OB-X8

USER'S GUIDE

Oberheim

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THE OBERHEIM CREW

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User's Guide

Version 1.2
May, 2023

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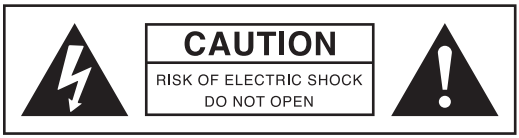

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This product may expose you to chemicals including BPA, which is known to the State of California to cause cancer and birth defects or other reproductive harm. Though independent laboratory testing has certified that our products are several orders 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.

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How We Got Here

The story of the OB-X8 is a story that has its beginning back in 1978. It's a story of innovation and competition, loss and gain, friends made and friends lost, and most of all, about the power and value of collaboration.

The original OB-X was developed as a response to the introduction of the Sequential Circuits Prophet-5®. What followed was a fierce but friendly competition that resulted in the OB-Xa, OB-8, and several other Oberheim instruments that helped shape the sound of an era, and that are still loved and used today.

Jump ahead 40 years. Both companies have been reborn and a decades-long friendship with Dave Smith has resulted in the synth which now sits in front of you — the OB-X8.

Along the way, the crew at Sequential and Oberheim alumni such as Marcus Ryle (who co-designed the OB-X8) breathed new life into the original OB concept and created an instrument that has captured and embodied the heart, soul, and every nuance of the original OB-series synths.

More importantly, it combines the voice architectures of the original OB-series synths in a way that gives you new sounds and new capabilities that even the originals didn't have. We think it's going to satisfy even the most die-hard Oberheim fans and introduce an entirely new generation to the Oberheim sound.

Best of all, the OB-X8 is a testament to the power of friendship, a mutual love of music and synths, and in the end, what can happen when good people dedicate their lives to making good instruments.

Now go make some music.

Tom Oberheim

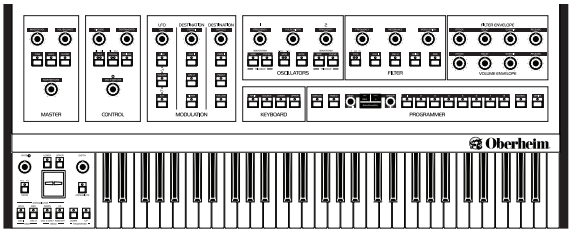
Chapter 1: Getting Started

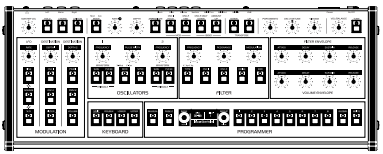
The OB-X8 is an eight-voice, polyphonic analog synthesizer with analog voltage-controlled oscillators, filters, and amplifiers. It faithfully reproduces the vintage sound and features of the original Oberheim programmable poly synths — the OB-X, OB-Xa, and the OB-8 (and the preset-only OB-SX.) It does this through the use of the original SEM filters and discrete oscillators as well as genuine Curtis 3320 filters. By using authentic legacy components, careful matched signal levels throughout the audio chain, meticulously accurate envelope shapes for the different models, and many other details, the new OB-X8 provides the best of all worlds — and all OB- poly synths.

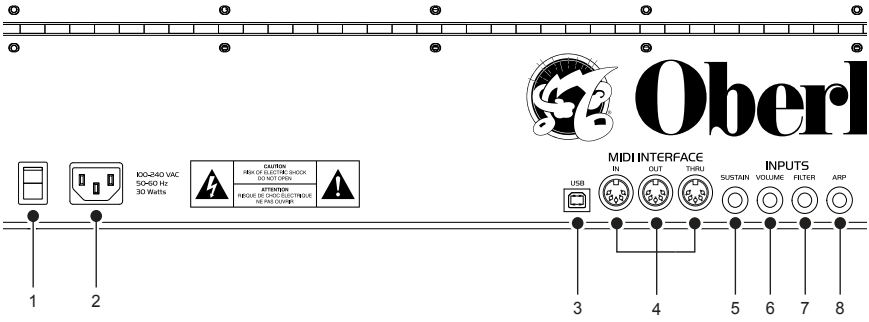
The OB-X8 is first and foremost a performance instrument. Most of the sound-shaping controls are immediately accessible on its front panel, packing a tremendous amount of power and versatility into a compact, easy-to-use format.

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 OB-X8 as well as how to program sounds and how to use the GLOBAL menu to manage its overall behavior.

All of the OB-X8's essential controls are within easy reach on the front panel, so go ahead and dive in and start turning knobs and pressing buttons to explore its sound and capabilities. 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 OB-X8 has connectors for power, USB, MIDI, audio, and pedals.

1. Power On/Off—This rocker switch controls power on and off to the OB-X8.

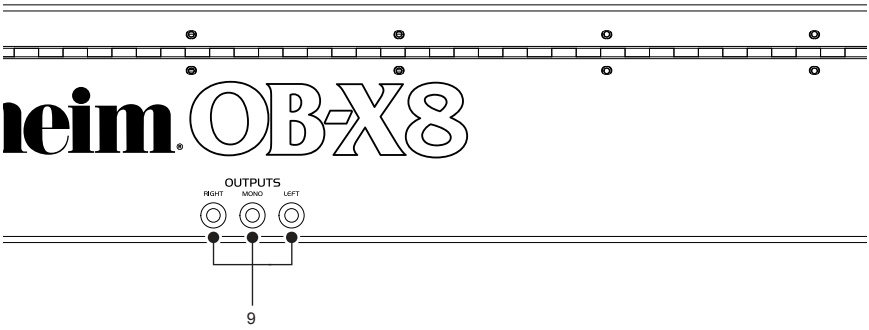
2. AC Power Connector—Accepts a standard, grounded IEC power cord. Operates at 100 to 240 volts, 50 to 60 Hz, at 22 Watts.

3. USB—For bidirectional MIDI communication with a computer. The OB-X8 is a Class Compliant USB device and does not require additional drivers when used with Mac OS or Windows. See “Using USB” on page 3 for more information.

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

5. Sustain—Accepts a momentary, normally open or normally closed footswitch to control sustain.

6. Volume —This connector accepts a standard expression pedal that has a variable resistor on a TRS (tip-ring-sleeve) ¼ inch phone plug. Connecting a pedal to the VOLUME connector controls Master Volume.



7. Filter—This connector accepts a standard expression pedal that has a variable resistor on a TRS (tip-ring-sleeve) ¼ inch phone plug. Connecting a pedal to the FILTER connector controls filter cutoff frequency.

8. Arp—Standard ¼ inch connector. This jack accepts a variable voltage clock signal from 1V to 10V which can be used to synchronize the OB-X8 Arpeggiator to an external device.

9. Audio Outputs—Unbalanced, ¼ inch audio outputs. RIGHT and LEFT for stereo operation, and MONO for single-cable mono operation.

10. Headphone Output— (not shown) ¼ inch stereo headphone jack. Headphone volume is controlled by the MASTER VOLUME knob on the front of the OB-X8, below the lever box.

Using USB

The OB-X8's USB 2.0 port enables bidirectional MIDI communication with a computer. A MIDI interface and MIDI cables are not necessary, just a USB cable. The OB-X8 is a Class Compliant USB device. It does not require any additional drivers to be installed to communicate with a Mac or Windows computer

. MIDI In and USB should not be used at the same time, as overlapping messages from different sources may cause the OB-X8 to respond unpredictably. MIDI Out and USB can be used at the same time and transmit the same data.

Under Mac OS, “OB-X8” will appear as a MIDI port when connected via USB and can be configured using the Mac’s Audio MIDI Setup utility (typically found in Applications/Utilities).

Under Windows, the first time the OB-X8 is connected via USB, the “Found new hardware” alert appears and it is automatically installed as “OB-X8.”

In Windows, if you unplug the USB cable and plug it back in while a program has the OB-X8 port open, you may have to resync. That usually means going to the OB-X8 Keyboard Properties — in the Windows Device Manager under “Sound, video, and game controllers” — and clicking OK. If *OB-X8* is no longer listed in the Device Manager, turn off the OB-X8 then turn it back on again while it is connected via USB. It should be detected on power up.

Setting Up the OB-X8

Here’s how to get your OB-X8 up and running:

1. Plug the power cable into the AC power connector on the back panel of the OB-X8.
2. If you have an expression pedal, connect it to VOLUME (for volume) or FILTER (for filter cutoff) on the back of the OB-X8. If you have a sustain pedal, connect it to the SUSTAIN jack.
3. If you have purchased the OB-X8 Module, connect a MIDI controller using a MIDI DIN cable. If using a DAW for control, connect to the MIDI interface of your choice or to the USB port on your computer.
4. Turn on the OB-X8.
5. Connect the RIGHT/LEFT connectors on the back of the OB-X8 to your amp/mixer/powered speakers using unbalanced, ¼ inch audio cables. These are the main outputs for the synth. You can connect a single unbalanced, ¼ inch audio cable to the MONO output for mono operation.
6. Turn up the volume on your amp/mixer/powered speakers.
7. Turn up the volume on the OB-X8.
8. Use the BANK and GROUP encoders and the PROGRAM switches to explore factory sounds.

Calibrating the Oscillators and Filters

The first time you use the OB-X8, please run the built-in calibration procedure. Repeat the calibration procedure as needed over the next few days of use. The OB-X8 learns the range of temperatures at your location and will keep itself in tune over this range.

Later, if you use the OB-X8 in a different environment that is measurably warmer or cooler (on stage, in an air-conditioned studio, and so on) run the calibration procedure again.

To calibrate the pitch of the oscillators:

1. Press the TUNE button. The program SELECT BUTTON LEDs begin flashing in sequence and the display indicates the tuning sequence while the OB-X8 performs its auto-calibration procedure.
2. When finished, the front panel controls return to normal and you can play the OB-X8.

To fully calibrate the oscillators, filters, and VCAs:

1. Press the GLOBAL button and scroll to Full Calibration, then press the flashing WRITE button. The program SELECT BUTTON LEDs begin flashing in sequence and the display indicates the tuning sequence while the OB-X8 performs its full auto-calibration procedure.
2. When finished, the front panel controls return to normal and you can play the OB-X8.

Sound Banks

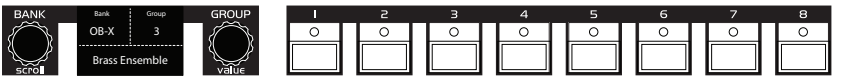
The OB-X8 contains 768 user-programmable presets. You can freely overwrite any of them. The presets are organized into six Banks, each of which contain 128 preset locations (organized as 16 Groups of 8 Programs). Although all six Banks can be used for storing any preset, they are named and organized to represent which OB-series synthesizer's factory presets exist in that Bank. The six Banks are named OB-X8, OB-8, OB-Xa, OB-SX, OB-X, and User.

If you choose a sound from the OB-X Bank/Group, for example, the sounds feature the filter type and envelope response specific to the OB-X. This Bank also includes the original presets found on the OB-X. This is true for each of the individual Banks and the presets within them. There is also an OB-X8 bank, filled with original presets that take advantage of the OB-X8's capabilities.

The original OB-series synths used buttons labeled A, B, C, and D to select their Group. It's not necessary to pay any attention to the letters, but they can come in handy if you are looking for a specific preset like OB-8 C7. Appendix E lists all of the original OB-series factory presets

There are also 128 Split program locations and 128 Double program locations. Split (four voices with one sound on the lower portion of the keyboard, and four voices with a different sound on the upper) and Double (two different programs of four voices each layered on top of each other) programs are each composed of two programs. A Split or Double program is composed of *pointers* to the two preset locations and associated Page 2 settings.

You can restore all OB-X8 factory sounds to their original state using the RESET PRGM TO FACTD command in the GLOBAL menu.



OB-X8 Programmer

Selecting Programs

Use the BANK/SCROLL, GROUP/VALUE and PROGRAM switches to select and recall programs.

To choose a program:

1. Turn the BANK knob to select a bank (OB-X8, OB-8, OB-Xa, OB-SX, OB-X, or User).
2. Turn the GROUP knob to choose a group within that bank (1-16). (Be sure the Lower and Upper buttons are turned off in order to select a Split or Double Group and Program.)
3. Press a PROGRAM button (1-8) to select a program.

To choose a Split or Double:

1. Press the SPLIT OR DOUBLE switch to specify the type of bank selected.
2. Turn the GROUP knob to select one of 16 Split or Double groups.
3. Press a PROGRAM switch to select one of eight Splits or Doubles in each bank. When a program is selected, the individual presets of the pair can be edited by pressing the UPPER or LOWER switch.

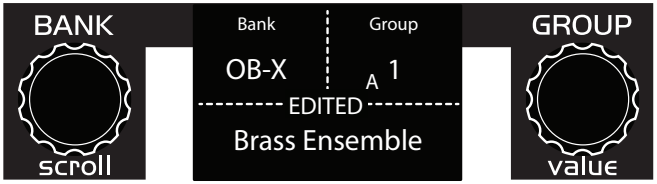
Editing Programs

Because all of the sound-shaping controls of the OB-X8 appear on the front panel, editing an existing program is simple: 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 10.)


If you overwrite or edit a program, the changes will be appear in any double/split that references the program.

When you're editing a preset, the OB-X8 has a convenient way of indicating that one or more parameters have changed and are no longer the same as the stored Preset: the word "EDITED" appears in the main OB-X8 display, just above the preset name. This also functions as a reminder to save your edits, if you want, by pressing the WRITE switch.

The display will also indicate that a parameter has passed through its saved value by displaying an asterisk (*) in the lower left corner. This can help in setingt a panel control back to its saved position by turning the knob until the asterisk appears.



OB-X8 display

Comparing an Edited Program to its Original State

When editing a program, it's often useful to compare its edited state to its original state to evaluate your edits.

To compare an edited program to its saved version:

1. Edit a program by changing something obvious, i.e. cutoff or pitch.
2. Press the WRITE switch. It starts flashing.
3. Press the GLOBAL switch. The LED on the GLOBAL switch lights up, and the display indicates COMPARE mode.
4. Play the keyboard to hear the saved version of the sound.

To disable the compare function and return to the edited sound, turn off the GLOBAL switch.

Manual Mode

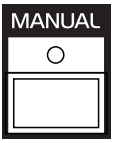
The OB-X8 also features a "live panel" mode in which its sound switches to the current settings of its knobs and switches. In other words, the current preset is ignored and what you see on the front panel is what you hear. This is a great mode for learning, experimentation, and instant gratification.

To enter live panel mode:

- Press the MANUAL button to toggle it on.

To return to preset mode:

- Press the MANUAL button again to toggle it off. You can also press any Program switch to go to that preset, in Preset mode.



Toggling on the MANUAL button enables “live panel” mode

Creating a Program from Scratch

An existing program can be very useful as a jumping off point for new sounds. But it’s also useful (and educational) to create a new sound from scratch. The OB-X8 makes this easy by providing a “Basic Program” that you can quickly recall at any time. This preset is very simple, with a single oscillator as its basis. Recalling the Basic Program is equivalent to editing all of the settings to this simple setting, and does not overwrite an existing program (unless you save it).

To recall the Basic Program:

1. Hold down the MANUAL button.
2. Press the WRITE button.

If the Basic Program is recalled when already in Manual Mode, all of the knobs will continue to represent their respective parameter settings and not be changed. However, all of the switches and Page 2 functions will be set to the Basic Program values.

Saving a Program

If you've created a sound that you like, you'll probably want to save it. Saving a program overwrites a previously saved program. Sound designers often save many incremental versions of a program as they continue to refine it. These intermediate versions often make good jumping off points for new sounds.

To save an edited program to the same preset location:

3. Press the WRITE switch. Its LED begins blinking.
4. Press a PROGRAM switch (1-8.)
5. The WRITE button LED stops blinking and the program is saved into the User sound set.

Be careful when WRITE is enabled. You can change GROUPS and BANKS without executing WRITE, but once you press a PROGRAM switch (1-8), the WRITE command is executed and the program at that location is overwritten.

To save a program to a different Group and/or Bank location:

1. Press the WRITE button. Its LED begins blinking.
2. Turn the BANK encoder to move through Banks to choose the desired BANK location.
3. Turn the GROUP encoder to choose one of the 16 Group locations.
4. Press a PROGRAM switch (1-8) to specify the location of the program in the Group. The WRITE switch LED stops blinking and the program is saved.

To rename a program:

1. Press the WRITE switch. It begins flashing.
2. While the WRITE LED is flashing, press the PAGE 2 SWITCH. The display changes to the EDIT NAME screen.
3. Use the SCROLL knob to select a character then use the VALUE knob to change the character.
4. When you have finished, press the PAGE 2 SWITCH to exit the EDIT NAME screen.

Canceling Save

Sometimes you may want to cancel saving a program before you commit.

To cancel the Save process before you commit:

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

Comparing Before You Save

Before saving a program to a new location, it's a good idea to listen to the program in the target location to make sure you really want to overwrite it.

To evaluate a program before you overwrite it:

1. Get ready to save by pressing the WRITE switch. It starts flashing.
2. Press the GLOBAL switch. The LED on the switch lights up, indicating COMPARE mode.
3. Use the Bank and Group knobs and the Program buttons to navigate to the sound you want to compare, then play the keyboard to hear the sound.
4. To disable the compare function and go back to the edited sound, turn off the GLOBAL switch. (You can't save a program while in compare mode.)
5. If you want to save the edited sound, the WRITE switch is still flashing and ready to save, so enter a location with the program switches. The sound is saved.
6. Alternatively, if you want to cancel saving and continue editing, press the WRITE button. It stops flashing and saving is canceled.

Exploring the OB-X8

Before you explore the sound creation possibilities of the OB-X8, 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 13. There are useful settings and functions found in the Global menu that will affect the overall behavior of your OB-X8. In particular, read about Pot Modes and determine which works best for you when you're editing sounds.

Finally, be on the lookout for tips and notes scattered throughout this manual to gain a better working knowledge of the OB-X8. We wish you many hours of musical exploration!

Chapter 2: OB-X8 Controls

This chapter explains all of the front panel controls of the OB-X8. It will go section by section, looking at the role each panel control plays in synthesizing sounds. The front panel of the OB-X8 is based on the original OB-X, Oberheim's first fully-programmable poly synth. Although the OB-X8 adds functionality not found on the historic OB-X, it builds on the parameters originally found on its front panel.

Global Settings

The Global Settings menu contains parameters that affect all programs. These include settings such as MIDI Channel and I/O, Aftertouch and Velocity Curves, Arpeggiator parameters, Calibration, and others. Global parameters are accessed by pressing the GLOBALS switch and scrolling through the various settings using the BANK/SCROLL encoder. Settings are made with the GROUP/VALUE encoder.

1. Master Tune Note: -12 - +12. Master tune control. Steps in semitones up to one octave up (+12) or down (-12.) 0 is centered and equals A-440 standard pitch.

2. Master Tune Fine (Module only): -127 - +127. Fine control over Master Tune, which replaces the Master Tune pot on the OB-X8 keyboard's top panel.

3. Local Control: All Off, Keys/Levers Off, On. When on (the default,) the keyboard, front panel, and modulation levers directly control the OB-X8. When off, the front panel controls are transmitted via MIDI, but do not directly affect the "local" synth/OB-X8. The is useful for avoiding MIDI feedback loops that may occur with some DAWs and external sequencers. When set to Keys/Levers OFF, the front panel controls remain active but the keybed and modulation levers do not directly control the OB-X8.

4. MIDI Channel: All, 1-16. This allows you to set the MIDI channel that the OB-X8 will both send and respond to. When set to ALL, the OB-X8 will receive on all MIDI channels, and will transmit on channel 1.

5. Pot Edit Mode: Relative, Passthru, Jump. These three potentiometer modes determine how the panel controls react when programmable parameters are edited. The OB-X8 defaults to Relative mode.

In *Relative* mode, changes are relative to the stored setting. In this 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 an internal value range of 0 to 127. Let's say the physical position of the resonance pot is the equivalent to an internal value of 100. If you switch to a program that has a stored Resonance value of 63 and turn the pot all the way up, it will only go to 90. To get to the maximum value of 127, 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).

Relative mode can be useful in performance since subtle incremental changes to parameters can be made without the parameter jumping to the current knob position. This was the only edit mode available on the original OB-series units, so it is the default mode for the OB-X8.

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 absolute position of the knob.

6. Key Aftertouch: On, Off. Selects whether aftertouch (key pressure) is enabled or disabled. If disabled, the OB-X8 will neither respond to nor transmit aftertouch/key pressure data.

7. Aftertouch Curve: Curve 1-8. Sets one of eight pressure curves for the keyboard to adjust the aftertouch to your playing style. Try experimenting with the different curves to find one that works best for your playing style. In general, the higher numbered curves will cause the aftertouch modulation to occur with a lighter amount of pressure on the keyboard.

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

The higher numbered curves will play at higher velocity levels when keys are played softly.

9. Page 2 Edit Mode: Panel + Display, Display Only. Allows you to set the way Page 2 editing functions can be accessed. Panel + Display mode provides the original vintage mode of accessing page 2 parameters. It allows Page 2 editing by setting the panel switches to Page 2 mode, while also showing Page 2 functions on the display. Display Only, allows Page 2 editing through the display only, allowing the normal front panel parameters to be edited at the same time the display is used for editing Page 2 parameters. See "Chapter 3: Page 2 Parameters" on page 50, for more information.

10. Arp Params: Global, Per Preset. The Arpeggiator parameters can be stored and recalled with each preset when in Per Preset mode. If set to Global, these parameters are left unchanged each time a new preset is selected and are not stored with a preset when writing the preset.

11. Arp Clock: Internal, Clock Input, MIDI DIN Clock, MIDI USB Clock. Sets the port (Arp, MIDI DIN, or USB,) by which Arpeggiator clock is received. When set to Internal, the RATE pot on the Lever Box sets the Arp tempo. When Clock Input is selected, a control voltage trigger or clock signal sent to the rear panel Arp jack will control the arp clock.

If ARP CLOCK is set to anything except INTERNAL, the Arpeggiator won't function unless it receives an external trigger signal on the ARP input jack or the selected MIDI clock.

12. 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.

13. Voice Pan Params: Per Preset, Global. Allows voice panning parameters to be stored and recalled with each preset when in Per Preset mode. If set to Global, these parameters are left unchanged each time a new preset is selected and are not stored when Writing a preset.

14. Voice Enables: This parameter is primarily used for troubleshooting voices, as when a voice or voices will not pass full calibration. The Program switches become active when this parameter is selected. Turning off any of the Program switches disables that voice, allowing the

OB-X8 to be used normally, with the selected voice or voices ignored (and fewer voices available.) With a voice disabled, you can still perform standard oscillator calibration using the TUNE switch.

15. Alt. Tuning Scale: Equal Temperament, 2-64. Selects one of the OB-X8's optional alternative tunings. Set to Equal Temperament, the tuning is standard, Western chromatic tuning. Choosing 2 through 64 selects an alternative, non-chromatic, non-Western scale that can be used to emulate ethnic instruments or for other creative uses, such as microtonal play. See "Appendix E: Alternative Tunings" on page 82 for a description of each tuning. Additional tunings can be imported as SysEx messages to replace tunings 2 through 64.

16. Hold/Chord Params: Global, Per Preset. The Hold and Chord parameters, but not the notes held, can be stored and recalled with each preset when in Per Preset mode. If set to Global, these parameters are left unchanged each time a new preset is selected and are not stored with a preset when Writing the preset.

17. Box Mod Params: Global, Per Preset. The Mod parameters in the Lever Box can be stored and recalled with each preset when in Per Preset mode. If set to Global, these parameters are left unchanged each time a new preset is selected and are not stored with a preset when Writing the preset.

18. Sustain Pedal Mode: Normal (Release), Note On. Sets the function of a sustain pedal connected to the rear panel Sustain jack. The default mode, Normal (Release,) sets the joined Filter and Volume Envelope release stages to the value set in the Page 2 parameter Pedal Release Time when the sustain pedal is pressed. This alternative Release mode is how the sustain pedal works in the original OB-8. The Note On setting will allow you to hold any triggered voice (up to 8, of course) for as long as the sustain pedal is held — which is how the sustain pedal functions on most modern synthesizers.

19. Filter Pedal Mode: Normal, Reversed. Sets the mode of operation for an expression pedal connected to the Filter jack on the OB-X8's rear panel. This allows for compatibility with different expression pedal types.

20. Volume Pedal Pol: Normal, Reversed. Sets the mode of operation for an expression pedal connected to the Volume jack on the OB-X8's rear panel. This allows for compatibility with different expression pedal types.

21. Stereo/Mono Out: Stereo, Mono, Auto. Sets the output mode for the OB-X8. Selecting STEREO allows for a full stereo signal using the Stereo LEFT and RIGHT jacks on the rear panel regardless of whether or not the MONO jack is in use. Selecting MONO sends a monophonic output to all jacks. Selecting AUTO enables auto-sensing and detects which jack or set of jacks is connected : the outputs will be Stereo when the Mono jack is not in use, and Mono if the Mono jack is in use.


The Mono output is always active, even in stereo mode. But in stereo mode, the Mono output may not output all voices equally, depending on the panning settings of a program.

22. Pitch Lever Direction: Normal, Reversed. Sets the operation of the Pitch Lever. In Normal, default mode, the pitch is raised when the lever is pulled toward you and lowered when it is pushed away from you. Reversed mode sets the opposite directionality for the lever.

23. 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.

24. 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.

25. MIDI Control Enable: On, Off. When On, the synth will respond to MIDI controller messages, including Pitch Wheel, Mod Wheel, Pedal, Breath, Volume, and Expression. When Off, the synth will not respond to MIDI controller messages.

26. MIDI Preset Change: Off, Transmit Only, Receive Only, Transmit & Receive. When set to OFF, the synth will not respond to received MIDI Program Change messages. When set to TRANSMIT ONLY, the synth will transmit but not receive MIDI Program Change messages. When set to RECIEVE ONLY, the synth will receive but not transmit MIDI Program Change messages. When set to TRANSMIT & RECEIVE, the synth will both transmit and receive MIDI Program Change messages.

27. MIDI Sysex Cable: Off, MIDI, USB. Sets the port, MIDI or USB, by which System Exclusive data will be transmitted and received. Also allows you to turn all SysEx communication off.

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

29. Send MIDI: Preset, Group, Bank, All. This command will transmit the selected Preset, Group, Bank, or the entire 640 program sound set (plus Splits/Doubles) to the selected MIDI Output. Pressing the WRITE switch performs the operation. This is useful for archiving your OB-X8 programs.

30. Reset Prgm To Factory: Preset, Group, Bank, All. Use this command to set the currently selected program, group, bank, or all of the synth's presets (including Splits/Doubles) back to factory default. All programs will be reset to the corresponding factory versions.

31. Screen Saver: On, Off. The OB-X8 OLED 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.

32. Load frm Cassette: Using the Arp input jack on the OB-X8's rear panel, data recordings of OB-X, OB-Xa, OB-SX, and OB-8 presets can be loaded to the synth's memory.

33. Basic Program: Select to load a basic, template program into the edit buffer. Alternatively, you can hold the MANUAL switch and press the WRITE button to call the basic program. With SPLIT or DOUBLE active and LOWER or UPPER not selected, Basic Program resets the split/double to its default state.

34. Reset Globals: Sets the global parameters to the factory default settings. You can also hold the WRITE switch and press the GLOBAL button to achieve the same result.

35. Full Calibration: Select and press WRITE to fully calibrate the OB-X8's VCOs, VCFs, and VCAs. The main display shows calibration progress, voice by voice.

36. Lever Calibration (Keyboard only): Allows you to calibrate the pitch and mod levers. Follow the directions on the display, and hit WRITE after each step. This should only be necessary if the range and/or centering of the levers do not seem to be functioning correctly.

Oscillators

Oscillators provide the raw building blocks of the OB-X8's sound by producing *waveforms*, each of which has its own inherent sound character based on its harmonic content. The OB-X8 has two oscillators per voice.

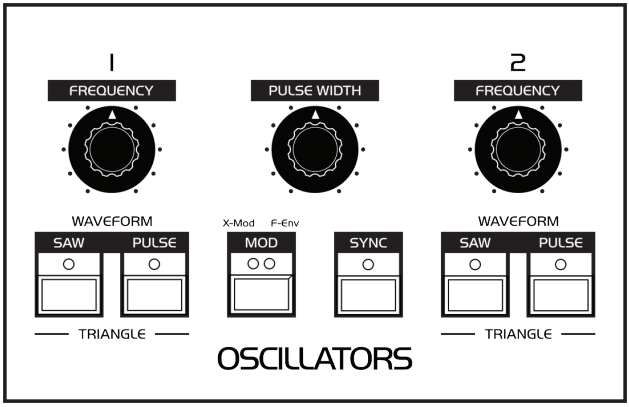
Each discrete oscillator generates sawtooth, pulse, and triangle waves. The square wave can be set to match OB-X/Xa or OB-8 level characteristics using Page 2. You can vary the pulse width of both pulse waves simultaneously using the PULSE WIDTH knob, or the LFO from the Modulation section.


You can set the individual pulse widths for Osc 1 and 2 by holding the Osc 1 or OSC 2 PULSE switch and turning the PULSE WIDTH pot. The Pulse Width of each oscillator can also be adjusted individually on Page 2.

Oscillator 2 can be hard-synced to Oscillator 1 for complex, harmonically-rich sounds when modulated. You can also cross-modulate Oscillator 1 by Oscillator 2's sawtooth wave, for further shape-bending.


The X-Mod on/off provides sawtooth cross modulation just like in the original OB-X. You can alternatively, or simultaneously, cross-mod Oscillator 1 by Oscillator 2's triangle wave using the Page 2 Osc 2 Tri. XMod parameter.

Oscillator 2 can be modulated by the Filter Envelope with the F-Env on/off switch, just as on the original OB-Xa and OB-8.



Oscillators section

To explore the sound of the oscillators:

1. Press the GLOBAL button
2. Use the select Bank/Scroll encoder to navigate to the basic program command, then press the WRITE switch to set the synth to the Basic Program.
3. In the basic program, only Oscillator 1 is audible. Both oscillators are set to generate sawtooth waves.
4. Hold down a note on the keyboard, and in the OSCILLATORS section press the PULSE switch to combine a pulse wave with the sawtooth wave.
5. Press the SAW switch once to generate only a pulse wave (SAW will be off.) Note that when turning the PULSE WIDTH knob, it's possible to make the pulse width so narrow that the sound "disappears." With both waveform switches off, the oscillator will generate a triangle waveform.
6. Turn up the level of Oscillator 2 in the Filter section by pressing the OSC 2 switch.
7. Experiment with setting each oscillator to a different waveshape.
8. Try tuning one oscillator to an interval such as a third, a fifth, or a sixth.

9. The OSC 2 DETUNE control in the CONTROL section can offset Oscillator 2's pitch from Oscillator 1. 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. The LED above OSC 2 DETUNE will turn off when there is no detuning (knob position at 12 o'clock when in Manual mode).

10. With Oscillator 1 and 2 on, press the SYNC switch. Then rotate the pitch knob on Oscillator 2 while you hold a note. This is the classic hard sync sound that you've probably heard before.

Oscillator Parameters

Frequency: Sets the base frequency of an oscillator over a 5-octave+minor third range (0-+63 semitones.) The Master Tune Note global setting affects the pitch of the oscillators, as does the global MASTER TUNE knob in the MASTER section. See "Global Settings" on page 13 for more information. The OSC 2 DETUNE knob affects the pitch of Oscillator 2.

Pulse Width: The pulse width control knob produces a square wave (50% duty cycle) when at zero, and reaches 100% duty cycle, of off, at maximum. Although the initial pulse width setting cannot be below 50%, modulation of the pulse width is bipolar and can range from 0% to 100%. More on this in the LFO section.

The PULSE WIDTH knob controls the pulse width of both oscillators simultaneously. The pulse width of each oscillator can be adjusted independently via one of two methods - hold an oscillator's PULSE switch and turn the PULSE WIDTH knob to adjust only that oscillator's pulse width. This hidden feature existed in the OB-8. Alternatively, the pulse width control of each oscillator was added to the set of Page 2 parameters for easy access

Waveform: Each oscillator generates sawtooth, pulse, and triangle waves. Pressing the SAW or PULSE switch will select the waveshape. With both switches off (LEDs unlit) the resulting waveshape is a triangle. Activating both waveshape switches (both LEDs lit) combines the saw and pulse waveshapes.

The OB-X provided only Saw and Pulse waves, while the OB-8 added the Triangle wave, plus the ability to combine Saw and Pulse. The Pulse wave was also softer on the OB-8 than on the OB-Xa and OB-X. Since the OB-X8 always allows for the saw and pulse waves to be combined, a Page 2 feature is provided to select whether the pulse wave's level should be that of the OB-8 (required to match OB-8 presets), or the level of the OB-X or OB-Xa.

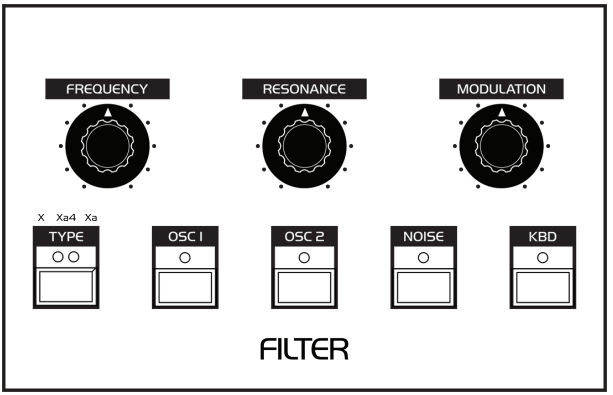
Mod: The MOD switch combines two modulation features from the OB-X and OB-Xa/8.

- Press the MOD switch once and the yellow LED will light. This engages X-Mod. Oscillator 2's sawtooth wave will now modulate Oscillator 1's frequency. As in the original OB-X, there's no way to vary the amount of modulation and the effect will vary from voice to voice.
- Press the MOD switch again and the red LED will light. This engages F-Env, or filter envelope modulation. This routes the filter envelope to the frequency of Oscillator 2 as found on the OB-Xa and OB-8. The modulation amount is shared with the filter, and both are set by the MODULATION knob amount in the FILTER section.
- Both X-Mod and F-Env can be engaged simultaneously by pressing the MOD switch a third time. Both yellow and red LEDs light.

Sync: Press the SYNC switch to enable hard sync of Oscillator 2 by Oscillator 1. This causes Oscillator 2 to restart its waveform on each cycle of Oscillator 1.

Filter

Each of the historic OB- polysynth filter types is available in the OB-X8, along with the additional modes of the SEM 2-pole filter (accessed via Page 2.) The OB-X used a discrete 2-pole, 12dB-per-octave, state-variable lowpass filter based on the original SEM filter design, but with programmable resonance added, as found on the OB-X. Both the OB-SX and OB-Xa utilized a Doug Curtis-designed CEM3320 configured in 2-pole mode to emulate the OB-X filter. The OB-Xa also added a second CEM3320 configured as a traditional 4-pole, 24dB-per-octave filter. The OB-8 also used a CEM3320 for its 2-pole and 4-pole filter. All of these are available from the OB-X8's front panel.



The Filter section

To hear the effect of the OB-X8 filter:

1. Recall the basic preset by holding down WRITE and pressing MANUAL. The X filter is selected by default. Switch to the Xa 2-pole by pressing the TYPE switch once. Switch to the Xa 4-pole by pressing the TYPE switch a second time.

2. In the basic program, only Oscillator 1 is turned on in the Filter. For a fuller sound, turn on Oscillator 2 in the Filter, set its waveshape to sawtooth and detune it slightly by turning its OSC 2 DETUNE knob to 2.

3. Hold down a note and rotate the filter's FREQUENCY knob. Notice how it cuts the high frequencies as you rotate counter-clockwise, making the sound of the oscillators less bright.

4. Return the FREQUENCY knob to its halfway position, hold down a note again then turn the resonance knob about halfway up.
5. Rotate the filter's FREQUENCY 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.
6. Now toggle between the filters by pressing the TYPE switch and listen to the differences in tone. The differences become more apparent with higher and lower resonance settings.

Filter Controls

Frequency: Sets the selected filter's cutoff frequency.

Resonance: Emphasizes a narrow band of frequencies around the cutoff frequency. Note that just as on the original OB synths, none of the OB-X8's filter types can self-oscillate to generate a pitch.

Modulation: The Modulation knob controls the amount of positive modulation that the Filter Envelope will have on the filter frequency. This same control also determines the amount of positive filter envelope modulation on Oscillator 2 if the F-Env function is on.

Type: The TYPE switch is used to select between the three different filter modes. The switch has two LEDs so that the three states can be indicated. The yellow LED on the left indicates OB-X 2-pole mode, the red LED on the right indicates OB-Xa/8 2-pole mode, and both LEDs on indicates OB-Xa/8 4-pole mode. Each subsequent press of the button will increment and loop through these three states.

The OB-X8 has three additional filter modes that were not available on any of the original OB synths, but were included in the SEM. These modes are Highpass, Bandpass, and Notch. These can be selected on the Filter Mode page of Page 2. If any of these three filter modes are selected, both LEDs in the TYPE switch will be off to indicate one of the extra filter modes was selected.

Type Switch	Filter Mode	Used In
X (yellow LED)	2-pole state-variable low-pass	OB-X & SEM
Xa (red LED)	2-pole CEM3320 low-pass	OB-Xa & OB-8
Xa4 (yellow & red LEDs)	4-pole CEM3320 low-pass	OB-Xa & OB-8
off (set on page 2)	2-pole state-variable high-pass	SEM
off (set on page 2)	2-pole state-variable band-pass	SEM
off (set on page 2)	2-pole state-variable notch	SEM

OB-X8 Filter Modes

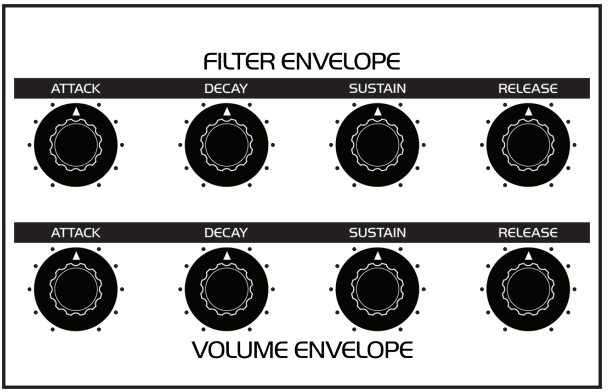
Inputs: The OSC 1, OSC 2, and NOISE switches function as a mixer. Pressing one of these sends the associated signal to the filter, at full level (127) as in the legacy instruments. Individual levels can be set for each of these by entering Page 2 and setting the Osc 1 Level, Osc 2 Level, and Noise Level parameters.

The original OB synths provided only an on/off control for Oscillator 1, and a "half" and "full" level for Oscillator 2. The OB-X8 keeps the simple on/off switches on the front panel, but provides continuous level control for each oscillator on Page 2 with a range of 0 (off) to 127 (max, and the same level as the original instruments' on position). The equivalent level of Oscillator 2's "Half" switch can be achieved by setting the Page 2 Oscillator 2 level to 49. Similarly, the Half level for Noise (which was only available on the OB-X) can be achieved with a Page 2 noise level of 49.

KBD: Enables key tracking of the selected filter type. When on, the filter tracks the keyboard at 1V/octave. Tracking also follows the TRANSPOSE DOWN and UP settings on the Lever Box, from 0V at the lowest C (TRANSPOSE DOWN) to 7V at the highest C (TRANSPOSE UP.) Key tracking can be adjusted from 0-127 using the Page 2 Filter KEYBD TRACK parameter. The original OB synths only provided 1V/octave keyboard tracking for the filter. This can be achieved when the Page 2 KEYBD TRACK parameter is set to 127. More subtle keyboard filter tracking can be achieved with lower values.

Envelopes

The OB-X8 has two 4-stage envelope generators (Attack, Decay, Sustain, Release). They are useful for creating modulation that varies over time according to the shape of the envelope. The Filter Envelope, for example, causes the filter to open or close according to the contour of the envelope. The Volume Envelope causes the volume to change according to the contour of the envelope. Both the Filter and Volume envelopes are hardwired to their destinations.



The Envelopes

This 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.

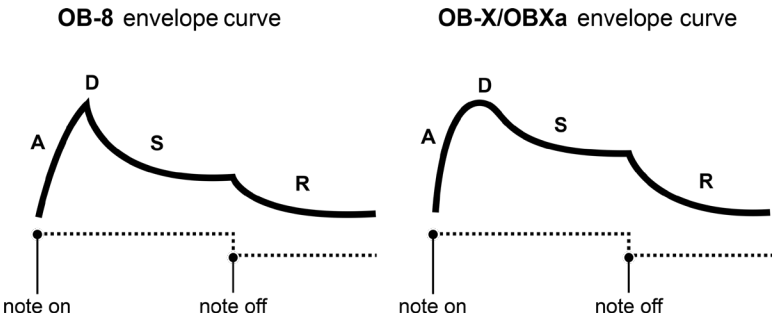
In general, sounds produced by an acoustic instrument are brighter at their beginning (the attack stage) and grow mellower as they die out (the decay and release stages). In other words, their harmonic content changes over time. This is exactly what the filter envelope is designed to emulate.

After passing through the filter, a synthesized sound goes into the amplifier, which controls its overall volume. The amplifier has a dedicated, 4-stage Volume Envelope generator (Attack, Decay, Sustain, Release) which 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.

All three legacy synthesizers utilized the CEM3310 chip for the filter and amplifier envelopes. However, the circuit topologies used created some differences. For example, the attack time on the OB-8 has a more linear shape than on the OB-Xa even though they both use the CEM3310. In use, you may hear a more exponential curve on the OB-X/Xa.



Differences between OB-8 and OB-X/OB-Xa envelope response

You can change the OB-X8's envelope shape characteristics per preset. Enter Page 2 and scroll to Envelope Type. You can select OB-X/Xa or OB-8 to utilize the particular shape characteristics of each legacy design. See "Chapter 3: Page 2 Parameters" on page 50 for more information about Page 2 parameters.

Filter Envelope Controls

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 MODULATION amount. Percussive sounds typically have sharp (short) attacks.

Decay: Sets the decay time of the envelope. After the filter frequency completes its Attack stage and reaches the Modulation amount, the Decay controls the rate in which the filter frequency will decay to the Sustain level. The higher the setting, the longer the decay. Percussive sounds, such as synth bass, typically have shorter decays (and a generous amount of 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.

To hear the effect of the Filter Envelope:

1. Recall the basic preset by holding down WRITE and pressing MANUAL. The OB-X filter is selected by default.
2. Hold down a note and rotate the filter's FREQUENCY knob to set it to about 30% of the knob's travel.
3. Play a note. At this point you may not hear anything because you've closed the filter significantly.
4. Turn the Filter's MODULATION knob to about 25% of the knob's travel. Play a note. Notice how the sound has changed. The Filter modulation is controlling filter cutoff frequency by the amount you set with the MODULATION knob.
5. Set the Filter Envelope's SUSTAIN to minimum.

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 Volume Envelope, so to hear its effect, first set the Volume Envelope's Release value to 60%.

10. Now repeatedly strike and release 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 the Filter Envelope's Modulation knob. Notice how greater modulation settings amplify the effect of the envelope on the filter.

As noted previously, the Filter Envelope and Volume Envelope often work in conjunction, with the Filter Envelope controlling how the filter opens and closes and the Volume Envelope controlling how the Volume controls the overall volume shape of the sounds you create. To learn more about the Volume Envelope, read on.

Volume Envelope Controls

Attack: Sets the attack time of the envelope. The higher the setting, the slower the attack time and the longer it takes for a sound to reach its full volume. Pads typically have softer (longer) attacks. Percussive sounds have sharper (shorter) attacks.

Decay: Sets the decay time of the envelope. After a sound reaches its full volume at its attack stage, decay controls how quickly the sound transitions to the level set with the sustain control. The higher the setting, the longer the decay. Percussive sounds, such as synth bass, typically have shorter decays.

Sustain: Sets the sustain level of the envelope. The higher the setting, the louder the sustained portion of the sound will be. The sound will stay at this level for as long as a note is held on the keyboard.

Release: Sets the release time of the envelope. This controls how quickly a sound dies out after a note is released.

To hear the effect of the Volume Envelope:

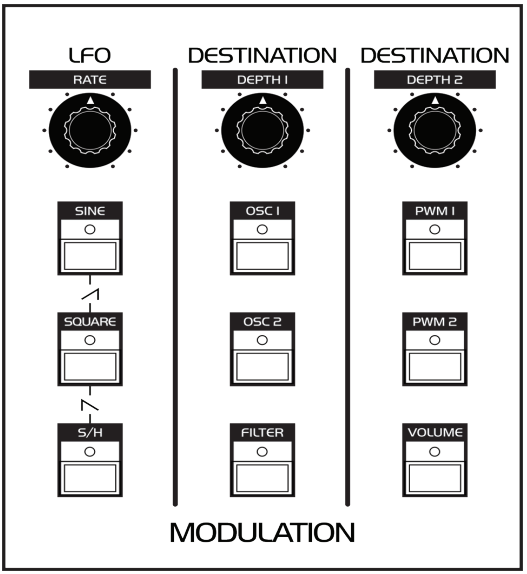
1. Recall the basic program by holding down WRITE and pressing MANUAL.
2. Repeatedly strike a note on the keyboard as you turn the Volume Envelope's attack knob clockwise. Notice how the attack becomes slower and more gradual the further you turn the knob.
3. Reset the attack knob to zero.
4. Next, repeatedly strike a note on the keyboard as you turn the Volume 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 Volume 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. Reset the decay parameter to 100%.
7. Finally, with decay set to 100% and sustain still set to zero, repeatedly strike and release note on the keyboard as you turn the Volume Envelope's release knob clockwise. Notice how the release becomes longer the further you turn the knob.

8. Continue experimenting with various Volume 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.

Modulation (LFO)

This section describes the functionality of the LFO section on the main panel. An additional LFO (Vibrato LFO) is controlled in the Lever Box and is described in another section.

The front panel parameters allow the selection of one of five waveforms: Sine, Square, S/H (sample & hold), Saw Up (pressing Sine and Square), and Saw Down (pressing Square and S/H). Pressing any individual Waveform switch should turn off the other two Waveform switches regardless of the previous selection. Selection of Saw Up can only occur when pressing Sine and Square at the same time, and Saw Down only by pressing Square and S/H at the same time.



Modulation section

The OB-X8 authentically recreates all of the modulation capabilities of the OB-X, OB-Xa, and OB-8, even though they are quite different. The OB-X and OB-Xa utilized analog LFOs with analog control of all routing and modulation amplitude. The OB-8's LFO was digitally generated before converting to analog control voltages to send to their destinations. The OB-X8 has a new Page 2 parameter to select whether the current preset's LFO will be from the OB-X/Xa or OB-8.

Several differences occur between the two modes since they represent very different implementations. The Speed and Depth controls will behave with different limits and curves, some waveforms have different shapes (for example, the Sine wave in OB-8 mode is actually a Triangle wave, since that is what was implemented in the OB-8) and different phases (the OB-X/Xa square wave is negative-going, while the OB-8 is positive).

As a bonus, all of the many new modulation features added to the OB-8, such as the additional waveforms, triggered LFO, delayed modulation, quantized modulation, and so on, can be applied to the OB-X/Xa LFO mode, allowing for a wider range of modulation possibilities than were available on any of the three legacy units.

Modulation Controls

LFO Rate: Sets the frequency for the Modulation LFO. The rate goes from 0.0667Hz (about 15 seconds) to 50Hz.

Waveform Switches: The three switches, pressed separately or in combination, allow for various LFO shapes. The switches allow the selection of one of five waveforms: Sine, Square, S/H, Saw Up (pressing Sine and Square together), and Saw Down (pressing Square and S/H together).

The OB-X square wave pitch modulation is mainly negative, while the OB-8 square wave to pitch is positive only. You can set the square wave LFO shape to match either legacy instrument using the Page 2 LFO Type parameter.

Destination 1: There are two modulation busses available on the OB-X8. This allows the Modulation LFO to be sent to two different sets of modulation destinations. Any singular or combination of destinations may be selected.

- **Depth 1:** Sets the overall modulation depth for the following three modulation destinations.
- **OSC 1:** Routes the Modulation LFO to Osc 1 pitch.
- **OSC 2:** Routes the Modulation LFO to Osc 2 pitch.
- **Filter:** Routes the Modulation LFO to Filter frequency.

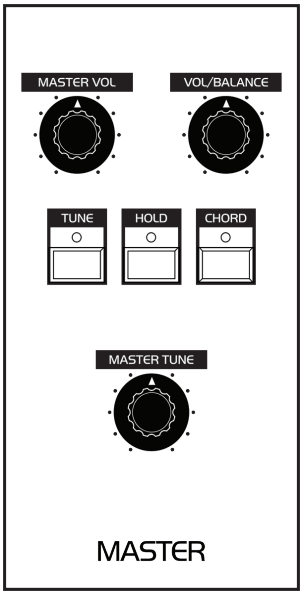
Destination 2: The second of the two Modulation busses, Destination 2 offers different modulation possibilities from Destination 1. As with the Destination 1 bus, any of the destinations or any combination of them may be selected simultaneously.

- **Depth 2:** Sets the overall modulation depth for the following three modulation destinations.
- **PWM 1:** Routes the Modulation LFO to Pulse Width of Oscillator 1.
- **PWM 2:** Routes the Modulation LFO to Pulse Width of Oscillator 2.
- **Volume:** Routes the Modulation LFO to the final VCA where voices are summed. The effect is amplitude modulation.

The modulation capabilities of the OB-X8 go far deeper than what is visible on the front panel, thanks to the implementation of all of the OB-8's Page 2 capabilities. There are 18 additional parameters that are detailed in the Page 2 section of this manual that allow for independent attack and delay per destination path, triggering of the LFO waveform, keyboard tracking of speed, quantized modulation, and more.

Master Section

This section contains a set of overall controls for the OB-X8, including Master Volume, Master Tune, and other unique performances features like Hold and Chord.



Master section

Master Section Controls

Master Volume: Master Volume is a global control for the overall volume. It controls the volume level for the Left, Mono, and Right rear panel outputs as well as the front headphone jack.

Vol/Balance: This has two functions, depending on whether Split or Double is engaged. When neither Split nor Double are engaged (when using a single preset), Vol/Balance functions as a programmable volume control for each preset – the value is in fact saved as part of a preset.

If Split/Double is engaged, the Vol/Balance control functions as a volume balance between the two presets that are part of the Split or Double program. Turning the knob to the left increases the Lower preset volume while decreasing the Upper preset volume. Turning the knob to the right increases the Upper preset volume and decreases the Lower preset volume. Setting Vol/Balance in the center sets both presets at equal volume. Vol/Balance can be saved to a split/double program.

Tune: This switch is used to calibrate the tuning of all VCOs. Audio is muted during tuning. LEDs on the Program 1-8 switches light sequentially to represent the frequencies of each oscillator being calibrated. Calibration progress is shown on the OLED display. Audio unmutes and returns to previous settings when completed.

Hold: The Hold switch is used to latch voices indefinitely (or until Hold is turned off). Hold down any number of keys and press HOLD once. These voices are now latched until the HOLD switch is pressed again (the LED will turn off.) If fewer than 8 notes were latched, you can continue to play these "free" voices while the held notes sustain indefinitely.

You can play a new note or series of notes while previous notes are latched as above and hit HOLD once. The LED will stay lit, and the previously held notes are released and the new note or notes are now latched instead.

If the HOLD switch is continually held down while notes are played, you can continue to add notes until all 8 voices are latched.

Pressing the Hold switch while its LED is on and no keys are pressed will immediately turn it off and release any latched voices. If the Hold switch is held after turning Hold off (LED off,) any new keys that are pressed will cause the LED to turn back on and the new voices will be held.

It's useful to think of the HOLD switch as a master latching control for the currently playing voices.

Chord: The CHORD switch is used to enable keyboard transposition of the notes being held with the Hold feature. This switch has no effect and the LED will not light if there are no voices currently latched by the HOLD switch (i.e., the HOLD LED must already be on).

Chord Mode

When voices are latched by the HOLD switch, pressing CHORD will allow all held notes to be transposed monophonically across the keyboard. The resulting chord will be transposed up based on the lowest key of the keyboard.

The range of the keyboard that can be used to trigger and transpose the chord can be set by holding the CHORD button and pressing a key, which will then become the highest key that will trigger the chord. Any free voices can be played on the range of keyboard above the set Chord range, without triggering the latched chord.


Pressing low C on the keyboard plays the chord untransposed.

The played "chord" functions as a monophonic keyboard would, i.e., with low-note priority playing the held chord. Any notes played above the lowest note (or any notes played above the range enabled for the Chord feature) will play normally with any remaining available voices.

Chord Hold

Additionally, the chord can be made to latch, i.e., continue to sustain the held notes at the transposed note after the key is released. To activate this, press and hold the CHORD button and press and release the HOLD button. When turning this feature on or off, the held notes are always retained (i.e., pressing HOLD while holding CHORD never turns off HOLD, it just switches the Chord Latch mode on or off). If Chord Latch is enabled with no notes held, the chord does not play (and latch) until a new note is played.

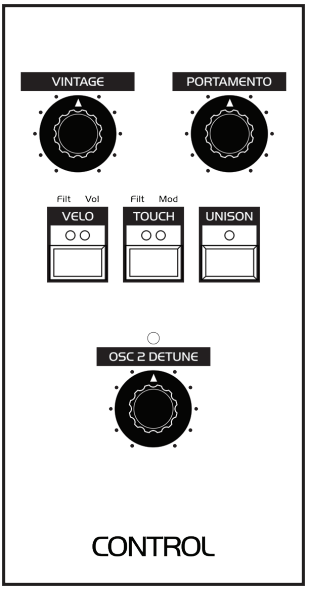

Since Chord only works while Hold is on, the Chord LED (and function) will be off if Hold is turned off.

Chord is also implemented in Page 2 as Chord Hold Mode and can be set to “Key Only” (the default), or “Infinite” (the latched mode described above). Note that when in Key Only mode, the held notes are off if no keys are being played. If you change the Chord Hold Mode via the hidden method (pressing HOLD while holding CHORD), it will be reflected in the Page 2 Chord Hold Mode display as well. The Chord Limit parameter is also available on Page 2.

Master Tune (Keyboard only): This knob is used to globally tune the synth up or down one semitone; center = 440Hz. On the Module, Master Tune is found in the Global menu.

Control Section

The Control section contains overall parameters that can affect a preset. Since Control parameters are saved per preset, Doubles or Splits can have different Control parameter settings. This can be useful for enabling different types of key response, glide, or detune, across the keyboard, specific for each of the layered or key-split presets.



Control section

Control Section Controls

Vintage: The OB-X8 is an authentically vintage-sounding instrument even though it was designed and constructed with state-of-the-art technology and components. Part of the reason for this is that it uses genuine analog, discrete, voltage-controlled oscillators, filters, and amplifiers that are as exact as possible to the versions used in the original instruments (OB-X/Xa/8) that provide the OB-X8's features and characteristics.

Another reason for the vintage sound of the new OB-X8 is that we did research into what made the original sound the way it did — warm, organic, and alive. Not surprisingly we found that much of this desirable character was due to slight voice-to-voice variations in the electronics often due to the accuracy (or lack thereof) of the many calibration controls within the synthesizers (The OB-Xa had over 150 trim pots that had to be calibrated by a technician.)

Since the OB-X8 is able to automate all of the calibration to a high degree of precision, to impart the same flavor to the OB-X8, the Vintage knob lets you dial in progressively more of this calibration and component variation as you go from very stable, with the control at minimum, to a highly variable state, with the knob at maximum. Try it out!

The Vintage parameter also controls the Voice Detune parameter on Page 2. Increasing the Vintage value will also increase the amount of voice detuning. For some sounds it is desirable for the parameters other than the oscillator tuning (such as filter frequency, envelope times, etc.) to be "vintage" while keeping the oscillators in tune. This is especially useful for OB-8 presets, since the OB-8 had much more accurate oscillator auto-calibration than the other models. To add "Vintage" without detuning the oscillators, first turn up the Vintage knob to the desired value, and then turn down the Voice Detune on Page 2

Portamento: Sets the rate at which the pitch of a note glides up or down from the pitch of the previously played note. Portamento operates on a given voice whenever that voice changes to a different note. It functions when the OB-X8 is in either polyphonic or Unison mode.

To use Portamento:

1. Turn the Portamento rate knob to approximately 40%.
2. Play a series of notes up and down the keyboard while you continue to turn the Portamento knob to adjust the amount of glide.

 There are many additional Portamento modes and parameters that are detailed in the Page 2 section of this manual.

Velo (Keyboard only): Filt, Vol. Allows key velocity to influence Filter Envelope Modulation amount and/or Volume Envelope amount. If on, the harder you play, the louder the sound will be. If off, key velocity will not affect the volume or filter modulation. This control allows for more expressive sounds. On the Module, Velocity is found in the Page 2 menu.

Touch (Keyboard only): Touch, or 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 pressed. The greater the pressure that's applied, the more modulation will result. The OB-X8 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 aftertouch switch lets you choose to apply aftertouch to the Filter cutoff and/or Modulation amount.

- In the case of Filter Touch, pressing a key harder will open the filter wider, increasing the brightness of the sound.
- In the case of Modulation Touch, pressing a key harder will apply oscillator pitch modulation via the currently enabled Vibrato LFO settings in the Lever Box section, effectively having aftertouch function in the same manner as the Lever Box's DEPTH knob.

On the Module, Aftertouch is found in the Page 2 menu.

To enable Touch (pressure) as a source for modulation:

1. Press TOUCH switch once to select Filter modulation.
2. Press TOUCH switch twice to select Vibrato LFO modulation.
3. Press the TOUCH switch three times to select both Filter modulation and Vibrato LFO modulation.
4. Hold down a note on the keyboard, then press harder. Modulation is applied to the selected destination(s).

The OB-X8 keyboard provides eight different aftertouch/pressure response settings. To choose a different response curve, use the AFTERTOUCH CURVE parameter in the Global parameters. The OB-X8 module features a Page 2 Aftertouch setting.

Unison: When unison is on, the OB-X8 functions 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 eight voices, depending on how many you choose to use. With up to 16 oscillators powering a single note (2 oscillators per voice x 8 voices), you can create some very dense, speaker-rattling sounds. Unison gives you control over how many voices to stack, as well as the amount of detuning between the oscillators.

To use Unison:

1. Press the UNISON switch. Unison mode is activated.
2. To choose the number of voices to stack, press the PAGE 2 switch and use the SCROLL knob to locate the UNISON VOICES parameter.
3. Use the VALUE knob to set the number of unison voices as desired.
4. When finished, press the PAGE 2 switch again to exit.

To detune the oscillators in Unison:

1. Press the UNISON switch to activate Unison mode.
2. Press the PAGE 2 switch and use the SCROLL knob to locate the VOICE DETUNE RANGE parameter.
3. Use the VALUE knob to set the desired range/amount of detuning.
4. When finished, press the PAGE 2 switch again to exit.

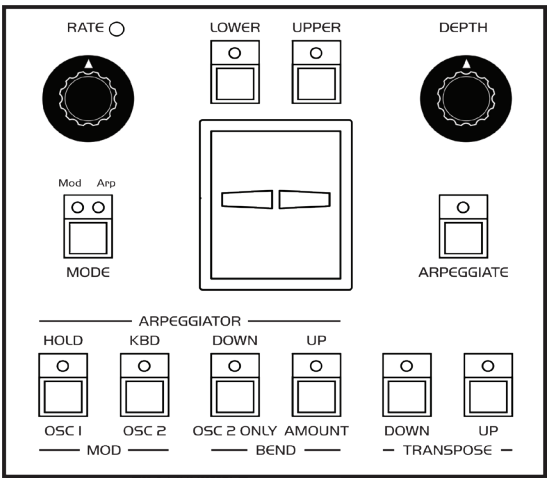
Set Unison voice priority with the Page 2 UNISON KEY MODE parameter.

OSC 2 Detune: Oscillator 2 has a dedicated Detune control, located in the Control Section. This positively or negatively offsets the pitch of Oscillator 2 from Oscillator 1. The range is exactly half that of the Master Tune range - detuning Oscillator 2 by +49.2/-49.2 cents with the resolution being greater near the center of the knob range.

When OSC 2 DETUNE is applied, the associated LED will light. When the parameter is at the center of its range (no Detune applied) the LED will be off.

Lever Box (Keyboard only)

The Keyboard's Lever Box contains most of the OB-X8 performance controls, including the pitch and modulation levers. It also contains an arpeggiator and an independent LFO dedicated to pitch vibrato. It is good to note that many of the Lever Box controls have multiple functions, faithfully recreating the many performance controls of the original OB-8. Most alternate functions are printed on the Lever Box, with some additional functions being activated by other button/key combinations.

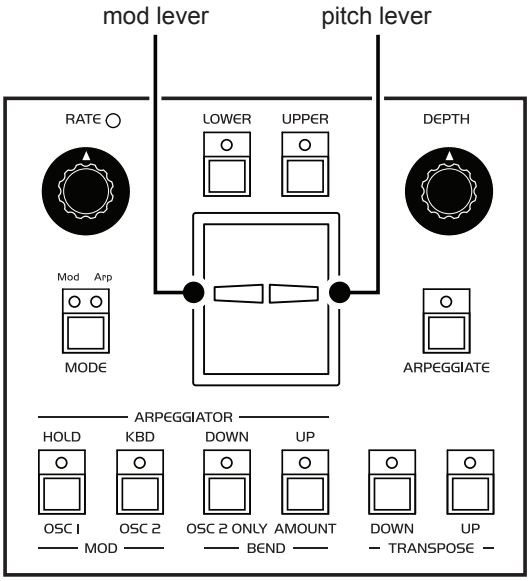


Lever Box

The two primary modes of the Lever Box are controlled by the MODE button. when set to MOD (red LED) the four buttons at the lower left control bend and mod parameters as printed below their buttons, and the RATE knob will control the speed of vibrato. When the MODE switch is set to ARP, the four lower left buttons will control Arpeggiator functions as printed above the buttons, and the RATE knob will control the speed of the arpeggiator. The LOWER and UPPER buttons independently assign the Mod or Arp to the Lower or Upper sections when in Split or Double. All other Lever Box functions operate in the same manner regardless of the MODE switch setting.

Using the Pitch and Mod Levers

The OB-X8 has a Pitch lever and a Mod lever. You can use these controls to enhance live performance by bending notes and adding modulation in real time as you play. In the same way that guitar players use note bends and vibrato to give their playing expressiveness and character, these two controls can help you define your sound as a performer and take you beyond just playing notes on the keyboard.



Pitch and Mod levers

The Oberheim Pitch and Mod levers are different from the pitch and mod wheels typically found on other synthesizers. The Oberheim levers have several differences from the familiar wheels:

- The pitch bend amount can be switched between two ranges (typically one whole step, or one octave).
- Both levers are spring loaded, ensuring that the sound returns to the expected state when your hands leave the levers.
- The pitch and mod controls can be easily manipulated in performance with two fingers.
- The pitch lever is on the right, so that it can be controlled by the more dominant index finger.
- The bend goes up when the lever is pulled towards you (as does the modulation amount on its lever).

Pitch Lever

You can set a range in semitones for the Pitch lever, depending on your playing preference. The range is up to 12 semitones (1 octave). 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.

When the UP/AMOUNT switch is off, the pitch lever bend range is always 2 semitones up/down (a whole step). But you can set the bend range to a different interval. When the AMOUNT switch is enabled, the pitch lever will bend according to the range you set, as explained below.

To set a custom bend interval for the Pitch lever:

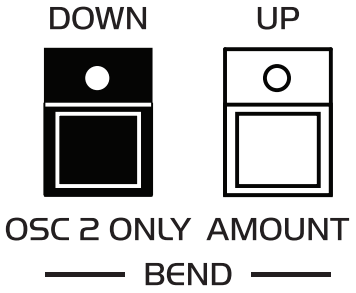
1. Toggle the Lever Box MODE switch to MOD.
2. Press and hold the AMOUNT switch and press a key from C0-C1 to set the pitch bend interval for the pitch lever. You can set a bend interval ranging from a quarter-step (when C0 is pressed) to one octave.

When the AMOUNT switch is enabled, the pitch lever will bend according to the range you have set.

Additionally you can set the pitch lever so that it applies the bend only to Osc 2 for a guitar-like bend effect.

To bend the pitch of just oscillator 2 with the Pitch lever:

1. Toggle the Lever Box MODE switch to MOD.
2. Enable the OSC 2 ONLY switch.



The Bend Osc 2 Only switch

Mod Lever

The Mod lever controls the amount of pitch modulation applied to Osc 1 and/or Osc 2 for effects such as vibrato. This allows you to "perform" pitch modulation in real time by moving the Mod lever. This is a great way to add expressiveness to a sound or performance.

By default, the Mod Lever LFO waveshape is a triangle wave. But you can change this to other waveshapes (square, saw up, sample and hold, saw down, noise) using the Page 2 VIBRATO LFO WAVE parameter.

Note that because several of the controls in the Lever Box are used for both modulation and the arpeggiator, you need to use the MODE switch to select MOD in order to set up modulation rate, depth and destination for the Vibrato LFO.

The DEPTH knob in the Lever Box controls the initial depth of pitch vibrato, independently from Mod lever use. Unlike most synthesizers with wheels, the Mod lever is spring loaded, which is very handy for performance, but doesn't allow for a constant amount of vibrato to be applied. The DEPTH knob can be used to set a static amount of vibrato, and its setting is combined with the Mod lever.

To set up modulation with the Mod lever:

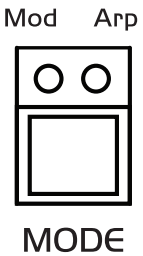
1. In the Lever Box, Toggle the MODE switch to MOD.
2. Use the OSC 1 and OSC 2 switches in the Lever Box to specify which oscillator(s) to apply vibrato to.
3. As you hold down a note and manipulate the Mod lever, adjust the RATE control as desired.

To change the vibrato LFO waveshape:

1. Press the PAGE 2 switch.
2. Use the SCROLL knob to locate the VIBRATO LFO wave parameter.
3. Use the VALUE knob to select the desired waveshape.
4. Press the PAGE 2 switch again to exit.

About Lever Box Mode (Keyboard and Module)

The MODE switch determines which set of controls (Mod or Arp) are active via the shared Lever Box controls.



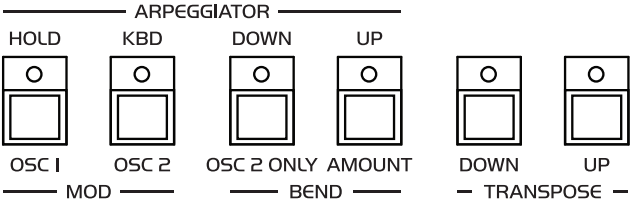
Lever Box Mode Switch

The MODE switch can be pressed at any time to enter either of the Lever Box modes (Mod or Arp), so mod parameters can be adjusted, even while the Arpeggiator is running, for example.

When Double/Split are engaged, the UPPER and LOWER switches in the Lever Box can be set separately for Mod and Arp modes.

Mod Mode

Press MODE once to enter Mod Mode. The red LED lights, and the RATE knob, MOD and BEND switches, and LOWER/UPPER switches control the vibrato LFO and Pitch and Mod levers. The row of text below the switches describes the available Mod features.



Shared Mod and Arp switches

Mod Controls

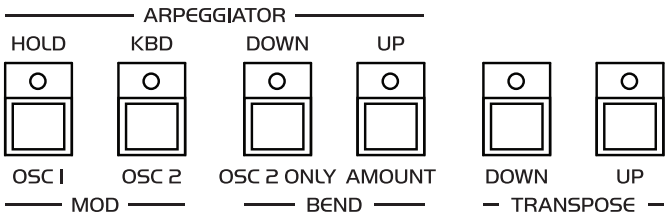
- **RATE:** Sets the rate of the vibrato LFO.
- **DEPTH**: Sets the initial depth of the Vibrato LFO, independent of Mod lever use.
- **OSC 1:** Selects Osc 1 as a destination for Vibrato LFO modulation.
- **OSC 2:** Selects Osc 2 as a destination for Vibrato LFO modulation
- **OSC 2 ONLY:** Selects Osc 2 as the sole destination for Pitch Lever bends. Osc 1 is not affected by the Pitch lever.
- **AMOUNT:** This switch is used to set and activate a custom bend interval. By default, the Pitch lever has a bend range of one whole step up and down when the AMOUNT switch is off, and one octave up and down when the AMOUNT switch is on. However, by holding down the AMOUNT switch and pressing any key from C0-C1 on the keyboard, you can set the pitch bend interval for the pitch lever, ranging from a quarter-step (when selecting C0) to one octave. Whenever the amount switch is enabled, this custom bend range is active.
- **TRANSPOSE DOWN:** Transposes the pitch of the oscillators one octave lower.
- **TRANSPOSE UP:** Transposes the pitch of the oscillators one octave higher.

Note that the Vibrato LFO follows the OB-X/Xa or OB-8 LFO mode set in Page 2. The response of the Rate and Depth knobs will be different in each mode, as will the response of the Mod lever.

Arp Mode

Press MODE to engage Arp Mode (the yellow LED will light.) Now the Rate and Mod and Bend switches change function to control the Arpeggiator. The ARPEGGIATE switch now functions to start arpeggiation. The ARPEGGIATE switch works regardless of the MODE switch setting.

The upper row of text describes available Arp features.



Shared Mod and Arp switches

Arpeggiator Controls

- **RATE:** In Arp Mode, this sets the rate of the Arpeggiator, independently from Mod Rate.
- **ARPEGGIATE:** The ARPEGGIATE switch starts the arpeggiator. If no keys are held, no arpeggiation will be heard. Arp Mode defaults to the following settings: ARPEGGIATE off, direction UP, play mode KBD (keyed-only.)
- **HOLD:** This switch allows the voices that are latched by the master hold switch to be arpeggiated. To use this feature, hold a selection of keys to be arpeggiated, then press the HOLD switch in the Master section. Release the keys and the notes will arpeggiate. Any free voices can now be played over the latched arpeggiation. The notes can be released by pressing Master HOLD once more. Pressing KBD while an arpeggiation is latched by Master Hold reverts the notes to a latched chord. Pressing the Lever Box HOLD switch again reverts the latched keys to the previously-latched arpeggiation.

- **KBD:** Pressing this switch will cause any held keys to arpeggiate if the ARPEGGIATE switch is engaged (LED is lit.) Arpeggiation will stop if the keys are released. Pressing the Lever Box HOLD switch while notes are being arpeggiated will change the arpeggiation to a latched chord. If Master HOLD is pressed while this chord is latched, arpeggiation will resume. If both HOLD and KBD are engaged (both LEDs lit,) the arpeggiator will function as though in KBD/keyed mode. The difference now is that pressing the Master HOLD switch once will immediately latch the arpeggiation. Any additional notes played will be added to the arpeggiation, though will not be latched (the notes will disappear from the arpeggiation when the added keys are released.)
- **DOWN:** When engaged (press once and LED will light,) this will cause any held or keyed arpeggiation to arpeggiate in the reverse order they were played in.
- **UP:** When lit, the held or latched notes will arpeggiate in the order they were played.
- **DOWN/UP both engaged:** With both the DOWN and UP switches pressed (both LEDs lit,) the arpeggiated notes will cycle between forward and reverse order.
- **DOWN/Up both OFF:** When lit, Arpeggiator will play the arpeggiated notes in random order.
- **TRANSPOSE DOWN:** Press to transpose any played or held arpeggio down one octave.
- **TRANSPOSE UP:** Press to transpose any played or held arpeggio up one octave. With both switches off (no LEDs lit,) arpeggios will play in the middle octave.
- **LOWER:** In Split or Double mode, this functions as an on/off switch for the Arp on the selected Lower preset. Its state is independent of the Mod mode selection. On the module, this parameter is found in the Page 2 menu.
- **UPPER:** As above, press UPPER to arpeggiate the Upper preset in a Split or Double program. As above, found in Page 2 on the module.

In Split Mode, there is a single Arpeggiator, which can be enabled for both or either of the sides of the keyboard Split. In Double Mode, there is still a single Arp, and it can be selected for the Lower or Upper layer or both layers of the Double.

Hidden Arp Features

Arp Transpose Select: Hold the MODE switch and press one of the six Lever Box bottom row switches from left to right to set the octave jump (from 0 to 5 octaves).

Arp Transpose Set: Hold the MODE and ARPEGGIATE switches together and press up to 5 keys on the keyboard. Each pressed key will sequentially set the transposition for the Arp Transpose Select setting. If fewer than 5 notes are played while MODE and ARP are held, the remaining transpositions are unaffected. The transpose amounts are always upward relative to the lowest note (C0). To set to the default values, Hold the MODE and ARPEGGIATE switches and while holding both sequentially play C1, C2, C3, C4, then C5.

Chapter 3: Page 2 Parameters

The Page 2 parameters encompass many of the additional software features that were added to the historic OB-8. These features were accessed by a second functional layer of panel parameters, revealed when the Page 2 switch was pressed.

On the OB-X8, these features, along with some new additions, can be accessed through the Page 2 display on the instrument's OLED display. There are 41 parameters within Page 2, and the upper left portion of the OLED shows the current parameter number. All normal panel parameters can be accessed while in Page 2 mode (see Global menu for the option to use the original OB-8 panel LEDs/switches in addition to the Page 2 display.)

The Page 2 switch accesses Page 2 parameters

1. Osc 1 Level: The Osc 1 level control allows you to set the specific volume level for Oscillator 1 when the OSC 1 panel switch in the Filter section is engaged. The default level value is 127, which matches the only level provided on the original OB synths.

2. Osc 2 Level: The Osc 2 level control allows you to set the specific volume level for Oscillator 2 when the OSC 2 panel switch in the Filter section is engaged. As with the Osc 1 Level parameter, the default level is 127. To set the level to the equivalent of the OB synthesizer's "half" switch, use a setting of 49.

3. Noise Level: Similar to the Osc 1 and 2 Level parameters, this allows you to set the level of noise when the NOISE switch is engaged. Default level is 127. To set the level to the equivalent of the OB-X's "half" Noise switch, use a setting of 49.

4. Osc 1 Pulse Width: Although the shared PULSE WIDTH potentiometer sets the pulse width of both oscillator pulse waves in tandem, this Page 2 parameter allows independent control of Oscillator 1's pulse width.

5. Osc 2 Pulse Width: As above, this allows independent control of Oscillator 2's pulse width, separate from the panel pot.

If you hold the OSC 1 PULSE WAVE switch on page 1 while turning the PULSE WIDTH knob, to control only Osc 1's pulse width. Similarly, holding the Osc 2 PULSE WAVE switch while adjusting the PULSE WIDTH knob will adjust only Osc 2's pulse width.

6. Osc Square Mode: This allows you to set Oscillator 1 and 2 square wave levels to match either OB-X/Xa or OB-8 levels.

7. Osc 2 Tri. XMod: This parameter is new on the OB-X8, and sets the amount of Oscillator 1 cross mod by Oscillator 2's triangle wave. This is independent of the panel-switched X-MOD parameter, which uses Oscillator 2's sawtooth wave. Both forms of X-Mod can be used simultaneously.

8. Voice Detune Range: This parameter detunes voices relative to one another by a fixed amount. The amount of shift is the same for Osc 1 and Osc 2, and does not affect the octave tracking; i.e., if a voice is 20 cents sharp, both oscillators over the entire range of the keyboard will be 20 cents sharp.

9. Unison Voices: The original OB synths would always play Unison with all available voices, unless a voice had been globally disabled. This parameter determines how many voices will be used in Unison mode, from 1 to 8. Note that if a preset has its Unison Voices parameter set to any of 5 through 8 and that preset is used in Split or Double, it will only play with 4 voices.

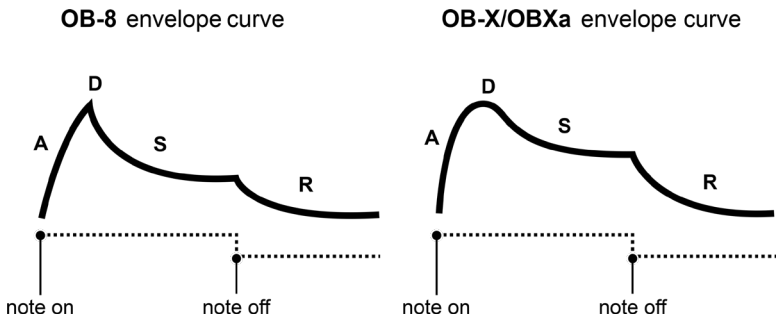
10. Unison Key Mode: This parameter sets the retrigger mode for Unison mode. The keyboard always plays monophonically in Unison, but you can select if it should always play the lowest note, highest note, or last note played, and whether the envelopes should retrigger or not when legato playing is used. The original OB synths could only play Unison in low-not mono trigger mode, so this is the default mode for the OB-X8.

11. Filter Type: As an additional parameter to the FILTER TYPE switch, this allows for the selection of the specific filter type. Although the original OB-X only had a single state-variable 2-pole low-pass filter, it was the same design as the filter in the SEM, which also provided for high-pass, band-pass, and notch filter outputs. Available types are:

- OB-X/SEM 2-Pole Low-pass
- SEM 2-Pole High-pass
- SEM 2-Pole Band-pass
- SEM 2-Pole Notch
- OB-Xa/8 2-Pole Low-pass
- OB-Xa/8 4-Pole Low-pass

12. Filter Keybd Track: Although the original Oberheim poly synths only allowed for on/off keyboard tracking of filter frequency, the OB-X8 allows adjustment of keyboard tracking from 0-127, or 0-100%, or 0-1V/Octave.

13. Envelope Type: This parameter allows the VOLUME and FILTER envelope models to be set to either OB-X/Xa or OB-8 contours.



Differences between OB-8 and OB-X/OB-Xa envelope response

14. Pedal Release Time: Pedal Release Time allows you to set an alternate release time for both Filter and Volume envelopes when a connected sustain pedal is pressed, just like on the OB-8 (the OB-X and OB-Xa would always set the release time to approximately 65% when the pedal was pressed). With a parameter range of 0-255, release times that are shorter or longer than that set via the panel controls can be achieved when pressing the sustain pedal.

The Sustain Pedal Mode can be set in the Global parameters to Note On, which will cause the sustain pedal to function as if a key is continued to be held down (as found on most modern keyboards). In this case, the Pedal Release Time parameter does not affect the sustain pedal functionality.

15. Pan Mode: Use this parameter to select from five different voice panning modes. The first four are presets and represent the most common user settings of the OB-8 pan pots: “4L-4R” (voices 1-4 panned hard left, voices 5-8 panned hard right), “PingPong” (voices 1, 3, 5, 7 hard left, 2, 4, 6, 8 hard right), “Splayed” (voice 1 hard left, voice 8 hard right, voices 2-7 gradually moving from left to right), “Spread” (alternates voices L/R with them gradually increasing the distance of L/R), and “Mono” (all voices center).

16. Pan Width: The Pan Width parameter scales the maximum L/R width of the selected pan mode. Settings are FULL, HALF, and QUARTER.

17. LFO Type: This parameter allows selection of OB-X /Xa or OB-8 LFO shapes. The OB-X LFO type models an analog sine wave, while the OB-8 type offers the digitally-generated triangle wave of the original. In OB-X/Xa mode the Square wave LFO is negative-going only, and the VCF Modulation path is inverted relative to the other Modulation paths. In OB-8 mode, the Square wave is positive-going only, and the VCF Modulation path is not inverted relative to the other Modulation paths. The scaling and range of the depth controls, as well as the curve of the rate control, perform differently between the two modes.

When the LFO Type is set to OB-8 mode, the following 17 Page 2 parameters faithfully function as they would on the OB-8, including many subtle quirks that are required in order to have OB-8 presets sound identical to the original. When the LFO Type is set to OB-X/Xa mode, all of the following parameters are still available, but in some cases will function as if applied to the analog LFOs of those models. In both cases, so as to stay authentic to the OB-8 design, a separate LFO is generated for voices 1 through 4, and for voices 5 through 8, which can result in some pseudo-random (but authentic) results when modulating the LFO speed or retriggering waveforms from the keyboard."

18. LFO Keyboard Trig: This parameter selects whether the selected LFO waveform will be keyboard triggered or not. The LFO is only retriggered when a new note is played after all notes are released (mono trigger). If additional notes are played, the LFO continues to freerun [the retriggering is independent for voices 1-4 and 5-8]. The trigger point of the waveform is at its beginning of each waveform if the LFO TRIG POINT parameter is set to zero. When the LFO TRIG POINT is set to maximum, the LFO waveform will retrigger at the 50% point of its cycle. Since the S/H and Sampled Vib LFO settings sample on the falling edge of the square wave LFO, it is necessary to set the LFO TRIG POINT to maximum if it is desired to have a new LFO sample occur immediately when a key is pressed.

19. LFO Trigger Point: Sets the phase of the LFO if LFO KEYBOARD TRIG is active. When a triggered LFO waveform is selected, this parameter determines the point in the waveform when the LFO starts. 0 selects the beginning of the LFO wave, while 127 selects the 50% point of the LFO wave.

20. LFO Keybd Track: Sets 1/4 keyboard tracking to LFO speed. LFO speed will double every four octaves of the keyboard. Keyboard tracking of the LFO follows the highest voice of each set of four voices. It will also follow the portamento rate, such that if the highest voice is gradually moving up or down the keyboard the LFO speed tracking will follow suit.

21. LFO Sample/Hold In: This parameter selects the input for the Sample/Hold LFO: noise or the selected Lever Box Vibrato LFO waveform. On the OB-8, these two choices were made with additional combinations of the LFO waveshape buttons, where the OB-X8 implementation makes more clear that the selection is between two sources of sample and hold.

22. LFO Shift Voice 5-8: This parameter is used to set the LFO phase shift of voices 5 thru 8 relative to the LFO of voices 1 thru 4. The choice of phase shift amount are None, 90 Degrees, or 180 Degrees. This parameter is ignored if LFO KEYBD TRACK is on, or if LFO ENV MOD is on, since the speeds of the LFOs for voices 1-4 and 5-8 will no longer be synchronized.

23. Vibrato LFO Wave: This parameter allows selection of the Vibrato LFO waveform (as found on the Lever Box.) Available waveforms are:

- Triangle
- Square
- Saw Up
- Sample and Hold
- Saw Down
- Noise

The OB-8 was also able to select these vibrato waveforms, but through a cumbersome method of holding the pitch bend lever while pulling up on the Depth knob.

24. Mod 1 Delay Time: Mod 1 delay time sets the time before ramping-up of LFO modulation's DEPTH 1 amount begins. The available range is 0 to 4.5 seconds on a linear scale.

25. Mod 1 Attack Time: This parameter sets the attack rate of a simple attack-only envelope (or ramp) to control DEPTH 1 amount over time. Range is 0 to 4.5 seconds on an exponential time scale.

26. Mod 1 Env Type: Allows Mod 1 Delay/Attack envelope to be inverted. This allows for fade-out, rather than fade-in, modulation envelope shapes.

27. Mod 1 Quantize: This parameter will allow the Mod 1 path to be quantized to semitones.

28. Osc 1 Mod Invert: Sets LFO to OSC 1 frequency 180 degrees out of phase relative to OSC 2 frequency modulation. This causes Oscillator 1's pitch to go down while Oscillator 2's pitch is going up.

29. Mod 2 Delay Time: Mod 2 delay time sets the time before ramping-up of Mod 2 LFO amount begins. The available range is 0 to 4.5 seconds on a linear scale.

30. Mod 2 Attack Time: This parameter sets the attack rate of a simple attack-only envelope to control Mod 2 amount over time. Range is 0 to 4.5 seconds on an exponential time scale.

31. Mod 2 Env Type: Allows Mod 2 Delay/Attack envelope to be inverted. This allows for fade-out, rather than fade-in, modulation envelope shapes.

32. Mod 2 Quantize: This parameter will allow the Mod 2 path to be quantized to semitones. For non-pitched destinations such as pulse width, this is the equivalent of quantizing the modulation to 1/12 of a volt steps.

33. Osc 1 Mod 2 Invert: Sets LFO to OSC 1 pulsewidth 180 degrees out of phase relative to OSC 2 pulsewidth mod.

34. Mod 2 Env->LFO spd: When on, the Mod 2 Envelope modulates the envelope rate with the amount of modulation set with the LFO Depth 2 control. This is typically used when you want to have the LFO speed change dynamically and you don't need PW or Volume mod (since they will share the same envelope for their mod depth). If the Mod 2 envelope is Inverted, then the LFO speed will slow down rather than speed up as per the shape of the envelope.

The amount of modulation applied to LFO speed is set by the Depth 2 panel control in the Modulation section.

35. Portamento Mode: This parameter allows for setting one of a variety of portamento types modes, as found on the OB-8.

- Normal/Linear
- Exponential
- Equal Time
- Bend Up -12.0 – 19.5

Normal/Linear mode functions like the portamento/glide found on most synthesizers in that the rate is constant, which results in the time of glide being longer the greater the interval to the new note. This is the only mode available on the original OB-X and OB-Xa.

Exponential mode allows for note-to-note glide with a curve that is (as expected) exponential in shape. Notes will glide at the same rate regardless of interval. When Portamento speed is at max, time is about 12 seconds, and 12 o'clock on the knob is about 2 seconds. Mutually exclusive with BEND and EQUAL TIME modes.

In Equal Time mode, portamento is linear, but adjusts time automatically to be the same regardless of interval. When Portamento speed is at max, the time is about 2.4 seconds. At 12 o'clock on the knob, the speed is about 0.4 seconds. Mutually exclusive with BEND and EXPONENTIAL modes.

Portamento Bend mode functions as though the interval that the portamento is moving from is always the same. In use, it becomes more like a type of envelope modulation of frequency. The amount is relative to C3, and is in 1/4 steps. For example, to bend up by one octave, press C1. To bend down one octave, press C5. The parameter range of the bend is displayed as -12.0 (as in start the bend from 12 semitones below the note played) to +19.5 (the bend starts 19.5 semitones above), in 0.5 semitone increments.

36. Portamento Match: When this parameter is set to ON, all voices' portamento times are identical. When set off, each voice glides at a slightly different speed, emulating the differences in the analog portamento of the OB-X.

37. Portamento Quantz: When this parameter is set to ON, all portamento modes are quantized to semitones.

38. Portamento Legato: Only operational while in Unison mode, this parameter causes portamento to only be on when playing legato from one note to another.

39. Chord Key Limit: This parameter limits the range of the keyboard that held chords can be played on. This means un-held notes can be played on the range of the keyboard that is outside the Key Limit, alongside held chords. The range of the Hold/Chord feature can also be set by holding the CHORD switch and pressing a key on the keyboard.

40. Chord Hold Mode: This parameter sets the behavior of the CHORD switch. The default mode is "Key Only" in which the held chord is only played when a key is played on the keyboard. If set to "Infinite" then the held Chord will continue to sound even after the key is released.

41. Bend Lever Amount: Use this parameter to limit the range of the Bend lever, from ¼ to 12 semitones. This parameter can also be set by holding the AMOUNT switch in the Lever Box and pressing a key from C0 to C1.

42. Velocity: Off, Amp, Filter, Amp + Filter - Allows velocity from the built-in keyboard or a connected keyboard controller to apply key velocity modulation to filter frequency, amp amount, or both.

43. Velocity Amount: 0-127 - Sets the amount of key velocity applied to the selections in the Velocity parameter.

44. Aftertouch: Off, Amp, Filter, Filter + Amp - As in the Velocity setting, allows keyboard aftertouch to affect amp, filter, or amp + filter parameters.

45. Aftertouch Amount: Sets the amount of key aftertouch applied to the selected parameters in the Aftertouch setting.

Split Mode Page 2 Parameters

When Split Mode is engaged, and with Upper/Lower unselected, pressing Page 2 reveals an additional set of parameters specific to Split Mode. Note that you have to have both the Lower and Upper switches off to access these parameters, otherwise you are accessing the Page 2 parameters of the Lower or Upper sound.

1. Balance: Allows for adjustment to the volume balance between the Upper and Lower presets used in the Split program.

2. Split Point: Use this parameter to set the Upper/Lower split point from C0 to C5.

3. Lower Transpose: Allows the Lower preset to be transposed by +/- three octaves. The Lower preset can also be transposed upward relative to C0 by pressing and holding Split and Lower and pressing the desired key.

4. Upper Transpose: As above, allows transposition of the upper preset by +/- three octaves. The Upper preset can also be transposed downward or upward relative to C2 by pressing and holding Split and Upper and pressing the desired key.

5. Lower Detune: Allows the Lower preset to be Detuned against the Upper preset by +/- 50 cents. The Lower Detune can also be set by holding Lower and turning the Osc 2 Detune knob.

6. Pan Mode: Sets the overall panning for the Split or Double program. This takes over from the Pan Mode settings saved for the Upper and Lower presets.

7. Pan Width: Sets the overall pan width for the Split or Double program. This takes over from the Pan Width settings saved for the Upper and Lower presets.

8. Hold/Chord Params: Selects whether Hold/Chord mode uses the saved setting from Upper, Lower, or Split program.

9. Lever Box Params: Selects whether the Lever Box uses saved settings from the Lower, Upper, or Split program.

10. Arp Params: Selects whether the Arpeggiator uses saved parameters from the Lower, Upper, or Split program.

11. Arp Assign: Off, Lower, Upper, Lower + Upper - Sets which layer of a Split program, Lower, Upper, or Lower + Upper, that the Arpeggiator affects. Defaults to Lower + Upper.

12. Mod Assign: Off, Lower, Upper, Lower + Upper- Sets which layer of a Split program the Mod LFO affects. Defaults to Lower + Upper.

Double Mode Page 2 Parameters

When Double Mode is engaged, pressing Page 2 reveals an additional set of parameters specific to Double Mode. Note that you have to have both the Lower and Upper switches off to access these parameters, otherwise you are accessing the Page 2 parameters of the Lower or Upper sound.

Split and Double Page 2 parameters are available when Split or Double is enabled and Upper and Lower deselected in the Lever Box.

1. Balance: Allows for adjustment to the volume balance between the Upper and Lower presets used in the Double program.

2. Lower Transpose: Allows the Lower preset to be transposed by +/- three octaves in semitones. The Lower preset can also be transposed upward relative to C0 by pressing and holding Split and Lower and pressing the desired key.

3. Upper Transpose: As above, allows transposition of the upper preset by +/- three octaves in semitones. The Upper preset can also be transposed downward or upward relative to C2 by pressing and holding Split and Upper and pressing the desired key.

4. Lower Detune: Allows the Lower preset to be Detuned against the Upper preset by +/- 50 cents.

5. Pan Mode: Selects saved Pan Mode settings from either the Upper, Lower, or Double program (this takes over from each individual preset's Pan Mode settings, or the Global Pan Mode setting.)

6. Pan Width: Selects saved Pan Width settings from either the Upper, Lower, or Double program (this takes over from each individual preset's Pan Mode settings, or the Global Pan Mode setting.)

7. Hold/Chord Params: Selects saved Hold/Chord settings from either the Upper, Lower, or Double program (both presets.)

8. Lever Box Params: Selects saved Lever Box settings from either the Upper, Lower, or Double program (both presets.)

9. Arp Params: Selects saved Arpeggiator settings from either the Upper, Lower, or Double program

10. Arp Assign: Off, Lower, Upper, Lower + Upper - Sets which layer of a Double program, Lower, Upper, or Lower + Upper, that the Arpeggiator affects. Defaults to Lower + Upper.

11. Mod Assign: Off, Lower, Upper, Lower + Upper - Sets which layer of a Double program the Mod LFO affects. Defaults to Lower + Upper.

Hidden/Panel Access Functions

1. Arp transpose select: Hold the lever box MODE button and press lever box bottom row buttons from left to right to set the octave (0-5).

2. Arp transpose set: Hold both the lever box MODE and ARPEGGIATE buttons and press up to 5 keys on the keyboard. Each pressed key will sequentially set the transposition for the transpose selections 1-5. If fewer than 5 notes played while MODE and ARPEGGIATE held, remaining transpositions are unaffected.

3. Portamento bend amount: Hold UNISON and play a key from C0-C5 to set portamento bend amount. Bend amount is set to half the interval played relative to C2. In other words, pressing C0 (two octaves below C2) will cause the bend to be set to bend up one octave.

4. OSC 1/2 pulse width: Hold oscillator 1 or 2 PULSE and turn PW to set width of pulse on each oscillator.

5. Chord Keyboard Range: Hold CHORD and press a key on the keyboard to set the highest note for chord playback. Keys above can be played independently of chord.

6. Bend Box Pitch Bend Amount: With lever box MODE set to mod, hold AMOUNT and press a key C0-C1 to set pitch bend amount.

7. Split Point: Hold SPLIT and press a key to set split point.

8. Lower Transpose: Hold SPLIT or DOUBLE and LOWER, press a key on the keyboard. The note played represents the amount the lower voices will be transposed upward, with the low C equal to no transpose.

9. Upper Transpose: Hold SPLIT or DOUBLE and UPPER and press a key on the keyboard. The note played represents the amount the upper voices will be transposed up or down, with middle C equal to no transpose, the low C equal to two octaves down, and the high C equal to three octaves up.

Chapter 4: Creating Sounds

The OB-X8 can produce a broad spectrum of sounds. Though the factory programs give you some idea of its scope, if you just play its programs, you're not using the OB-X8 to its full potential. The real fun is in creating sounds of your own.

This chapter provides some short sound programming tutorials. Though there isn't enough space here to cover how to use every OB-X8 function, the examples will help you get familiar with some basic concepts.

Synth Bass

A synth bass is one of the easiest and most useful sounds you can make on a synth. Many great synth bass sounds consist of a single oscillator, a bit of filter resonance, the proper envelope, and that's it. So start with the Basic Program and go from there.

Short Version

To create a classic synth bass:

1. Recall the basic program by holding down WRITE and pressing MANUAL.
2. Press DOWN in the TRANSPOSE section to lower to overall pitch.
3. Set filter CUTOFF to 25%.
4. Set filter RESONANCE to 60%.
5. In the FILTER ENVELOPE section, set the Filter Envelope's DECAY to 60%.
6. In the FILTER ENVELOPE section, set the Filter Envelope's SUSTAIN to 0.
7. In the FILTER section, set the MODULATION AMOUNT to 50%.
8. Play some low notes on the keyboard. Instant synth bass!
9. Experiment with the Filter's MODULATION AMOUNT and Envelope DECAY settings.
10. Experiment with the Filter's RESONANCE settings.

Long Version

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 100% (a value of 127.) (The Oscillator 2 switch in the FILTER section is off and no wave shape is selected.)

To start with the Basic Program:

1. Recall the basic program by holding down MANUAL and pressing WRITE.

Each of the waveforms have their own unique sound:

- The SAW 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. (Perform a web search on this if you want to learn more.)
- The triangle wave (both WAVEFORM switches off) has very few harmonics. It's useful used alone for its pure tone, or in combination with another oscillator to reinforce the fundamental pitch of a sound and add weight.
- Press TRANSPOSE DOWN to lower the overall pitch of the oscillator.

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 FREQUENCY 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 FREQUENCY knob fully counterclockwise you'll filter out almost all frequencies and hear very little (the basic program is set to the X, or 2-pole SEM filter, does not cut all frequencies, by design.)

2. Return the FREQUENCY knob to 25% and the turn the Filter's MODULATION knob to a value of 50%.

3. In the FILTER ENVELOPE section, set the Filter Envelope's DECAY to 40%.

4. In the FILTER ENVELOPE section, set the Filter Envelope's SUSTAIN to 0.

5. Repeatedly play a note as you turn the RESONANCE knob to 75%. Notice how the sound changes as a band of frequencies near the cutoff is amplified. Hold a note while increasing RESONANCE and listen to how the decay of the note is affected.

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

7. Set the Filter FREQUENCY to a value of 25%.

8. Set the filter RESONANCE to a value of 70%. This is going to give the synth bass its funky "zap."

9. Play a note and listen to the sound. You can open the filter wider using the Filter MODULATION knob (so you don't have to turn the CUTOFF knob by hand).

To adjust the filter envelope:

1. In the Filter section, turn the Filter's MODULATION knob to a value of ~70%.

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

Notice how the sound has changed. The Filter Envelope is controlling filter cutoff by the amount you set with the MODULATION knob.

3. Continue experimenting with the Filter Envelope's MODULATION knob. Notice how greater MODULATION settings amplify the effect of the envelope on the filter.

4. 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.

Be aware that the Filter Envelope and Volume Envelope work in conjunction, with the Filter Envelope controlling how the filter opens and closes and the Volume Envelope controlling the overall volume shape. To learn more about the Volume Envelope, see "Volume Envelope Controls" on page 30.

5. The Filter Envelope's RELEASE parameter acts in conjunction with the Volume Envelope. In other words, you can't hear a long release on the Filter Envelope if the Volume Envelope is short! So to hear the filter envelope's RELEASE parameter in action, first set the Amp Envelope's RELEASE value to 70%.

6. 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.

How to make the synth bass fatter:

- Press the PULSE switch in Oscillator 1.
- Turn up Oscillator 2 in the Filter section by pressing the OSC 2 switch. Turn on the saw wave by pressing the Oscillator 2 SAW switch, and use the OSC 2 DETUNE control to slightly detune Oscillator 2.
- Hit the UNISON switch to stack all eight of the OB-X8's voices.

Now you know how to create a simple synth bass program using the most essential synthesizer components of the OB-X8: 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 the Filter Envelope to modulate the pitch of Oscillator 1 to simulate an aggressively blown horn effect.

To create synth brass:

1. Recall the basic program by holding down MANUAL and pressing WRITE. Oscillator 1 is set to sawtooth by default.

2. Turn on Oscillator 2 in the Filter Section, then switch on its sawtooth wave and set the OSC 2 DETUNE control to 2 o'clock to detune it slightly.

3. In the FILTER section, set FREQUENCY to 10%, RESONANCE to 30%, and MODULATION TO 70%.

4. In the FILTER ENVELOPE section, set the ATTACK to 40%, DECAY to 60%, SUSTAIN to 40%, and RELEASE to 0.
5. Enable touch sensitivity to Filter Modulation by pressing and enabling the VELOCITY button once.
6. Play a few chords. Basic synth brass!
7. If you want, set the frequency of Oscillator 1 and Oscillator 2 an octave lower using the TRANSPOSE DOWN switch.

To create the "pitch blip":

1. In the Oscillators section, press MOD twice to enable F-Env (Filter Envelope.) This will route the Filter Envelope modulation to the frequency of Oscillator 1.
2. As you repeatedly play a chord, gradually turn up the Filter MODULATION knob. This sets the amount of modulation from the Filter Envelope to both the frequency of Oscillator 1 and the Frequency of the filter. The exact shape of the Filter Envelope determines the rise and fall of the frequency. This create the slight pitch variation at the beginning of the sound (the "pitch blip").
3. Set Filter MODULATION to somewhere between 40 and 50%.
4. In the FILTER ENVELOPE section, experiment with different values for the DECAY parameter. The controls how quickly the pitch falls.
5. Play some notes in the upper range of the keyboard. Classic synth brass!

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" by turning off F-ENV in the Oscillators section.
2. press the KBD switch to turn keyboard filter tracking to off. (As an experiment, you can enter Page 2, scroll to Filter Keybd Track and set the value to 64.)
3. In the FILTER section, set the FREQUENCY to 70% and RESONANCE to 20%.
4. In the FILTER ENVELOPE section, set the ENV AMOUNT to 0.

5. Set Filter Envelope ATTACK to 60%, DECAY to 60%, SUSTAIN to 70%, and RELEASE to 70%.
6. Set Volume Envelope ATTACK to 60%, DECAY to 50%, SUSTAIN to 100%, and RELEASE to 60%.
7. Use the OSC 2 DETUNE control to adjust the amount of detuning/chorusing.
8. Play some chords. You've now got a good basic string pad.

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. In this example you'll learn how to hard-sync the oscillators, and pitch-modulate one of them with the MOD feature.

To create a hard-sync lead:

1. Recall the basic program by holding down WRITE and pressing MANUAL. Oscillator 1 is set to sawtooth by default.
2. In the Oscillator section, press the SYNC switch.
3. Set Oscillator 2 FREQUENCY to 4. This will allow for a wide range of pitch modulation.
4. In the Oscillator section, press F-ENV. This enables modulation of Oscillator 2 by the Filter Envelope.
5. In the FILTER section, set the CUTOFF to 70% and RESONANCE to 30%.
6. Set the Filter MODULATION amount to 80%.
7. In the FILTER ENVELOPE section, set ATTACK to 50%, DECAY to 70%, SUSTAIN to 30%, and RELEASE to 50%. This will set the "shape" of the modulation.
8. Play some notes. Classic hard-sync lead!
9. Experiment with the Filter Envelope's Attack, Decay, Sustain, and Release settings to better understand how these affect the shape of pitch modulation routed to Oscillator 2.
10. Also experiment with Oscillator 1's FREQ setting.
11. Try changing Oscillator 2's waveform setting.

A Final Word

The examples provided are pretty basic, but they give you some idea of the power of synthesis. Imagine what you can create by experimenting more with the oscillators, filter, envelopes, LFOs, and modulation.

It's often useful to start with a simple sound and make it progressively more complex, 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. Enjoy exploring the OB-X8!

Appendix A: Troubleshooting and Support

Troubleshooting

If you're experiencing problems or unexpected behavior from your OB-X8, here are a few typical scenarios and their solutions:

If the OB-X8 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 any of the LEFT/RIGHT or MONO OUTPUTS.
- In the GLOBAL menu, make sure that LOCAL CONTROL is set to ON.
- Check to see if the MANUAL switch is on (LED is lit.)

If the sequencer or arpeggiator has stopped running:

- Check the ARP CLOCK setting in GLOBAL to ensure the OB-X8 is set to INTERNAL. Or if set to CLOCK INPUT, MIDI DIN CLOCK, or MIDI USB CLOCK, make sure the OB-X8 is receiving external clock.

If some of the programs sound different than usual:

- In the Global menu, check ALT. TUNING SCALE and make sure it's set to EQUAL TEMPERAMENT. Also, check the Mod Box DEPTH position. The Mod Box vibrato LFO could be affecting pitch if the Mod Box settings are global. Also, check the ARP CLOCK setting in the GLOBAL menu to ensure the OB-X8 is set to INTERNAL. Or if set to a CLOCK mode, make sure the OB-X8 is receiving external clock.

If there is a ground hum in the audio output:

- USB can cause ground loops, so try disconnecting the USB cable, if present. If this removes the hum, resolve any grounding issues between the computer (if connected) and the OB-X8. Or use MIDI, which is opto-isolated.

If the OB-X8 is behaving erratically:

- Disconnect all OB-X8 MIDI connections (MIDI and USB cables) and see if the problem persists. Erratic behavior 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. You can also monitor the MIDI traffic with *MIDI Monitor* (Mac OS) or *MIDI-OX* (Windows) to see if the OB-X8 is being overrun with duplicate messages.

If the OB-X8 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 OB-X8 plays out of tune:

- Check the MASTER TUNE parameter in the GLOBAL menu to make sure it's set to 0.
- You may need to recalibrate the oscillators. See "Calibrating the VCOs and Filters" on page 74.

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

- Recalibrate the Pitch and Mod levers. See "Calibrating the Levers (Keyboard only)" on page 74.

If the filter sounds strange or out of tune:

- You may need to recalibrate the filters. See "Calibrating the VCOs and Filters" on page 74.

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 OB-X8 returns to its factory settings. No programs will be overwritten by this process.

To reset all Global parameters to their default settings:

1. Press the GLOBAL button.
2. Use the SCROLL knob to select RESET GLOBALS, then press WRITE. Globals are reset. You can now can play the OB-X8 again.

Contacting Technical Support

If you are still having a problem with the OB-X8, contact Technical Support at *support@oberheim.com*. Please include the purchase date of your OB-X8, its serial number, and the operating system version. Press the GLOBAL button to see this at the top right 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

Oberheim warrants that the OB-X8 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.oberheim.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@oberheim.com* to determine the best course of action for getting your OB-X8 repaired. For your own protection, as well as ours, please do not return any product to Oberheim 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 OB-X8'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 Oberheim. 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 B: Calibrating the OB-X8

Because the OB-X8 is calibrated at the factory, it 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 navigate to the FULL CALIBRATION command, then press WRITE.
3. The synthesizer performs its auto-calibration procedure.
4. When finished, the front panel controls will return to normal and you can play the OB-X8 again.

Calibrating the Levers (Keyboard only)

To calibrate the Pitch and Mod levers:

1. Press the GLOBAL button.
2. Use the SELECT knob to locate the LEVER CALIBRATION command, then follow the instructions in the display.
3. When finished, the Global menu is automatically exited.

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 OB-X8 returns to its factory settings. No programs are over-written by this process.

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 OB-X8 again.

Appendix C: Exporting and Importing Programs and Banks

You can use the SEND MIDI - PRESET, GROUP, BANK, ALL command in the GLOBAL menu to transmit the current preset, group, bank, or all banks in SysEx format via the selected MIDI port. Use the VALUE knob to select Preset, Group, Bank, or All banks. 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, group, 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 OB-X8.
4. Use the SCROLL knob to select MIDI PRESET CHANGE. Use the VALUE knob to select Transmit Only or Transmit & Receive.
5. Use the SCROLL knob to select MIDI SYSEX CABLE, then use the VALUE knob to choose USB.
6. Use the SCROLL knob to select SEND MIDI, and the VALUE knob to select PRESET, GROUP, BANK, or ALL depending on which of these you would like to transmit.
7. Press WRITE. The preset, group, or bank is exported.

Dumped programs will load back into the same bank and program location in memory when received by the OB-X8 via MIDI.

Programs can also be dumped directly from one OB-X8 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 OB-X8 as a SysEx file over MIDI:

1. Connect two OB-X8 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 SCROLL knob to select MIDI SYSEX CABLE, then use the VALUE knob to choose MIDI.
3. On both OB-X8s Use the SCROLL knob to select MIDI PRESET CHANGE. Use the VALUE knob to select Transmit & Receive.
4. On the OB-X8 that you want to send the programs to, press the GLOBAL button again to exit the GLOBAL menu.
5. On the OB-X8 that you want to send the programs from, in the GLOBAL menu select SEND MIDI - PRESET, GROUP, BANK, or ALL depending on which of these you would like to transmit.
6. Press WRITE. The program, group, or bank is exported to the other OB-X8.


Dumped programs will load back into the same bank and program location in memory when received by the OB-X8 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 OB-X8. 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 OB-X8.
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. Use the SCROLL knob to select MIDI PRESET CHANGE. Use the VALUE knob to select Receive Only or Transmit & Receive.
5. Open your MIDI librarian software and configure it to send SysEx messages to your OB-X8.

6. In the MIDI librarian, open the programs and/or banks you want to send.
7. Transmit the programs. The OB-X8 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 D: Factory Sounds List

OB-X8

G 1 P 1 It's an Oberheim!
G 1 P 2 X8 Brass
G 1 P 3 Dive Bomb Bass
G 1 P 4 Vox Eternal
G 1 P 5 SyncPad
G 1 P 6 Lyle
G 1 P 7 OB-8 Arpeggio
G 1 P 8 Wurligig
G 2 P 1 DX vs OBX
G 2 P 2 Expressivo
G 2 P 3 Destructibell
G 2 P 4 Organic
G 2 P 5 Stereo Bass
G 2 P 6 Echo Arpeggio
G 2 P 7 Dreamer
G 2 P 8 Aggression
G 3 P 1 Campfire Harp
G 3 P 2 Blaster Lead
G 3 P 3 Osaka
G 3 P 4 Symple Piano
G 3 P 5 Echoplasm
G 3 P 6 Kitschy Pins
G 3 P 7 Jersey Girl Bass
G 3 P 8 Orb8 X
G 4 P 1 Mr Steppy
G 4 P 2 SyncArpeggio
G 4 P 3 Haus Bass
G 4 P 4 Mirror Man
G 4 P 5 StabbyBrassy
G 4 P 6 Shine Up
G 4 P 7 Meditation Sweep
G 4 P 8 Slow Strings
G 5 P 1 Kick Drum
G 5 P 2 Snare-ish
G 5 P 3 Percpeggio
G 5 P 4 Toms
G 5 P 5 Triangle 808
G 5 P 6 Taiko Drum
G 5 P 7 Exotic Percs
G 5 P 8 DrumRoll
G 6 P 1 Fifth Swell
G 6 P 2 Obie Strings
G 6 P 3 Deep Squares
G 6 P 4 Bubbly Cauldron
G 6 P 5 Arpy Groove
G 6 P 6 Choirpad
G 6 P 7 Seismic Bass
G 6 P 8 Melting Faces
G 7 P 1 String Masheen
G 7 P 2 Low Saw Bass
G 7 P 3 Tangerine State
G 7 P 4 Karplucks
G 7 P 5 Vibey
G 7 P 6 Rippler
G 7 P 7 Blorch Injector
G 7 P 8 Rezzy Brass
G 8 P 1 Ober-Uber Clav
G 8 P 2 Slow Touching
G 8 P 3 Notta Delay
G 8 P 4 SEM Sizzle
G 8 P 5 Delayed Flight
G 8 P 6 Running Plucks
G 8 P 7 BlowOut Bass
G 8 P 8 Comes a'Knockin'
G 9 P 1 Voyet Sqrx
G 9 P 2 Slide Home
G 9 P 3 Pong
G 9 P 4 June Gloom
G 9 P 5 Blenderizer
G 9 P 6 Strummer
G 9 P 7 Pedal Harp
G 9 P 8 Thick Xa Bass
G 10 P 1 Fountaysia
G 10 P 2 NotchyWash
G 10 P 3 Rossum8or
G 10 P 4 Mallet Plonk
G 10 P 5 Sparkle Plenty
G 10 P 6 LittleSequence
G 10 P 7 Body Bass
G 10 P 8 Shore Line
G 11 P 1 Cinemotion
G 11 P 2 Mallets X8
G 11 P 3 Organic Velocity
G 11 P 4 Nice Hollow
G 11 P 5 Touch Arpeggio
G 11 P 6 B Bass
G 11 P 7 Sweep St8x
G 11 P 8 Chaos Engine
G 12 P 1 Notcho Cheese
G 12 P 2 Harmo Whistle
G 12 P 3 ebivibe
G 12 P 4 FM Bassorama
G 12 P 5 Smooth Wave
G 12 P 6 Runner
G 12 P 7 Carrilon Bells
G 12 P 8 Clavinot
G 13 P 1 Kalimbooo
G 13 P 2 Unstable Pad
G 13 P 3 Octavius
G 13 P 4 Square Space
G 13 P 5 Straw Bent
G 13 P 6 OBlophone
G 13 P 7 Monstrosity
G 13 P 8 PsuedoBenignBas
G 14 P 1 Surgery Dervish
G 14 P 2 Afterglow
G 14 P 3 SEM Bass
G 14 P 4 Reverse Logic
G 14 P 5 Highpass Swell
G 14 P 6 Voxy Bass
G 14 P 7 Broken Signal Pad
G 14 P 8 Arctic Wind
G 15 P 1 Seq It To Me
G 15 P 2 Phasey Daysey
G 15 P 3 X-Tension
G 15 P 4 Phantoms
G 15 P 5 Sola Bzzz
G 15 P 6 Raindrop
G 15 P 7 Yeeow Bass
G 15 P 8 AI Will Eat You
G 16 P 1 Struck MetalArp
G 16 P 2 Vintage S&H
G 16 P 3 FunUnderPresh
G 16 P 4 Melting Crystal
G 16 P 5 Instant Horror
G 16 P 6 Dark Chamber
G 16 P 7 Clock Bell
G 16 P 8 Old Coms

OB-8

G 1 P 1 Brass Ensemble
G 1 P 2 St. Genevieve
G 1 P 3 String Ensemble
G 1 P 4 Vibes
G 1 P 5 Accel Rotary Organ
G 1 P 6 Whistle
G 1 P 7 Repeat
G 1 P 8 Bouncing Ball
G 2 P 1 Dem Bones
G 2 P 2 Clavinet
G 2 P 3 High Strings
G 2 P 4 Digital Piano
G 2 P 5 Cathedral Organ
G 2 P 6 Chorus
G 2 P 7 Pulse Sweep
G 2 P 8 Calliope
G 3 P 1 French Horns
G 3 P 2 Bass 1
G 3 P 3 Bright Strings
G 3 P 4 Electric Piano
G 3 P 5 Rotary Organ
G 3 P 6 Bagpipes
G 3 P 7 Quantized LFO
G 3 P 8 Rush Rezz
G 4 P 1 Trumpet
G 4 P 2 Magic Clavinet
G 4 P 3 Slow Strings
G 4 P 4 Resonance Sweep
G 4 P 5 Combo Organ
G 4 P 6 Double Reed
G 4 P 7 Farr's Funk
G 4 P 8 FM
G 5 P 1 Trumpet Ensemble
G 5 P 2 Bass 2
G 5 P 3 Four Pole Strings
G 5 P 4 Reed Piano
G 5 P 5 Circus Organ
G 5 P 6 Sax
G 5 P 7 Harp
G 5 P 8 Distortion Solo
G 6 P 1 Tropical Horns
G 6 P 2 Rubber Clavinet
G 6 P 3 Strings 2
G 6 P 4 Klink Piano
G 6 P 5 Hymn Organ
G 6 P 6 Recorder
G 6 P 7 Long Chimes
G 6 P 8 Percussive Solo
G 7 P 1 Comp Horns
G 7 P 2 Bells
G 7 P 3 Four Pole Strings 2
G 7 P 4 Soft Piano
G 7 P 5 Birds
G 7 P 6 Vocal Wow
G 7 P 7 Marimbas
G 7 P 8 Rock Unison
G 8 P 1 Delayed Octave
G 8 P 2 Trig Pulse Width
G 8 P 3 Poly Portamento
G 8 P 4 Steel Drums
G 8 P 5 Square Mod
G 8 P 6 Comp Synth
G 8 P 7 Unison Portamento
G 8 P 8 Delay Mod
G 9 P 1 Swell Horns
G 9 P 2 Sitar
G 9 P 3 Fiddle
G 9 P 4 Saw Piano
G 9 P 5 Pulse Width Rezz
G 9 P 6 Triangle Comp
G 9 P 7 Jazz Solo
G 9 P 8 Earthquake
G 10 P 1 S/H Port Rezz
G 10 P 2 Conga
G 10 P 3 Strings 3
G 10 P 4 Funky Keys
G 10 P 5 Fading Detune
G 10 P 6 Tremolo Rezz
G 10 P 7 Box O' Pups
G 10 P 8 Stereo Spin
G 11 P 1 Decelerate
G 11 P 2 Carillon
G 11 P 3 Solo Strings
G 11 P 4 Detuned Long Piano
G 11 P 5 Filter Drone
G 11 P 6 3 Way
G 11 P 7 Harmonic Percuss
G 11 P 8 Chopper
G 12 P 1 Tuned Portamento
G 12 P 2 Alien Craft
G 12 P 3 Strings 4
G 12 P 4 Pulse Width Mod
G 12 P 5 Whippets
G 12 P 6 Metal Solo
G 12 P 7 Clave
G 12 P 8 Jet
G 13 P 1 Water Wiggle
G 13 P 2 Stripper Sax
G 13 P 3 Rosin Strings
G 13 P 4 Flanged Piano
G 13 P 5 Saw Mod
G 13 P 6 Impact
G 13 P 7 Thunder
G 13 P 8 Start Engines

OB-Xa

G 1 P 1 Brass Ensemble
G 1 P 2 Clavinet
G 1 P 3 Low Strings
G 1 P 4 Electric Piano
G 1 P 5 Rotary Organ
G 1 P 6 Flutes
G 1 P 7 Harpsichord
G 1 P 8 Rock Unison
G 2 P 1 French Horns
G 2 P 2 Celeste
G 2 P 3 High Strings
G 2 P 4 Electronic Piano
G 2 P 5 Pipe Organ
G 2 P 6 Xa Chorus
G 2 P 7 Harp I
G 2 P 8 Calliope
G 3 P 1 Trumpet Ensemble
G 3 P 2 Harmonica
G 3 P 3 Strings I
G 3 P 4 Accordion
G 3 P 5 Filter Drone
G 3 P 6 Bag Pipes
G 3 P 7 Banjo
G 3 P 8 Rush Rezz
G 4 P 1 Trumpets
G 4 P 2 Mellow Wow
G 4 P 3 Slow Strings
G 4 P 4 Resonance Sweep
G 4 P 5 Combo Organ
G 4 P 6 Double Reed
G 4 P 7 Farr's Funk
G 4 P 8 Pizzicato
G 5 P 1 Modern Horns
G 5 P 2 Bass I
G 5 P 3 4-Pole Strings
G 5 P 4 Reed Piano
G 5 P 5 Perc Organ
G 5 P 6 Sax
G 5 P 7 Harp II
G 5 P 8 Orient Unison
G 6 P 1 Tropical Horns
G 6 P 2 Rubber Clav
G 6 P 3 Strings II
G 6 P 4 Edge Piano
G 6 P 5 Hymn Organ
G 6 P 6 Recorder
G 6 P 7 Long Chimes
G 6 P 8 Unison Fear
G 7 P 1 Comp Horns
G 7 P 2 Bells
G 7 P 3 Strings III
G 7 P 4 Soft Piano
G 7 P 5 Reed Organ
G 7 P 6 Vocal Wow
G 7 P 7 Marimba
G 7 P 8 Terror
G 8 P 1 F-Env Horns
G 8 P 2 S/H Fifths
G 8 P 3 Poly Port
G 8 P 4 Steel Drums
G 8 P 5 Square Mod
G 8 P 6 Comp Synth
G 8 P 7 Unison Port
G 8 P 8 Delay Mod
G 9 P 1 Tenth Decay
G 9 P 2 Sitar
G 9 P 3 Fiddle
G 9 P 4 Pulse Comp
G 9 P 5 PW Rezz
G 9 P 6 Comedy Comp
G 9 P 7 Jazz Solo
G 9 P 8 Earthquake
G 10 P 1 S/H Port Rezz
G 10 P 2 Conga
G 10 P 3 Strings IV
G 10 P 4 Funk Keys
G 10 P 5 Organ
G 10 P 6 Tremolo Rezz
G 10 P 7 Box O' Pups
G 10 P 8 Martian Hop
G 11 P 1 Claps
G 11 P 2 Carillon
G 11 P 3 Solo Strings
G 11 P 4 Tuned Bees
G 11 P 5 Rezz Reeds
G 11 P 6 Three Way
G 11 P 7 Percussion
G 11 P 8 Chopper
G 12 P 1 Io
G 12 P 2 S/H PW
G 12 P 3 Strings V
G 12 P 4 Clarinet
G 12 P 5 Bright Drone
G 12 P 6 Solo Unison
G 12 P 7 Claves
G 12 P 8 Jet
G 13 P 1 Water Wiggle
G 13 P 2 Water Piano
G 13 P 3 Slower Strings
G 13 P 4 Flanged Piano
G 13 P 5 Space Bugs
G 13 P 6 Taped Voices
G 13 P 7 Thunder
G 13 P 8 Pong

OB-SX

G 1 P 1 Brass Ensemble
G 1 P 2 Clavinet
G 1 P 3 Low Strings
G 1 P 4 Electric Piano
G 1 P 5 Percussive Organ
G 1 P 6 Flutes
G 1 P 7 Harpsichord
G 1 P 8 Lead Sync
G 2 P 1 Classic Horns
G 2 P 2 Celeste
G 2 P 3 High Strings
G 2 P 4 Brass in Fifths
G 2 P 5 Pipe Organ
G 2 P 6 OB-SX Choir
G 2 P 7 Harp
G 2 P 8 Calliope
G 3 P 1 Calculator
G 3 P 2 Mellow Wow
G 3 P 3 Fiddle
G 3 P 4 Reed Piano
G 3 P 5 Double Reed
G 3 P 6 Sax
G 3 P 7 Marimba
G 3 P 8 PW Rezz
G 4 P 1 Trumpets
G 4 P 2 Pop Organ
G 4 P 3 Slow Strings
G 4 P 4 Rezz Sweep
G 4 P 5 Combo Organ
G 4 P 6 SX-6
G 4 P 7 SX-7
G 4 P 8 SX-8
G 5 P 1 Ensemble Trmpets
G 5 P 2 Poly Portamento
G 5 P 3 Strings
G 5 P 4 Accordion
G 5 P 5 Filter Drone
G 5 P 6 Pulse Comp
G 5 P 7 Steel Drums
G 5 P 8 Water Wiggle
G 6 P 1 Square Wave Mod
G 6 P 2 Bells
G 6 P 3 Strings II
G 6 P 4 Sitar
G 6 P 5 Unison Portamento
G 6 P 6 Cross Mod Delay
G 6 P 7 Kalimba
G 6 P 8 Solo Unison
G 7 P 1 Bass
G 7 P 2 Cross Mod Bells
G 7 P 3 Solo Strings
G 7 P 4 Harmonica
G 7 P 5 Rotary Organ
G 7 P 6 Clarinet
G 7 P 7 Conga
G 7 P 8 Rush Rezz

OB-X

G 1 P 1 Brass Ensemble
G 1 P 2 Clavinet
G 1 P 3 Low Strings
G 1 P 4 Electric Piano
G 1 P 5 Percussive Organ
G 1 P 6 Flutes
G 1 P 7 Harpsichord
G 1 P 8 Lead Sync
G 2 P 1 Classic Horns
G 2 P 2 Celeste
G 2 P 3 High Strings
G 2 P 4 Bells
G 2 P 5 Pipe Organ
G 2 P 6 Swimmy Pad
G 2 P 7 Harp
G 2 P 8 Calliope
G 3 P 1 Brass in Fifths
G 3 P 2 Mellow Perc Organ
G 3 P 3 Slow Strings
G 3 P 4 Rez Sweep Pad
G 3 P 5 Farfisa
G 3 P 6 Narrow Vib
G 3 P 7 Farr's Funk
G 3 P 8 Stab Lead
G 4 P 1 Trumpet
G 4 P 2 Sample and Hold
G 4 P 3 Poly Portamento
G 4 P 4 Metal Percussion
G 4 P 5 Windy
G 4 P 6 Square Wave Mod
G 4 P 7 Slow Glide
G 4 P 8 Spacey Xmod

SPLIT

Airhorn Split
Buzzbomb Split
Oberheim Split
Moody Split
Mallet Split
Drums Split
Steppy Wurli Split
Mellow Split
Progrock Split
C;avinete Split
Fountasy Split
Vocalize Split
Octavius Split
Organic DX Split
Aggressive Split
Horror Film Split

DOUBLE

G1

Brass Hollow
Bellvox
Stringstack
Osaka Sunrise
Mirages
Orphan Cloned
Echotronic
Bigbells

G2

Exotic Drums
Spitty Brass
Bigpad
Resonant Swell
For Vangelis
Malletizer
Tales With Tails
Bad Robots

Appendix E: Alternative Tunings

By default, the OB-X8 is set to standard, chromatic western tuning. Additionally, it supports up to 63 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 OB-X8 using SysEx Librarian for Mac or MIDI-OX for Windows.

Here are descriptions of the default OB-X8 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, Piano 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)

OB-X8 MIDI Implementation

The OB-X8 receives MIDI data according to the settings you have chosen in GLOBALS. In addition, there is interaction between some of the program parameters that determine the overall response of OB-X8 to MIDI data. These are the GLOBAL parameters that affect response to MIDI:

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

Param Param Send: Off, CC, NRPN—Changes to the values of front panel controls are transmitted via MIDI as Continuous Controllers (CC) or Non-Registered Parameter Number (NRPN). 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

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

MIDI Control Enable: Off, On— Sets the OB-X8's ability to receive MIDI messages. When set to On, the synth will respond to MIDI controllers, including pitch wheel, mod wheel, pedal, and volume.

MIDI SysEx Cable: Off, MIDI, USB—When set to MIDI it will receive and transmit MIDI SysEx messages using the MIDI ports/cables When set to USB it will receive and transmit MIDI SysEx messages using the USB port/cable. When set to OFF, no SysEx will be received or transmitted on any of the ports. MIDI SysEx messages are used when sending and receiving a variety of data including, programs, alternative tunings, system updates, and more.

MIDI Out Cable: Off, MIDI, USB, All—Sets the port, MIDI and/or USB, by which MIDI signals are sent. When set to OFF, no MIDI data will be sent out any of the ports.

MIDI Messages

Received Channel Messages

Status	Second	Third	Description
1000 nnnn	0kkkkkkk	0vvvvvvv	Note Off. Velocity is ignored
1001 nnnn	0kkkkkkk	0vvvvvvv	Note On. Note off if vvvvvvv = 0
1010 nnnn	0kkkkkkk	0vvvvvvv	Polyphonic Key Pressure
1011 nnnn	0vvvvvvv	0vvvvvvv	Control Change; see “Received Controller Messages”
1100 nnnn	0ppppppp		Program change, 0-39 for Programs 0-7 within Group 1, 8-15 within Group 2, 16-23 within Group 3, 24-31 within Group 4, 32-39 within Group 5, 40-47 within Group 6, 48-55 within Group 7, 56-63 within Group 8, 64-71 within Group 9, 72-79 within Group 10, 80-87 within Group 11, 88-95 within Group 12, 96-103 within Group 13, 104-111 within Group 14, 112-119 within Group 15, 120-127 within Group 16
1101 nnnn	0vvvvvvv		Channel Pressure
1110 nnnn	0vvvvvvv	0vvvvvvv	Pitch Bend LS Byte then MS Byte

Notes: 0kkkkkkk Note number 0-127
nnnn Channel number 0 to 15 (MIDI channel 1-16). Ignored if MIDI channel set to ALL
0vvvvvvv Value

Received Controller Messages

Status	Second	Third	Description
1011 nnnn	0000 0001	0vvvvvvv	Mod Wheel: directly assignable controller
1011 nnnn	0000 0100	0vvvvvvv	Foot Controller: directly assignable controller
1011 nnnn	0100 1010	0vvvvvvv	Brightness: Added to filter cutoff frequency
1011 nnnn	0010 0000	0vvvvvvv	Bank Select: 1 - 5 select user banks 1 - 5; 6 - 9 select factory banks 1 - 4
1011 nnnn	0100 0000	0vvvvvvv	Damper pedal: Holds envelopes in Sustain if 0100 0000 or higher
1011 nnnn	0111 1011	0vvvvvvv	All Notes Off: Clear all MIDI notes
1011 nnnn	0111 1001	0vvvvvvv	Reset All Controllers: Clears all MIDI controllers to 0, MIDI volume to maximum

See subsequent sections for additional Continuous Controller (CC) and Non-Registered Parameter Number (NRPN) messages received.

Transmitted Channel Messages

Status	Second	Third	Description
1000 nnnn	0kkkkkkk	0000000	Note Off.
1001 nnnn	0kkkkkkk	0vvvvvvv	Note On.
1011 nnnn	0vvvvvvv	0vvvvvvv	Control Change; see “Transmitted Controller Messages”
1100 nnnn	0ppppppp		Program change
1101 nnnn	0vvvvvvv		Channel Pressure
1110 nnnn	0vvvvvvv	0vvvvvvv	Pitch Bend LS Byte then MS Byte

Notes: 0kkkkkkk Note number 0 — 127
nnnn Channel number 0 to 15 (MIDI channel 1-16). Ignored if MIDI channel set to ALL
0vvvvvvv Value

Transmitted Controller Messages

Status	Second	Third	Description
1011 nnnn	0000 0001	0vvvvvvv	Mod Wheel
1011 nnnn	0000 0010	0vvvvvvv	Breath Controller: When assigned to Pedal/CV
1011 nnnn	0000 0100	0vvvvvvv	Foot Controller: When assigned to Pedal/CV
1011 nnnn	0000 1101	0vvvvvvv	Expression: When assigned to Pedal/CV
1011 nnnn	0000 0111	0vvvvvvv	Volume: When assigned to Pedal/CV
1011 nnnn	0100 1010	0vvvvvvv	Brightness: Assigned to Pedal/CV
1011 nnnn	0010 0000	0vvvvvvv	Bank Select: 1 – 5
1011 nnnn	0100 0000	0vvvvvvv	Damper pedal: Sends 0 if off, 0111 1111 when on

See sections that follow for additional Continuous Controller (CC) and Non-Registered Parameter Number (NRPN) messages transmitted.

Additional Continuous Controllers Transmitted/Received

The following table details how MIDI Continuous Controllers (CCs) are mapped to OB-X8 controls. They are transmitted when Param Xmit is set to CC, and recognized/received when Param Rcv is set to CC.

CC#	Param	Range
0	BANK SELECT MSB	0-127
1	MOD BOX LFO2 BEND AMOUNT	0-255
3	VINTAGE	0-127
5	PORTAMENTO RATE	0-127
6	DATA ENTRY MSB	0-1
7	MASTER VOLUME	0-127
8	PROGRAM VOLUME	0-127
9	TRANSPOSE UP/DOWN	0-2
10	PAGE 2 PANWIDTH	0-2
11	EXPRESION PEDAL	0-127
12	OSC 1 XMOD	0-1
12	OSC 1 FILTER ENV MOD	0-1
13	PAGE 2 OSC XMOD AMT	0-127
15	OSC 1 FREQ	0-63
16	0SC 2 FREQ	0-63
17	OSC 2 DETUNE	0-63
18	PAGE 2 VOICE DETUNE RANGE	0-127
19	OSC 1 WAVEFORM	0-3
20	OSC 2 WAVEFORM	0-3
21	OSC 1 PW	0-127
22	OSC 2 PW	0-127
23	OSC SQUARE MODE	0-1
24	OSC 1 SYNC	0-1
25	OSC 1 LEVEL	0-1
26	OSC 2 LEVEL	0-1
27	PAGE 2 OSC 1 ON LEVEL	0-127
28	PAGE 2 OSC 2 ON LEVEL	0-127
29	NOISE LEVEL	0-1
30	PAGE 2 NOISE ON LEVEL	0-127
31	FILTER MODULATION	0-127
32	BANK SELECT LSB	0-127
33	FILTER FREQUENCY	00-175

CC#	Param	Range
34	FILTER RESONANCE	0-127
35	FILTER TYPE	0-5
36	FILTER KEYBOARD	0-1
37	PAGE 2 FILTER KBD ON LEVEL	0-127
38	DATA ENTRY LSB	0-127
39	FILTER ENV ATTACK	0-255
40	FILTER ENV DECAY	0-255
41	FILTER ENV SUSTAIN	0-127
42	FILTER ENV RELEASE	0-255
43	FILTER ENV VELOCITY ON/OFF	0-1
44	FILTER PRESSURE	0-1
45	VOLUME ENV ATTACK	0-255
46	VOLUME ENV DECAY	0-255
47	VOLUME ENV SUSTAIN	0-127
48	VOLUME ENV RELEASE	0-255
49	VOLUME ENV VELOCITY ON/OFF	0-1
50	ENV TYPE	0-1
51	LFO 1 RATE	0-127
52	LFO 1 SHAPE	0-4
53	LFO 1 DEPTH 1	0-127
54	LFO 1 DEPTH 2	0-127
55	LFO 1 DEST 1 OSC 1	0-1
56	LFO 1 DEST 1 OSC 2	0-1
57	LFO 1 DEST 1 FILTER	0-1
58	LFO 1 DEST 2 PWM 1	0-1
59	LFO 1 DEST 2 PWM 2	0-1
60	LFO 1 DEST 2 VOLUME	0-1
61	LFO PRESSURE	0-1
62	PAGE 2 LFO TYPE	0-1
63	PAGE 2 LFO SAMPLE/HOLD IN	0-1
64	SUSTAIN	0-1
70	UNISON	0-1
71	UNISON VOICE COUNT	0-7
72	UNISON KEY MODE	0-5
73	PAGE 2 PEDAL RELEASE	0-255
74	BRIGHTNESS (FILTER CUTOFF - RELATIVE)	0-175

CC#	Param	Range
75	MOD BOX LFO 2 RATE	0-127
76	MOD BOX LFO 2 SHAPE	0-5
77	MOD BOX LFO 2 DEST OSC 1	0-1
78	MOD BOX LFO 2 DEST OSC 2	0-1
79	MOD BOX LFO 2 DEPTH	0-127
80	MOD BOX LFO 2 BEND OSC 2 ONLY	0-1
81	MOD BOX MODE	0-1
82	MOD BOX LFO 2 LOWER	0-1
83	MOD BOX LFO 2 UPPER	0-1
84	MOD BOX ARP ON	0-1
85	MOD BOX ARP SPEED	0-127
86	MOD BOX ARP HOLD KBD	0-2
87	MOD BOX ARP DOWN/UP	0-3
88	MOD BOX ARP LOWER	0-1
89	MOD BOX ARP UPPER	0-1
90	ARP TRANSPOSE	0-2
91	PAGE 2 PORTAMENTO MODE	0-66
92	PAGE 2 PORTAMENTO MATCH	0-1
93	PAGE 2 PORTAMENTO QUANTIZE	0-1
94	PAGE 2 PORTAMENTO LEGATO	0-1
95	LOWER/UPPER/NO SELECT	0-2
96	DATA INCREMENT	+1
97	DATA DECREMENT	-1
98	NRPN LSB	
99	NRPN MSB	
100	RPN LSB	
101	RPN MSB	
102	PAGE 2 LFO 1 TRIGGER	0-1
103	PAGE 2 LFO 1 TRIGGER PHASE	0-127
104	PAGE 2 LFO 1 KBD TRACK	0-1
105	PAGE 2 LFO 1 MOD 1 RAMP DELAY	0-127
106	PAGE 2 LFO 1 MOD 1 RAMP UP	0-127
107	PAGE 2 LFO 1 RAMP INVERT	0-1
108	PAGE 2 LFO 1 MOD 1 QUANTIZE	0-1
109	PAGE 2 LFO 1 OSC 1 MOD 1 INVERT	0-1
110	PAGE 2 LFO 1 MOD 2 RAMP DELAY	0-127

CC#	Param	Range
111	PAGE 2 LFO 1 MOD 2 RAMP UP	0-127
112	PAGE 2 LFO 1 MOD 2 RAMP INVERT	0-1
113	PAGE 2 LFO 1 MOD 2 QUANTIZE	0-1
114	PAGE 2 LFO 1 OSC 1 MOD 2 INVERT	0-1
115	PAGE 2 MOD 2 RAMP TO LFO SPEED	0-1
116	PAGE 2 LFO SHIFT VOICES 5-8	0-2
117	PAGE 2 CHORD KEY LIMIT	0-127
118	PAGE 2 CHORD HOLD MODE	0-1
119	NORMAL/SPLIT/DOUBLE MODE	0-2
120	ALL SOUND OFF	
121	RESET CONTROLLERS	
122	LOCAL CONTROL ON/OFF	0-1
123	ALL NOTES OFF	
124	OMNI MODE OFF	
125	OMNI MODE ON	
126	MONO MODE ON	
127	POLY MODE ON	

NRPN Messages

The Non-Registered Parameter Number (NRPN) MIDI messages are used to transmit and receive both global and program parameters. They are transmitted when MIDI Parameter Send is set to NRPN in GLOBALS, and received when MIDI Parameter Receive is set to NRPN in GLOBALS.

The messages are handled in standard MIDI format using the NRPN CC commands in running status byte format. Below is the format used for transmitting a NRPN parameter.

Transmitted NRPN Messages

Status	Description
1011 nnnn	Control Change
0110 0011	NRPN parameter number MSB CC
0vvv vvvv	Parameter Number MSB
0110 0010	NRPN parameter number LSB CC
0vvv vvvv	Parameter Number LSB
0000 0110	NRPN parameter value MSB CC
0vvv vvvv	Parameter value MSB
0010 0110	NRPN parameter value LSB CC
0vvv vvvv	Parameter value LSB

The parameter number can be found in the two tables below, one for global parameters, and the other for program parameters. The parameter numbers and the parameter values are broken into two 7-bit bytes for MIDI transmission; the LSB has the seven least-significant bits, and the MSB has the seven most-significant bits, though in most cases the MSB will be zero or one, and never more than two.

When receiving an NRPN, all messages do not necessarily need to be transmitted, since the synth will track the most recent NRPN number, though it is usually good practice to send the entire message above.

Once an NRPN is selected, the synth will also respond to NRPN Data Increment and Decrement commands, which some controllers utilize. Finally, it responds to one RPN (Registered Parameter Number) command, the RPN/NRPN Reset command, which can be handy for resetting the currently selected parameter to a known state.

Received NRPN Messages

Status	Second	Third	Description
1011 nnnn	0110 0011	0vvvvvvv	NRPN parameter number MSB CC
1011 nnnn	0110 0010	0vvvvvvv	NRPN parameter number LSB CC
1011 nnnn	0000 0110	0vvvvvvv	NRPN parameter value MSB CC
1011 nnnn	0010 0110	0vvvvvvv	NRPN parameter value LSB CC
1011 nnnn	0110 0000	0xxxxxxx	NRPN parameter value Increment
1011 nnnn	0110 0001	0xxxxxxx	NRPN parameter value Decrement
1011 nnnn	0010 0101	0111111	RPN parameter number MSB CC - Reset NRPN parameter number (when both MSB and LSB received)
1011 nnnn	0010 0100	0111111	RPN parameter number LSB CC - Reset NRPN parameter number (when both MSB and LSB received)

Control NRPN Data

The following table lists the OB-X8's control NRPN data. It is received and transmitted but not saved as part of a program.

Name	NRPN	Range
OSC 1 FREQUENCY	1	0-63
OSC 2 FREQUENCY	2	0-63
OSC 2 DETUNE	3	0-63
PAGE 2 VOICE DETUNE RANGE	4	0-127
OSC 1 WAVEFORM	5	0-3
OSC 2 WAVEFORM	6	0-3
OSC 1 PULSEWIDTH	7	0-127
OSC 2 PULSEWIDTH	8	0-127
OSC 1 XMOD	9	0-1
OSC SQUARE MODE	10	0-1
PAGE 2 OSC XMOD AMOUNT	11	0-127
OSC 1 FILT ENV MOD	12	0-1
OSC SYNC	13	0-1
PORTAMENTO RATE	14	0-127
PAGE 2 PORTA MODE	15	0-66
PAGE 2 PORTA MATCH	16	0-1
PAGE 2 PORTA QUANTIZE	17	0-1
PAGE 2 PORTA LEGATO	18	0-1
OSC 1 LEVEL	19	0-1
OSC 2 LEVEL	20	0-1
NOISE LEVEL	21	0-1
FILTER FREQUENCY	22	0-175
FILTER RESONANCE	23	0-127
FILTER TYPE	24	0-5
FILTER KBD TRACK	25	0-1
VINTAGE	26	0-127
PAGE 2 LFO TYPE	27	0-1

Name	NRPN	Range
PAGE 2 LFO S+H IN	28	0-1
LFO 1 RATE	29	0-127
LFO 1 SHAPE	30	0-4
LFO 1 DEPTH 1	31	0-127
LFO 1 DEPTH 2	32	0-127
LFO 1 DEST 1 OSC 1	33	0-1
LFO 1 DEST 1 OSC 2	34	0-1
LFO 1 DEST FILTER	35	0-1
LFO 1 DEST 2 PWM 1	36	0-1
LFO1 DEST 2 PWM 2	37	0-1
LFO 1 DEST 2 VOLUME	38	0-1
PAGE 2 LFO 1 TRIGGER	39	0-1
PAGE 2 LFO TRIG PHASE	40	0-127
PAGE 2 LFO 1 KBD TRACK	41	0-1
PAGE 2 LFO 1 MOD 1 RAMP DELAY	42	0-127
PAGE 2 LFO 1 MOD 1 RAMP UP	43	0-127
PAGE 2 LFO 1 MOD 1 RAMP INVERT	44	0-1
PAGE 2 LFO 1 MOD 1 QUANTIZE	45	0-1
PAGE 2 LFO 1 OSC 1 MOD 1 INVERT	46	0-1
PAGE 2 LFO 1 MOD 2 RAMP DELAY	47	0-127
PAGE 2 LFO 1 MOD 2 RAMP UP	48	0-27
PAGE 2 LFO 1 MOD 2 RAMP INVERT	49	0-1
PAGE 2 LFO 1 MOD 2 QUANTIZE	50	0-1
PAGE 2 LFO 1 OSC 1 MOD 2 INVERT	51	0-1
PAGE 2 LFO 1 MOD 2 RAMP TO LFO SPEED	52	0-1
PAGE 2 LFO SHIFT VOICES 5-8	53	0-2
MOD BOX LFO 2 RATE	54	0-127

Control NRPN Data (Continued)

The following table lists the OB-X8's control NRPN data. It is received and transmitted but not saved as part of a program.

Name	NRPN	Range
MOD BOX LFO 2 SHAPE	55	0-5
MOD BOX LFO 2 DEST OSC 2	56	0-1
MOD BOX LFO 2 DEST OSC 2	57	0-1
MOD BOX LFO 2 DEPTH	58	0-127
FILTER MODULATION	59	0-127
FILTER ENV ATTACK	60	0-255
VOLUME ENV ATTACK	61	0-255
FILTER ENV DECAY	62	0-255
VOLUME ENV DECAY	63	0-255
FILTER ENV SUSTAIN	64	0-127
VOLUME ENV SUSTAIN	65	0-127
FILTER ENV RELEASE	66	0-255
VOL ENV RELEASE	67	0-255
FILTER ENV VELO ON/OFF	68	0-1
VOL ENV VELO ON/OFF	69	0-1
PRESSURE > FILTER	70	0-1
PRESSURE > LFO	71	0-1
MOD BOX LFO 2 BEND AMT	72	0-12
PROGRAM VOLUME	73	0-127
UNISON	74	0-1
UNISON VOICE COUNT	75	0-7
UNISON KEY MODE	76	0-5
MOD BOX MODE	77	0-1
MOD BOX LFO 2 LOWER	78	0-1
MOD BOX LFO 2 UPPER	79	0-1
MOD BOX ARP ON	80	0-1
MOD BOX ARP SPEED	81	0-27
MOD BOX ARP HOLD KBD	82	0-2
MOD BOX ARP DOWN/UP	83	0-3
MOD BOX ARP LOWER	84	0-1
MOD BOX ARP UPPER	85	0-1

Name	NRPN	Range
ARP NUMBER OF TRANS-POSE INTERVALS	86	0-5
ARP TRANS INTVAL NOTE 0	87	0-120
ARP TRANS INTVAL NOTE 1	88	0-120
ARP TRANS INTVAL NOTE 2	89	0-120
ARP TRANS INTVAL NOTE 3	90	0-120
ARP TRANS INTVAL NOTE 4	91	0-120
MODBOX LFO 2 BEND OSC 2	92	0-1
PAGE 2 PEDAL RELEASE	93	0-255
PAGE 2 CHORD KEY LIMIT	94	0-1207
PAGE 2 CHORD HOLD MODE	95	0-1
ENVELOPE TYPE	96	0-2
PAGE 2 OSC 1 ON LEVEL	97	0-127
PAGE 2 OSC 2 ON LEVEL	98	0-127
PAGE 2 NOISE ON LEVEL	99	0-127
PAGE 2 PAN MODE	100	0-4
PAGE 2 PAN WIDTH	101	0-2
PROGRAM NAME CHAR 0	102	0-87
PROGRAM NAME CHAR 1	103	0-87
PROGRAM NAME CHAR 2	104	0-87
PROGRAM NAME CHAR 3	105	0-87
PROGRAM NAME CHAR 4	106	0-87
PROGRAM NAME CHAR 5	107	0-87
PROGRAM NAME CHAR 6	108	0-87
PROGRAM NAME CHAR 7	109	0-87
PROGRAM NAME CHAR 8	110	0-87
PROGRAM NAME CHAR 9	111	0-87
PROGRAM NAME CHAR 10	112	0-87

Control NRPN Data (Continued)

Name	NRPN	Range
PROGRAM NAME CHAR 11	113	0-87
PROGRAM NAME CHAR 12	114	0-87
PROGRAM NAME CHAR 13	115	0-87
PROGRAM NAME CHAR 14	116	0-87
PROGRAM NAME CHAR 15	117	0-87
PROGRAM NAME CHAR 16	118	0-87
PROGRAM NAME CHAR 17	119	0-87
PROGRAM NAME CHAR 18	120	0-87
PROGRAM NAME CHAR 19	121	0-87
MOD BOX TRANSPOSE UP/ DOWN	122	0-2
PAGE 2 FILTER KBD TRACK	123	0-127
SPLIT PARAMS UPPER LEVEL (UPPER/LOWER)	1122 1090	0-63
SPLIT PARAMS SPLIT POINT (UPPER/LOWER)	1123 1092	0-127
SPLIT LOWER TRANSPOSE	1093	0-72
SPLIT UPPER TRANSPOSE	1125	0-72
SPLIT LOWER DETUNE	1094	0-64
SPLIT PAN MODE	1076	0-4
SPLIT PAN WIDTH	1077	0-2
SPLIT HOLD/CHORD SOURCE	1072	0-2
SPLIT BOX MOD SOURCE	1061	0-2
SPLIT ARP SOURCE	1047	0-2

SysEx Messages

Universal System Exclusive Message (Device Inquiry)

Status	Description
1111 0000	System Exclusive (SysEx)
0111 1110	Non-realtime message
0vvv vvvv	If MIDI channel is set to 1 - 16, 0vvvvvvv must match (unless MIDI Channel = ALL); always responds if 0vvvvvvv = 0111 1111.
0000 0110	Inquiry Message
0000 0001	Inquiry Request
1111 0111	End of Exclusive (EOX)

The OB-X8 responds with:

Status	Description
1111 0000	System Exclusive (SysEx)
0111 1110	Non-realtime message
0vvv vvvv	If MIDI Channel = ALL, 0vvvvvvv = 0111 1111. Otherwise 0vvvvvvv = Channel Number 0 - 15.
0000 0110	Inquiry Message
0000 0010	Inquiry Reply
0000 0001	DSI ID
0011 0011	OB-X8 ID (Family LS)
0000 0001	Family MS
0000 0000	Family Member LS
0000 0000	Family Member MS
0000 nnnn	Main OS Version High Byte
0000 nnnn	Main OS Version Middle Byte
0000 nnnn	Main OS Version Low Byte
1111 0111	End of Exclusive (EOX)

Request Program Dump

Status	Description
1111 0000	System Exclusive (SysEx)
0000 0001	DSI ID
0011 0001	OB-X8 ID
0000 0101	Request Program Transmit
0000 00vv	Bank Number, 0 - 7
0vvv vvvv	Program Number, 0 - 127
1111 0111	End of Exclusive (EOX)

The OB-X8 will respond by sending out the program data in the format described below in *Program Data Dump*.

Request Program Edit Buffer Dump

Status	Description
1111 0000	System Exclusive (SysEx)
0000 0001	DSI ID
0011 0001	OB-X8 ID
0000 0110	Request Program Edit Buffer Transmit
1111 0111	End of Exclusive (EOX)

The OB-X8 will respond by sending out the current program edit buffer in the format described below in *Program Edit Buffer Data Dump*.

Request Global Parameter Dump

Status	Description
1111 0000	System Exclusive (SysEx)
0000 0001	DSI ID
0011 0001	OB-X8 ID
0000 1110	Request Global Parameter Transmit
1111 0111	End of Exclusive (EOX)

The OB-X8 will respond by sending out the current values of the global parameters in the format described in *Global Parameters Data Dump*.

Program Data Dump

Status	Description
1111 0000	System Exclusive (SysEx)
0000 0001	DSI ID
0011 0001	OB-X8 ID
0000 0010	Program Data
0000 00vv	Group Number: 0 - 9
0vvv vvvv	Program Number: 0 - 39
0vvv vvvv	599 bytes in “packed MS bit” format
1111 0111	End of Exclusive (EOX)

Program Edit Buffer Data Dump

Status	Description
1111 0000	System Exclusive (SysEx)
0000 0001	DSI ID
0011 0001	OB-X8 ID
0000 0011	Edit Buffer Data
0vvv vvvv	597 bytes in “packed MS bit” format
1111 0111	End of Exclusive (EOX)

Save Edit Buffer

Status	Description
1111 0000	System Exclusive (SysEx)
0000 0001	DSI ID
0011 0001	OB-X8 ID
0000 0101	Request Program Transmit
0000 00vv	Bank Number, 0 - 7
0vvv vvvv	Program Number, 0 - 127
1111 0111	End of Exclusive (EOX)

Global Parameters Data Dump

Value	Description
1111 0000	System Exclusive (SysEx)
0000 0001	DSI ID
0011 0001	OB-X8 ID
0000 1111	Main Parameter Data
0vvv vvvv	27 nibbles (LS then MS) for 32 Global parameters
1111 0111	End of Exclusive (EOX)

The Global Parameters Data Dump is not recognized when received. It is only transmitted when requested. NRPN messages are used to change Globals.

The 128 “packed” parameter bytes in the program dump follow the order of the NRPN list, one byte per parameter, and padded with zeros from the final parameter to the 128th byte.

Packed Data Format

Data is packed in 8 byte “packets”, with the MS bit stripped from 7 parameter bytes, and packed into an eighth byte, which is sent at the start of the 8 byte packet.

Example:

Input Data

```
1 A7 A6 A5 A4 A3 A2 A1 A0
2 B7 B6 B5 B4 B3 B2 B1 B0
3 C7 C6 C5 C4 C3 C2 C1 C0
4 D7 D6 D5 D4 D3 D2 D1 D0
5 E7 E6 E5 E4 E3 E2 E1 E0
6 F7 F6 F5 F4 F3 F2 F1 F0
7 G7 G6 G5 G4 G3 G2 G1 G0
```

Packed MIDI data

```
1   00 G7 F7 E7 D7 C7 B7 A7
2   00 A6 A5 A4 A3 A2 A1 A0
3   00 B6 B5 B4 B3 B2 B1 B0
4   00 C6 C5 C4 C3 C2 C1 C0
5   00 D6 D5 D4 D3 D2 D1 D0
6   00 E6 E5 E4 E3 E2 E1 E0
7   00 F6 F5 F4 F3 F2 F1 F0
8   00 G6 G5 G4 G3 G2 G1 G0
```