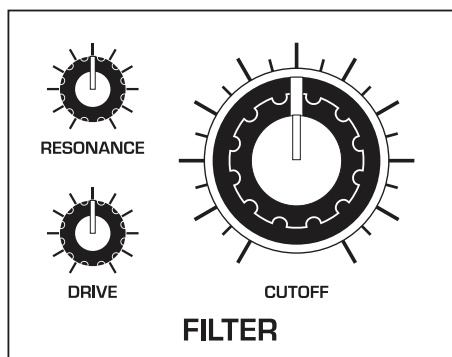
The Filter section

To hear the effect of the filter:

1. Recall the Basic Program by pressing the GLOBAL button and using the SELECT knob to navigate to the BASIC PROGRAM command, then press WRITE.

2. Hold down a note and rotate the filter's CUTOFF knob. Notice how it cuts the high frequencies as you rotate counter-clockwise, making the sound of the oscillator less bright. If you turn the CUTOFF knob fully counter-clockwise you'll filter out all frequencies and hear nothing.

3. Return the CUTOFF knob to its halfway position, hold down a note again then turn the RESONANCE knob about halfway up.

4. Rotate the filter's CUTOFF knob again and listen to the sound change as a band of frequencies near the cutoff is amplified. This is how to create a classic resonant filter sweep.

In the previous example, you controlled the filter cutoff by hand. In most cases, you will use the Filter Envelope to do this. To learn more about the Filter Envelope, see "About the Filter Envelope" on page 24.

Filter Parameters

Cutoff: Sets the filter's cutoff frequency.

Resonance: Emphasizes a narrow band of frequencies around the cutoff frequency. High levels of resonance can cause the filter to self-oscillate and generate its own pitch.

Drive: Increases signal input to the filter, boosting volume and adding harmonic saturation and warmth. The effect of Drive can be subtle depending on the amplitude and harmonic content of a signal.

Additional Filter Parameters (Program Menu)

Additional Filter parameters are accessible by pressing the front-panel PROGRAM button and scrolling through the list that appears. The parameter explained below does not appear on the front panel.

Key>LPF Freq: 0...127—Sets the amount of modulation from the keyboard to the filter's cutoff frequency. Any setting above zero means that the higher the note played on the keyboard, the more the filter opens. This is useful for adding brightness to a sound as higher notes are played, which is typically how acoustic instruments behave. When set to zero, keyboard filter tracking is off, meaning that filter frequency is unaffected by playing higher or lower notes on the keyboard. When set to 127, the filter will track in half-step increments, which can be useful if you are using the filter to generate a pitch through self-oscillation.

Envelopes

The Take 5 has two 5-stage envelope generators (attack, decay, sustain, release, plus delay). They are useful for creating modulation that varies over time according to the shape of the envelope. Routing an envelope to Filter Cutoff, for example, causes the filter to open or close according to the contour of the envelope. Routing an envelope to Amplifier causes the volume to change according to the contour of the envelope.

Similarly, using one of the envelopes as an auxiliary envelope and routing it to a different destination in the mod matrix allows you to apply modulation that changes according to the contour of the envelope.

There are many creative ways to use the Envelopes:

- Use the mod matrix to route Envelope 1 or 2 to one of the oscillators' FINE (pitch) parameter to create the classic "pitch blip" effect used in many synth lead sounds.

- Use the mod matrix to route Envelope 1 or 2 to one or both of the oscillators' SHAPE parameter to make their timbre evolve according to envelope's contour.

- Use the mod matrix to route Envelope 1 or 2 with a fast attack and short decay to NOISE (level) to add a percussive attack to a sound. (Noise should be set to zero in the Mixer.)

Using the Env Routing Button to Assign the Envelopes

The ENV ROUTING button provides a way to assign the envelopes to specific destinations. Pressing the ENV ROUTING button toggles through the various options.
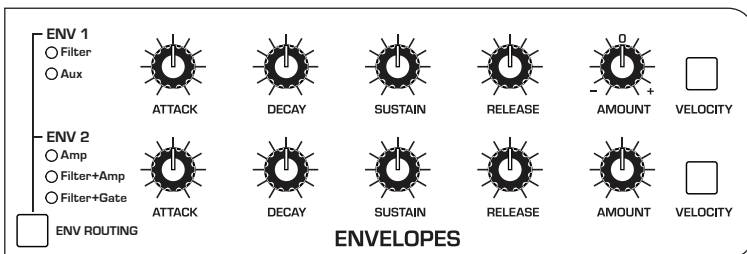
Env 1 Destinations:

- FILTER - Envelope 1 controls Filter Cutoff frequency

- AUX - Envelope 1 functions as an auxiliary envelope that can be used to modulate a destination selected through the Mod Matrix. The Aux setting is available when Env 2 is set to FILTER + AMP or FILTER + GATE.

Env 2 Destinations:

- AMP - Envelope 2 controls the Amplifier (loudness)

- FILTER + AMP - Envelope 2 controls both Filter Cutoff frequency and the Amplifier (loudness). Note that if the Env 2 VELOCITY button is on, it affects only Filter Cutoff and not Amplifier volume.

- FILTER + GATE - Envelope 2 controls Filter Cutoff frequency while Amplifier volume is simply triggered (gated) on/off each time you press a key on the Take 5 keyboard. Note that if the Env 2 VELOCITY button is on, it affects only Filter Cutoff and not Amplifier volume.

About the Filter Envelope

Routing Envelope 1 or 2 to the Filter shapes the harmonic characteristics of a synthesized sound by giving you filtering control with each of the envelope stages (attack, decay, sustain, release).

A filter envelope is one of the most important aspects of a synthesized sound. Without an envelope, the filter would be static and unchanging. It would stay open or closed by a fixed amount that wouldn't change over the duration of a sound. That's not very expressive or interesting to listen to — and it's not how most real-world instruments behave.

In general, sounds produced by an acoustic instrument are brighter at their beginning (the attack stage) and grow mellower as they die out (the decay and release stages). In other words, their harmonic content changes over time. This is exactly what the filter envelope is designed to emulate.
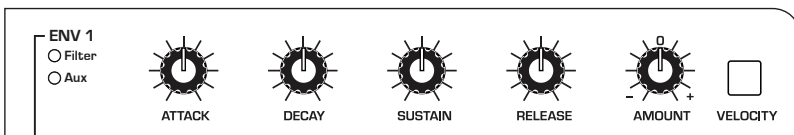
Envelope 1 parameters
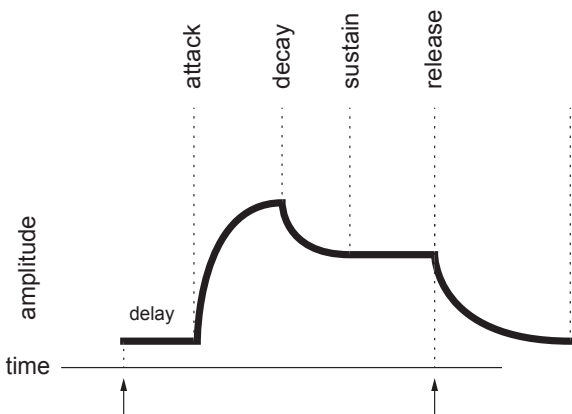
A typical 5-stage DADSR envelope

To hear the effect of the Filter Envelope:

1. Recall the Basic Program by pressing the GLOBAL button and using the SELECT knob to navigate to the BASIC PROGRAM command, then press WRITE.

2. Hold down a note and rotate the filter's CUTOFF knob to set it to an 8 o'clock position.

3. Play a note. At this point you may not hear anything because you've closed the filter significantly.

4. In the Envelopes section, turn the AMOUNT knob of Env 1 (which is routed to the Filter by default) to a 3 o'clock position.

5. Play a note. Notice how the sound has changed. The Filter Envelope is controlling filter cutoff by the amount you set with the AMOUNT knob.

6. Repeatedly strike a note on the keyboard as you turn the Filter Envelope's DECAY knob clockwise and counterclockwise. Notice how it changes the sound as the note decays faster or slower after its initial attack stage.

7. Now experiment with the Filter Envelope's ATTACK knob. Notice how the attack becomes faster or slower.

8. Now hold down a note and experiment with the Filter Envelope's SUSTAIN knob. This controls how wide the filter stays open while you hold down a key on the keyboard.

9. The Filter Envelope's RELEASE parameter acts in conjunction with the Amplifier Envelope (Envelope 2 by default), so to hear its effect, first set the Amp Envelope's RELEASE value to a 1 o'clock position.

10. Now repeatedly strike a note on the keyboard as you turn the Filter Envelope's RELEASE knob clockwise and counterclockwise. Notice how the note fades out faster or slower as you change the RELEASE value.

11. Continue experimenting with various Filter Envelope settings while you adjust Envelope 1's AMOUNT knob. Notice how greater AMOUNT settings amplify the effect of the envelope on the filter.

As noted above, the Filter Envelope and Amplifier Envelope often work in conjunction, with the Filter Envelope controlling how the filter opens and closes and the Amplifier Envelope controlling how the Amplifier controls the overall volume shape of the sounds you create. To learn more about the Amplifier Envelope, see "About the Amp Envelope" on page 27.

Envelope Parameters

Attack: Sets the attack time of the envelope. The higher the setting, the slower the attack time and the longer it takes for the filter to open from the level set with the filter CUTOFF knob to the level set by the filter envelope amount. Percussive sounds typically have sharp (short) attacks.

Decay: Sets the decay time of the envelope. After a sound reaches the filter frequency set at its attack stage, DECAY controls how quickly the filter then transitions to the cutoff frequency set with the SUSTAIN knob. The higher the setting, the longer the decay. Percussive sounds, such as synth bass, typically have shorter decays (and a generous amount of low-pass filter resonance).

Sustain: Sets the filter cutoff frequency for the sustained portion of the sound. The sound will stay at this filter frequency for as long as a note is held on the keyboard.

Release: Sets the release time of the envelope. This controls how quickly the filter closes after a note is released.

Velocity On/Off: On, Off—Allows key velocity to influence filter cutoff frequency. If on, the harder you play, the more the filter will open and the brighter the sound will be. If off, key velocity will not affect the filter. This control allows for more touch-sensitive sounds.

Amount: Sets the amount of modulation from the filter envelope to the filter's cutoff frequency. Any setting above zero means that each time you strike a key, the filter envelope controls how the filter opens and closes. Higher amounts more dramatically affect the cutoff frequency. This control is bipolar. Positive settings produce standard behavior. Negative settings invert the envelope.

Additional Envelope Parameters (Program Menu)

Additional Envelope parameters are accessible by pressing the front-panel PROGRAM button and scrolling through the list that appears. The parameters below do not appear on the front panel.

Env 1 Delay: 0...127—Sets a delay between the time the envelope is triggered (note on) and when the attack portion actually begins.

Env 2 Delay: 0...127—Sets a delay between the time the envelope is triggered (note on) and when the attack portion actually begins.

About the Amp Envelope

After passing through the filters, a synthesized sound goes into an amplifier, which controls its overall volume. The Amp envelope is used to shape the volume characteristics of a sound over time by giving you control over these stages. Along with the Filter envelope, this is one of the most important aspects of a synthesized sound.

Without a volume envelope, the volume of a sound wouldn't change over the duration of a note. It would begin immediately, remain at its full volume for its duration of the note, then end immediately when the note was released. Again, that's not very interesting sonically and it's not typically how instruments behave in the real world.

To give you a real-world example, the main difference between the sound of the wind and the sound of a snare drum is that they have very different volume envelopes. Otherwise, they are essentially both white noise. Wind has a relatively slow attack, a long sustain, and a long decay and release. A snare drum has a sharp attack, no sustain, and very little decay or release. But again, they are both fundamentally white noise.
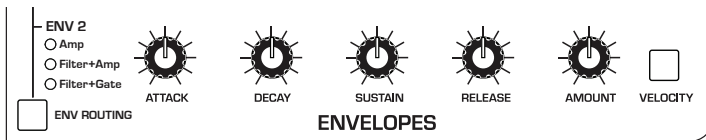
Envelope 2 parameters
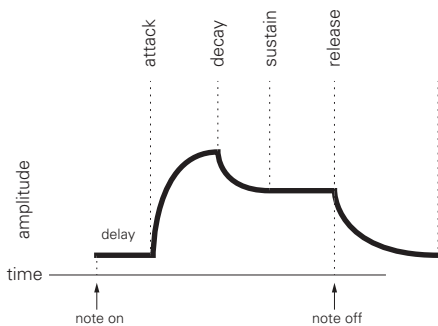
A typical 5-stage, DADSR envelope

As noted previously, the Amplifier Envelope works in conjunction with the Filter Envelope, with the Filter Envelope controlling how the filter opens and closes and the Amplifier Envelope controlling how the Amplifier controls the overall volume shape of the sounds you create.

To hear the effect of the Amplifier Envelope:

1. Recall the Basic Program by pressing the GLOBAL button and using the SELECT knob to navigate to the BASIC PROGRAM command, then press WRITE.

2. Repeatedly strike a note on the keyboard as you turn the Amplifier Envelope's ATTACK knob clockwise. Notice how the attack becomes slower and more gradual the further you turn the knob.

3. Reset the ATTACK parameter to zero (fully counter-clockwise).

4. Next, repeatedly strike a note on the keyboard as you turn the Amplifier Envelope's SUSTAIN to zero. Notice how it changes the sound so that the sound no longer sustains even if you hold down the key. The only sound you hear is the decay portion of the sound.

5. Now, with SUSTAIN still set to zero, repeatedly strike a note on the keyboard as you turn the Amplifier Envelope's DECAY knob clockwise and counterclockwise. Notice how it changes the sound as the note decays faster or slower after its initial attack stage.

6. Set the DECAY parameter to 3 o'clock.

7. Finally, with DECAY set to 3 o'clock and SUSTAIN still set to zero, repeatedly strike a note on the keyboard as you turn the Amplifier Envelope's RELEASE knob clockwise. Notice how the release becomes longer the further you turn the knob.

8. Continue experimenting with various Amplifier Envelope settings while you also adjust the Filter Envelope to hear how these two controls interact. You will understand how powerful the envelopes are and how essential they are to designing sounds.

Auxiliary Envelope

Envelope 1 can be designated as an Auxiliary envelope using the front-panel ENV ROUTING button. By doing so, you can set its shape as you wish and use the modulation matrix to route it to a specific modulation destination to create modulation that varies over time according to the shape of the envelope. Routing an envelope to an oscillator's frequency, for example, causes the oscillator's pitch to rise and fall according to the contour of the envelope.

Either of the Take 5's envelopes can be routed to any destination (or multiple destinations) using the modulation matrix. See "Modulation" on page 34 for more details.

There are many ways to make creative use of the Auxiliary Envelopes:

- Route an envelope to one of the oscillators' OSC 1 OCTV parameter to create the classic "pitch blip" effect used in many synth lead sounds.

- Route an envelope to the filter's CUTOFF parameter (in addition to the standard Filter Envelope) to create a more complex filter envelope shape.

- Route an envelope to one or more of the oscillators' SHAPE parameter to make their timbre evolve according to envelope's contour.

- Route an envelope with a fast attack and short decay to NOISE LEVEL to add a percussive attack to a sound. (Noise should be set to zero in the Mixer.)

Low Frequency Oscillators

LFOs are special-purpose oscillators that produce a frequency that is typically below the range of human hearing (although these can actually extend into the audio range if set to their maximum frequency). The LFOs are used for periodic modulation such as vibrato (periodic pitch modulation) and tremolo (periodic amplitude modulation). They can also be used as modulation sources for any of the many modulatable parameters in the Take 5.

The LFOs produce a variety of waveshapes, including triangle, sawtooth, reverse sawtooth, square, and S&H (sample & hold/random). Though most often used for low-frequency modulation, the Take 5 LFOs can actually function at speeds that extend into the audible range for extreme effects.
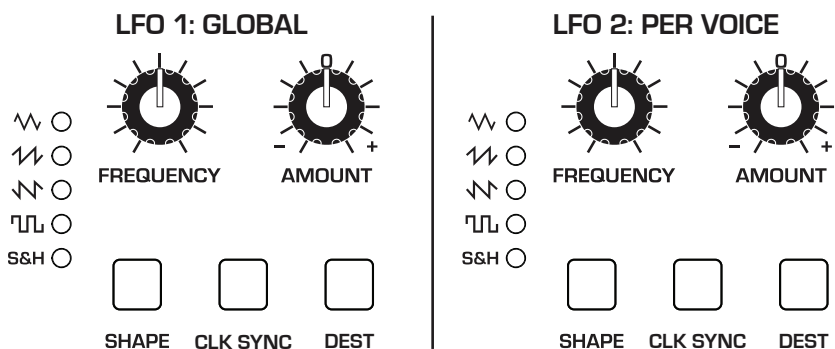
The Low Frequency Oscillators

The triangle wave is bipolar. That is, its waveshape is positive for half of its cycle and negative for the other half. This makes it possible to generate a vibrato that goes alternately sharp and flat in equal amounts on either side of a center frequency.

The square, sawtooth, reverse sawtooth, and sample & hold (random) waves generate only positive values. In the case of the square wave, this makes it possible to generate trills.

LFO waveshapes
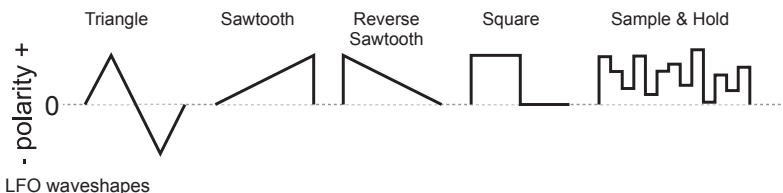
The LFOs can be free-running or synced to the Arpeggiator, Sequencer, or MIDI clock for tempo-synced effects such as filter sweeps, tremolo, and so on.

Global LFO Versus Per-Voice LFO

The Take 5 has two separate LFOs. LFO 1 is "global" and LFO 2 is "per voice." It's useful to understand the difference:

Global LFO (LFO 1)

LFO 1 is a Global LFO and is a single modulator that is applied to all voices in a program equally — with no variation from voice to voice. A simple example of this is using LFO 1 to modulate Osc 1 Freq. Doing so will change the pitch of all notes you play in exactly the same way and with the same timing. In other words, if you play a chord, and strike each note within the chord at slightly different times, the notes will shift their pitch together in perfect sync with each other with no variation from note to note/voice to voice. Compare this to the example given below for LFO 2, which is per voice.

Per-Voice LFO (LFO 2)

LFO 2 is a per-voice modulator that is applied to each voice individually, and can vary from voice to voice. A simple example of this is using LFO 2 to modulate Osc 1 Freq. Doing so will change the pitch of all notes that you play, but the modulation will be applied individually to each note. In other words, if you play a chord, and strike each note within the chord at slightly different times, each note will be modulated individually beginning from the time it is struck, making the cycle of the pitch shift different from note to note/voice to voice. It's a subtle but noticeable difference.

LFO Parameters

Frequency: Sets the frequency of the selected LFO from a slow .022Hz to a fast 500Hz. This is affected by the CLK SYNC (clock sync) parameter as explained below.

Amount: Sets the amount of LFO modulation routed to the selected destination. Setting an amount here applies the selected modulation continuously. You can also use the modulation matrix to route an LFO to additional destinations and use a different modulation amount if you want.

Shape: Triangle, Sawtooth, Reverse Sawtooth, Square, S&H—This button sets the waveshape of the selected LFO.

Clock Sync: When on, the LFO synchronizes with the master clock, which controls the Arpeggiator, Sequencer, and certain effects such as the various delays.

Destination: Various—Routes the selected LFO to one of the many modulation destinations within the synthesizer. These appear in the display. You can also use the modulation matrix to route an LFO to additional destinations.

There are many ways to make creative use of the LFOs:

- Route an LFO to the FINE parameter of the oscillators to create vibrato (TRIANGLE wave) or random pitches (S&H/RANDOM wave).

- Route an LFO's triangle wave to the filter's CUTOFF parameter and use a medium FREQ and AMOUNT setting to create a wah-wah effect, or use a slow FREQ setting and low AMOUNT setting to create subtle harmonic movement.

- Route an LFO's square wave to the amplifier's AMOUNT parameter and use a medium FREQ and AMOUNT setting to create a tremolo effect.

- Route an LFO to an oscillator's SHAPE parameter to make its timbre evolve.

- Route the LFO's triangle wave to the TIME parameter of the stereo delay and use a slow FREQ and low AMOUNT setting to create a chorus effect.

Any LFO can be routed to any destination (or multiple destinations) using the modulation matrix. See "Appendix B: Modulation Destinations" on page 69 for a list of destinations.

Additional LFO Parameters (Program Menu)

Additional LFO parameters are accessible by pressing the front-panel PROGRAM button and scrolling through the list that appears. The parameters explained below do not appear on the front panel.

LFO 1 Reset: Off, On—When off, the LFO is free running. When on, the LFO is re-started each time a new note is played. However, if the first note is held and more notes are played, the LFO does not reset on the newly played notes. LFO reset is useful if you want to ensure that the full cycle of the waveshape is applied each time you strike a key.

LFO 2 Reset: Off, On—When off, the LFO is free running. When on, the LFO is re-started each time a new note is played. WAVE RESET is set independently for each LFO. This is useful if you want to ensure that the full cycle of the waveshape is applied each time you strike a key.

There is a shortcut for routing an LFO to a front-panel destination (provided that the destination is a valid destination). Simply hold down the DEST button of the desired LFO, then move the knob or control you want to use as a destination (the filter cutoff, for example). Set the amount using the LFO AMOUNT knobs. Be aware that not all front-panel controls can be used as a modulation destinations.

Modulation

Although the overall sonic character of the Take 5 is determined by its oscillators and filters, much of its power to make unique sounds comes from creative use of modulation. Modulation is the process of routing one parameter (used as a control voltage) to another parameter in order to change the way the targeted parameter behaves.

MOD

SRC ASSIGN

DEST ASSIGN
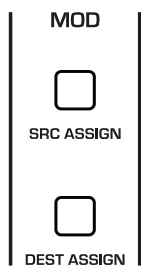
The Modulation assignment controls

The idea is simple:

1. Choose a source.

2. Choose a destination.

3. Set an amount. The amount can usually be either positive or negative.

Indicates mod slot number

bpm   clk div

| 120 | MOD 1 | 1/16 |

source — ModWheel [M]
amount — 45
destination — Overdrive [M]

Up+Down   BBD

arp   effect

Indicates whether
a mod source/destination
is mono (M) or poly (P)

select

value

Use this knob to
scroll through
mod slots and
source/amount/destination

Use this knob to
set the mod source
mod amount
mod destination
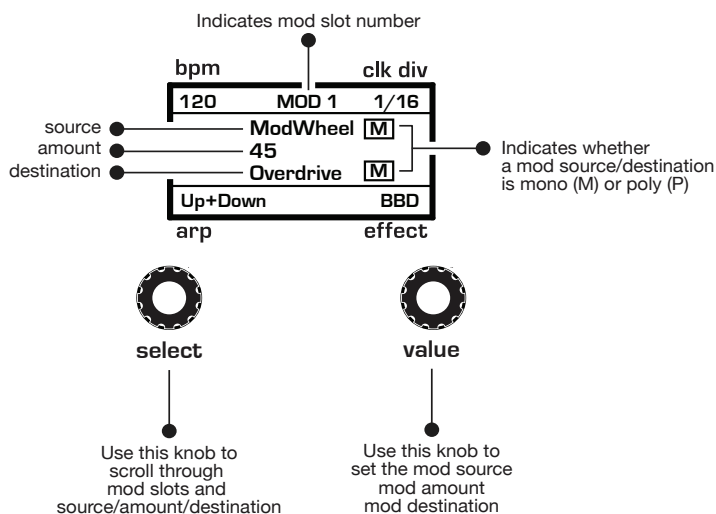
You already understand and apply the concept of modulation whenever you use the filter envelope to control the filter's cutoff frequency. In this case, the modulation *source* is the filter envelope (or more precisely, any of its controls, such as attack, decay, sustain, or release). The modulation *destination* is the filter's CUTOFF frequency. The modulation *amount* is set with the Filter Envelope's AMOUNT knob.

There are 19 different modulation sources and 54 different destinations to choose from. This gives you a large number of sound-shaping options.

There are shortcuts for routing modulation to various front panel sources/destinations. Simply hold down the SOURCE ASSIGN button and move the control you want to use as a source (the Mod wheel, for example). Then hold down the DESTINATION ASSIGN button and move the control that you want to use as a destination (filter cutoff, for example). Set the amount with the VALUE knob while referring to the display. Be aware that not all front-panel controls can be used as a modulation source/destination.

Mono and Poly Modulation Sources/Destinations

There are two types of mod sources and destinations: mono and poly. In general, you don't need to think too much about which to use when assigning modulation, but it's useful to understand the difference.

- A mono modulation source, such as LFO 1: Global, is a single modulator that is applied to all voices in a program equally — with no variation from voice to voice. Other mono mod sources include the Pitch Bend wheel or Mod wheel, which can be used to control oscillator frequency (pitch) or other aspects of a sound depending on how you assign it in the Mod Matrix (in the display).

- A poly modulation source, such as Key Velocity, is a modulator that is applied to each voice individually, and can vary in its amount from voice to voice. A simple example of this is using key velocity to control filter cutoff frequency per voice or the volume of individual voices (Amp). Other poly mod sources include LFO 2, Envelope 1, Envelope 2, Note Number, and others. These can all be used to control things such as the pitch of individual oscillators/voices, oscillator wave shape per voice, and many other things.

Modulation Examples

Here are several modulation scenarios that illustrate how to use the modulation matrix. The examples provide step-by-step instructions for clarity. Some of these setups are built into the basic program, which you can recall from the GLOBAL menu.

To use the Mod wheel to add vibrato:

1. In the LFO section, set LFO 1 to TRIANGLE and set FREQUENCY to a medium value. Set DESTINATION to OSC ALL FINE. Set AMOUNT to 0. (You will control the amount with the Mod wheel.)

2. In the MODULATION section, press the SOURCE button. Use the SELECT knob to scroll to Mod Slot 1 if it's not already displayed.

3. Use the VALUE knob to scroll through the various mod sources and choose MOD WHEEL (As a shortcut for steps 2 and 3, you can hold down the SRC ASSIGN button and move the Mod wheel.)

4. Use the VALUE knob to set the amount to 30.

5. Use the VALUE knob to scroll through the various mod destinations and choose LFO 1 AMT. (As a shortcut you can hold down the DEST ASSIGN button and move the LFO 1 AMOUNT knob.)

6. Hold down a note on the keyboard and turn the Mod wheel. You should hear vibrato.

Use PRESSURE as the modulation source instead of the Mod wheel in the previous example to add vibrato with key pressure/aftertouch.

To use the Mod Wheel to control the filter cutoff:

1. In the MODULATION section, press the SOURCE button. Use the SELECT knob to scroll to Mod Slot 1 if it's not already displayed.

2. Use the VALUE knob to scroll through the various mod sources and choose MOD WHEEL.

3. Use the VALUE knob to scroll through the various mod destinations and choose CUTOFF.

4. Hold down a note on the keyboard (or press the HOLD button and play a note on the keyboard) and move the Mod Wheel up and down.

5. Use the VALUE knob to set the amount to your preference. Higher AMOUNT settings cause the filter to open wider the farther up you move the Mod Wheel. A negative amount setting will close the filter the farther up you move the Mod Wheel.

Use PRESSURE as the modulation source instead of the Mod Wheel slider in the previous example to open the filter (positive AMOUNT) or close the filter (negative AMOUNT) with key pressure (aftertouch.

Other modulation ideas:

- To create the classic "attack pitch blip" effect in many synth brass sounds, choose a good two-oscillator synth brass sound. Set ENV 1 to AUX and ENV 2 to FILTER + AMP. In the Mod Matrix route ENV 1 OSC 2 FINE. Set ENV 1 to Attack: 0, Decay: 9 o'Clock, Sustain: 0, and Release: 0 with an amount of 30.

- Route an LFO to PAN to create an auto-panning effect. Panning width is controlled by the modulation amount. Panning speed is controlled by the LFO frequency. Add a second mod path to control the LFO speed with the Mod wheel for a controllable rotating speaker spin-up/spin-down effect. Add the rotating speaker effect as Effect 1 and set up a third mod path to control FX1 MIX with the Mod wheel for even better results.

- Route VELOCITY to OVERDRIVE to distort a synth lead sound the harder you play.

Unison

When UNISON is on, the Take 5 acts like a monophonic synthesizer in that only 1 note can be played at a time. However, that one note can be powered by as many as five voices, depending on how many you choose to use.

To use Unison:

1. Press and hold the UNISON button.

2. With the UNISON switch held down, use the VALUE knob to choose the number of voices to stack, then release the Unison switch.

```
bpm              clk div
┌──────────────────────────┐
│ 120     UNISON    1/16    │
│                          │
│        4 Voices          │
│                          │
├──────────────────────────┤
│ Up+Down            BBD    │
└──────────────────────────┘
  arp              effect
```

Setting the number of Unison voices

To detune the oscillators in Unison:

1. Press PROGRAM settings button.

2. With the SELECT knob, choose the UNISON DETUNE command

3. Use the VALUE knob to set the amount of detuning. A setting of 0 is minimum detuning. A setting of 7 is maximum detuning.

```
bpm              clk div
┌──────────────────────────┐
│ 120    PROGRAM    1/16    │
│    11. Unison Detune     │
│            3             │
├──────────────────────────┤
│ Up+Down            BBD    │
└──────────────────────────┘
  arp              effect
```

Detuning Unison voices

Using Chord Memory

Unison has a useful feature called chord memory. Instead of assigning voices to a single note, hold down a chord on the keyboard and press the UNISON switch. The Take 5 memorizes the notes of the chord. Single notes played on the keyboard then trigger all notes of the stored chord, transposing them as you play up or down the keyboard. Try using this feature to create powerful chord stabs.

To use chord memory:

1. Hold down a chord on the keyboard (5 notes maximum).

2. Press the UNISON switch. The chord voicing is memorized. Play a few notes to listen to the result.

3. If you save the program, the unison chord memory is saved with it.

To clear chord memory:

1. Turn off Unison.

2. Hold down a single note.

3. Press the UNISON button.

4. Save the program again.

Effects

You can add up to two digital effects per program. The first effect can be one of several classic device emulations, including various delays, chorus, flanging, ring modulation, and others. The second effect is a dedicated reverb with variable decay, pre-delay, damping, and tone. Effects are saved with programs.

Effect Types

> • Delay - classic stereo digital delay
>
> • BBD - vintage bucket-brigade delay emulation
>
> • Tape Delay 1 - vintage tape delay emulation
>
> • Tape Delay 2 - vintage tape delay emulation with greater tape saturation
>
> • Chorus - vintage stereo chorus
>
> • Flanger - vintage through-zero flanger
>
> • Phaser - vintage 6-stage phaser
>
> • HP Filter - high-pass filter
>
> • Distortion - classic op amp distortion
>
> • Ring Mod - ring modulation
>
> • Rotating Speaker - vintage rotating speaker emulation
>
> • Dedicated Reverb (Effect 2) - plate reverb with variable time, tone, and early reflections.

EFFECT	TIME KNOB	DEPTH/MIX KNOB	FBACK/MISC KNOB
Stereo Delay	Time	Mix	Feedback
BBD	Time	Mix	Feedback
Tape Delay 1	Time	Mix	Feedback
Tape Delay 2	Time	Mix	Feedback
Chorus	Rate	Depth	LPF Cutoff
Flanger	Rate	Depth	Feedback
Phaser	Rate	Depth	Feedback
High-pass Filter	Frequency	Mix	Resonance
Distortion	Gain	Output Level	Tone
Ring Modulation	Pitch/Carrier Freq	Mix	Pitch Track On/Off
Rotating Speaker	Speed	Drive	Mic Distance

To add an Effect:

1. Press the EFFECT ON/OFF button to turn it on.

2. Turn the TYPE knob to select an effect. The effect name is shown in the lower right of the main display. Names are abbreviated. For instance "bbd" is the bucket-brigade delay. Refer to the previous list.

3. Turn the DEPTH/MIX knob clockwise to blend in the processed signal.

4. Use the TIME and FEEDBACK/MISC knobs to adjust effect parameters. Refer to the chart to see which parameters each of these knobs control

To add Reverb:

1. Press the REVERB ON/OFF button to turn it on.

2. Turn the MIX knob clockwise to blend in the processed signal.

3. Use the DECAY knob to adjust the length of the reverb tail.

4. Use the PRE-DELAY knob to adjust the pre-delay.

5. Use the TONE knob to shape the frequency content of the reverb. The TONE parameter uses both high-pass and low-pass filtering to sculpt the reverb's sound.

6. Use the DAMPING knob to adjust reverb damping (absorption of the high frequencies of the reverb). Less damping allows high frequencies to decay slower to create a brighter reverb sound. More damping darkens the sound of the reverb.

Vintage Knob

Because the Take 5 has analog VCOs and filters, it is capable of producing many classic, vintage poly synth sounds, even though it was designed and constructed with state-of-the-art technology and components. To add even more vintage character, we designed the VINTAGE knob, which introduces parameter variations from voice to voice. This type of behavior was a big part of why vintage synths sounded so warm, organic, and alive. Turning up the VINTAGE knob adds progressively more variation between voices. Try it out!

VINTAGE

The Vintage knob

To use the Vintage knob:

- Turn the VINTAGE knob clockwise to add progressively more variation from voice to voice.

Overdrive

The Take 5 has an Overdrive effect that is separate from the digital effects available in the Effect and Reverb sections. A little Overdrive is great for adding harmonic complexity and an aggressive edge to sounds. The character of the Overdrive is affected by the harmonic content of a program. Sounds with more high-end will sound different than sounds with fewer harmonics.

OVERDRIVE

The Overdrive knob

To add Overdrive:

- Turn the OVERDRIVE knob clockwise to add progressively more of this effect.

Arpeggiator

The Arpeggiator allows you to hold a chord and the synthesizer will play a pattern based on the individual notes held. You can adjust the playback mode (up, down, up+down, random, assign.), the octave range (1, 2, or 3), the number of repeats per note, and the tempo. The Arpeggiator usually works best on sounds with a fast attack.

While you hold down a chord, pressing any additional notes will add those notes to the arpeggio. You can change chords and notes and the arpeggio will continue to play as long as at least one note is always held.

You can also use the HOLD feature with the Arpeggiator. When you enable HOLD, you can release the notes on the keyboard and the arpeggio will continue to play — with any additional notes that you play added to the arpeggio.

📝 To prevent the Arpeggiator from adding new notes to an arpeggio when keys are continuously held (and instead start a new arpeggio each time you change notes), turn ARP RELATCH ON in the Arpeggiator. To do this, press the PROGRAM button and use the SELECT knob to scroll to the ARP RELATCH parameter. Use the VALUE knob to set it to ON.

Set the tempo of the Arpeggiator with the TAP TEMPO or BPM and DIVIDE controls. To use TAP TEMPO, tap this button 4 times to set the tempo. You can also sync the Arpeggiator to external MIDI clock.

CLOCK   ARPEGGIATOR

BPM   CLK DIVIDE   ON   OCTAVE

TAP TEMPO   MODE   REPEAT
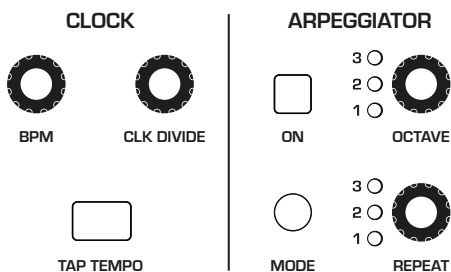
The Arpeggiator

To use the Arpeggiator:

1. Press the ARPEGGIATOR ON/OFF button to turn it on.

2. Hold down one or more notes on the keyboard. The Arpeggiator plays them according to the settings you've chosen.

3. To latch arpeggiation on (so that you don't have to continuously hold down notes) press the HOLD button.

4. In the display menu, adjust settings such as MODE, OCTAVE RANGE, REPEATS, and BPM.

5. To synchronize a delay effect to the Arpeggiator, enable Effect 1, choose a delay, then turn on SYNC in the delay's parameter page in the display. Adjust the delay's TIME parameter as desired.

Arpeggiator "Momentary Sustain" Mode

The Take 5 allows you to use the sustain pedal to turn the Arpeggiator's Hold function on and off and perform other Arpeggiator-related functions. To access this feature, use the FOOT FUNCTION setting in the GLOBAL menu.

There are three modes to choose from:

- SUSTAIN - With the Arpeggiator running in this mode, pressing and holding the Sustain pedal sustains the notes, as the Sustain pedal normally would.

- ARP HOLD - With the Arpeggiator running in this mode, pressing the Sustain pedal once causes the Arpeggiator to hold the sequence (even when you release the notes on the keyboard). Pressing it again stops the Arpeggiator.

- ARP HOLD MOM - With the Arpeggiator running in this mode, pressing and holding the Sustain pedal causes the Arpeggiator to sustain (even when you release the notes on the keyboard) for as long as you hold down the pedal. Releasing the Sustain pedal stops the Arpeggiator.

To select the Arpeggiator's sustain pedal mode:

1. Press the GLOBAL button then use the SELECT knob to scroll to FOOT FUNCTION.

2. Use the VALUE knob to select SUSTAIN, ARP HOLD, or ARP HOLD MOM, depending on your preference. Press the GLOBAL button again to exit the Global menu.

MIDI Note Output from the Arpeggiator

The Arpeggiator outputs MIDI note messages. Any notes that you hold on the keyboard will be arpeggiated according to the current settings of the Arpeggiator and output over MIDI as MIDI notes. You can use this feature to drive other MIDI-equipped devices such as synthesizers and drum machines. To access this feature, use the MIDI ARP NOTES setting in the GLOBAL menu.

To enable MIDI Note output from the Arpeggiator:

1. Press the GLOBAL button, then use the SELECT knob to locate the MIDI ARP NOTES parameter.

2. Use the VALUE knob to select ON.

To control an external MIDI device:

1. Connect the MIDI or USB output of the Take 5 to the MIDI or USB input of the external device, depending on which type of connection the external device requires.

2. On the Take 5, press the GLOBAL button, then use the SELECT knob to locate the MIDI CABLE OUT parameter.

3. Use the VALUE knob to select MIDI, USB, or ALL, depending on how your Take 5 and external device are connected.

4. Press the GLOBAL button again to exit the Global menu.

5. On the external device, set the the MIDI Channel and MIDI Receive port to match the Take 5.

6. Hold down a chord on the Take 5 or start Sequencer playback. The external device should be triggered by the arpeggiated or sequenced notes.

Arpeggiator Parameters

Arpeggiator On/Off: This button turns the Arpeggiator on and off.

Arp Mode: Sets the order in which notes play when the Arpeggiator is on. The setting appears in the lower left of the display. See the table below.

Arp Mode	Behavior
Up	Plays from lowest to highest note
Down	Plays from highest to lowest note
Up + Down	Plays from lowest to highest and back to lowest
Random	Plays notes in random order
Assign	Plays notes in the order the keys were pressed

Octave: 1, 2, 3—Set to 1, only the held notes are arpeggiated. Set to 2, the held notes and the notes one octave above them arpeggiate. Set to 3, the held notes and the notes one and two octaves above them arpeggiate.

Repeat: 1, 2, 3 —Set to off, each note in the arpeggio plays once. Set to 1, each note in the arpeggio plays twice. Set to 2, each note in the arpeggio plays three times. Set to 3, each note in the arpeggio plays four times.

Relatch (in the Program Menu): Off, On—Works in conjunction with HOLD. When HOLD and the Arpeggiator are on, and ARP RELATCH is off, played notes are held on and arpeggiated, with additional played notes added to the held notes and the arpeggio. When ARP RELATCH is on, played notes are held on and arpeggiated, but additional played notes will restart the arpeggio with the new notes. If you release all keys and play new notes, the arpeggio restarts using the new notes.

Clock Parameters

BPM: 30…250—Sets the tempo for the Arpeggiator in BPM (beats per minute). The TAP TEMPO LED flashes at the BPM rate. When SYNC is enabled on the low-frequency oscillator, or enabled in the Effects section, the BPM rate affects the LFO frequency and/or delay effect. When syncing to an external MIDI clock source, the BPM setting has no effect.

Clock Divide—Selects a basic note value relative to the BPM. See the table below:

Name	Tempo	Timing Division
1/2	BPM/2	Half note
1/4	BPM	Quarter note
1/8	BPM x 2	Eighth note
1/8 T	BPM x 3	Eighth note triplets
1/16	BPM x 4	Sixteenth note
1/16 T	BPM x 6	Sixteenth note triplets
1/32	BPM x 8	Thirty-second note
64th	BPM x 16	Sixty-fourth note

Tap Tempo—Pressing the TAP TEMPO button 4 times sets the tempo. The LED flashes at the BPM rate you set.

Step Sequencer

The step sequencer allows you to record a series of notes and chords of up to 64 steps in length. You can record up to a 5-note chord on each step. It records note and velocity data, but not timing. You can add ties and rests after you have recorded the notes/steps. Once you have recorded a sequence, you can play it back and adjust its playback speed with the BPM control. You can also play along with a sequence (if there are voices available), and transpose its playback.

To program a note sequence:

1. Press the RECORD button.

2. Play the notes of your sequence on the keyboard. The display indicates the current step as you play.

When recording a chord as a step, as long as you continue to hold at least one note down, you can keep adding notes to the chord/step, and even use the TRANSPOSE buttons to extend the keyboard range while doing it.

3. To add a rest as you play, press the PROGRAM settings button for that step, then continue playing. To add multiple rests, press the PROGRAM settings button multiple times.

4. To add a "tie" that extends the length of a note, play a note, then press the WRITE button repeatedly to extend the note for the number of steps you want for that note.

5. When you're done, press PLAY to listen to your sequence. Use the BPM, VALUE, or TAP TEMPO controls to adjust sequencer playback speed

6. To save the sequence, save the program and they are saved together.

If you want to play live along with the sequencer, be sure to leave voices available. In other words, don't play 5-note chords for every step in the sequence!

To transpose a sequence:

1. Press PLAY. The sequence begins playback.

2. Press and hold RECORD and press a key on the keyboard. "Middle C" is the reference point. Playing a note above middle C transposes the sequence higher by that interval. Playing a note below middle C transposes the sequence lower by that interval.
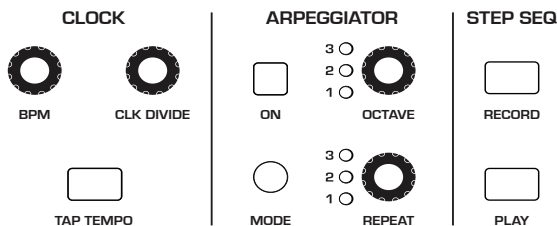
The Sequencer and Clock controls

Master Volume/Program Volume

The master output level of the Take 5 is controlled by the front-panel VOLUME knob. In addition, the volume of an individual program can be set with the PROG VOLUME parameter in the PROGRAM menu. This is useful for ensuring that your sounds have roughly the same volume from program to program.

```
bpm              clk div
┌─────────────────────────┐
│ 120    PROGRAM    1/16  │
│    15. ProgVolume       │
│         127             │
│ Up+Down            BBD  │
└─────────────────────────┘
arp              effect
```

Setting Program Volume in the PROGRAM menu

To set the volume of an individual program:

1. Choose a program.

2. Press the PROGRAM button to the lower left of the display.

3. Use the SELECT knob to locate the PROGVOLUME parameter.

4. Use the VALUE knob to set the volume level.

5. Press the WRITE button twice to save the program.

MIDI volume can also influence the overall volume of the Take 5 if you are controlling it from an external MIDI source.

Transpose

The UP and DOWN buttons in the TRANSPOSE section transpose the keyboard up or down in octaves. The LED indicates the current keyboard transposition state. Transposing the keyboard also changes the MIDI note numbers of the keys so that MIDI notes sent are also transposed. Transpose settings are global and are not saved with individual programs. Note that press one of the Transpose button won't affect any keys currently held down. It only affects keys/notes played after you have transposed the keyboard.
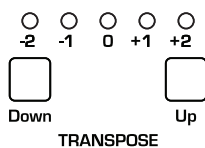
The Transpose controls

Hold

When HOLD is on, any notes played will continue to play until HOLD is turned off. When used in conjunction with the Arpeggiator, notes are latched on.
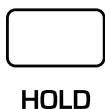
The Hold button

Glide

Glide causes the pitch of a note to glide up or down from the pitch of the previously played note. Glide is turned on and off using the GLIDE switch, but the RATE must also be set. If the GLIDE button is on, but RATE is set to 0, glide has no effect. Glide can be set individually for each oscillator.

● Press to enable Glide

GLIDE

The Glide button

To use Glide:

1. Press the GLIDE button to turn Glide on.

2. Play a series of notes up and down the keyboard while you turn the GLIDE RATE knob to adjust the amount of glide.

Glide Modes

There are four modes that determine how glide behaves. You can set your preferred mode using the PROGRAM menu.

Fixed Rate: The time to transition between notes varies with the interval between the notes; the greater the interval, the longer the transition time. The glide rate is fixed. This is the default glide mode.

Fixed Rate A: The same as Fixed Rate, but glide is only applied when playing legato. That is, glide only occurs when a note is held until the next note is played. This effectively allows glide to be turned on and off from the keyboard. This mode is only available when Unison is on.

Fixed Time: Glide is set to a fixed time, regardless of the interval between notes. This mode is only available when Unison is on.

Fixed Time A: The same as Fixed Time, but glide only occurs when playing legato.

To select a Glide Mode:

1. Press the PROGRAM button.

2. Use the SELECT knob to locate the GLIDE MODE parameter.

3. Use the VALUE knob to choose a glide mode.

4. Play a series of notes up and down the keyboard to hear the effect.

5. Once you've chosen the desired mode, press the WRITE button twice to save the program.

To set the Glide Amount separately for each oscillator:

1. Press the PROGRAM button.

2. Use the SELECT knob to locate the OSC 1 GLIDE parameter.

3. Use the VALUE knob to set the amount as you play a series of notes up and down the keyboard to hear the effect.

4. Once you've chosen the desired amount of glide for oscillator 1, use the SELECT knob to locate the OSC 2 GLIDE parameter.

5. Use the VALUE knob to set the desired amount of glide for oscillator 2 as you play a series of notes up and down the keyboard to hear the effect.

6. When you're finished, press the WRITE button twice to save the program.

Pitch and Mod Wheels

The Take 5 has a spring-loaded Pitch wheel and a Mod wheel. You can use these controls to enhance live performance by bending notes and adding modulation in real time as you play.
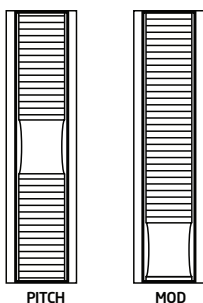
The Pitch and Modulation wheels

Pitch Wheel

You can set a range in semitones for the Pitch wheel, depending on your playing preference. The upward range is 12 semitones (1 octave). The downward range is 24 semitones (2 octaves). Many musicians use a range of 2 semitones (a whole step) since this is the bend range of many acoustic instruments. For guitar whammy bar effects, you many wish to set a wider range.

To set the pitch bend range:

1. Press the PROGRAM button.

2. Use the SELECT knob to locate the PITCH BEND UP parameter.

3. Use the VALUE knob to choose a bend interval.

4. Hold a note and move the Pitch wheel to hear the effect.

5. Once you've set the bend up interval as desired, use the SELECT knob to locate the PITCH BEND DOWN parameter.

6. Use the VALUE knob to choose a bend interval.

7. Hold a note and move the Pitch wheel to hear the effect.

8. Once you've chosen the desired mode, press the WRITE button twice to save the program.

Modulation Wheel

The Mod wheel controls the amount of modulation for any program that uses it as a modulation source. This allows you to "perform" modulation in real time by moving the wheel. This is a great way to add expressiveness to a sound or performance by using it to control vibrato, filter effects, and potentially a lot more.

To choose a modulation destination for the Mod wheel:

1. In the MODULATION section, press the SRC ASSIGN button. Use the select knob to scroll to Mod Slot 1 if it's not already displayed.

2. Use the VALUE knob to scroll through the various mod sources and choose MOD WHEEL.

3. Use the VALUE knob to to scroll through the various mod destinations and choose a parameter (such as CUTOFF).

4. Hold down a note on the keyboard (or press the HOLD button and play a note on the keyboard) and turn the Mod wheel.

5. Use the VALUE knob to set the modulation amount to your preference. Higher AMOUNT settings add greater modulation the further you push the Mod wheel. A negative amount setting will apply modulation in the negative direction.

As a shortcut, you can hold down the SRC ASSIGN button and move the Mod wheel to quickly assign this modulation path.

Indicates mod slot number

bpm   clk div

120   MOD 1   1/16

source — ModWheel M

amount — 45

destination — Overdrive M

Indicates whether a mod source/destination is mono (M) or poly (P)

Up+Down   BBD

arp   effect

select

value

Use this knob to scroll through mod slots and source/amount/destination

Use this knob to set the mod source mod amount mod destination
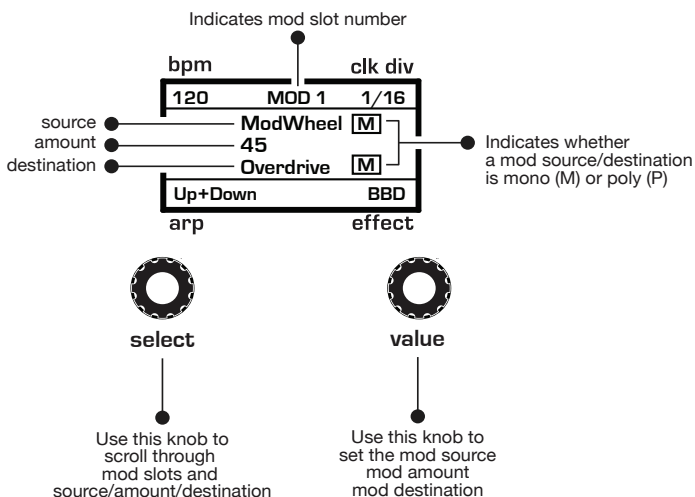
Using the Mod Matrix to assign the Mod Wheel

Adding Aftertouch

Aftertouch is a performance feature that allows you to add modulation to a sound by applying additional pressure to a key after the key is already down. The greater the pressure applied, the more modulation is applied. The Take 5 provides *monophonic* (or "channel") aftertouch, which means that applying pressure to any key within a chord will apply modulation to *all* notes currently held.

The Mod Matrix lets you choose the amount of modulation applied using aftertouch and also which parameters are modulated (oscillator frequency, filter frequency, sand so on). You can set either a positive or negative amount.

For example, if you select the filter cutoff as modulation destination (CUTOFF), set a *positive* amount of pressure, then press a key harder, the filter cutoff frequency will increase, making the filter open wider and the sound become brighter.

Conversely, if you select the filter frequency as destination, set a *negative* amount of pressure, then press a key harder, the filter cutoff frequency will be lowered, making the filter close more and the sound become more muted.

To choose aftertouch (pressure) as a source for modulation:

1. Press the MOD button. The Mod Matrix appears in the display.

2. Use the SELECT knob to scroll through the various mod sources and choose PRESSURE. (As a shortcut, hold down the SRC ASSIGN button and press a key repeatedly to toggle through the available key-related mod sources.)

3. Use the VALUE knob to scroll through the various mod destinations and choose a parameter (such as CUTOFF).

4. Hold down a note on the keyboard. Then, press harder.

5. Hold a note and move the Pitch wheel to hear the effect.

6. Use the VALUE knob to set the amount to your preference. Higher AMOUNT settings add greater modulation the harder you press a key. A negative amount setting will apply modulation in the negative direction.

📝 The Take 5 provides eight different aftertouch/pressure response settings. The default setting provides a linear response. To choose a different response curve, use the AFTERTOUCH CURVE parameter in the GLOBAL menu.
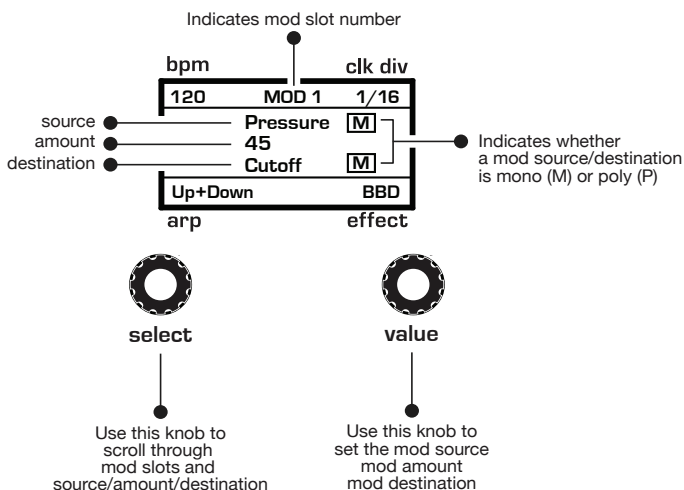
Using the Mod Matrix to assign the pressure (aftertouch)

Chapter 3: Creating Sounds

The Take 5 can produce a huge variety of sounds. While the factory programs give you some idea of its scope, if you only make use of its presets, you're not really using the Take 5 to its full potential. The real excitement is in creating sounds that are uniquely your own.

This chapter provides some brief tutorials. While there isn't enough space here to cover how to use every Take 5 function, the examples will help you get familiar with some basic concepts.

Synthesis 101: Synth Bass

Many great synth bass sounds consist of a single oscillator, a bit of filter resonance, the right envelope, and not much else. So start with the Basic Program and go from there.

Short Version

To create a classic synth bass:

1. Press the GLOBAL button.

2. Use the SELECT knob to navigate to the BASIC PROGRAM command, then press the WRITE button to set the synth to the Basic Program.

3. In the basic program, only Oscillator 1 is audible. (The levels of Oscillator 2 and the Sub Oscillator and Noise are set to zero in the Mixer by default.)

4. Repeatedly strike a note on the keyboard as you do the following and listen to how the sound evolves:

5. Set Oscillator 1's OCTAVE knob to -2.

6. Set filter CUTOFF to zero.

7. In the ENVELOPES section, set Envelope 1's AMOUNT fully clockwise.

8. Set filter RESONANCE to a 9 o'clock position.

9. Play a low note on the keyboard. Instant synth bass!

10. Experiment with Envelope 1 (the Filter Envelope) AMOUNT and DECAY settings to fine tune your synth bass sound.

Long Version with Explanations

Here's a more detailed version that provides insight into the process. You'll start with the Basic Program, then learn how to choose an appropriate oscillator waveshape, how to use the filter, how to use the envelopes, and how to use Unison to fatten things up.

In the Basic Program, only Oscillator 1 is audible. Its waveshape is set to sawtooth and its level is 127 in the MIXER.

To start with the Basic Program:

1. Press the GLOBAL button.

2. Use the SELECT knob to navigate to the BASIC PROGRAM command, then press the WRITE button to set the synth to the Basic Program.

Each of the oscillator's waveforms have their own unique sound:

- The sawtooth waveform is a good starting point for sounds because it has plenty of harmonics. This gives you a lot to work with in terms of a raw sound that you can filter and modulate.

- The pulse (square) wave is a good starting point, too, but sounds different than the sawtooth, because of its different harmonic content. The sawtooth has even and odd-numbered harmonics and the square wave has odd-numbered harmonics. (Google this if you want to learn more.)

- The sine wave has no harmonics. It's useful used alone for its pure tone, or in combination with another oscillator or sample(s) to reinforce the fundamental pitch of a sound and add weight.

To listen to the various oscillator waveshapes:

1. In the OSCILLATORS section, the Sawtooth waveform is selected by default. Play and hold a note, then turn the SHAPE knob to step through the various waveshapes.

2. Select the sawtooth waveshape.

Next, you'll use the filter to shape the raw sound of the sawtooth wave.

To adjust the filter:

1. Press and hold down a key and turn the filter's CUTOFF knob. Notice how it cuts the high frequencies as you rotate counter-clockwise, making the sound of the oscillator less bright. If you turn the CUTOFF knob fully counterclockwise you'll filter out all frequencies and hear nothing.

2. Return the CUTOFF knob to its 12 o'clock position.

3. Repeatedly strike a note and turn the RESONANCE knob about halfway up. Notice how the sound changes as a band of frequencies near the cutoff is amplified.

4. Rotate the filter's CUTOFF knob again and you'll hear a classic resonant filter sweep. You're going to use this to create your synth bass.

5. Set the filter CUTOFF to zero.

6. In the ENVELOPES section, set Envelope 1's AMOUNT fully clockwise. This will cause the Envelope 1 (the Filter Envelope) to modulate (open) the filter as much as possible according to the shape of the envelope (its attack, decay, sustain, and release settings).

7. Set filter RESONANCE to a 9 o'clock position. This gives the synth bass its funky "zap."

8. Play some low notes and listen to the sound. Classic synth bass.

To tweak the sound:

1. Experiment with the Filter Envelope's AMOUNT knob. Notice how greater AMOUNT settings amplify the effect of the envelope on the filter.

2. Repeatedly strike a note on the keyboard as you turn the Filter Envelope's DECAY knob clockwise and counterclockwise. Notice how it changes the sound as the note decays faster or slower.

3. Experiment with the Filter Envelope's CUTOFF knob.

4. The Filter Envelope's RELEASE parameter acts in conjunction with the Amplifier Envelope. In other words, you can't hear a long release on the filter envelope if the amplifier envelope is short! So to hear the filter envelope's RELEASE parameter in action, set the both the Filter Envelope and Amp Envelope's RELEASE values to an 11 o'clock position.

5. Now repeatedly strike a note on the keyboard as you turn the Filter Envelope's RELEASE knob clockwise and counterclockwise. Notice how the note fades out faster or slower as you change the RELEASE value.

Now you know how to create a simple synth bass program using the most essential synthesizer components of the Take 5: the oscillators, the filters, and the envelopes. Using just these three things you can create an enormous variety of sounds. Keep experimenting with them and if you like what you've created, save the programs in one of the user banks. (See "Saving a Program" on page 10.)

Creating Synth Brass

Here's another easy-to-construct sound: synth brass, with a classic "pitch blip" effect on the attack. In this example you'll learn how to use an auxiliary envelope to modulate the pitch of oscillator 2 to simulate an aggressively blown horn effect.

To create synth brass:

1. Press the GLOBAL button.

2. Use the SELECT knob to navigate to the BASIC PROGRAM command, then press the WRITE button to set the synth to the Basic Program.

3. In the mixer, turn Oscillator 2 fully clockwise to maximize its volume. (Osc 1 is already at full.)

4. In the OSCILLATORS section, adjust the PITCH knob on Oscillator 2 to slightly detune it and thicken the sound.

5. In the FILTER section, set CUTOFF to a 9 o'clock position.

6. Set RESONANCE to a 10 o'clock position.

7. Set ENVELOPE 1's, AMOUNT to a 3 o'clock position.

8. Set ENVELOPE 1's, ATTACK to 10 o'clock, DECAY to 10 o'clock, SUSTAIN to 11 o'clock, and RELEASE to 10 o'clock.

9. Enable touch sensitivity by pressing and enabling the VELOCITY button.

10. Play some chords and listen to the sound. Classic synth brass.

11. Use the VINTAGE knob to make the brass sound even more organic by adding parameter variations from voice to voice.

To add a "pitch blip" to the brass sound:

1. In the MOD section, press the SOURCE button.

2. Use the SELECT knob to scroll to Mod Slot 3 if it's not already displayed.

3. Use the VALUE knob to scroll through the various mod sources and choose ENV 1.

4. Use the SELECT knob to to the VALUE field then use the VALUE knob to set it to +5.

5. Use the SELECT knob to scroll to the DESTINATION field then use the VALUE knob to choose OSC2 FINE.

6. Play some notes in the upper range of the keyboard. Classic synth brass!

7. Experiment with different envelope AMOUNT and DECAY settings.

Indicates mod slot number

bpm   **clk div**

| 120 | MOD 3 | 1/16 |

source ● ——— Env 1 [P]
amount ● ——— +5
destination ● ——— Osc2Fine [P]

| Up+Down | | BBD |

arp   **effect**

select   **value**

Use this knob to scroll through mod slots and source/amount/destination

Use this knob to set the mod source mod amount mod destination
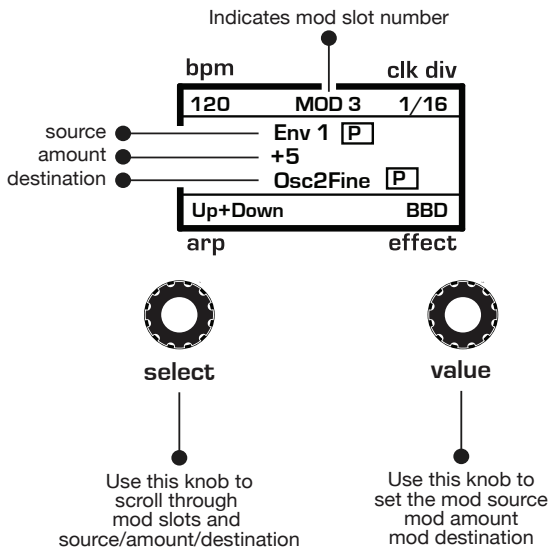
Turning Synth Brass into a String Pad

It's a simple matter to turn the previous synth brass sound into a string pad by simply adjusting its envelope and filter settings.

To turn the synth brass into a string pad:

1. Remove the pitch blip effect by setting the ENV1 to OSC2 FINE value to 0.

2. In the FILTER section, set the CUTOFF to 12 o'clock.

3. In the ENV 1 (Filter) section, set the AMOUNT to 2 o'clock

4. Set ENV 1 (Filter) ATTACK to 2 o'clock, DECAY to 2 o'clock, SUSTAIN to 2 o'clock, and RELEASE to 12 o'clock.

5. Set ENV 2 (Amp) ATTACK to 2 o'clock, DECAY to 2 o'clock, SUSTAIN to 5 o'clock, and RELEASE to 12 o'clock.

6. Play some chords. You've now got a good basic string pad.

Making the String Pad More Lush

Now lets make the string pad more lush by using the LFOs to modulate the oscillator waveshapes and recreate the classic "pulse-width mod" strings found on many vintage synths.

To use waveshape mod to make the string pad more lush:

1. On Oscillator 1, set the SHAPE knob to 2 o'clock (square/pulse wave).

2. On Oscillator 2, set the SHAPE knob to 2 o'clock (square/pulse wave), as well.

3. In the Mixer section, set the OSC 1 SUB knob to 1 o'clock.

4. On LFO 1: GLOBAL press the DEST button and using the controls in the display, set the destination to OSC1 SHP (Oscillator 1 shape).

5. Set the AMOUNT parameter to +8.

6. On LFO 1: GLOBAL, set FREQUENCY to 10 o'clock.

7. Next, On LFO 2: PER VOICE press the DEST button and using the controls in the display, set the destination to OSC2 SHP (Oscillator 2 shape).

8. Set the AMOUNT parameter to -39.

9. On LFO 1: GLOBAL, set FREQUENCY to 9 o'clock.

10. Play some chords and listen to the sound.

You are now modulating the waveshape of each oscillator differently. This gives the sound more animation. Try experimenting with different LFO FREQUENCY and AMOUNT settings.

Adding Effects to the String Pad

You can enhance the string pad adding an effect such as chorus, flanging, or phasing for a retro feel.

To add effects to the string pad:

1. In the EFFECT section, press the ON button.

2. Turn the TYPE knob and choose PHASER.

3. Set TIME to 8 o'clock.

4. Set DEPTH/MIX to 12 o'clock.

5. Set FEEDBACK/MISC to 12 o'clock.

6. Set DEPTH/MIX to 12 o'clock

7. Play some chords. Retro string machine! For even more dramatic phasing, set DEPTH/MIX and FEEDBACK/MISC to 3 o'clock.

8. Experiment with changing the effect to the flanger or chorus and adjust their settings to your preference.

Adding Reverb to the String Pad

Adding reverb can also enhance the string sound in a very lush way.

To add Reverb to the string pad:

1. In the REVERB section, press the ON button.

2. Turn the MIX knob to 10 o'clock.

3. Set DAMPING to 2 o'clock.

4. Set PREDELAY to 2 o'clock.

5. Set DECAY to 3 o'clock.

6. Set TONE to 11 o'clock.

7. Play some chords. Experiment with the DECAY, PREDELAY, and TONE settings to fine tune the reverb sound to your preference.

Creating a Hard-Sync Lead

Here's another classic sound: a hard-sync lead. A famous example of this is "Let's Go" by the Cars (performed on a Prophet-5). In this example you'll learn how to hard-sync the oscillators, pitch-modulate one of them with an auxiliary envelope, then add effects.

To create a hard-sync lead:

1. Press the GLOBAL button.

2. Use the SELECT knob to navigate to the BASIC PROGRAM command, then press the WRITE button to set the synth to the Basic Program.

3. In the mixer, turn up Oscillator 2 to 127. (Osc 1 is already at 127.)

4. In the OSCILLATORS section, set both oscillators to sawtooth.

5. Enable the SYNC 2-1 button. (See page 19 for an explanation of hard sync.)

6. Set Oscillator 1's OCTAVE to 1. This will allow for a wide range of pitch modulation in step 9.

7. Set Oscillator 2's OCTAVE to -2. This will help create a more aggressive hard-sync effect.

8. In the ENVELOPE section, set the envelopes to ENV 1: AUX and ENV 2 FILTER + AMP. This will allow you to use Envelope 1 as an auxiliary envelope that will modulate the pitch of oscillator 1.

9. Press the MOD button. In the display, use the SELECT knob to choose ENV 1 as the source.

10. Set the AMOUNT to 127.

11. Set the DESTINATION to OSC1 FINE.

12. This routes Envelope 1 to modulate Oscillator 1 pitch according to its ADSR (attack, decay, sustain, release) settings.

13. Set Envelope 1 (Aux) to ATTACK: 9 o'clock, DECAY 2 o'clock, SUSTAIN 9 o'clock,, and RELEASE to 12 o'clock,. This will set the amount and "shape" of the modulation.

14. Play some notes. Classic hard-sync lead!

15. Experiment with Envelope 1's Attack, Decay, Sustain, and Release settings to better understand how these affect the shape of pitch modulation routed to Oscillator 1.
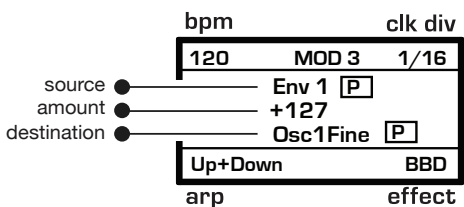
Adding Effects to the Lead

You can enhance the sync lead by adding some delay and reverb.

To add effects:

1. In the EFFECTS section, press the EFFECT 1 button.

2. Use the TYPE knob to select DELAY.

3. Set TIME to 12 o'clock.

4. Set DEPTH/MIX to 9 o'clock.

5. Set FEEDBACK/MISC to 9 o'clock.

6. Play some notes. Perfect hard-sync lead!

A Final Word

The examples given here are fairly basic, but they give you some idea of the power of synthesis. Imagine what you can create by using these as starting points, then modulating the filters, oscillators, and even effects with LFOs, Envelopes, and other modulation sources.

It's often useful to start with a simple sound and make it progressively more complex, while saving edited versions as you go so that you can retrace your steps and branch off at different points in the sound design process if you want.

Appendix A: Modulation Sources

No Source
Osc 2
Noise
LFO 1
LFO 2
Env 1
Env 2
Voice Spread
Pitch Bend
Mod Wheel
Pressure
Breath
Foot Pedal
Expression Pedal
Velocity
Note Number
Filter Out
Random
DC
Audio Out

Appendix B: Modulation Destinations

No Dest	LFO 1 Amt
Osc 1 Octave	LFO 2 Amt
Osc 2 Octave	LFO All Amt
Osc 1 Fine Freq	Env 1 Amt
Osc 2 Fine Freq	Env 2 Amt
Osc All Fine Freq	Env 1 Attack
Osc 1 Shape	Env 2 Attack
Osc 2 Shape	Env 1 Decay
Osc All Shape	Env 2 Decay
Osc 1 Level	Env 1 Release
Osc 2 Level	Env 2 Release
Osc FM Level	Mod 1 Amount
Sub Level	Mod 2 Amount
Noise	Mod 3 Amount
Drive	Mod 4 Amount
Cutoff	Mod 5 Amount
Resonance	Mod 6 Amount
Overdrive	Mod 7 Amount
Panning	Mod 8 Amount
FX Mix	Mod 9 Amount
FX Time	Mod 10 Amount
FX Misc	Mod 11 Amount
Reverb Mix	Mod 12 Amount
Reverb Size	Mod 13 Amount
Reverb PreDelay	Mod 14 Amount
Reverb Decay	Mod 15 Amount
Reverb Tone	Mod 16 Amount
LFO 1 Freq	
LFO 2 Freq	
LFO All Freq	

Appendix C: Troubleshooting and Support

Troubleshooting

If you're experiencing problems or unexpected behavior from your Take 5, here are a few typical scenarios and their solutions:

If the Take 5 isn't producing sound:.

1. Recall the Basic Program. (Global>BasicProgram>Write)

2. If the problem is still there, check the following:

- Volume - make sure it's set to an appropriate value

- Rear-panel output jacks - make your audio cables are connected to LEFT/RIGHT OUTPUT.

- In the GLOBAL menu, make sure that LOCAL CONTROL is set to ON.

If the sequencer or arpeggiator has stopped running:

- Check the MIDI CLOCK MODE setting in GLOBAL to ensure the Take 5 is set to OUT or OFF. Or if set to IN or IN THRU or IN NO S/S, make sure the Take 5 is receiving MIDI clock.

If some of the programs sound different than usual:

- In the Global menu, check SCALE/ALT TUNING and make sure it's set to EQUAL TEMPERAMENT. Also, check the Mod wheel position. The Mod wheel can do more than just add vibrato. Also, check the CLOCK MODE setting in the GLOBAL menu to ensure the Take 5 is set to OUT or OFF. Or if set to IN or IN THRU or IN NO S/S, make sure the Take 5 is receiving MIDI clock.

If there is a ground hum in the audio output:

- USB can cause ground loops, so try to resolve any grounding issues between the computer (if connected) and the Take 5. Or use MIDI, which is opto-isolated.

If the Take 5 is behaving erratically:

* This is almost always caused by a MIDI feedback loop. Make sure that any MIDI Thru functionality is turned off on the MIDI interface/hardware or in the MIDI software application. Disconnect all Take 5 MIDI connections (MIDI and USB cables) and see if the problem persists. You can also monitor the MIDI traffic with *MIDI Monitor* (Mac OS) or *MIDI-OX* (Windows) to see if the Take 5 is being overrun with duplicate messages.

If the Take 5 doesn't seem to respond to its controls:

* Make sure LOCAL CONTROL is ON in the GLOBAL menu.

If MIDI System Exclusive data is not transmitted/received:

* Make sure that the MIDI SYSEX CABLE setting in the GLOBAL menu is set to USB or MIDI depending on which you are using to transmit or receive MIDI messages.

If the Take 5 plays out of tune:

* Check the MASTER COARSE and MASTER FINE parameter in the GLOBAL menu to make sure they are both set to 0.

* You may need to recalibrate the oscillators. See "Calibrating the VCOs and Filters" on page 75.

If the pitch or Mod wheel doesn't go to full range:

* Recalibrate the Pitch and Mod wheels. See "Calibrating the Pitch and Mod Wheels" on page 75.

If the filter sounds strange or out of tune:

* You may need to recalibrate the filters. See "Calibrating the VCOs and Filters" on page 75.

Resetting the Global Parameters

If you're trying to track down a problem, it's sometimes a good idea to reset the Global parameters to their defaults. This is a quick way to make sure that the Take 5 returns to its factory settings.

> ***To reset all Global parameters to their default settings:***

1. Press the GLOBAL button.

2. Use the SELECT knob to select RESET GLOBALS, then press WRITE. Globals are reset. You can now can play the Take 5 again.

Contacting Technical Support

If you are still having a problem with the Take 5, contact Technical Support at *support@sequential.com*. Please include the purchase date of your Take 5, its serial number, and the operating system version. Press the GLOBAL button to see this at the bottom of the main display.

If you haven't already reset the Global parameters and run the calibration routines (see Troubleshooting), you should do it before contacting Technical Support. This is probably the first thing you will be asked to do.

Warranty Repair

Sequential warrants that the Take 5 will be free from defects in materials and/or workmanship for 1 year from the date of purchase. Please register your product online at www.sequential.com to establish the date of purchase. (This is not a requirement for warranty service, but it will help expedite the process.)

Please contact *support@sequential.com* to determine the best course of action for getting your Take 5 repaired. For your own protection, as well as ours, please do not return any product to Sequential without a return authorization (RA) number. To issue an RA number, Technical Support needs:

- Your name
- Your return address
- Your email address
- A phone number where you can be reached
- Your Take 5's serial number
- The date of purchase and where purchased

If you need to return your instrument for repair, you are responsible for getting it to Sequential. We highly recommend insuring it and packing in the original packaging. Damage resulting from shipping a product with insufficient packaging is not covered by warranty.

Appendix D: Calibrating the Take 5

Because the Take 5 is calibrated at the factory, controls such as the Pitch and Mod wheels, Touch Slider, and analog filters shouldn't require re-calibration. But if you experience unexpected behavior with these controls, you can use the calibration function to tune them occasionally.

Calibrating the VCOs and Filters

To calibrate the VCOs and filters:

1. Press the GLOBAL button.

2. Use the SELECT knob to select CAL VOICES, then press WRITE.

3. The synthesizer performs its auto-calibration procedure. Don't turn off the power while it's doing this.

4. When finished, the front panel controls will return to normal and you can play the Take 5 again.

Calibrating the Pitch and Mod Wheels

To calibrate the Pitch and Mod wheels:

1. Press the GLOBAL button.

2. Use the SELECT knob to select CAL WHEELS, then follow the instructions in the display.

3. When finished, press the GLOBAL button again to exit the GLOBAL menu. You can now can play the Take 5 again.

Resetting the Global Parameters

If you're trying to track down a problem, it's sometimes a good idea to reset the Global parameters to their defaults. This is a quick way to make sure that the Take 5 returns to its factory settings.

To reset all Global parameters to their default settings:

1. Press the GLOBAL button.

2. Use the SELECT knob to select RESET GLOBALS, then press WRITE. Globals are reset. You can now can play the Take 5 again.

Appendix E: Exporting and Importing Programs and Banks

You can use the DUMP PRESET, DUMP BANK, and DUMP ALL BANKS commands in the GLOBAL menu to transmit the current program, bank, or all banks in SysEx format via the selected MIDI port. This allows you to save your programs so that you can share or archive them. You will need a computer and software application such as SysEx Librarian for Macintosh, or MIDIOX for Windows.

To export a program or bank as a SysEx file over USB:

1. Connect your synthesizer to a computer using a USB cable.

2. Open your MIDI librarian software (SysEx Librarian, etc.) and configure it to receive SysEx messages.

3. Press the GLOBAL button on the Take 5.

4. Use the SELECT knob to select MIDI SYSEX CABLE, then use the value knob to choose USB.

5. Use the SELECT knob to select DUMP PRESET, DUMP BANK, or DUMP ALL BANKS, depending on which of these you would like to do.

6. Press write. The program or bank is exported.

Dumped programs will load back into the same bank and program location in memory when received by the Take 5 via MIDI.

Programs can also be dumped directly from one Take 5 to another using the MIDI DIN jack, if the MIDI SYSEX CABLE parameter is set to MIDI in the GLOBAL menu.

To send a program or bank to another Take 5 as a SysEx file over MIDI:

1. Connect two Take 5 synthesizers together using MIDI cables and the MIDI IN AND MIDI OUT jacks on their rear panels.

2. On both synthesizers, Press the GLOBAL button and use the SELECT knob to select MIDI SYSEX CABLE, then use the VALUE knob to choose MIDI.

3. On the Take 5 that you want to send the programs to, press the GLOBAL button again to exit the GLOBAL menu.

4. On the Take 5 that you want to send the programs from, in the GLOBAL menu select DUMP PRESET, DUMP BANK, or DUMP ALL BANKS, depending on which of these you would like to do.

5. Press WRITE. The program or bank is exported to the other Take 5.

Dumped programs will load back into the same bank and program location in memory when received by the Take 5 via MIDI.

Importing Programs and Banks

You can use a MIDI librarian application such as such as SysEx Librarian for Macintosh, or MIDI-OX for Windows to transmit exported program or banks back into your Take 5. You will need a computer and an appropriate software application.

To import a program or bank as a SysEx file over MIDI:

1. Connect your synthesizer to a computer using a USB cable (or MIDI cable, if you are using a dedicated MIDI interface).

2. Press the GLOBAL button on the Take 5.

3. Use the SELECT knob to select MIDI SYSEX CABLE, then use the value knob to choose USB or MIDI, depending on which port you are using to connect to your computer.

4. Open your MIDI librarian software and configure it to send SysEx messages to your Take 5.

5. In the MIDI librarian, open the programs and/or banks you want to send.

6. Transmit the programs. The Take 5 should load them. They will replace any existing programs in those same memory locations on the synth.

Programs will load back into the same bank and program locations from which they were originally exported.

Appendix F: Alternative Tunings

By default, the Take 5 is set to standard, chromatic western tuning. Additionally, it supports up to 64 additional alternative tunings, which you can access using the ALT TUNINGS parameter in the GLOBAL menu.

These 64 alternative tunings range from Equal temperament to Indonesian Gamelan tunings. If you want, you can replace these with other tunings that you can find on the Internet. These must be in SysEx format. You can download them into the Take 5 using SysEx Librarian for Mac or MIDI-OX for Windows.

Here are descriptions of the default Take 5 alternative tunings:

1. 12-Tone Equal Temperament (non-erasable)

The default Western tuning, based on the twelfth root of two.

2. Harmonic Series

MIDI notes 36-95 reflect harmonics 2 through 60 based on the fundamental of A = 27.5 Hz. The low C on a standard 5 octave keyboard acts as the root note (55Hz), and the harmonics play upwards from there. The remaining keys above and below the 5 octave range are filled with the same intervals as Carlos' Harmonic 12 Tone that follows.

3. Carlos Harmonic Twelve Tone

Wendy Carlos' twelve note scale based on octave-repeating harmonics. A = 1/1 (440 Hz). 1/1 17/16 9/8 19/16 5/4 21/16 11/8 3/2 13/8 27/16 7/4 15/8

4. Meantone Temperament

An early tempered tuning, with better thirds than 12ET. Sounds best in the key of C. Use this to add an authentic touch to performances of early Baroque music. C=1/1 (260 Hz)

5. 1/4 Tone Equal Temperament

24 notes per octave, equally spaced 24root2 intervals. Mexican composer Julian Carillo used this for custom-built pianos in the early 20th century.

6. 19 Tone Equal Temperament

19 notes per octave (19root2) offering better thirds than 12 ET, a better overall compromise if you can figure out the keyboard patterns.

7. 31 Tone Equal Temperament

Many people consider 31root2 to offer the best compromise towards just intonation in an equal temperament, but it can get very tricky to keep track of the intervals.

8. Pythagorean C

One of the earliest tuning systems known from history, the Pythagorean scale is constructed from an upward series of pure fifths (3/2) transposed down into a single octave. The tuning works well for monophonic melodies against fifth drones, but has a very narrow palate of good chords to choose from. C=1/1 (261.625 Hz) 1/1 256/243 9/8 32/27 81/64 4/3 729/512 3/2 128/81 27/16 16/9 243/128

9. Just Intonation in A with 7-Limit Tritone at D#

A rather vanilla 5-limit small interval JI, except for a single 7/5 tritone at D#, which offers some nice possibilities for rotating around bluesy sevenths. A=1/1 (440 Hz) 1/1 16/15 9/8 6/5 5/4 7/5 3/2 8/5 5/3 9/5 15/8

10. 3-5 Lattice in A

A pure 3 and 5-limit tuning which resolves to very symmetrical derived relationships between notes. A=1/1 (440 Hz) 1/1 16/15 10/9 6/5 5/4 4/3 64/45 3/2 8/5 5/3 16/9 15/8

11. 3-7 Lattice in A

A pure 3 and 7-limit tuning which resolves to very symmetrical derived relationships between notes. Some of the intervals are very close together, offering several choices for the same nominal chords. A=1/1 (440 Hz) 1/1 9/8 8/7 7/6 9/7 21/16 4/3 3/2 32/21 12/7 7/4 63/32

12. Other Music 7-Limit Black Keys in C

Created by the group Other Music for their homemade gamelan, this offers a wide range of interesting chords and modes. C=1/1 (261.625 Hz) 1/1 15/14 9/8 7/6 5/4 4/3 7/5 3/2 14/9 5/3 7/4 15/8

---

13. Dan Schmidt Pelog/Slendro

Created for the Berkeley Gamelan group, this tuning fits an Indonesian-style heptatonic Pelog on the white keys and pentatonic Slendro on the black keys, with B and Bb acting as 1/1 for their respective modes. Note that some of the notes will have the same frequency. By tuning the 1/1 to 60 Hz, Dan found a creative way to incorporate the inevitable line hum into his scale. Bb, B = 1/1 (60 Hz) 1/1 1/1 9/8 7/6 5/4 4/3 11/8 3/2 3/2 7/4 7/4 15/8

14. Yamaha Just Major C

When Yamaha decided to put preset microtunings into their FM synth product line, they selected this and the following tuning as representative just intonations. As such, they became the de-facto introduction to JI for many people. Just Major gives preferential treatment to major thirds on the sharps, and a good fourth relative to the second. C= 1/1 (261.625) 1/1 16/15 9/8 6/5 5/4 4/3 45/32 3/2 8/5 5/3 16/9 15/8

15. Yamaha Just Minor C

Similar to Yamaha's preset Just Major, the Just Minor gives preferential treatment to minor thirds on the sharps, and has a good fifth relative to the second. C= 1/1 (261.625) 1/1 25/24 10/9 6/5 5/4 4/3 45/32 3/2 8/5 5/3 16/9 15/8

16. Harry Partch 11-Limit 43 Note Just Intonation

One of the pioneers of modern microtonal composition, Partch built a unique orchestra with this tuning during the first half of the 20th century, to perform his own compositions. The large number of intervals in this very dense scale offers a full vocabulary of expressive chords and complex key changes. The narrow spacing also allows fixed-pitched instruments like marimbas and organs to perform glissando-like passages. G = 1/1 (392 Hz, MIDI note 67)

1/1 81/80 33/32 21/20 16/15 12/11 11/10 10/9 9/8 8/7 7/6 32/27 6/5 11/9 5/4 14/11 9/7 21/16 4/3 27/20 11/8 7/5 10/7 16/11 40/27 3/2 32/21 14/9 11/7 8/5 18/11 5/3 27/16 12/7 7/4 16/9 9/5 20/11 11/6 15/8 40/21 64/33 160/81

17. Arabic 12-Tone

A 12-tone approximation of an Arabic scale, which appears in some electronic keyboards designed for use with Arabic music. Not a JI scale, nor equal tempered. These are the intervals in Cents relative to C:

60 = Cents 0

61 = Cents +151

62 = Cents +204

63 = Cents +294

64 = Cents +355

65 = Cents +498

66 = Cents +649

67 = Cents +702

68 = Cents +853

69 = Cents +906

70 = Cents +996

71 = Cents +1057

72 = Cents +1200

18. 12 Out of 19-tET Scale from Mandelbaum's Dissertation

An interesting non-just 12 tone scale that has some unusual relationships.

note 0=0

note 1=63

note 2=189

note 3=253

note 4=379

note 5=505

note 6=568

note 7=695

note 8=758

note 9=884

note 10=947

note 11=1074

note 12=1200

19. 12 Out of 31-tET, Meantone Eb-G#

note 0=0

note 1=77

note 2=194

note 3=310

note 4=387

note 5=503

note 6=581

note 7=697

note 8=774

note 9=890

note 10=1006

note 11=1084

note 12=1200

20. Terry Riley's Harp of New Albion scale, Inverse Malcolm's Monochord

Original 1/1 on C#, here it is set to C.

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +111.731285	Ratio: 16/15 (JUST)
62 = Cents +203.910002	Ratio: 9/8 (JUST)
63 = Cents +315.641287	Ratio: 6/5 (JUST)
64 = Cents +386.313714	Ratio: 5/4 (JUST)
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +609.776284	Ratio: 64/45 (JUST)
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +813.686286	Ratio: 8/5 (JUST)
69 = Cents +884.358713	Ratio: 5/3 (JUST)
70 = Cents +996.089998	Ratio: 16/9 (JUST)
71 = Cents +1088.268715	Ratio: 15/8 (JUST)
72 = Cents +1200.	Ratio: 2/1 (JUST)

21. Lute tuning of Giovanni Maria Artusi (1603). 1/4-comma w. Acc. 1/2-way Naturals

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +96.578	Ratio: 8607/8140
62 = Cents +193.157	Ratio: 2889/2584
63 = Cents +289.735	Ratio: 11687/9886
64 = Cents +386.313714	Ratio: 5/4 (JUST)
65 = Cents +503.422	Ratio: 5267/3938
66 = Cents +600.	Ratio: 11482/8119
67 = Cents +696.578	Ratio: 7876/5267
68 = Cents +793.157	Ratio: 14771/9342
69 = Cents +889.735	Ratio: 11718/7009
70 = Cents +986.314	Ratio: 17561/9934
71 = Cents +1082.892	Ratio: 18204/9739
72 = Cents +1200.	Ratio: 2/1 (JUST)

22. J.S. Bach "well temperament", Acc. to Jacob Breetvelt's Tuner

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +92.18	Ratio: 10472/9929
62 = Cents +200.	Ratio: 5252/4679
63 = Cents +296.09	Ratio: 11781/9929
64 = Cents +390.225	Ratio: 9638/7693
65 = Cents +500.	Ratio: 6793/5089
66 = Cents +590.225	Ratio: 45/32 (just)
67 = Cents +700.	Ratio: 10178/6793
68 = Cents +794.135	Ratio: 15708/9929
69 = Cents +895.1125	Ratio: 14857/8859
70 = Cents +998.045	Ratio: 12503/7025
71 = Cents +1090.225	Ratio: 18484/9847
72 = Cents +1200.	Ratio: 2/1 (JUST)

23. Bulgarian Bagpipe tuning, Empirically Measured.

0 = Cents 0.	Ratio: 1/1 (JUST)
1 = Cents +66.	Ratio: 5427/5224
2 = Cents +202.	Ratio: 1925/1713
3 = Cents +316.	Ratio: 11586/9653
4 = Cents +399.	Ratio: 4965/3943
5 = Cents +509.	Ratio: 7451/5553
6 = Cents +640.	Ratio: 13435/9283
7 = Cents +706.	Ratio: 857/570
8 = Cents +803.	Ratio: 2681/1686
9 = Cents +910.	Ratio: 12130/7171
10 = Cents +1011.	Ratio: 1205/672
11 = Cents +1092.	Ratio: 12599/6705
12 = Cents +1200.	Ratio: 2/1 (JUST)

24. Wendy Carlos' Alpha Scale with Perfect Fifth Divided in Nine. 19 Tone cycle

Octaves are stretched, and the tuning is quite microtonal.

```
 0 = Cents  0.          Ratio: 1/1 (JUST)
 1 = Cents +78.         Ratio: 7241/6922
 2 = Cents +156.        Ratio: 8994/8219
 3 = Cents +234.        Ratio: 10686/9335
 4 = Cents +312.        Ratio: 11873/9915
 5 = Cents +390.        Ratio: 11636/9289
 6 = Cents +468.        Ratio: 13024/9939
 7 = Cents +546.        Ratio: 12433/9070
 8 = Cents +624.        Ratio: 11605/8093
 9 = Cents +702.        Ratio: 14999/9999
10 = Cents +780.        Ratio: 3471/2212
11 = Cents +858.        Ratio: 15361/9358
12 = Cents +936.        Ratio: 11467/6678
13 = Cents +1014.       Ratio: 17889/9959
14 = Cents +1092.       Ratio: 12599/6705
15 = Cents +1170.       Ratio: 18593/9459
16 = Cents +1248.       Ratio: 14957/7274
17 = Cents +1326.       Ratio: 8049/3742
18 = Cents +1404.       Ratio: 9617/4274
19 = Cents +1482.       Ratio: 1111/472
```

25. Wendy Carlos' Beta Scale with Perfect Fifth Divided by Eleven. 23-Tone Cycle

Octaves are stretched, and the tuning is quite microtonal (First repeat shown.)

```
 0 = Cents  0.          Ratio: 1/1 (JUST)
 1 = Cents +63.8        Ratio: 6191/5967
 2 = Cents +127.6       Ratio: 9725/9034
 3 = Cents +191.4       Ratio: 7739/6929
 4 = Cents +255.2       Ratio: 8821/7612
 5 = Cents +319.        Ratio: 7636/6351
 6 = Cents +382.8       Ratio: 11690/9371
 7 = Cents +446.6       Ratio: 9007/6959
 8 = Cents +510.4       Ratio: 1500/1117
 9 = Cents +574.2       Ratio: 13547/9723
10 = Cents +638.        Ratio: 12529/8667
11 = Cents +701.8       Ratio: 5584/3723
12 = Cents +765.6       Ratio: 9281/5964
13 = Cents +829.4       Ratio: 15760/9761
14 = Cents +893.2       Ratio: 1047/625
15 = Cents +957.        Ratio: 9629/5540
16 = Cents +1020.8      Ratio: 16551/9178
17 = Cents +1084.6      Ratio: 16263/8692
18 = Cents +1148.4      Ratio: 13585/6998
19 = Cents +1212.2      Ratio: 17231/8555
20 = Cents +1276.       Ratio: 12503/5983
21 = Cents +1339.8      Ratio: 10583/4881
22 = Cents +1403.6      Ratio: 12564/5585
23 = Cents +1467.4      Ratio: 8727/3739
```

26. Wendy Carlos' Gamma Scale with Third Divided by Eleven or Fifth by Twenty. 36 Tone

Octaves are stretched, and the tuning is quite microtonal.

```
 0 = Cents  0.           Ratio: 1/1 (JUST)
 1 = Cents +35.099       Ratio: 1146/1123
 2 = Cents +70.198       Ratio: 7449/7153
 3 = Cents +105.297      Ratio: 4118/3875
 4 = Cents +140.396      Ratio: 475/438
 5 = Cents +175.495      Ratio: 5363/4846
 6 = Cents +210.594      Ratio: 3990/3533
 7 = Cents +245.693      Ratio: 11307/9811
 8 = Cents +280.792      Ratio: 4495/3822
 9 = Cents +315.891      Ratio: 9707/8088
10 = Cents +350.99       Ratio: 1989/1624
11 = Cents +386.089      Ratio: 1926/1541
12 = Cents +421.188      Ratio: 7321/5740
13 = Cents +456.287      Ratio: 2089/1605
14 = Cents +491.386      Ratio: 8563/6447
15 = Cents +526.485      Ratio: 6117/4513
16 = Cents +561.584      Ratio: 148/107
17 = Cents +596.683      Ratio: 2895/2051
18 = Cents +631.782      Ratio: 7627/5295
19 = Cents +666.881      Ratio: 13901/9457
20 = Cents +701.98       Ratio: 3/2 (just)
21 = Cents +737.079      Ratio: 5477/3578
22 = Cents +772.178      Ratio: 6981/4469
23 = Cents +807.277      Ratio: 14613/9167
24 = Cents +842.376      Ratio: 10660/6553
25 = Cents +877.475      Ratio: 1255/756
26 = Cents +912.574      Ratio: 3959/2337
27 = Cents +947.673      Ratio: 16513/9552
28 = Cents +982.772      Ratio: 15424/8743
29 = Cents +1017.871     Ratio: 7563/4201
30 = Cents +1052.97      Ratio: 7367/4010
31 = Cents +1088.069     Ratio: 11918/6357
32 = Cents +1123.168     Ratio: 13310/6957
33 = Cents +1158.267     Ratio: 17050/8733
34 = Cents +1193.366     Ratio: 14586/7321
35 = Cents +1228.465     Ratio: 13368/6575
36 = Cents +1263.564     Ratio: 1276/615
```

27. Carlos Super Just

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +104.95541	Ratio: 17/16 (JUST)
62 = Cents +203.910002	Ratio: 9/8 (JUST)
63 = Cents +315.641287	Ratio: 6/5 (JUST)
64 = Cents +386.313714	Ratio: 5/4 (JUST)
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +551.317942	Ratio: 11/8 (JUST)
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +840.527662	Ratio: 13/8 (JUST)
69 = Cents +884.358713	Ratio: 5/3 (JUST)
70 = Cents +968.825906	Ratio: 7/4 (JUST)
71 = Cents +1088.268715	Ratio: 15/8 (JUST)
72 = Cents +1200.	Ratio: 2/1 (JUST)

28. Jon Catler 24-tone JI from "Over and Under the 13 Limit"

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +53.272943	Ratio: 33/32 (JUST)
62 = Cents +111.731285	Ratio: 16/15 (JUST)
63 = Cents +203.910002	Ratio: 9/8 (JUST)
64 = Cents +231.174094	Ratio: 8/7 (JUST)
65 = Cents +266.870906	Ratio: 7/6 (JUST)
66 = Cents +315.641287	Ratio: 6/5 (JUST)
67 = Cents +342.905379	Ratio: 128/105
68 = Cents +359.472338	Ratio: 16/13 (JUST)
69 = Cents +386.313714	Ratio: 5/4 (JUST)
70 = Cents +470.780907	Ratio: 21/16 (JUST)
71 = Cents +498.044999	Ratio: 4/3 (JUST)
72 = Cents +551.317942	Ratio: 11/8 (JUST)
73 = Cents +590.223716	Ratio: 45/32 (JUST)
74 = Cents +648.682058	Ratio: 16/11 (JUST)
75 = Cents +701.955001	Ratio: 3/2 (JUST)
76 = Cents +813.686286	Ratio: 8/5 (JUST)
77 = Cents +840.527662	Ratio: 13/8 (JUST)
78 = Cents +884.358713	Ratio: 5/3 (JUST)
79 = Cents +905.865003	Ratio: 27/16 (JUST)
80 = Cents +968.825906	Ratio: 7/4 (JUST)
81 = Cents +996.089998	Ratio: 16/9 (JUST)
82 = Cents +1061.427339	Ratio: 24/13 (JUST)
83 = Cents +1088.268715	Ratio: 15/8 (JUST)
84 = Cents +1200.	Ratio: 2/1 (JUST)

29. John Chalmers JI-1, Based loosely on Wronski's and similar JI scales, May 2, 1997.

(Chalmer's book "Divisions of the Tetrachord" is a late 20th century masterwork, exploring the mathematical underpinnings of just tunings.)

```
6 0 = Cents  0.               Ratio: 1/1 (JUST)
 61 = Cents +104.95541        Ratio: 17/16 (JUST)
 62 = Cents +203.910002       Ratio: 9/8 (JUST)
 63 = Cents +297.513016       Ratio: 19/16 (JUST)
 64 = Cents +386.313714       Ratio: 5/4 (JUST)
 65 = Cents +498.044999       Ratio: 4/3 (JUST)
 66 = Cents +603.000409       Ratio: 17/12 (JUST)
 67 = Cents +701.955001       Ratio: 3/2 (JUST)
 68 = Cents +795.558015       Ratio: 19/12 (JUST)
 69 = Cents +884.358713       Ratio: 5/3 (JUST)
 70 = Cents +999.468017       Ratio: 57/32 (JUST)
 71 = Cents +1088.268715      Ratio: 15/8 (JUST)
 72 = Cents +1200.            Ratio: 2/1 (JUST)
```

30. John Chalmers JI-3, 15 16 17 18 19 20 21 on 1/1, 15-20 on 3/2, May 2, 1997.

```
60 = Cents  0.                Ratio: 1/1 (JUST)
61 = Cents +111.731285        Ratio: 16/15 (JUST)
62 = Cents +216.686695        Ratio: 17/15 (JUST)
63 = Cents +315.641287        Ratio: 6/5 (JUST)
64 = Cents +409.244301        Ratio: 19/15 (JUST)
65 = Cents +498.044999        Ratio: 4/3 (JUST)
66 = Cents +582.512193        Ratio: 7/5 (JUST)
67 = Cents +701.955001        Ratio: 3/2 (JUST)
68 = Cents +813.686286        Ratio: 8/5 (JUST)
69 = Cents +918.641696        Ratio: 17/10 (JUST)
70 = Cents +1017.596288       Ratio: 9/5 (JUST)
71 = Cents +1111.199302       Ratio: 19/10 (JUST)
72 = Cents +1200.             Ratio: 2/1 (JUST)
```

31. John Chalmers JI-4, 15 16 17 18 19 20 on 1/1, same on 4/3, + 16/15 on 16/9

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +111.731285	Ratio: 16/15 (JUST)
62 = Cents +216.686695	Ratio: 17/15 (JUST)
63 = Cents +315.641287	Ratio: 6/5 (JUST)
64 = Cents +409.244301	Ratio: 19/15 (JUST)
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +609.776284	Ratio: 64/45 (JUST)
67 = Cents +714.731694	Ratio: 68/45 (JUST)
68 = Cents +813.686286	Ratio: 8/5 (JUST)
69 = Cents +907.289301	Ratio: 76/45 (JUST)
70 = Cents +996.089998	Ratio: 16/9 (JUST)
71 = Cents +1107.821284	Ratio: 256/135
72 = Cents +1200.	Ratio: 2/1 (JUST)

32. Chinese scale, 4th century

0 = Cents 0.	Ratio: 1/1 (JUST)
1 = Cents +99.2	Ratio: 3735/3527
2 = Cents +199.5	Ratio: 11126/9915
3 = Cents +296.7	Ratio: 9181/7735
4 = Cents +398.	Ratio: 10405/8268
5 = Cents +492.9	Ratio: 448/337
6 = Cents +595.2	Ratio: 11312/8021
7 = Cents +699.	Ratio: 6439/4300
8 = Cents +790.9	Ratio: 7578/4799
9 = Cents +896.1	Ratio: 15436/9199
10 = Cents +984.9	Ratio: 6357/3599
11 = Cents +1091.4	Ratio: 1591/847
12 = Cents +1200.	Ratio: 2/1 (JUST)

33. Chinese Lu scale by Huai Nan Zi, Han era. (P. Amiot 1780, Kurt Reinhard)

```
60 = Cents  0.              Ratio: 1/1 (JUST)
61 = Cents +98.954592       Ratio: 18/17 (JUST)
62 = Cents +203.910002      Ratio: 9/8 (JUST)
63 = Cents +315.641287      Ratio: 6/5 (JUST)
64 = Cents +394.347297      Ratio: 54/43 (JUST)
65 = Cents +498.044999      Ratio: 4/3 (JUST)
66 = Cents +608.351986      Ratio: 27/19 (JUST)
67 = Cents +701.955001      Ratio: 3/2 (JUST)
68 = Cents +800.909593      Ratio: 27/17 (JUST)
69 = Cents +905.865003      Ratio: 27/16 (JUST)
70 = Cents +1017.596288     Ratio: 9/5 (JUST)
71 = Cents +1106.396986     Ratio: 36/19 (JUST)
72 = Cents +1200.           Ratio: 2/1 (JUST)
```

34. Colonna 1

Fabio Colonna lived in Naples, and published a treatise in 1618 called "La Sambuca Lincea", which included a description of the instrument by that name which he built on commission from Scipione Stella, who had had the opportunity in 1594 to examine Vincentino's "Archicembalo" — a 31-tone-per-octave (not equal-tempered) keyboard instrument.

```
60 = Cents  0.              Ratio: 1/1 (JUST)
61 = Cents +70.672427       Ratio: 25/24 (JUST)
62 = Cents +182.403712      Ratio: 10/9 (JUST)
63 = Cents +287.359122      Ratio: 85/72 (JUST)
64 = Cents +386.313714      Ratio: 5/4 (JUST)
65 = Cents +498.044999      Ratio: 4/3 (JUST)
66 = Cents +568.717426      Ratio: 25/18 (JUST)
67 = Cents +701.955001      Ratio: 3/2 (JUST)
68 = Cents +733.721654      Ratio: 55/36 (JUST)
69 = Cents +884.358713      Ratio: 5/3 (JUST)
70 = Cents +989.314122      Ratio: 85/48 (JUST)
71 = Cents +1088.268715     Ratio: 15/8 (JUST)
72 = Cents +1200.           Ratio: 2/1 (JUST)
```

35. Colonna 2 - Second 12 Note Subset of the Colonna Scale

60 = Cents 0.   Ratio: 1/1 (JUST)

61 = Cents +70.672427   Ratio: 25/24 (JUST)

62 = Cents +203.910002   Ratio: 9/8 (JUST)

63 = Cents +315.641287   Ratio: 6/5 (JUST)

64 = Cents +386.313714   Ratio: 5/4 (JUST)

65 = Cents +498.044999   Ratio: 4/3 (JUST)

66 = Cents +582.512193   Ratio: 7/5 (JUST)

67 = Cents +701.955001   Ratio: 3/2 (JUST)

68 = Cents +813.686286   Ratio: 8/5 (JUST)

69 = Cents +884.358713   Ratio: 5/3 (JUST)

70 = Cents +1017.596288 Ratio: 9/5 (JUST)

71 = Cents +1049.362941 Ratio: 11/6 (JUST)

72 = Cents +1200.   Ratio: 2/1 (JUST)

36. Ivor Darreg's 19 ratios in 5-limit JI for his Megalyra Family

Darreg was one of the great modern theorists of just intonation.

60 = Cents 0.   Ratio: 1/1 (JUST)

61 = Cents +70.672427   Ratio: 25/24 (JUST)

62 = Cents +111.731285   Ratio: 16/15 (JUST)

63 = Cents +182.403712   Ratio: 10/9 (JUST)

64 = Cents +203.910002   Ratio: 9/8 (JUST)

65 = Cents +274.582429   Ratio: 75/64 (JUST)

66 = Cents +315.641287   Ratio: 6/5 (JUST)

67 = Cents +386.313714   Ratio: 5/4 (JUST)

68 = Cents +498.044999   Ratio: 4/3 (JUST)

69 = Cents +590.223716   Ratio: 45/32 (JUST)

70 = Cents +609.776284   Ratio: 64/45 (JUST)

71 = Cents +701.955001   Ratio: 3/2 (JUST)

72 = Cents +772.627428   Ratio: 25/16 (JUST)

73 = Cents +813.686286   Ratio: 8/5 (JUST)

74 = Cents +884.358713   Ratio: 5/3 (JUST)

75 = Cents +905.865003   Ratio: 27/16 (JUST)

76 = Cents +976.537429   Ratio: 225/128

77 = Cents +1017.596288 Ratio: 9/5 (JUST)

78 = Cents +1088.268715 Ratio: 15/8 (JUST)

79 = Cents +1200.   Ratio: 2/1 (JUST)

37. Dorian Diatonic Tonos

60 = Cents 0. Ratio: 1/1 (JUST)
61 = Cents +111.731285 Ratio: 16/15 (JUST)
62 = Cents +231.174094 Ratio: 8/7 (JUST)
63 = Cents +359.472338 Ratio: 16/13 (JUST)
64 = Cents +427.372572 Ratio: 32/25 (JUST)
65 = Cents +498.044999 Ratio: 4/3 (JUST)
66 = Cents +571.725653 Ratio: 32/23 (JUST)
67 = Cents +648.682058 Ratio: 16/11 (JUST)
68 = Cents +813.686286 Ratio: 8/5 (JUST)
69 = Cents +902.486984 Ratio: 32/19 (JUST)
70 = Cents +996.089998 Ratio: 16/9 (JUST)
71 = Cents +1095.04459 Ratio: 32/17 (JUST)
72 = Cents +1200. Ratio: 2/1 (JUST)

38. Almost Equal 12-tone Subset of Duodenarium

60 = Cents 0. Ratio: 1/1 (JUST)
61 = Cents +92.178716 Ratio: 135/128
62 = Cents +203.910002 Ratio: 9/8 (JUST)
63 = Cents +296.088718 Ratio: 1215/1024
64 = Cents +405.866283 Ratio: 512/405
65 = Cents +498.044999 Ratio: 4/3 (JUST)
66 = Cents +609.776284 Ratio: 64/45 (JUST)
67 = Cents +701.955001 Ratio: 3/2 (JUST)
68 = Cents +794.133717 Ratio: 405/256
69 = Cents +903.911282 Ratio: 2048/1215
70 = Cents +998.043719 Ratio: 3645/2048
71 = Cents +1107.821284 Ratio: 256/135
72 = Cents +1200. Ratio: 2/1 (JUST)

39. Ellis's Just Harmonium

60 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents +111.731285   Ratio: 16/15 (JUST)
62 = Cents +203.910002   Ratio: 9/8 (JUST)
63 = Cents +315.641287   Ratio: 6/5 (JUST)
64 = Cents +386.313714   Ratio: 5/4 (JUST)
65 = Cents +498.044999   Ratio: 4/3 (JUST)
66 = Cents +519.551289   Ratio: 27/20 (JUST)
67 = Cents +701.955001   Ratio: 3/2 (JUST)
68 = Cents +813.686286   Ratio: 8/5 (JUST)
69 = Cents +884.358713   Ratio: 5/3 (JUST)
70 = Cents +1017.596288   Ratio: 9/5 (JUST)
71 = Cents +1088.268715   Ratio: 15/8 (JUST)
72 = Cents +1200.   Ratio: 2/1 (JUST)

40. Bali/Java Slendro, Siam 7, empirical

0 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents +111.731285   Ratio: 16/15 (JUST)
62 = Cents +203.910002   Ratio: 9/8 (JUST)
63 = Cents +315.641287   Ratio: 6/5 (JUST)
64 = Cents +386.313714   Ratio: 5/4 (JUST)
65 = Cents +498.044999   Ratio: 4/3 (JUST)
66 = Cents +519.551289   Ratio: 27/20 (JUST)
67 = Cents +701.955001   Ratio: 3/2 (JUST)
68 = Cents +813.686286   Ratio: 8/5 (JUST)
69 = Cents +884.358713   Ratio: 5/3 (JUST)
70 = Cents +1017.596288   Ratio: 9/5 (JUST)
71 = Cents +1088.268715   Ratio: 15/8 (JUST)
72 = Cents +1200.   Ratio: 2/1 (JUST)

41. Tibetian Ceremonial, empirical

```
 0 = Cents  0.          Ratio: 1/1 (JUST)
 1 = Cents +58.         Ratio: 2762/2671
 2 = Cents +232.        Ratio: 6889/6025
 3 = Cents +310.        Ratio: 10601/8863
 4 = Cents +378.        Ratio: 11945/9602
 5 = Cents +522.        Ratio: 849/628
 6 = Cents +618.        Ratio: 483/338
 7 = Cents +725.        Ratio: 605/398
 8 = Cents +773.        Ratio: 13070/8363
 9 = Cents +896.        Ratio: 14076/8389
10 = Cents +1019.       Ratio: 12585/6986
11 = Cents +1086.       Ratio: 16205/8654
```

42. Erlangen, revised

```
60 = Cents  0.            Ratio: 1/1 (JUST)
61 = Cents +92.178716     Ratio: 135/128
62 = Cents +203.910002    Ratio: 9/8 (JUST)
63 = Cents +294.134997    Ratio: 32/27 (JUST)
64 = Cents +386.313714    Ratio: 5/4 (JUST)
65 = Cents +498.044999    Ratio: 4/3 (JUST)
66 = Cents +590.223716    Ratio: 45/32 (JUST)
67 = Cents +701.955001    Ratio: 3/2 (JUST)
68 = Cents +794.133717    Ratio: 405/256
69 = Cents +905.865003    Ratio: 27/16 (JUST)
70 = Cents +996.089998    Ratio: 16/9 (JUST)
71 = Cents +1088.268715   Ratio: 15/8 (JUST)
72 = Cents +1200.         Ratio: 2/1 (JUST)
```

43. Euler - Monochord (1739)

60 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents +70.672427   Ratio: 25/24 (JUST)
62 = Cents +203.910002   Ratio: 9/8 (JUST)
63 = Cents +274.582429   Ratio: 75/64 (JUST)
64 = Cents +386.313714   Ratio: 5/4 (JUST)
65 = Cents +498.044999   Ratio: 4/3 (JUST)
66 = Cents +590.223716   Ratio: 45/32 (JUST)
67 = Cents +701.955001   Ratio: 3/2 (JUST)
68 = Cents +772.627428   Ratio: 25/16 (JUST)
69 = Cents +884.358713   Ratio: 5/3 (JUST)
70 = Cents +976.537429   Ratio: 225/128
71 = Cents +1088.268715   Ratio: 15/8 (JUST)
72 = Cents +1200.   Ratio: 2/1 (JUST)

44. Fokker's 7-limit 12-tone Just Scale

60 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents +119.442808   Ratio: 15/14 (JUST)
62 = Cents +203.910002   Ratio: 9/8 (JUST)
63 = Cents +266.870906   Ratio: 7/6 (JUST)
64 = Cents +386.313714   Ratio: 5/4 (JUST)
65 = Cents +498.044999   Ratio: 4/3 (JUST)
66 = Cents +590.223716   Ratio: 45/32 (JUST)
67 = Cents +701.955001   Ratio: 3/2 (JUST)
68 = Cents +821.397809   Ratio: 45/28 (JUST)
69 = Cents +884.358713   Ratio: 5/3 (JUST)
70 = Cents +968.825906   Ratio: 7/4 (JUST)
71 = Cents +1088.268715   Ratio: 15/8 (JUST)
72 = Cents +1200.   Ratio: 2/1 (JUST)

45. Bagpipe tuning from Fortuna ("Try Key of G with F Natural")

60 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents +29.849602   Ratio: 117/115
62 = Cents +187.681869   Ratio: 146/131
63 = Cents +256.596489   Ratio: 196/169
64 = Cents +343.090647   Ratio: 89/73 (JUST)
65 = Cents +493.957077   Ratio: 141/106
66 = Cents +548.648344   Ratio: 81/59 (JUST)
67 = Cents +684.728649   Ratio: 150/101
68 = Cents +729.878736   Ratio: 125/82 (JUST)
69 = Cents +871.94838   Ratio: 139/84 (JUST)
70 = Cents +985.798925   Ratio: 205/116
71 = Cents +1049.362941   Ratio: 11/6 (JUST)
72 = Cents +1200.   Ratio: 2/1 (JUST)

46. Gamelan Udan Mas (approx) s6,p6,p7,s1,p1,s2,p2,p3,s3,p4,s5,p5

60 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents 0.   Ratio: 1/1 (JUST)
62 = Cents +182.403712   Ratio: 10/9 (JUST)
63 = Cents +266.870906   Ratio: 7/6 (JUST)
64 = Cents +427.372572   Ratio: 32/25 (JUST)
65 = Cents +510.367002   Ratio: 47/35 (JUST)
66 = Cents +571.725653   Ratio: 32/23 (JUST)
67 = Cents +701.955001   Ratio: 3/2 (JUST)
68 = Cents +745.786052   Ratio: 20/13 (JUST)
69 = Cents +996.089998   Ratio: 16/9 (JUST)
70 = Cents +996.089998   Ratio: 16/9 (JUST)
71 = Cents +1126.319346   Ratio: 23/12 (JUST)
72 = Cents +1200.   Ratio: 2/1 (JUST)
73 = Cents +1200.   Ratio: 2/1 (JUST)

47. Kraig Grady's 7-limit "Centaur" Scale, 1987.

See Xenharmonikon 16.

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +84.467193	Ratio: 21/20 (JUST)
62 = Cents +203.910002	Ratio: 9/8 (JUST)
63 = Cents +266.870906	Ratio: 7/6 (JUST)
64 = Cents +386.313714	Ratio: 5/4 (JUST)
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +582.512193	Ratio: 7/5 (JUST)
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +764.915905	Ratio: 14/9 (JUST)
69 = Cents +884.358713	Ratio: 5/3 (JUST)
70 = Cents +968.825906	Ratio: 7/4 (JUST)
71 = Cents +1088.268715	Ratio: 15/8 (JUST)
72 = Cents +1200.	Ratio: 2/1 (JUST)

48. Harmonics 1 to 12 and Subharmonics Mixed

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +203.910002	Ratio: 9/8 (JUST)
62 = Cents +231.174094	Ratio: 8/7 (JUST)
63 = Cents +386.313714	Ratio: 5/4 (JUST)
64 = Cents +498.044999	Ratio: 4/3 (JUST)
65 = Cents +551.317942	Ratio: 11/8 (JUST)
66 = Cents +648.682058	Ratio: 16/11 (JUST)
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +813.686286	Ratio: 8/5 (JUST)
69 = Cents +968.825906	Ratio: 7/4 (JUST)
70 = Cents +996.089998	Ratio: 16/9 (JUST)
71 = Cents +1200.	Ratio: 2/1 (JUST)

49. Michael Harrison, Ppiano Tuning for "Revelation" (2001)

Original 1/1=F, here it is set to C.

```
60 = Cents  0.              Ratio: 1/1 (JUST)
61 = Cents -27.264092       Ratio: 63/64 (JUST)
62 = Cents +203.910002      Ratio: 9/8 (JUST)
63 = Cents +176.64591       Ratio: 567/512
64 = Cents +407.820003      Ratio: 81/64 (JUST)
65 = Cents +470.780907      Ratio: 21/16 (JUST)
66 = Cents +611.730005      Ratio: 729/512
67 = Cents +701.955001      Ratio: 3/2 (JUST)
68 = Cents +674.690909      Ratio: 189/128
69 = Cents +905.865003      Ratio: 27/16 (JUST)
70 = Cents +968.825906      Ratio: 7/4 (JUST)
71 = Cents +1109.775004     Ratio: 243/128
72 = Cents +1200.           Ratio: 2/1 (JUST)
```

50. Helmholtz's two-keyboard Harmonium Tuning Untempered, 24 notes per octave

60 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents +92.178716   Ratio: 135/128
62 = Cents +111.731285   Ratio: 16/15 (JUST)
63 = Cents +182.403712   Ratio: 10/9 (JUST)
64 = Cents +203.910002   Ratio: 9/8 (JUST)
65 = Cents +274.582429   Ratio: 75/64 (JUST)
66 = Cents +294.134997   Ratio: 32/27 (JUST)
67 = Cents +386.313714   Ratio: 5/4 (JUST)
68 = Cents +405.866283   Ratio: 512/405
69 = Cents +478.49243   Ratio: 675/512
70 = Cents +498.044999   Ratio: 4/3 (JUST)
71 = Cents +590.223716   Ratio: 45/32 (JUST)
72 = Cents +609.776284   Ratio: 64/45 (JUST)
73 = Cents +680.448711   Ratio: 40/27 (JUST)
74 = Cents +701.955001   Ratio: 3/2 (JUST)
75 = Cents +772.627428   Ratio: 25/16 (JUST)
76 = Cents +792.179997   Ratio: 128/81 (JUST)
77 = Cents +884.358713   Ratio: 5/3 (JUST)
78 = Cents +905.865003   Ratio: 27/16 (JUST)
79 = Cents +976.537429   Ratio: 225/128
80 = Cents +996.089998   Ratio: 16/9 (JUST)
81 = Cents +1088.268715 Ratio: 15/8 (JUST)
82 = Cents +1107.821284 Ratio: 256/135
83 = Cents +1178.49371   Ratio: 160/81 (JUST)
84 = Cents +1200.   Ratio: 2/1 (JUST)

51. North Indian Gamut, Modern Hindustani 12 Selected from 22 or More Shrutis

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +111.731285	Ratio: 16/15 (JUST)
62 = Cents +203.910002	Ratio: 9/8 (JUST)
63 = Cents +315.641287	Ratio: 6/5 (JUST)
64 = Cents +386.313714	Ratio: 5/4 (JUST)
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +590.223716	Ratio: 45/32 (JUST)
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +813.686286	Ratio: 8/5 (JUST)
69 = Cents +905.865003	Ratio: 27/16 (JUST)
70 = Cents +1017.596288	Ratio: 9/5 (JUST)
71 = Cents +1088.268715	Ratio: 15/8 (JUST)
72 = Cents +1200.	Ratio: 2/1 (JUST)

52. Carnatic Gamut. Kuppuswami: Carnatic Music and the Tamils, p. v

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +98.954592	Ratio: 18/17 (JUST)
62 = Cents +203.910002	Ratio: 9/8 (JUST)
63 = Cents +315.641287	Ratio: 6/5 (JUST)
64 = Cents +394.347297	Ratio: 54/43 (JUST)
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +596.999591	Ratio: 24/17 (JUST)
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +800.909593	Ratio: 27/17 (JUST)
69 = Cents +905.865003	Ratio: 27/16 (JUST)
70 = Cents +1017.596288	Ratio: 9/5 (JUST)
71 = Cents +1096.302298	Ratio: 81/43 (JUST)
72 = Cents +1200.	Ratio: 2/1 (JUST)

53. Observed South Indian Tuning of a vina, Ellis

Octaves are stretched.

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +97.	Ratio: 8644/8173
62 = Cents +195.	Ratio: 10974/9805
63 = Cents +312.	Ratio: 11873/9915
64 = Cents +397.	Ratio: 3372/2681
65 = Cents +515.	Ratio: 9782/7265
66 = Cents +596.	Ratio: 12731/9023
67 = Cents +692.	Ratio: 13439/9011
68 = Cents +782.	Ratio: 6031/3839
69 = Cents +883.	Ratio: 6793/4079
70 = Cents +997.	Ratio: 4863/2734
71 = Cents +1092.	Ratio: 12599/6705
72 = Cents +1207.	Ratio: 15117/7528

54. 7-limit 12-tone Scale

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +111.731285	Ratio: 16/15 (JUST)
62 = Cents +203.910002	Ratio: 9/8 (JUST)
63 = Cents +266.870906	Ratio: 7/6 (JUST)
64 = Cents +386.313714	Ratio: 5/4 (JUST)
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +582.512193	Ratio: 7/5 (JUST)
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +813.686286	Ratio: 8/5 (JUST)
69 = Cents +933.129094	Ratio: 12/7 (JUST)
70 = Cents +968.825906	Ratio: 7/4 (JUST)
71 = Cents +1088.268715	Ratio: 15/8 (JUST)
72 = Cents +1200.	Ratio: 2/1 (JUST)

55. Alternate 7-limit 12-tone Scale

60 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents +70.672427   Ratio: 25/24 (JUST)
62 = Cents +182.403712   Ratio: 10/9 (JUST)
63 = Cents +266.870906   Ratio: 7/6 (JUST)
64 = Cents +386.313714   Ratio: 5/4 (JUST)
65 = Cents +470.780907   Ratio: 21/16 (JUST)
66 = Cents +582.512193   Ratio: 7/5 (JUST)
67 = Cents +701.955001   Ratio: 3/2 (JUST)
68 = Cents +813.686286   Ratio: 8/5 (JUST)
69 = Cents +933.129094   Ratio: 12/7 (JUST)
70 = Cents +968.825906   Ratio: 7/4 (JUST)
71 = Cents +1088.268715   Ratio: 15/8 (JUST)
72 = Cents +1200.   Ratio: 2/1 (JUST)

56. Kurzweil "Just with Natural b7th", is Sauveur Just with 7/4

60 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents +70.672427   Ratio: 25/24 (JUST)
62 = Cents +203.910002   Ratio: 9/8 (JUST)
63 = Cents +315.641287   Ratio: 6/5 (JUST)
64 = Cents +386.313714   Ratio: 5/4 (JUST)
65 = Cents +498.044999   Ratio: 4/3 (JUST)
66 = Cents +590.223716   Ratio: 45/32 (JUST)
67 = Cents +701.955001   Ratio: 3/2 (JUST)
68 = Cents +813.686286   Ratio: 8/5 (JUST)
69 = Cents +884.358713   Ratio: 5/3 (JUST)
70 = Cents +968.825906   Ratio: 7/4 (JUST)
71 = Cents +1088.268715   Ratio: 15/8 (JUST)
72 = Cents +1200.   Ratio: 2/1 (JUST)

57. 3 and 7 prime rational interpretation of 17-tET

60 = Cents 0.   Ratio: 1/1 (JUST)
61 = Cents +62.960904   Ratio: 28/27 (JUST)
62 = Cents +140.949098   Ratio: 243/224
63 = Cents +203.910002   Ratio: 9/8 (JUST)
64 = Cents +294.134997   Ratio: 32/27 (JUST)
65 = Cents +357.095901   Ratio: 896/729
66 = Cents +435.084095   Ratio: 9/7 (JUST)
67 = Cents +498.044999   Ratio: 4/3 (JUST)
68 = Cents +561.005903   Ratio: 112/81 (JUST)
69 = Cents +638.994097   Ratio: 81/56 (JUST)
70 = Cents +701.955001   Ratio: 3/2 (JUST)
71 = Cents +764.915905   Ratio: 14/9 (JUST)
72 = Cents +842.904099   Ratio: 729/448
73 = Cents +905.865003   Ratio: 27/16 (JUST)
74 = Cents +996.089998   Ratio: 16/9 (JUST)
75 = Cents +1059.050902   Ratio: 448/243
76 = Cents +1137.039096   Ratio: 27/14 (JUST)
77 = Cents +1200.   Ratio: 2/1 (JUST)

58. 11-limit 'prime row' from Ben Johnston's "6th Quartet".

Not octave repeating, with some very narrow intervals. These are the first 30 pitches:

```
 0 = Cents  0.            Ratio: 1/1 (JUST)
 1 = Cents +70.672427     Ratio: 25/24 (JUST)
 2 = Cents +182.403712    Ratio: 10/9 (JUST)
 3 = Cents +274.582429    Ratio: 75/64 (JUST)
 4 = Cents +386.313714    Ratio: 5/4 (JUST)
 5 = Cents +505.756522    Ratio: 75/56 (JUST)
 6 = Cents +568.717426    Ratio: 25/18 (JUST)
 7 = Cents +733.721654    Ratio: 55/36 (JUST)
 8 = Cents +772.627428    Ratio: 25/16 (JUST)
 9 = Cents +884.358713    Ratio: 5/3 (JUST)
10 = Cents +923.264486    Ratio: 75/44 (JUST)
11 = Cents +1088.268715   Ratio: 15/8 (JUST)
12 = Cents +1151.229619   Ratio: 35/18 (JUST)
13 = Cents +1221.902045   Ratio: 875/432
14 = Cents +1333.633331   Ratio: 175/81 (JUST)
15 = Cents +1425.812047   Ratio: 875/384
16 = Cents +1537.543332   Ratio: 175/72 (JUST)
17 = Cents +1656.986141   Ratio: 125/48 (JUST)
18 = Cents +1719.947045   Ratio: 875/324
19 = Cents +1884.951273   Ratio: 1925/648
20 = Cents +1923.857046   Ratio: 875/288
21 = Cents +2035.588332   Ratio: 175/54 (JUST)
22 = Cents +2074.494105   Ratio: 875/264
23 = Cents +2239.498333   Ratio: 175/48 (JUST)
24 = Cents +2302.459237   Ratio: 1225/324
25 = Cents +2373.131664   Ratio: 30625/7776
26 = Cents +2484.862949   Ratio: 6125/1458
27 = Cents +2577.041666   Ratio: 30625/6912
28 = Cents +2688.772951   Ratio: 6125/1296
29 = Cents +2808.215759   Ratio: 4375/864

30 = Cents +2871.176663   Ratio: 30625/5832
```

59. 1/9-Harrison's comma mean-tone scale

60 = Cents 0.　　　　　　　Ratio: 1/1 (JUST)
61 = Cents +74.23293　　　　Ratio: 8315/7966
62 = Cents +192.63798　　　　Ratio: 6334/5667
63 = Cents +266.870906　　　Ratio: 7/6 (JUST)
64 = Cents +385.27596　　　　Ratio: 6671/5340
65 = Cents +503.68101　　　　Ratio: 13025/9737
66 = Cents +577.91394　　　　Ratio: 2632/1885
67 = Cents +696.31899　　　　Ratio: 14567/9743
68 = Cents +770.55192　　　　Ratio: 9743/6243
69 = Cents +888.95697　　　　Ratio: 1885/1128
70 = Cents +963.1899　　　　 Ratio: 13187/7560
71 = Cents +1081.59495　　　 Ratio: 1780/953
72 = Cents +1200.　　　　　　Ratio: 2/1 (JUST)

60. Rousseau's Monochord, Dictionnaire de musique (1768)

60 = Cents 0.　　　　　　　Ratio: 1/1 (JUST)
61 = Cents +70.672427　　　 Ratio: 25/24 (JUST)
62 = Cents +203.910002　　　Ratio: 9/8 (JUST)
63 = Cents +315.641287　　　Ratio: 6/5 (JUST)
64 = Cents +386.313714　　　Ratio: 5/4 (JUST)
65 = Cents +498.044999　　　Ratio: 4/3 (JUST)
66 = Cents +568.717426　　　Ratio: 25/18 (JUST)
67 = Cents +701.955001　　　Ratio: 3/2 (JUST)
68 = Cents +813.686286　　　Ratio: 8/5 (JUST)
69 = Cents +884.358713　　　Ratio: 5/3 (JUST)
70 = Cents +1017.596288　　 Ratio: 9/5 (JUST)
71 = Cents +1088.268715　　 Ratio: 15/8 (JUST)
72 = Cents +1200.　　　　　　Ratio: 2/1 (JUST)

61. Persian santur tuning. 1/1=E in Original

Here it is set to C. Note that scale is 8 notes per octave, so it will not map normally to a 12 note keyboard.

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +129.99971	Ratio: 10727/9951
62 = Cents +345.	Ratio: 4710/3859
63 = Cents +490.00034	Ratio: 5797/4368
64 = Cents +630.00051	Ratio: 8153/5666
65 = Cents +849.99952	Ratio: 13952/8539
66 = Cents +1034.99975	Ratio: 20/11 (just)
67 = Cents +1137.00011	Ratio: 15866/8227
68 = Cents +1200.	Ratio: 2/1 (JUST)
69 = Cents +1329.99971	Ratio: 21454/9951
70 = Cents +1545.	Ratio: 18281/7489
71 = Cents +1690.00034	Ratio: 5797/2184
72 = Cents +1830.00051	Ratio: 28347/9850
73 = Cents +2049.99952	Ratio: 32211/9857
74 = Cents +2234.99975	Ratio: 36331/9991
75 = Cents +2337.00011	Ratio: 38073/9871
76 = Cents +2400.	Ratio: 4/1 (JUST)

62. Vallotti & Young (Vallotti Version)

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +94.135	Ratio: 10487/9932
62 = Cents +196.09	Ratio: 10851/9689
63 = Cents +298.045	Ratio: 4679/3939
64 = Cents +392.18	Ratio: 3843/3064
65 = Cents +501.955	Ratio: 5467/4091
66 = Cents +592.18	Ratio: 13863/9847
67 = Cents +698.045	Ratio: 8182/5467
68 = Cents +796.09	Ratio: 13019/8220
69 = Cents +894.135	Ratio: 2427/1448
70 = Cents +1000.	Ratio: 17189/9647
71 = Cents +1090.225	Ratio: 18484/9847
72 = Cents +1200.	Ratio: 2/1 (JUST)

63. LaMonte Young, Tuning of For Guitar '58. 1/1 March '92, inv.of Mersenne lute 1

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +111.731285	Ratio: 16/15 (JUST)
62 = Cents +182.403712	Ratio: 10/9 (JUST)
63 = Cents +315.641287	Ratio: 6/5 (JUST)
64 = Cents +386.313714	Ratio: 5/4 (JUST)
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +590.223716	Ratio: 45/32 (JUST)
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +813.686286	Ratio: 8/5 (JUST)
69 = Cents +884.358713	Ratio: 5/3 (JUST)
70 = Cents +1017.596288	Ratio: 9/5 (JUST)
71 = Cents +1088.268715	Ratio: 15/8 (JUST)
72 = Cents +1200.	Ratio: 2/1 (JUST)

64. LaMonte Young's Well-Tuned Piano

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +176.64591	Ratio: 567/512
62 = Cents +203.910002	Ratio: 9/8 (JUST)
63 = Cents +239.606814	Ratio: 147/128
64 = Cents +470.780907	Ratio: 21/16 (JUST)
65 = Cents +443.516816	Ratio: 1323/1024
66 = Cents +674.690909	Ratio: 189/128
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +737.651813	Ratio: 49/32 (JUST)
69 = Cents +968.825906	Ratio: 7/4 (JUST)
70 = Cents +941.561815	Ratio: 441/256
71 = Cents +1172.735908	Ratio: 63/32 (JUST)
72 = Cents +1200.	Ratio: 2/1 (JUST)

65. Thomas Young - well temperament (1807). Also Luigi Malerbi nr.2 (1794)

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +90.224996	Ratio: 256/243
62 = Cents +196.09	Ratio: 10851/9689
63 = Cents +294.134997	Ratio: 32/27 (JUST)
64 = Cents +392.18	Ratio: 3843/3064
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +588.269995	Ratio: 1024/729
67 = Cents +698.045	Ratio: 8182/5467
68 = Cents +792.179997	Ratio: 128/81 (JUST)
69 = Cents +894.135	Ratio: 2427/1448
70 = Cents +996.089998	Ratio: 16/9 (JUST)
71 = Cents +1090.225	Ratio: 18484/9847
72 = Cents +1200.	Ratio: 2/1 (JUST)

Original 1/1 on C#, here it is set to C.

60 = Cents 0.	Ratio: 1/1 (JUST)
61 = Cents +111.731285	Ratio: 16/15 (JUST)
62 = Cents +203.910002	Ratio: 9/8 (JUST)
63 = Cents +315.641287	Ratio: 6/5 (JUST)
64 = Cents +386.313714	Ratio: 5/4 (JUST)
65 = Cents +498.044999	Ratio: 4/3 (JUST)
66 = Cents +609.776284	Ratio: 64/45 (JUST)
67 = Cents +701.955001	Ratio: 3/2 (JUST)
68 = Cents +813.686286	Ratio: 8/5 (JUST)
69 = Cents +884.358713	Ratio: 5/3 (JUST)
70 = Cents +996.089998	Ratio: 16/9 (JUST)
71 = Cents +1088.268715	Ratio: 15/8 (JUST)
72 = Cents +1200.	Ratio: 2/1 (JUST)