USER MANUAL

DX7 V

ARTURIA®
YOUR EXPERIENCE · YOUR SOUND

Special Thanks

DIRECTION

Frédéric Brun   Kevin Molcard

DEVELOPMENT

Theo Niessink (DSP lead)	Stefano D'Angelo	Valentin Lepetit	Benjamin Renard
Corentin Comte (lead)	Baptiste Aubry	Samuel Limier	
Pierre Pfister	Raynald Dantigny	Germain Marzin	
Matthieu Courouble	Pierre-Lin Laneyrie	Mathieu Nocenti	

DESIGN

Shaun Elwood   Baptiste Le Goff   Morgan Perrier   Greg Vezon

SOUND DESIGN

Allert Aalders "Sonar Traffic"	Spline"	"Summa"	Theo Niessink
	Glen Darcey	Mark Gijsman "FM Bass"	Matt Pike
Clément Bastiat "Cubic	Klaus-Dieter Pollack	Victor Morello	Nori Ubukata

MANUAL

Randy Lee   Morgan Perrier

SPECIAL THANKS

Angel Alvarado	Chuck Capsis	Jay Janssen	George Ware
Adrien Bardet	Jeffrey M. Cecil	Terry Mardsen	Stephen Wey
Clément Bastiat	Marco Correia "Koshdukai"	Fernando Manuel Rodrigues	Chuck Zwicky
Jeremy Bernstein	Ken Flux Pierce	Florian Marin	
Gustavo Bravetti	Simon Gallifet	Paolo Negri	
Andrew Capon	Lance Gilbert		

Product version: 1.0

Revision date: 5 December 2017

Thank you for purchasing DX7 V!

This manual covers the features and operation of Arturia's **DX7 V**, the latest in a long line of powerful virtual instruments.

Be sure to register your software as soon as possible! When you purchased DX7 V you were sent a serial number and an unlock code by e-mail. These are required during the online registration process.

Special Messages

Specifications Subject to Change:

The information contained in this manual is believed to be correct at the time of printing. However, Arturia reserves the right to change or modify any of the specifications without notice or obligation to update the hardware that has been purchased.

IMPORTANT:

The software, when used in combination with an amplifier, headphones or speakers, may be able to produce sound levels that could cause permanent hearing loss. DO NOT operate for long periods of time at a high level or at a level that is uncomfortable.

If you encounter any hearing loss or ringing in the ears, you should consult an audiologist.

Introduction

Congratulations on your purchase of Arturia's DX7 V!

We'd like to thank you for purchasing DX7 V, our latest resurrection of a beloved synthesizer. Based on the sales numbers alone, the Yamaha DX-7 holds the title of the most popular synthesizer ever produced. Its impact on music worldwide cannot be overstated. In fact, had the internet existed in 1983, the phrase "it went viral" would have fit the DX-7 perfectly.

Arturia has a passion for excellence, and DX7 V is no exception. We have not only emulated the sound and behavior of the original instrument; we have taken it far beyond the wildest imaginings of the engineers and musicians who helped introduce it to the world. We are confident that DX7 V will revolutionize your creative process the same way the DX-7 revolutionized the world of music.

Be sure to visit the www.arturia.com website for information about all of our other great hardware and software instruments. They have become indispensable, inspiring tools for musicians around the world.

Musically yours,

The Arturia team

Table Of Contents

1. WELCOME TO DX7 V!

DX7 V is the newest addition to our extensive family of virtual instruments. Not only have we faithfully modeled the sound of this ground-breaking instrument, we have incorporated features from generations of FM synthesizers that had yet to be born in the mid-1980s. We have also added many features that were originally add-on items, and others that were only fantasies at the time! DX7 V takes FM synthesis beyond ground-breaking to breath-taking.

DX7 V runs both as a standalone instrument on Windows and Mac OS X and as a plug-in in all major formats inside your DAW. It has easy MIDI learn functionality for hands-on control of most parameters, and as a plug-in also allows parameter automation for greater creative control.

1.1. A Brief History of FM

FM synthesis has its origins in the work of Dr. John Chowning at Stanford University in the late 1960s. The first FM synthesizer was a mainframe computer! Think of a room full of refrigerators and you'll have an idea of what that was like.

Dr. Chowning's theory was that an entire range of acoustic instrument emulations would be possible by modulating a waveform with others that were tuned to the harmonic series. It was also discovered that deviations from the harmonic series (i.e., inharmonic relationships) resulted in bell-like tones and other complex sounds. In fact, many of the timbres that came easily to FM synthesis had proven difficult for the reigning generation of analog synthesizers to reproduce.

This radical new approach to synthesis was licensed to Yamaha by Stanford in 1973, and patented by Stanford in 1975.

Yamaha made its own patentable modifications to the work of Dr. Chowning and released its first FM synthesizer in 1980: the venerable GS1. At a cost of roughly $16,000 and weighing almost 200 pounds, it was intended mainly for use in recording studios. Only 16 were made, and many of those wound up in the hands of famous artists such as Stevie Wonder, Chick Corea, Herbie Hancock, and the band Toto.

The unique sound of the GS1 was well-received, and Yamaha decided to make a more affordable version that was also far more portable (the GS2). Smaller instruments were eventually added to the line-up (the CE20 and CE25 Combo Ensembles).

Yamaha also licensed an FM synthesis algorithm to a company called New England Digital (NED) for inclusion in their highly coveted Synclavier I. NED applied its own innovations to this form of synthesis, with the use of selectable waveforms and the ability to cause a sound to evolve in new ways through Time Slices. The revolutionary sound of the Synclavier is perfectly recreated in Arturia's Synclavier V.

When other companies want to license a product you have developed, it's a sign that you've done something right. Even computer game companies like Sega began to use Yamaha's FM technology as the sound source for their game cards, a role they fulfilled for many years. But Yamaha struck gold when they released the DX7 in 1983.

1.2. Enter the DX7

The engineers at Yamaha worked for years to harness the power of FM synthesis through such innovations as keyscaling, which made it easier to produce a musically useful sound across a keyboard. Their efforts paid off handsomely with the release of the DX7.

The response to this iconic instrument was so enthusiastic that many Yamaha dealers had long waiting lists. The units sold as quickly as Yamaha was able to produce them for many months.

The demand for keyboardless expansion modules began to rise, which Yamaha met with its TX series of synthesizers.

The DX/TX family eventually grew to include almost a dozen stand-alone instruments such as the DX1, DX5, DX9, and DX7 II series keyboards, plus various expansion modules such as the TX7, TX216, TX816, TX81Z, and TX8O2. Yamaha even produced its own computer, the CX5M, with an FM synthesizer built in.

Eventually the market for purely FM synthesizers became saturated, and Yamaha began to incorporate FM technology into products containing sampled instruments and other forms of synthesis. And so a long line of hybrid instruments stretching from the SY99, through the FS1R module, to the modern-day Montage were born.

The DX7 was manufactured from 1983 until 1989, and by the time the dust settled, about 2OO,OOO units had been sold. To this day the DX7 holds the honor of being the most popular synthesizer ever made.

And though they are no longer being produced in their original configurations, the DX clan survives and thrives in the form of Arturia's DX7 V.

1.3. The sound of ubiquity

When it burst upon the music scene in the 198Os, the DX7 swept everything from its path. Its crystal-clear "electric piano" and punchy bass sounds dominated pop, dance, and jazz records almost overnight. Its brass, saxophone, and harmonica emulations made increasingly frequent appearances on record albums, and its glassy, haunting pads sent chills up our collective spine.

The list of artists who used the DX7 on their albums in the first few years is practically identical to the list of every top-1O hit from the mid- to late 198Os:

- Berlin: "Take My Breath Away"
- Celine Dion & Peabo Bryson: "Beauty and the Beast"
- Chicago: "Hard Habit to Break"
- Phil Collins: "One More Night"
- Commodores: "Night Shift"
- Hall & Oates: "Out Of Touch"
- Kenny Loggins: "Danger Zone"
- Bette Midler: "Wind Beneath My Wings"
- Tears For Fears: "Shout"
- Tina Turner: "What's Love Got to Do With It"
- Whitney Houston: "I Get So Emotional"
- Wilson Phillips: "Hold On"

The entire catalog of songs graced by the many generations of the DX family would fill a library!

1.4. Features of DX7 V

If FM synthesizers had a wish list, they couldn't ask for more than the array of features and controls we have included with DX7 V:

- 6 operators, with all original tuning and scaling options
- 32 algorithms like the original
- 25 selectable waveforms per operator
- Operator waveform inversion switch
- Oscillator sync per operator (waveform phase reset)
- Independent feedback loops per operator
- Unison mode (monophonic and polyphonic) with detune
- Portamento (glide) and glissando
- Two independent, multi-waveform LFOs (syncable)
- Three resonant filter options, selectable per operator
- Three types of output envelopes per operator: DX7 (original), DADSR, and multi-segment (MSEG)
- MSEG envelopes can be looped and synchronized to a master clock
- Three additional envelopes per program (Pitch, Mod 1, Mod 2)
- Copy/paste settings of one or more operators
- An oscilloscope for viewing the master output waveform
- 12-bit and 24-bit output resolution options
- Hundreds of built-in presets (the original had only 64, counting the cartridge)
- Patch compatibility: import original DX7 SysEx banks into DX7 V

But we didn't stop there! DX7 V also offers:

- An astounding modulation matrix
- Assignable macro controls for complex, simultaneous modulations
- Powerful sequencer and arpeggiator features
- An array of FX: chorus/flange/phaser, reverb, delay, EQ, distortion, filter, etc.
- Up to four FX may be used at once
- FX may be routed in series or in two parallel pairs
- User-selectable velocity response (original or full-range)
- MIDI-assignable parameter control
- Preset categories

The previous lists are not exhaustive! There are too many features to list them all here. But it's easy to see why we're so excited about making this synthesizer available to you.

And now we are pleased to introduce the two of you: Esteemed and beloved customer, we give you an FM synthesizer you will always want near you: Arturia's DX7 V.

2. ACTIVATION & FIRST START

DX7 V works on computers equipped with Windows 7 or later and macOS 10.10 or later. You can use the stand-alone version or use DX7 V as an Audio Units, AAX, VST2 or VST3 instrument.

2.1. Activate the DX7 V license

Once DX7 V has been installed, the next step is to activate your license for the software.

This is a simple process that involves a different software program: the Arturia Software Center.

2.1.1. The Arturia Software Center (ASC)

If you have not already installed the ASC, please go to this web page:

Arturia Updates & Manuals

Look for the Arturia Software Center at the top of the page, and then download the version of the installer that you need for your system (macOS or Windows).

Follow the installation instructions and then:

- Launch the Arturia Software Center (ASC)
- Log into your Arturia account
- Scroll down to the My Products section of the ASC
- Click the Activate button

That's all there is to it!

2.2. Initial setup

2.2.1. Audio and MIDI settings: Windows

At the top left of the DX7 V application is a pull-down menu. It contains various setup options. Initially you will need to go to this menu and choose the Audio Settings option to get MIDI flowing in and sound flowing out.
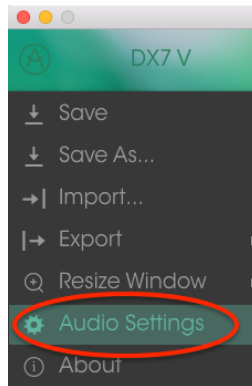
You will then see the Audio MIDI settings window. This works in the same way on both Windows and macOS, although the names of the devices available to you will depend on the hardware you are using.
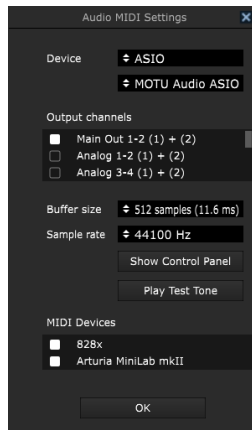
The Audio MIDI Settings window (PC)

Starting from the top you have the following options:

- **Device** lets you choose which audio driver you want to use to route sound out of the instrument. This might be your computer's own driver like Windows Audio, or an ASIO driver. The name of your hardware interface may appear in this field.
- **Output Channels** lets you select which of the available outputs will be used to route audio out. If you only have two outputs, only two will appear as options. If you have more than two you can select a specific pair of outputs.
- The **Buffer Size** menu lets you select the size of the audio buffer your computer uses to calculate sound. A smaller buffer means lower latency between pressing a key and hearing the note. A larger buffer means a lower CPU load as the computer has more time to think, but can result in a small latency. Find the optimum buffer size for your system. A fast, modern computer should easily be able to operate at 256 or 128 sample buffer size without creating pops or clicks in the sound. If you are getting clicks, try raising the buffer a little. The latency is displayed on the right hand side of this menu.
- The **Sample Rate** menu lets you set the sample rate at which audio is sent out of the instrument. The options here will depend on the capability of your audio interface hardware though even most computers' own hardware can operate at up to 48kHz which is perfectly fine. Higher sample rates use more CPU power so unless you have a good reason to go up to 96kHz, then 44.1k or 48k is usually fine.
- The **Show Control Panel** button will jump to the system control panel for whatever audio device is selected.
- **Play Test Tone** helps you to troubleshoot audio issues by confirming whether sound can be heard through the correct device.
- Your connected MIDI devices will appear in the **MIDI Devices** area. Click the check box to accept MIDI from the device you want to use to trigger the instrument. In standalone mode, DX7 V listens for all MIDI channels so there's no need to specify a channel. You can specify more than one MIDI device at once.

2.2.2. Audio and MIDI settings: macOS

The process is very similar to initial setup for Windows and the menu is accessed in the same way. The difference is that OS X uses CoreAudio to handle audio routing and the audio device selection is made in the second dropdown menu. Apart from that, the options work the same way as described in the Windows section.
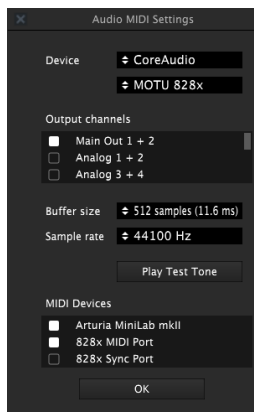
The Audio MIDI Settings window (macOS)

2.2.3. DX7 V as a plug-in

DX7 V comes in VST, AU and AAX plug-in formats for use in all major DAW software such as Cubase, Logic, Pro Tools and so on. You can load it as a plug-in instrument and its interface and settings work the same way as in standalone mode, with a couple of differences.

- You can automate numerous parameters using your DAW's automation system.
- You can use more than one instance of DX7 V in a DAW project. In standalone mode you can only use one at once.
- Any additional audio effects your DAW has available may be used to process the sound, including delay, chorus, filters, etc.
- You can route DX7 V's audio outputs freely inside your DAW using the DAW's own audio routing system.
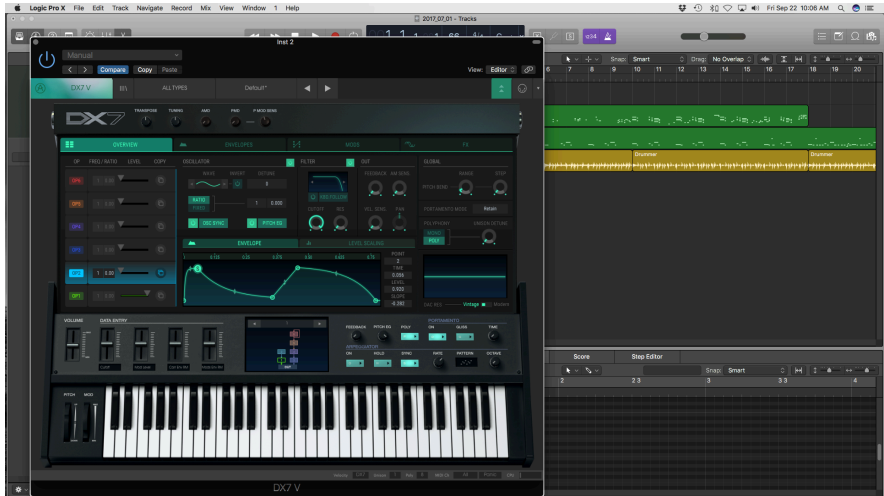
3. USER INTERFACE

DX7 V is packed with great features, and in this chapter we'll make sure you know what each one does. We think you'll be amazed by the power and versatility of this instrument.

And while DX7 V is very flexible, there's nothing complicated about it. That will always be the main focus of every Arturia product: to maximize your creativity while remaining easy to use.

3.1. The basic view

3.1.1. Virtual keyboard

The virtual keyboard allows you to play a sound without the need for an external MIDI device. Simply click on a virtual key to hear the currently selected sound. You can also drag the cursor across the keys to hear a glissando.

Clicking near the front edge of the key results in a higher velocity note; clicking near the back of the key produces a soft velocity.

The DX7 V virtual keyboard

3.1.2. Pitch and Mod wheels

These wheels may be dragged up and down with your mouse. As you do they will perform the functions they have been assigned elsewhere in the user interface. They will also respond to the appropriate MIDI controller input.

The pitch wheel will return to zero when it is released; the modulation wheel will stay at its current location until moved.

3.1.3. The top panel

The top panel shows the most basic controls. It can be opened to reveal the complete set of parameters. See the Advanced chapters [p.48] for a detailed description of each one.

3.1.3.1. Volume

This is the master volume control for DX7 V. Click and drag the slider to make a change. It will also respond to incoming MIDI CC #7 messages. The volume range is +24 to -80 dB. Double-click the slider to reset the value to 0 dB.

3.1.3.2. Data entry / Macro controls

These sliders provide a quick way to alter the sound of a preset. The parameters they control are assigned on the Mods page [p.88].

New names can be entered under each control, so their labels may be different from one preset to the next.

3.1.3.3. Global controls

The five knobs located at the very top of the panel affect all 6 operators simultaneously.

- Transpose

Offers chromatic transposition of the preset within a 4 octave range.

- Tuning

This is a fine-tune control that can adjust the overall pitch. Range: -64 / +63

- AMD

Controls the depth of the global Amplitude Modulation.

- PMD

Controls the depth of the global Pitch Modulation.

- Pitch Mod Sensitivity

Works with the PMD parameter to introduce pitch modulation to the overall sound.

> ♪: The Global settings are stored with each preset.

3.1.3.4. Algorithm window

This provides a visual representation of the relationship between the carriers and modulators in a preset. There are 32 algorithms, and selecting a new one can have a significant impact on the sound.

If you're feeling adventurous, try selecting a new one by clicking the left / right arrows at the top of the window, or by clicking the number at the top and dragging it up and down.

To learn more about FM algorithms and FM synthesis in general, see the FM synthesis basics [p.42] chapter.

> ♪: You can mute or unmute an operator within the Algorithm window with a right-click on the operator icon.

3.1.3.5. Quick edit controls

- Feedback

Each algorithm has a feedback loop that affects one or more operators. This control provides a quick way to increase or decrease the feedback amount for the selected preset. For the definition of feedback as it pertains to FM synthesis, see the Feedback [p.44] section of the next chapter.

- Pitch EG

A single Pitch envelope generator (EG) is shared by all 6 operators, though each operator has a Pitch EG on/off button. This knob will control the Pitch EG depth for any operator that has Pitch EG active.
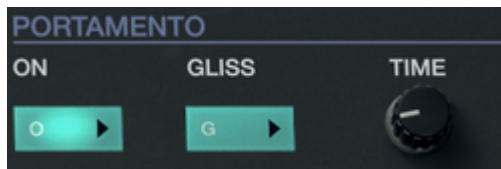
- Poly

DX7 V can provide up to 32 voice polyphony, twice as many as the original synth. This button provides a quick way to switch between polyphonic and monophonic performance.

> ♪: DX7 V ignores any notes beyond the polyphony value, as did the original DX7.

3.1.3.6. Portamento

Portamento is also known as "glide". It will change the pitch gradually between two played notes.

- On

Toggles the Portamento effect on and off.

- Gliss

When this button is enabled the pitch will change chromatically between two played notes. When the Gliss button is off the pitch will change smoothly between the two notes.

- Time

This knob controls the amount of time it takes to change the pitch from one note to another.

3.1.3.7. Arpeggiator

An arpeggiator allows you to hold down one or more notes and hear those notes played back automatically. When a single note is held it will be repeated; when two or more notes are held the arpeggiator will alternate between the notes.

- On

This button turns the arpeggiator on and off.

- Hold

When the Hold button is enabled, the arpeggiator will keep running after your fingers are lifted from the keys.

- Sync

Enabling the Sync button will lock the arpeggiator to an external clock, after which the Rate knob is used to select a rhythmic subdivision. The synced Rate options are between 1/1 (whole notes) to 1/64th notes.
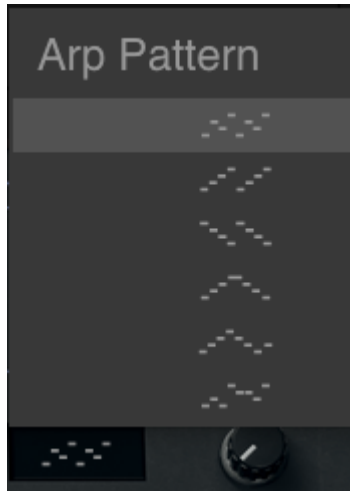
The arpeggiator will run "freeform" when the Sync button is disabled, with a range between 0.010 – 50 Hz.

- Rate

This knob allows you to set the speed of the arpeggiator. The range of values is either 1/1 to 1/64 (Sync enabled) or 0.010 – 50 Hz (Sync disabled).

- Pattern

Click on the window and a pull-down menu will provide six different response patterns for the arpeggiator.

Arp Pattern menu

From top to bottom, the options are:

1. **Note Order**: Held notes will be arpeggiated in the same order they were played.
2. **Up**: Notes are played back in ascending order. New notes are inserted into the arpeggio as they are played.
3. **Down**: Notes are played back in descending order. New notes are inserted into the arpeggio as they are played.
4. **Up & Down (inclusive)**: Held notes are played back in ascending order and then descending order. The highest and lowest notes are retriggered one time when the direction is reversed.
5. **Up & Down (exclusive)**: Held notes are played back in ascending order and then descending order. The highest and lowest notes are *not* retriggered when the direction is reversed.
6. **Random**: Held notes are played back in random order.
7. **Octave**: This knob sets the range of the arpeggiator between 1 and 5 octaves.

3.2. The upper tool bar

The toolbar that runs along the top edge of the instrument both in standalone and plug-in mode provides access to many useful features. Let's look at them in detail.

The first group of options can be found by clicking on the DX7 V section at the top left hand corner of the instrument window.

We'll go through each of these functions in the following sections.

3.2.1. Save Preset

> ℹ !: This option will overwrite the active preset with any changes you have made, so if you want to keep the source preset also, use the Save As option instead. See the next section for information about this.
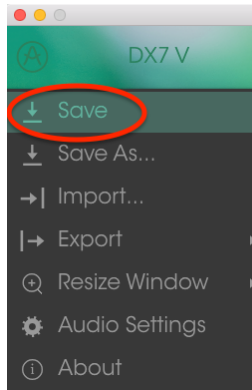
Save Preset

3.2.2. Save Preset As...

If you select this option you are presented with a window where you can enter information about the preset. In addition to naming it you can enter the Author name, select a Bank and Type, select tags that describe the sound, and even create your own Bank, Type, and Characteristics. This information can be read by the preset browser and is useful for searching the preset banks later.

You can also enter freeform text comments in the Comments field, which is handy for providing a more detailed description.


The Save As window

3.2.3. Import...

This command lets you import a file that was originally exported by DX7 V. It can be either a single preset, an entire bank of presets, or a playlist. Presets are stored in the **.dx7x** format, while playlists are given the extension **.playlist**.

After selecting this option the default path to these files will appear in the window, but you can navigate to whichever folder you prefer to use.
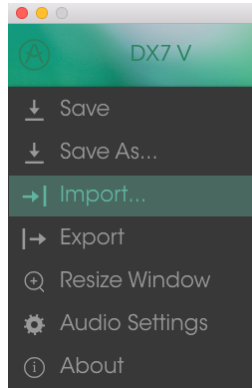
The Import Preset window

You can also use the Import function to import banks of sounds from the original DX7! The banks must be in the sys-ex format (.syx) and must be from a DX7, not from one of its hybrid relatives like the TX8O2 or TX81Z.

3.2.4. Export menu

The Export menu has several options for exporting files from DX7 V, which enables you to share your sounds and playlists with other users. You could also use these options to transfer files to another computer.

3.2.4.1. Export Preset

You can export a single preset using this command. The default path to these files will appear in the window, but you can create a folder at another location if you like.
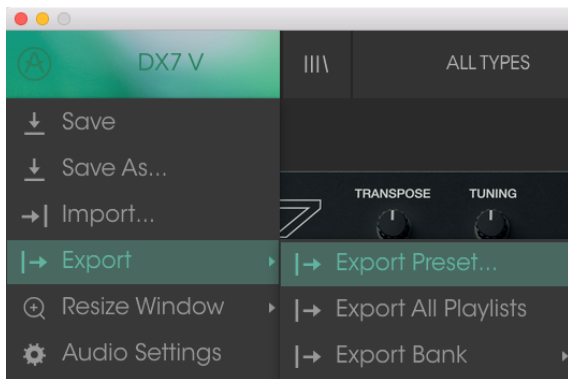
3.2.4.2. Export All Playlists

Playlists allow you to select which sounds to use for a particular gig or session. With this command you can export all of your playlists and import them into another computer that also has DX7 V installed.
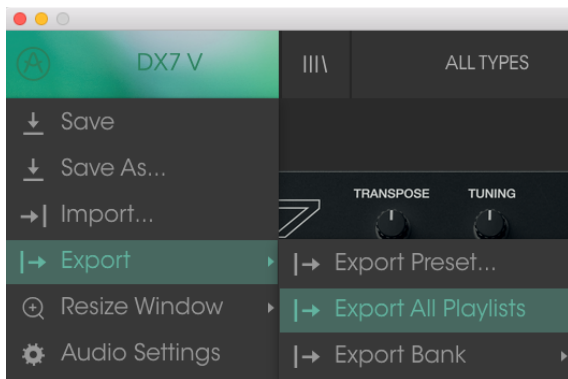
3.2.4.3. Export Bank

This option can be used to export an entire bank of sounds from the instrument, which is useful for backing up or sharing presets.
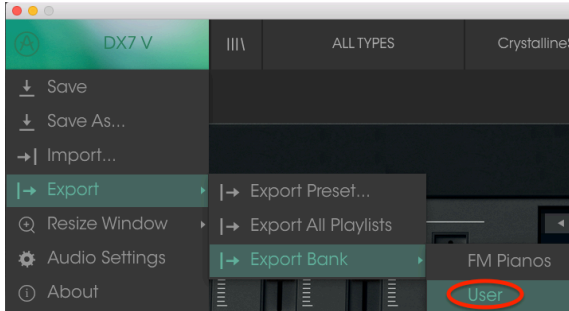
Selecting a Bank to export

3.2.5. Resize Window options

The DX7 V window can be resized from 60% to 200% of its original size without any visual artifacts. On a smaller screen such as a laptop you may want to reduce the interface size so it doesn't dominate the display. On a larger screen or a second monitor you can increase the size to get a better view of the controls. The controls work the same at any zoom level but the smaller ones can be harder to see at the smaller magnification values.
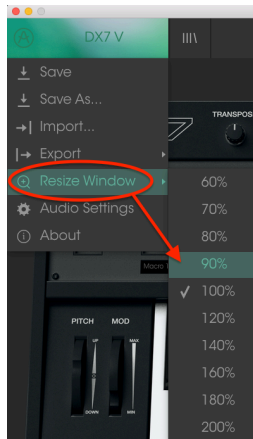
The Resize Window menu

3.2.6. Audio Settings

Here you manage the way the instrument transmits sound and receives MIDI. See the section Audio and MIDI settings [p.8] for full details on this.
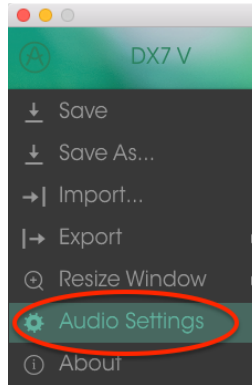
3.2.7. About

In this window you can view the DX7 V software version and developer credits. Click on the About window to close it.

3.2.8. Preset browser overview

The Preset browser can be opened by clicking the toolbar button that has four vertical lines. The Filter, name field and left / right arrows located in the upper toolbar can assist with preset selection.
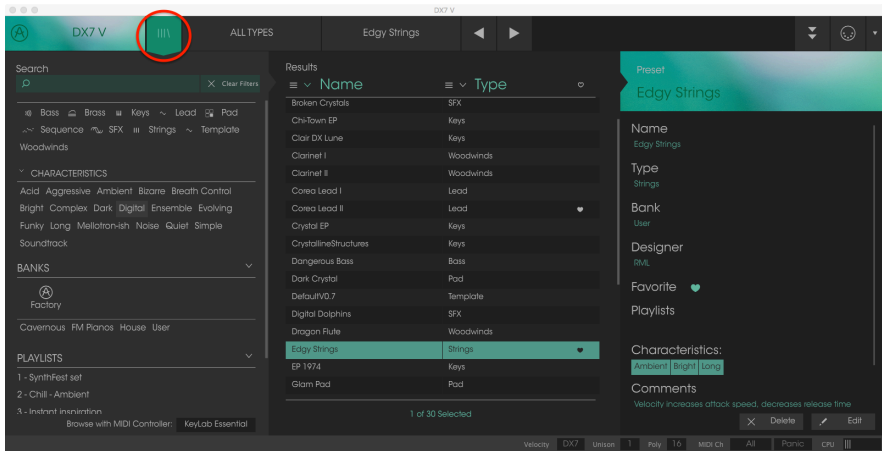
The Preset Browser

More details about this window are found in the Preset Browser [p.33] section.

3.2.8.1. Browse with MIDI controller

At the bottom of the Preset browser window on the left side is a field labeled Browse with MIDI Controller. It will configure DX7 V to work with an Arturia controller so you can browse the preset search results without having to map any controllers to those functions.
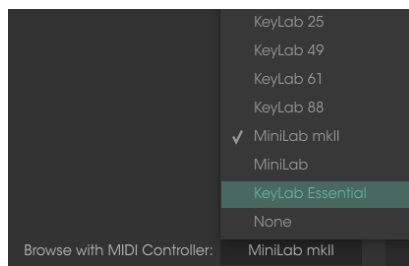
DX7 V will detect which Arturia controller you are using and will be configured automatically to enhance the preset browsing experience. Refer to the documentation for your controller to learn more.

If you want to defeat this feature, click the menu window and select None.

3.2.9. Advanced features

The front panel looks simple, but it hides an extremely powerful set of features. To access Advanced mode, click the two downward arrows:
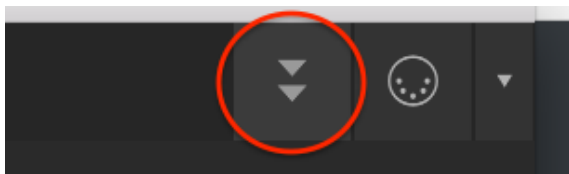
The Advanced mode button

You can also click the blank area on the right side of the top panel to enter Advanced mode. Either way the top panel will open, as will a whole world of new options for sound design.

To exit Advanced mode and close the lid, click the same spot on the lid or click the two upward arrows, which are now inside a green square.
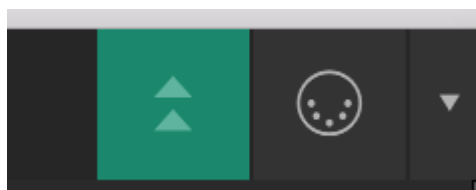
Click the button to exit Advanced mode

When you're ready to learn more about these features, we suggest starting with the Introduction to Advanced mode [p.48].

3.2.10. MIDI Learn assignment

The MIDI plug icon at the far right side of the toolbar places the instrument into MIDI learn mode. MIDI-assignable parameters will be shown in purple, which means you can map physical controls to those destinations inside the instrument. A typical example might be to map a physical expression pedal to the Volume control, or buttons on a controller to the Preset selection arrows so you can change the preset from your hardware keyboard.
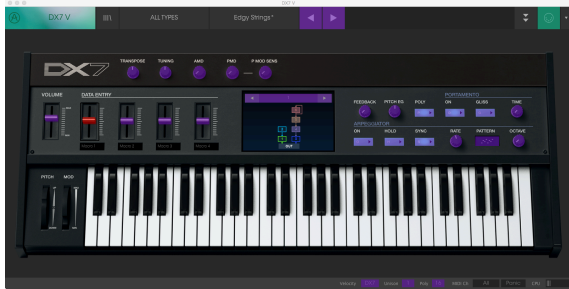
MIDI Learn mode (top section)

In the image above one of the sliders is red. That means it has already been assigned to an external MIDI control. It can be reassigned [p.26], though.

Note that there are some MIDI-assignable parameters in the lower tool bar [p.29] also.
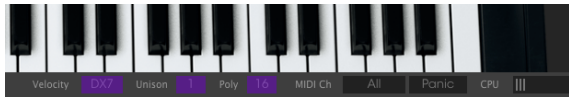
MIDI Learn mode (lower tool bar)

There are many more assignable parameters that are revealed when the top panel is opened. We'll describe them all in the Advanced [p.48] chapters.

3.2.10.1. Assigning / unassigning controls

If you click on a purple area you'll put that control into learning mode. Move a physical knob, fader, or button and the target goes red, indicating that a link has been made between the hardware control and the software parameter. There's a popup window that displays which two things are being linked and an Unassign button that will disconnect the two.
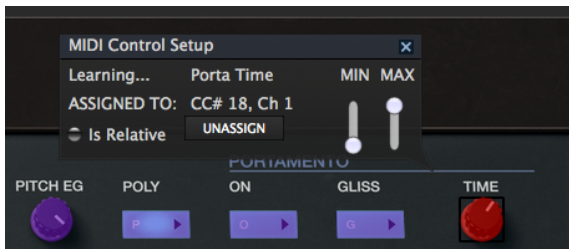
Portamento Time control selected and assigned

You can also right-click on a control to unassign it.

3.2.10.2. Min / Max value sliders

There are also minimum and maximum value sliders ("Min" and "Max") that you can use to restrict the range of the parameter response to something other than 0–100%. For example you might want the master volume slider to move within the range of 30–90%. If you made this setting (Min set to 0.30 and Max set to 0.90) your physical knob would be unable to alter the volume lower than 30% or higher than 90%, no matter how far you turned it. This is very useful for making sure you can't accidentally make the sound too quiet or too loud when performing.

In the case of switches which only have two positions (on or off), those would normally be assigned to buttons on your controller. But it is possible to toggle those with a fader or another control if you like.

3.2.10.3. Relative control option

The final option in this window is a check box labelled "Is Relative". It is intended for use with a specific type of control: one which sends only a few values to indicate the direction and speed at which a knob is turning, as opposed to sending a full range of values in a linear fashion (0-127, for example).

To be specific, a "relative" knob will send values 61-63 when turned in a negative direction and values 65-67 when turned in a positive direction. The turn speed determines the parameter response. Refer to the documentation of your hardware controller to see if it has this capability. If so, be sure to switch this parameter on when setting up its MIDI assignments.

When configured this way, movements of the physical control (usually a knob) will change the software parameter by starting at its current setting, rather than being an "absolute" control and snapping it to some other value as soon as you start to move it.

This can be a great feature when controlling things like volume, filter, or effect controls, since you won't usually want them to jump noticeably from their current setting when they are modified.

3.2.10.4. Reserved MIDI CC numbers

Certain MIDI Continuous Controller (MIDI CC) numbers are reserved and cannot be reassigned to other controls. These are:

- Pitch bend
- Modulation wheel (CC #01)
- Breath controller (CC #02)
- Expression controller (CC #11)
- Sustain (CC #64)
- All Notes Off (CC #123)

All other MIDI CC numbers may be used to control any assignable parameter in DX7 V.

3.2.11. MIDI controller configuration

There's a small arrow at the far right hand side of the toolbar that opens the MIDI controller configurations menu. This allows you to manage the different sets of MIDI maps you may have set up for controlling the instrument's parameters from MIDI hardware. You can copy the current MIDI assignment setup or delete it, import a configuration file, or export the currently active one.

This is a quick way to set up different hardware MIDI keyboards or controllers with DX7 V without having to build all the assignments from scratch each time you swap hardware.
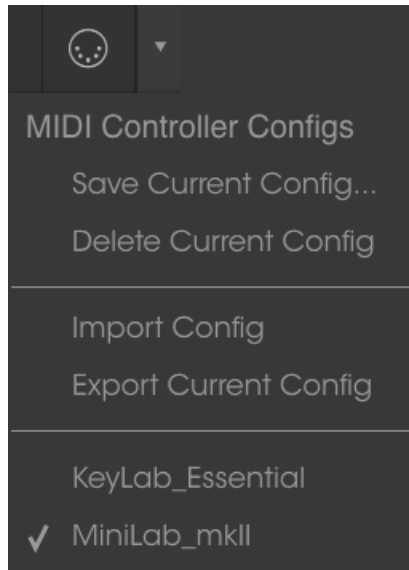
Note the check mark next to one of the controller names: that indicates that the MiniLab mk II configuration is currently active.

3.3. The lower toolbar

At the left hand side of the lower toolbar you will see a readout showing the value or state of whatever control you are modifying. It will also display the current value of a parameter without editing it: just hover the cursor over the related control and the value will appear as pictured below.
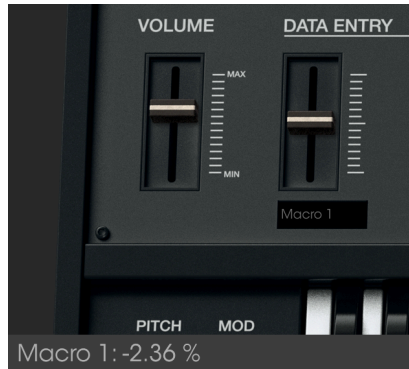

Displaying the current control's value

3.3.1. Utility options

At the right hand side of the lower toolbar are several small windows and buttons. These are very important features, so let's take a closer look at them.

3.3.1.1. Velocity

The original DX7 keyboard did not transmit the entire range of MIDI velocity values (0-127). Instead it transmitted a limited range (16-109), and a limited number of values within that range (only 30). Arturia's DX7 V gives you the choice between the full MIDI velocity range or the range of the original DX7.
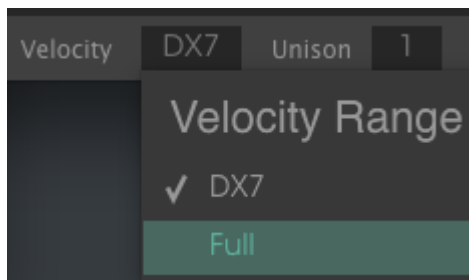
The Velocity Range options

Since DX7 V can import banks of original DX7 presets, Arturia wanted to make sure you are able to hear those sounds as they were originally designed. But again, if you're feeling adventurous, widen the velocity range when you audition those presets and see what happens!

3.3.1.2. Unison

DX7 V allows you to specify how many voices will be used when a note is played. Many great sounds can be made even better by selecting a Unison value >1 and then detuning the unison voices.
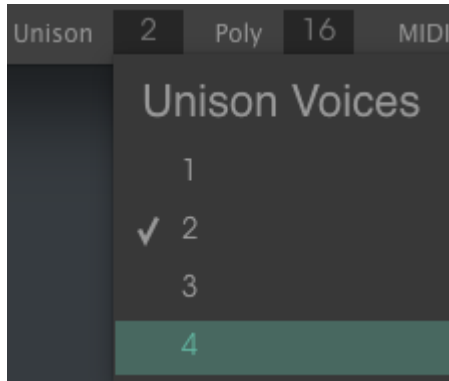
The Unison Voices menu

The top-panel Poly button toggles DX7 V between polyphonic and monophonic performance. The Unison Detune [p.66] parameter is located "under the hood" inside the Advanced mode Overview tab [p.50].

The check mark indicates the currently selected Unison Voices value. It is possible to stack as many as 32 voices onto a single note.

> ♪: The Unison Voices value is always active in both unison and polyphonic modes. If the Unison Detune parameter will not be used for a preset, you may prefer the sound when the Unison Voices value is set to 1. This also will reduce CPU load.

3.3.1.3. Poly

DX7 V allows a maximum polyphony of 32 voices, twice the number of the original synth. A higher voice count is also more CPU-intensive, so DX7 V gives you the option to limit the number of voices it will use.
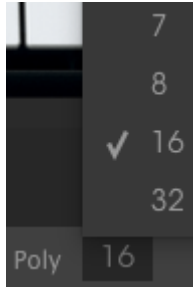
Options include 1-8 voices, 16 voices like the original synth, or 32 voices. The check mark indicates the currently selected Polyphony limit.

> ♪: When the Unison Voices value is set to a number >1, the Poly choices will be limited automatically so the overall polyphony will not exceed 32 voices.

3.3.1.4. MIDI Channel setting

This window indicates the current MIDI Channel setting. Click on it and it will expand to show the full range of values you can select (All, 1-16).
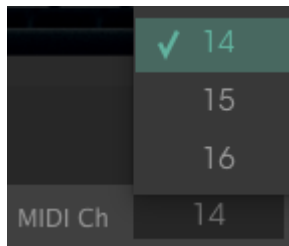
The check mark indicates the currently selected MIDI channel number.

3.3.1.5. Panic button

The Panic button can be pressed to reset all MIDI signals in the event of stuck notes or other issues.

3.3.1.6. CPU meter

The CPU meter is used to monitor how much of your computer's CPU is being used by the instrument.

3.4. The Preset browser

The preset browser is how you search, load and manage sounds in DX7 V. It has a couple of different views but they all access the same banks of presets.

To access the search view, click the browser button (the icon looks a bit like books on a library shelf).
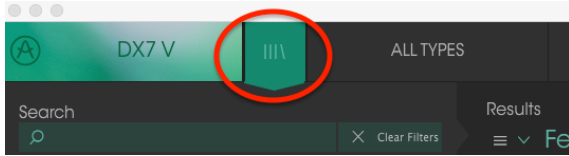
The Preset Browser button

3.4.1. Searching presets

The Search screen has a number of sections. By clicking on the Search field at the top left you can quickly enter any search term to filter the preset list by patch name. The Results column is updated to show the results of your search. Press the Clear Filters button in the Search field to clear the search.
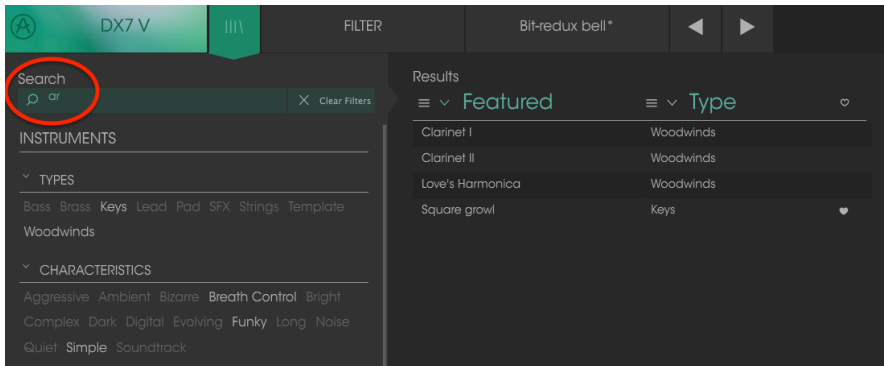
Filter by typing text in the Search field

In the example above the letters "a" and "r" were typed into the Search field. This selects all presets that have those two letters next to eachother in the preset name.

3.4.2. Using tags as a filter

You can also search using different tags. So for example by clicking on the Woodwinds option in the Types field you can show only presets that match that tag. The tag fields can be shown or hidden by using the small down arrow buttons in their title fields. Results columns can be sorted by clicking the same arrow button in their own section.
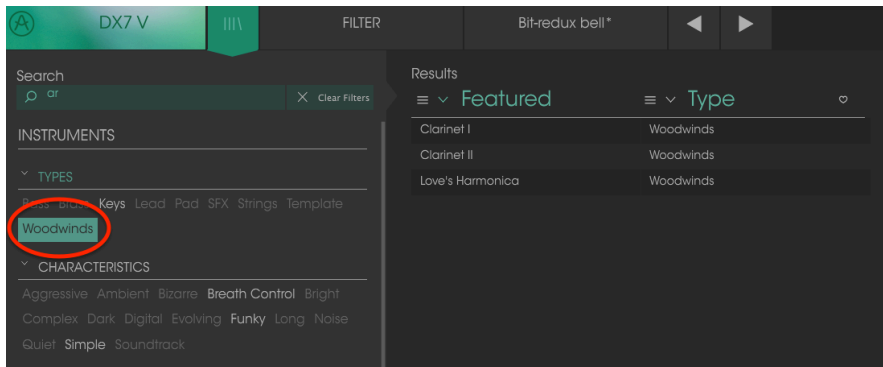
You can use multiple search fields to perform narrower searches. So by entering a text search and also specifying the Type, Bank, and Characteristics options you will see only the presets that match those exact criteria. Deselect any tag in any area to remove that criteria and widen the search without having to go back and start again.
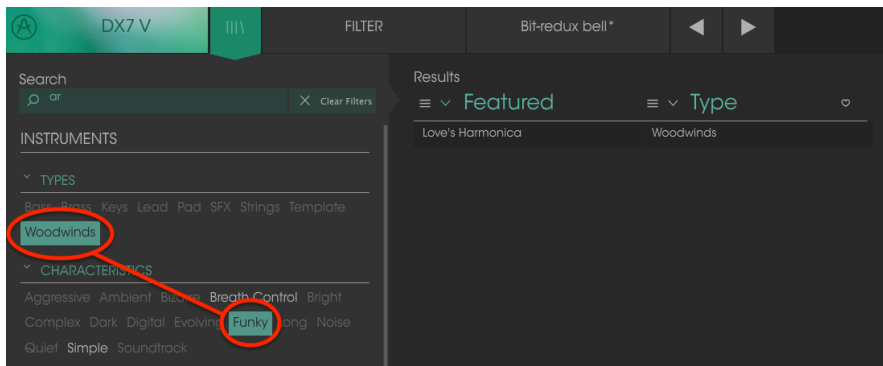
3.4.3. Tag category windows

The Tag category windows may be collapsed and expanded using the arrows near their names.
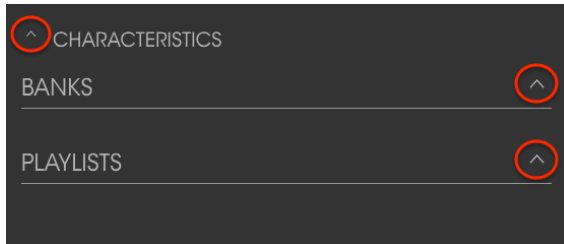
Tag category windows closed
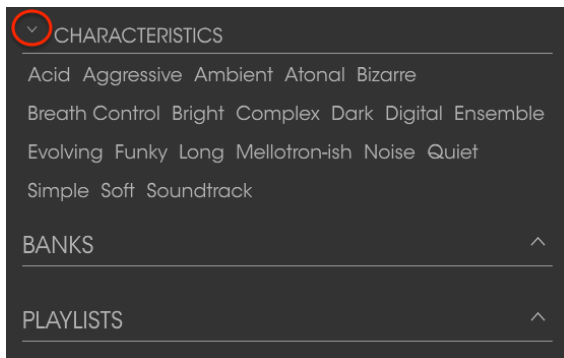
Characteristics window open

3.4.4. Search Results window

Click the options menu button in the first Results column to specify whether you want to view the presets by **Featured** or by **Name**. Click the sort arrow to reverse the alphabetical order.
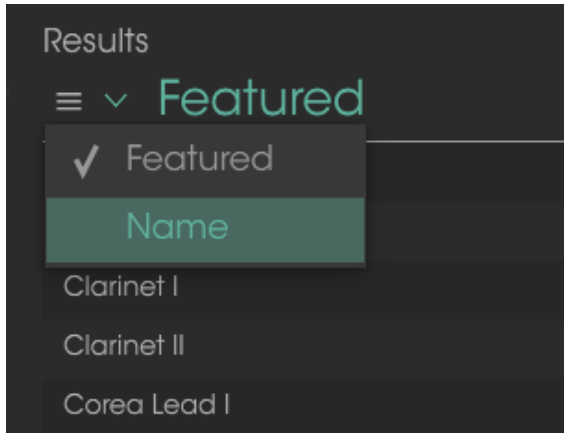
Similarly, click the options menu button in the second Results column to order its display results by Type, Sound Designer, or Bank tags. Click the sort arrow to reverse the alphabetical order.
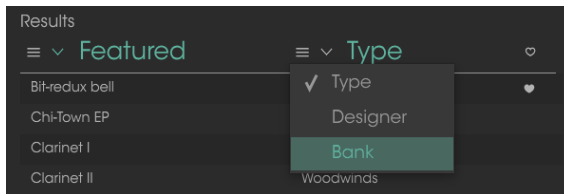
3.4.5. The Preset Info section

The Info column on the right side of the search field shows specific information about each preset. The information for User presets may be changed here: Name, Type, Favorite, etc.

Click Edit and then make the desired changes, either by typing in one of the fields or by using a pull-down menu to change the Bank or Type. You can even add new Characteristics by clicking the + sign at the end of that list. Click Save when you are done.
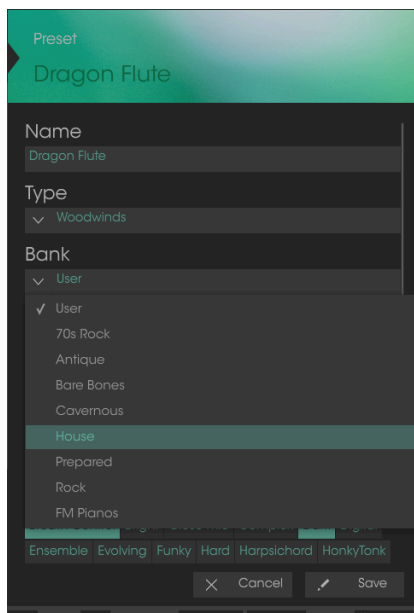
Select a new Bank for the preset   *Add a new Characteristic and Comments*
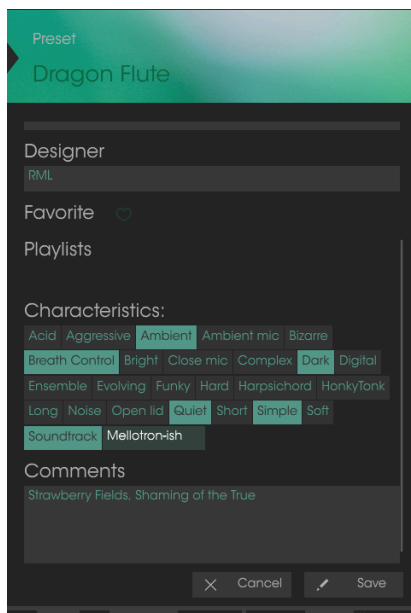
♪: If you want to alter the information for a Factory preset you must first use the Save As command to re-save it as a User preset. After this the Info section will gain Edit and Delete buttons at the bottom of the window.

3.4.6. Preset selection: other methods

The pull-down menu to the right of the Search menu provides a different way to select presets. The first option in this menu is called Filter, and it will display the presets that fit the search terms you used in the Search field. So if you searched for the word **Crystal** in the main search area, the results of that search will appear here.
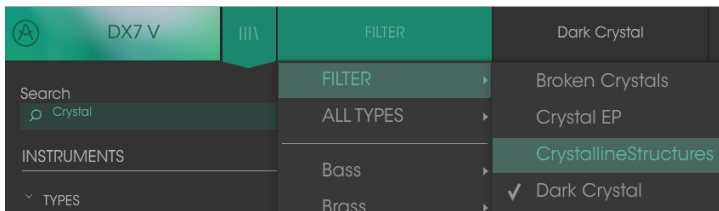
Filter results may differ based on Search criteria

Similarly, if you previously selected **Type: Keys** and **Characteristics: Ambient** in the Search field you would see the results of that search in this area instead.
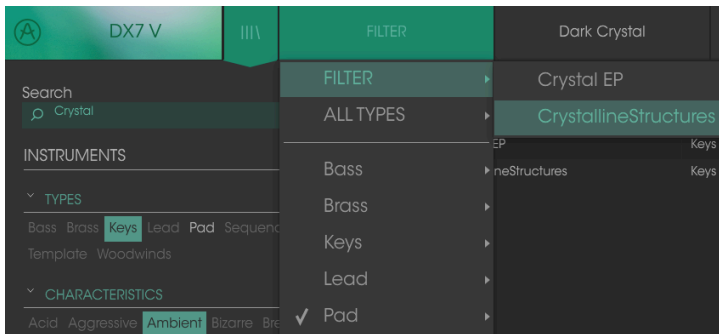
Filter results may differ based on Search criteria

Selecting the All Types option in the pull-down menu will bypass the Search criteria and show the entire list of presets.

The Categories below the line also ignore the Search criteria and display the presets based on their Type: *Bass, Brass, Keys,* and so on.
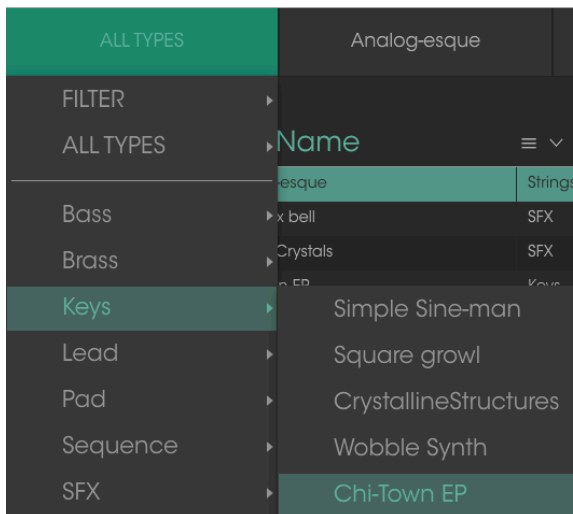
Selecting a preset by its Type

Clicking on the name field in the center of the toolbar will show you a list of all available presets. The list will also take into account any selections you have made in the Search field. So if you have pre-selected a Characteristic such as "Funky" this shortcut menu will only show you presets that match that tag.
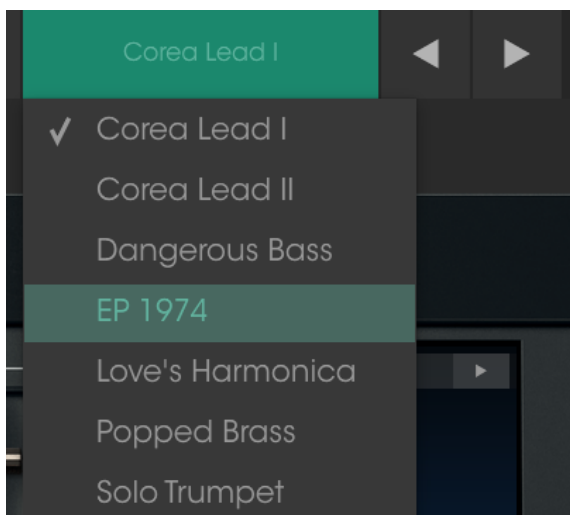
The left and right arrows in the toolbar cycle up and down through the preset list: either the full list, or the filtered list that resulted from the use of one or more search terms.

3.4.7. Playlists

In the lower left corner of the Preset Browser window is a feature titled Playlists. This is used to collect presets into different groups for different purposes, such as a set list for a particular performance or a batch of presets related to a particular studio project.

3.4.7.1. Add a playlist

To create a playlist, click the field at the bottom:
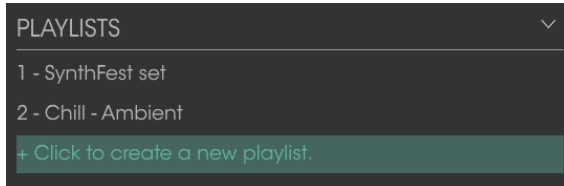
Give the playlist a name and it will appear in the Playlists menu. You can rename the playlist at any time; just click the pencil icon at the end of its row.

3.4.7.2. Add a preset

You can use all of the options in the Search window to locate the presets you want to have in your playlist. Once you have found the right preset, click and drag it onto the playlist name.
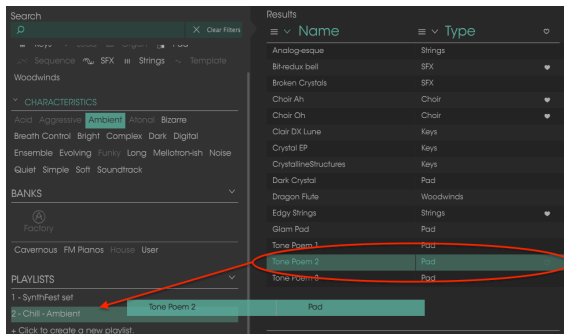
Click and drag from the Search Results list onto one of the playlists

To view the contents of a playlist, click on the playlist name.

3.4.7.3. Re-order the presets

Presets may be reorganized within a playlist. For example, to move a preset from slot 1 to slot 3, drag and drop the preset to the desired location.
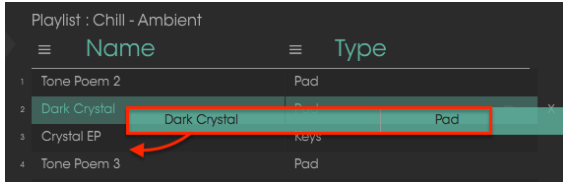
This will cause the other presets to be bumped up in the list to accommodate the new location of the preset being moved.
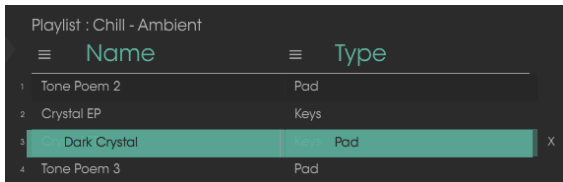
3.4.7.4. Remove a preset

To delete a preset from a playlist, click the x at the end of the preset row.
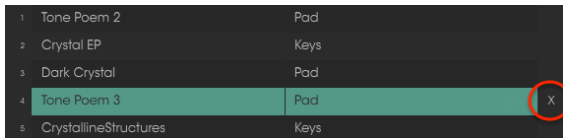
Click the X to remove a preset from a playlist

3.4.7.5. Delete a playlist

To delete an entire playlist, click the x at the end of the playlist row. This will only delete the playlist; it will not delete any of the presets inside the playlist.
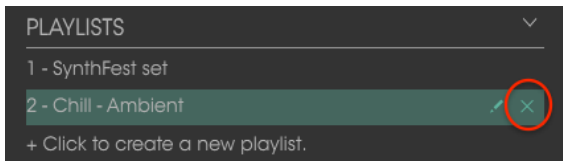
Click the X to delete a playlist

4. FM SYNTHESIS BASICS

4.1. FM synthesis: a definition

Frequency Modulation (FM) is a method of synthesis that uses the frequency of one waveform to modulate the frequency of another. In FM synthesis, these waveform generators are called "operators."

Operators are arranged in different relationships to one another; these arrangements are known as algorithms. Depending on the algorithm, one or more operators is usually routed directly to the audio output. For example, with algorithm 32 all six of the DX7 V operators are tied directly to the output.

Algorithm 32

In many algorithms there are several operators that are *not* tied directly to the output, as is the case with algorithm 5 and algorithm 17:
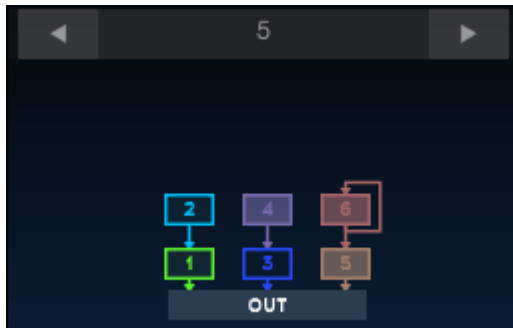
Algorithm 5

Algorithm 17

The primary operator in this case is known as the carrier, and the other operators are known as modulators. When a modulator does not have a direct link to the output it is being used to alter the sound of the carrier.

A series of pictures may help to illustrate what the operators are doing. *(The following graphics are courtesy of Schwa's schOPE plug-in, which is available through Stillwell Audio.)*

Here's the output of a single operator generating a sine wave:
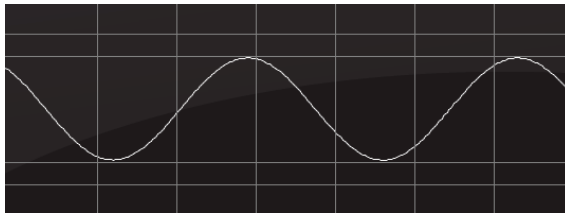
One operator generating a sine wave

Here's the output of a sine wave at double the frequency of the first sine wave:
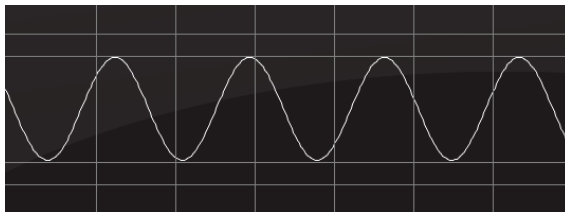
One operator generating a sine wave an octave higher

When both of those sine waves are tied directly to the output it looks like this. This is additive synthesis:
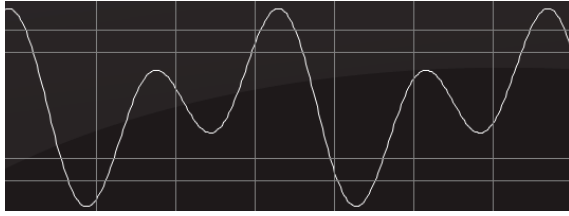
The combined output of both operators (additive synthesis)

Here's how it looks when the higher sine wave (the modulator) is used to modulate the frequency of the lower sine wave (the carrier). This is FM synthesis:
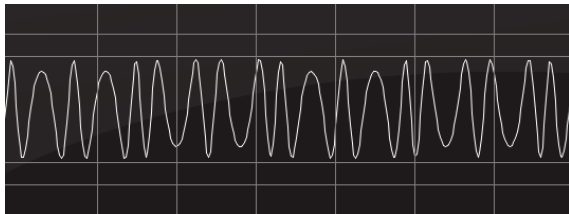
The output of operator 1 modulated by the output of operator 2 (FM synthesis)

As you can see, there is a big difference between the additive and FM synthesis methods!

And something even more fascinating than how they look is how they *sound*. The 2:1 modulator-to-carrier tuning ratio introduces even-numbered harmonics into the carrier's sine wave, and as the level of the modulator is increased from zero a square wave begins to be heard. As the tuning of the modulator is raised incrementally through the harmonic series, the square wave becomes thinner-sounding; this is because the pulse width of the square wave has been narrowed and fewer harmonics are being generated.

More than one modulator can be linked to a carrier, which allows the introduction of even more complex harmonics into the output of the carrier. The waveshapes can become very complex.

4.1.1. Feedback

The graphics for each algorithm have a loop drawn around one or more operators. This indicates that there is a feedback loop attached to that operator or stack of operators. This is the feedback loop that is controlled by the front panel Feedback knob.

A feedback loop is a way for an operator to modulate itself, or to provide additional modulation for an entire stack of operators.

> ♪: Unlike the original synth, DX7 V provides an individual feedback loop for each operator. These feedback loops are not controlled by the front panel Feedback knob; their levels are set in the Out window of each operator.

The simplest example of feedback is Algorithm 32:

Algorithm 32

In this case, operator 6 has a feedback loop. When the feedback is set to O its output is a normal sinewave:
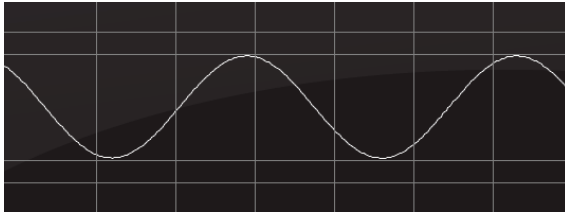
Algorithm 32, operator 6, zero feedback

With maximum feedback, the operator modulates itself into a rounded sawtooth waveform:
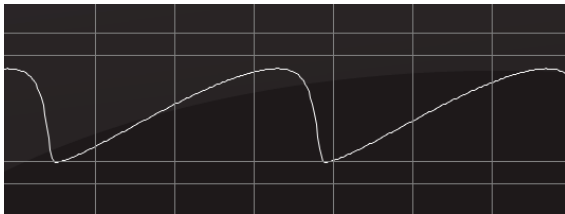
Algorithm 32, operator 6, maximum feedback

Here's another example. Algorithm 5 has operators 5 and 6 in a single stack, and operator 6 has a feedback loop:

Algorithm 5

When both the carrier and modulator are set to the same frequency and level, and the feedback amount is 0, the output looks like this:
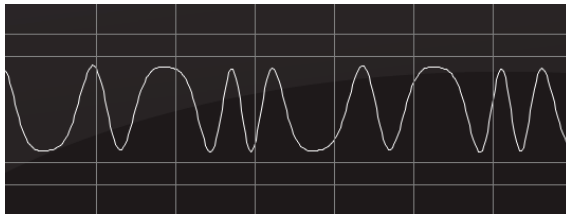
2-operator stack; modulator feedback = 0%

However, with two operators under identical conditions and 100% feedback on the modulator, the output looks like this:
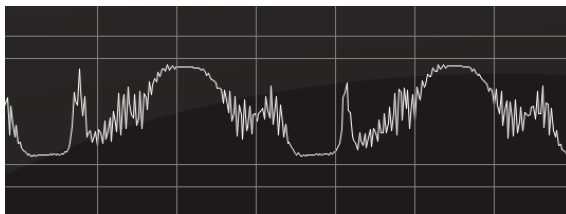
2-operator stack; modulator feedback = 100%

These are radically different waveforms! And we have shown only a few examples using sine waves. But DX7 V offers 25 different waveforms *per operator*. The combination of those waveforms and the judicious use of feedback promises a limitless number of potential sounds.

> ♪: Feedback loops exist in every DX7 V algorithm; some affect only one operator, and some affect an entire stack of operators. As you experiment with feedback, remember that it is possible to add only a small amount. A little bit of feedback can make a significant difference to the overall sound.

The original DX7 had many other features such as output envelopes, level scaling with break points, and a pitch envelope. Arturia has provided all of those features and many more in DX7 V. These will be described in the next few chapters.

5. INTRODUCTION TO ADVANCED MODE

As with all of our virtual modeling instruments, with DX7 V we have gone to great lengths to recreate the original sound of the legendary DX-7. But we are never content to stop there! We envisioned many new and wonderful features, and then set about bringing them to life. In doing so we have multiplied the capabilities of the original instrument tenfold, and have hidden this new monster of a synthesizer under the lid of the original design. To discover them is like uncovering a forgotten chamber, one that is piled to the ceiling with gold and other treasures.

5.1. Opening Advanced mode

There are two ways to access the Advanced editing mode: either click the top panel of DX7 V or click the two arrows on the right side of the upper tool bar. Either action will open the DX7 V lid, revealing all of the original DX-7 parameters and a dazzling array of new ones.
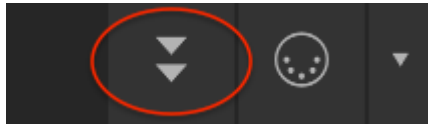
The Advanced features button: click to open

To close the lid, use the same procedure you used to open it: either click the upper inside edge of the wooden top panel, or click the two arrows in the Tool bar.

The Advanced features button: click to close

5.2. Advanced mode: tabs

The Advanced mode window contains four tabs, each of which contains its own set of parameters.

The Advanced mode tabs

Each tab has its own chapter, but here's a quick description:

5.2.1. Overview tab

The Overview tab [p.50] contains many parameters from the original DX-7: Operator Frequency, Envelope, Level Scaling, Pitch Bend Range, etc. There are also some features added by Arturia, such as Oscillator Waveform, Filters, Pan, Unison Detune, and the output waveform display.

5.2.2. Envelopes tab

The Envelopes tab [p.69] duplicates the envelopes from the Overview tab, but also displays the Pitch envelope and the two Modulation envelopes. Each envelope offers a choice of three types: DX7, DADSR, and MSEG. The MSEG envelopes can be looped (full-length or partial sections), and also can synchronized to a master clock.

5.2.3. Mods tab

The Mods tab [p.88] provides a powerful modulation matrix with up to 24 sets of routings. There are also two sub-tabs that access LFO settings, a step sequencer, and the modulation envelopes from the Envelopes tab.

5.2.4. FX tab

The effects reside on the FX tab [p.107]. This is where the pitch effects such as chorus, flanger, and phaser are found, plus two types of delays and a reverb. There is also a handful of other useful (and sometimes crazy) FX such as compressor, distortion, and bit-reducer.

6.1. Operator selection window

The foundations of an FM sound are the relative frequencies and levels of each operator. This window is where you select each operator and adjust its frequency and level.
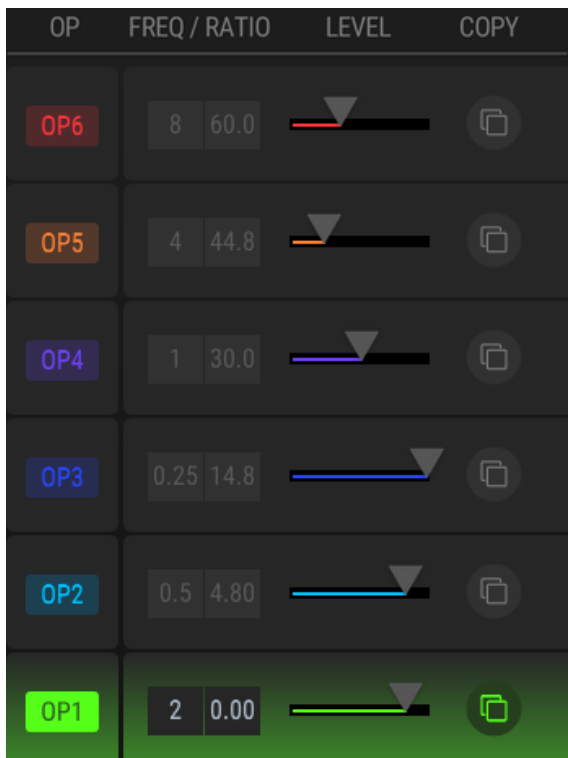
The operator selection window

Click one of the OP buttons on the left to select an operator for editing. To edit a parameter, click within its field and drag it to the desired value. To reset the parameter to its default, double-click the parameter field.

6.1.1. Muting an operator

To mute or unmute an operator, right-click its OP button. You will see that operator's color change in the Algorithm window too.

There are a couple of things to keep in mind about this, because it has a different impact than disabling an oscillator [p.54]:

- If an operator is a carrier, muting it will also mute its modulators.
- If a modulator is muted, its carrier will still be heard. The effect of the modulator on the carrier will be removed.

6.1.2. Multi-edit operator selection

To select multiple operators for simultaneous editing, use [Command/Control] + click the desired operators. To select a range of operators click the first operator, hold [Shift], and click the last operator in the group.

When multiple operators are linked for editing, the first operator you select becomes the master control for all the chosen operators. But you can still make independent edits to all of the other operators.

6.1.3. Freq/Ratio

Operators may be tuned using one of two methods: Frequency Ratio or Fixed Frequency. The tuning method is selected in the Oscillator window [p.54].

6.1.3.1. Frequency Ratio

The Frequency Ratio selection causes the frequency of the operator to follow the keyboard. In other words, higher notes produce higher frequencies.

Two fields are available: Coarse and Fine. The coarse tuning follows the harmonic series within a range of 0.25 to the 64th harmonic. 1.00 is the fundamental pitch, so the values 0.25 and 0.50 are considered sub-harmonic.

As with the notes on a piano, doubling the coarse tuning value raises the frequency by an octave, and lowering the value by half produces a frequency that is an octave lower. For example, a value of 2.00 is an octave higher than a value of 1.00, and a value of 0.50 is an octave lower than a value of 1.00.

6.1.3.2. Fixed Frequency

The Fixed Frequency selection causes the frequency of the operator to be the same no matter which note is played on the keyboard. This is useful, for example, when you want to create a mechanical noise that is consistent throughout the range of a preset.

Only one field is available in this case. The fixed frequency range is 0.370 Hz to 20 kHz.

6.1.4. Level

Click and drag one of the horizontal sliders to adjust the level of an operator.

6.1.5. Copy/paste functions

If you would like to have two operators set to the same frequency and level, there's an easy way to do that.

- 1. Click the copy/paste icon on the right side of the operator window.
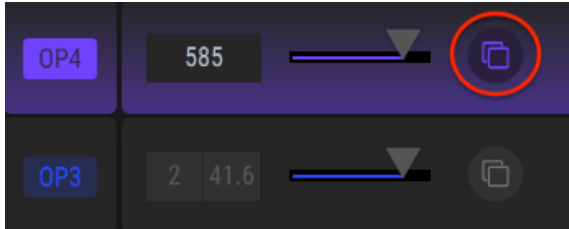
Copy/paste, step 1

- 2. Click the down arrow icon in the destination operator's window.
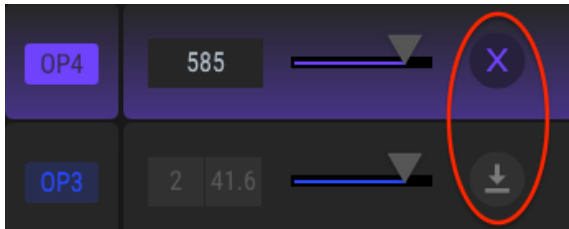
Copy/paste, step 2

To cancel, click the X in the source operator's window.

- 3. The settings for Frequency and Level will be pasted onto the destination operator, as will all the other settings (oscillator, filter, envelope, level scaling, and other output parameters).
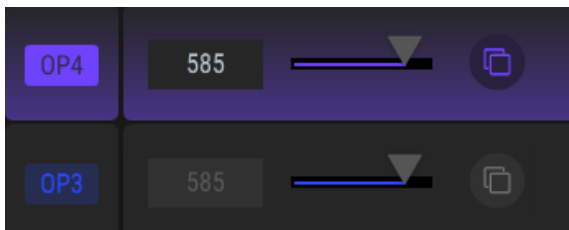
Copy/paste result

6.2. Operators vs. Oscillators

Before we proceed it is important to understand the difference between an Operator and an Oscillator.

- An Operator is composed of several parts: an oscillator, an envelope generator, and a VCA (voltage controlled amplifier; i.e., its final output stage).
- An Oscillator is a component of an Operator: it defines the most basic characteristics of the operator such as the waveform and the tuning parameters.

Remembering this basic fact will help in understanding the difference between muting an operator [p.50] and disabling an oscillator [p.54].

6.3. Oscillator window

The Oscillator window is where the operator waveform is selected. It also provides the first set of modification parameters for the operator: the tuning settings. There are also four buttons that enable and disable certain features.
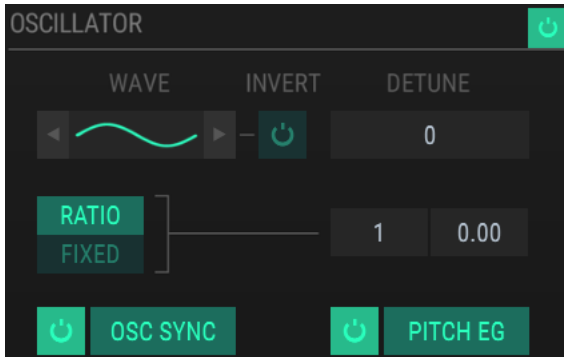
The Oscillator window

6.3.1. Disabling an oscillator

To disable an oscillator, click its on/off button.

This has a different impact than muting the entire operator [p.50]. Disabling the oscillator of a carrier will still allow its modulators to be heard at the output. For example, if operators 3-6 are stacked, as in algorithm 1, and the oscillator of operator 3 is disabled, operators 4-6 will still be heard. But now operator 4 serves as the carrier for operators 5 and 6.

Interestingly, you can still use the filter of an operator even when its oscillator is disabled. So using the same example, if operators 3-6 are stacked, as in algorithm 1, and the oscillator of operator 3 is disabled, operators 4-6 will still be affected by the filter of operator 3.

The pan position of a carrier with a disabled oscillator will also be applied to the modulators.

6.3.2. Wave menu

There are 25 waveforms available per operator. The arrows immediately to the left and right of the waveform icon will select the next waveform.

To select a particular waveform, click on the Wave field to open the selection menu:
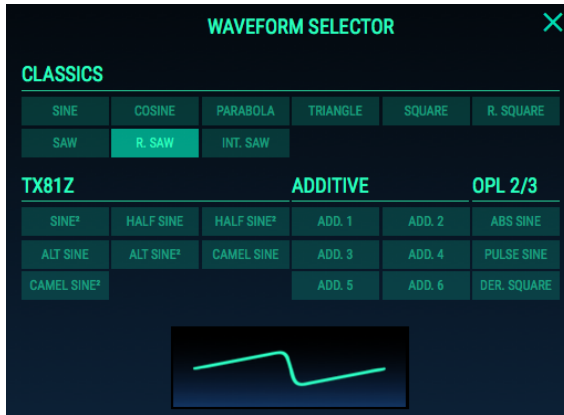
The Waveform Selector window

The lit menu button shows the current waveform selection. As the cursor hovers over each button its waveform will be shown in the smaller window. Double-click a waveform to select it, or select a waveform and then the click the X in the upper right side; either action will close the Waveform Selector window.

6.3.2.1. Invert button

The polarity of a waveform may be inverted by clicking the Invert button.
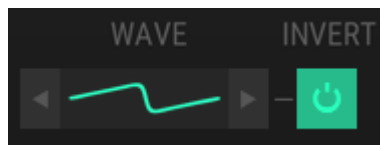
The Invert button

When the button is lit, the phase of the waveform has been inverted.

6.3.3. Detune

An operator may be detuned from its center pitch with this parameter. Click in the field to drag the value up and down. Range: +/- 15

6.3.4. Frequency: Ratio or Fixed

The tuning method for an operator is selected in this window. Click on the button to select either Ratio or Fixed.
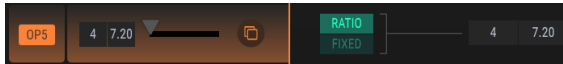
Ratio is selected

The tuning value may be altered here as well. Click and drag either field to change its value.

If Fixed is selected, you can double-click in the value field and enter a number manually. This may be the preferred method if you are looking for a particular frequency; some values might be skipped when click/dragging the value.

> ♪: When a change is made in this window it also will be made in the Operator Selection window, and vice versa.

6.3.5. Osc Sync

An operator can run freely or force its waveform to start from the beginning when it is used by a new voice.
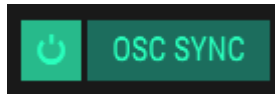
The Osc Sync button

Click the button to toggle Osc Sync on and off. When this button is lit, Osc Sync is activate for this operator.

6.3.6. Pitch EG

This button determines whether the operator will follow the Pitch Envelope or not.

The Pitch EG button

The Pitch envelope itself is located on the Envelopes tab [p.69]. When this button is lit, the Pitch envelope is activated for the current operator.

> ♪: The Pitch EG button is only available when the operator tuning mode is set to Ratio [p.56]. The button will be darkened when the tuning mode is set to Fixed [p.56],

6.3.7. Envelope

This window displays the output envelope for the current operator.

The Envelope window

The round circles are called "points". They may be clicked and dragged to make changes. For more precise edits, click and drag the appropriate value field on the right side.

6.3.7.1. Point

Click and drag this number to select a specific point in the envelope.

6.3.7.2. Time

This field controls the amount of time it takes for the operator to reach this point from the previous point. Changing this value will also affect the Time value of the next point in the envelope.

6.3.7.3. Level

This field controls the output level of the operator at this point. Changing this value will not affect any values of the adjacent points in the envelope.

6.3.7.4. Slope

Adjusting this value will change the shape of the envelope between the current point and the next one. A value of O slope will produce a linear stage; positive values will result in an exponential shape, and negative values will result in a logarithmic shape.

6.3.7.5. The ruler

Envelopes can be very long: click and drag the ruler to move the envelope left and right. This will reveal stages in the envelope that may be currently out of view.

Click the ruler and drag the cursor up and down to zoom in and out. A double-click on the ruler will rescale the view to include all stages.

> ♪: The ruler is not available for all envelope types [p.72]: it has no markings for DX7-style envelopes, but works as described above; however, it is unavailable for the DADSR envelope type because it is not needed.

6.3.7.6. Adding/removing points

An envelope may contain up to 16 points. Click anywhere in the envelope field to add another point. Right-click a point to remove it from the envelope.

> ♪: Edits to the envelope can be made here, but the envelope type can only be changed on the Envelopes tab [p.69].

For more details on editing an envelope, see Editing envelopes [p.72] in the Envelopes [p.69] chapter.

6.3.8. Level Scaling: Selecting the curve style

The output level of an operator can be increased or decreased across the note range using the Level Scaling window. Two types of scaling are available: DX7 style (original) and Modern style.

To switch from one curve style to another, open the pull-down menu:
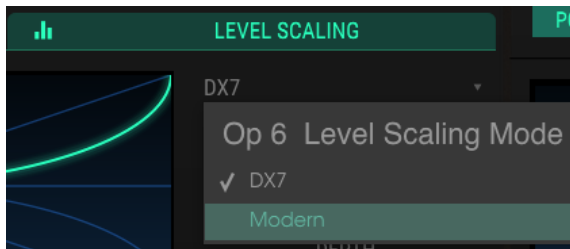
The Level Scaling curve style menu

A check mark indicates the current selection.

> ♪: If an Operator has its output level set to maximum, a choice of +Exp or +Lin may not seem like it is doing anything because it doesn't have anywhere to go: there is no headroom for an increase in level.

6.3.9. Level Scaling: DX7 curves
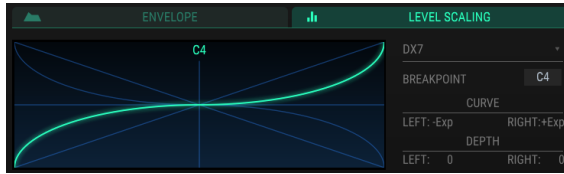
The Level Scaling window: DX7 curves

The green line indicates the current Curve selection. Edits are made using the value fields on the right side. Click/drag the field to change a value.

6.3.9.1. Breakpoint

This represents the MIDI note at which the left curve will transition into the right curve. Middle C = C3.

6.3.9.2. Curve

There are two curves: one to the left of the breakpoint and one to the right. Each curve has four shape options: +/-Linear and +/- Exponential.

6.3.9.3. Depth

The intensity of the selected curve is set using this parameter. The graphic will not change to indicate the strength of the curve.

6.3.10. Level Scaling: Modern curves

The Modern level scaling curve can contain up to 32 definable points, with independent slope and level adjustments for each one.

An example of a Modern level scaling curve

6.3.10.1. Point

Click and drag the number field up and down to select the point to be edited. To add another point, click anywhere in the level scaling field. Right-click a point to remove it.

To zoom in and out, drag the ruler in the upper part of the window up and down. Drag the ruler left and right to access points outside the viewing area.

6.3.10.2. Level

The intensity of the selected curve is set using this parameter. The graphic will change to indicate the strength of the curve.

6.3.10.3. Note

This represents the MIDI note at which the selected curve will transition into the next curve.

6.3.10.4. Slope

Each point has an adjustable slope that governs the shape of the transition into the next point. Positive values are exponential; negative values are logarithmic.

This is a crazy Modern level scale, simply because we can

6.4. Filter window

Each operator has an independent filter setting. Three resonant filter types are available.
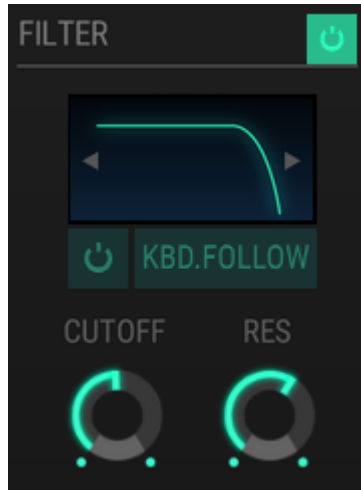
The Filter window

6.4.1. Filter bypass

To disable the operator's filter click its on/off button.

When the button is lit the filter is active. When the button is dark, the filter is inactive. Its image will become grey and the filter menu will not open.

6.4.2. Filter menu

To select a different filter, click the image of the filter curve.
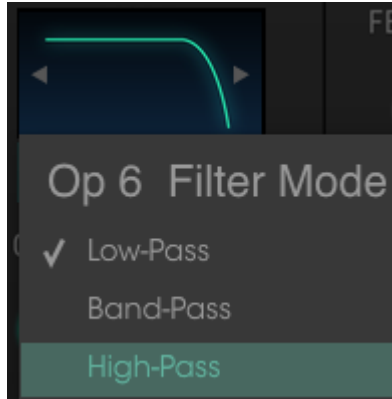
The Filter Mode menu

The filters can also be selected by clicking on the left/right arrows inside the window.

Three Filter modes are available: Low-Pass, Band-Pass, and High-Pass.

6.4.3. Keyboard follow button

When this button is lit the filter frequency will increase as the MIDI note number increases. Conversely, as the MIDI note number decreases, so will the filter frequency.

When the button is lit, the filter will track the keyboard. When the button is not lit the filter frequency will not track the keyboard.

6.4.4. Cutoff & Resonance

These two knobs will control the cutoff frequency of the filter and the filter resonance, respectively.

Filter cutoff and resonance controls

When the Band-Pass filter is selected, the cutoff knob moves the center frequency.

6.5. Output window

The Output window has four controls that affect the output of each operator differently depending on whether the operator is a carrier or a modulator.
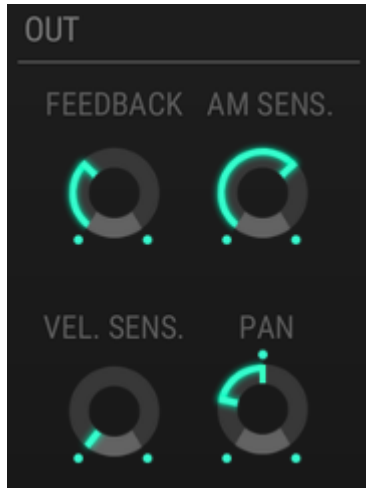
6.5.1. Operator Feedback

This knob controls the feedback level for the selected operator; i.e, the amount of self-modulation an operator will apply to itself. It is only available when the oscillator is on.

> ♪: The Feedback control in the Output window is independent of the front-panel Feedback knob: when you turn one the value of the other will not change. However, their effects are cumulative: a little feedback here plus a little feedback there could equal a lot of feedback.

6.5.2. AM Sensitivity

This knob allows you to set the Amplitude Modulation Sensitivity for the selected operator. It is available for all six operators, and each can be set to a different value.

This parameter is related to the AMD knob on the top panel, so it is possible you won't hear the AM effect of the selected operator until the AMD knob is turned up.

Only four values are available: 0, 1, 2, and 3.

6.5.3. Velocity Sensitivity

This parameter governs the velocity response of the selected operator.

6.5.4. Pan

Use this parameter to set the stereo position of the operators. The Pan knob is only available when one of the carriers is selected.

6.6. Global settings

The following settings affect the entire preset.

6.6.1. Pitch Bend Range / Step
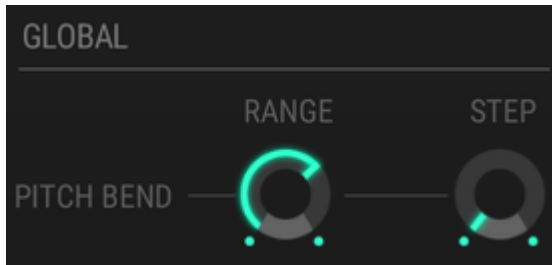
6.6.1.1. Range

The Range knob determines how far the pitch can be bent up or down. The maximum range is +/- 24 semitones (two octaves).

6.6.1.2. Step

The Step knob lets you choose whether the pitch will bend smoothly (range = 0), chromatically (range = 1), or in larger intervals (up to 24 steps).

One step equals one semitone, so if the Step value = 4 then the smallest possible response to pitch bend activity will be 4 semitones.

6.6.1.3. Interaction of the Range and Step parameters

Here's an example of how these two parameters interact.

- Set the Range value to 18 and the Step value = 5.
- Play a note and move the pitch bend control from maximum to minimum.
- You should hear the pitch jump (i.e., step) only 3 times in each direction.
- The highest and lowest pitches produced will be +/- 15 semitones (5+5+5 = 15).
- A 4th step will not be produced in either direction unless the Range value is increased to 20 (5+5+5+5 = 20).

> ♪: When the Range value is smaller than the Step value, pitch bend will conform to the Range value. In other words, if the Range value is 10 and the Step value is 24, pitch bend will only jump +/- 10 semitones, not +/- 24 semitones.

6.6.2. Polyphony

We'll describe the next two parameters first because the Portamento Mode section will refer to this information.

DX7 V has two modes that determine whether it is possible to play a chord on the keyboard or not: Mono and Poly.

- Mono turns DX7 V into a monophonic synthesizer, which means only one note may be played at one time.
- Poly allows DX7 V to play chords.

> ♪: Some monophonic synthesizers are "low-note priority", which means they ignore notes that are played higher on the keyboard than the current note being held. Other synths are "high-note priority", which means the opposite: they will ignore notes that are played *lower* on the keyboard than the current note. DX7 V is "auto-priority" in Mono mode (as was the original DX7): it will respond to notes that are played on either side of the current note.

The buttons you see in the image below are linked to the Poly button on the front panel, so when one is changed the other will change at the same time.
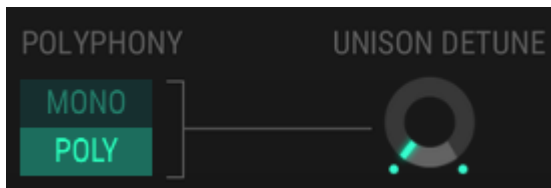
> ♪: Remember, DX7 V will ignore any notes beyond the polyphony value, as did the original DX7.

6.6.3. Unison Detune

> !: The Unison setting in the lower tool bar must be set to a value >1 for the Unison Detune feature to be heard.

The Unison Detune knob will detune any voices that are stacked from one another. For example, if the Unison value is set to 2, increasing the Unison Detune value will take the pitch of one voice down (flat) and take the pitch of the other note up (sharp).

If the Unison value is set to 3, the middle voice will split the difference between the two detuned notes and stay at the original pitch.

The higher the Unison value becomes, each increase in the Unison Detune value will spread the pitch of the added notes evenly across the detuning range.

> ♪: The Unison Detune feature works for polyphonic presets, too!

6.6.4. Portamento Mode

> **i** !: The front-panel Portamento On button must be active in order for the Portamento feature to be heard.

This drop-down menu contains two portamento modes at any given time, but the menu options will change depending on the Polyphony mode.

6.6.4.1. Polyphonic options

The two Poly Porta Mode options are Retain and Follow.
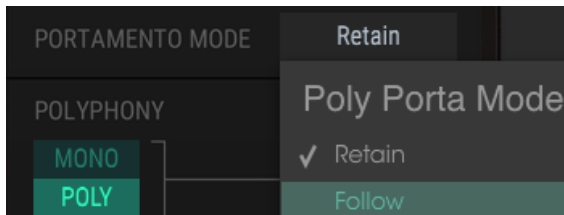
A check mark indicates the current selection. Here's a description of each:

- Retain: If you play a note with a sustain pedal pressed and then play a second note, the pitch of the first note will stay where it is and the portamento will affect the second note.
- Follow: If you play a note with a sustain pedal pressed and then play a second note, the first note you played will glide to the second note.

6.6.4.2. Monophonic options

The two Mono Porta Mode options are Fingered and Full-Time.
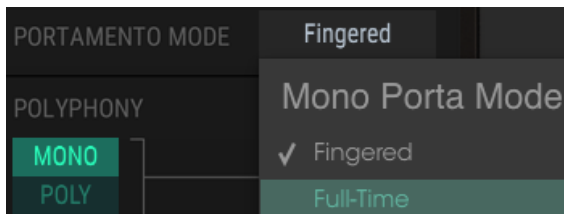
A check mark indicates the current selection. Here's how they behave:

- Fingered: Portamento will only be triggered when notes are played in a legato fashion. No portamento will occur between disconnected or staccato notes.
- Full-Time: Portamento will always be active.

> **i** ♪: When Fingered is the selected Porta Mode, it is active whether the Portamento button is on or off.

6.7. Waveform output display

This small window is both beautiful and functional. It displays a waveform of the combined output of all operators and voices being played. A single note from a single operator will display a basic waveform, and the visual complexity of the waveform will increase as more operators and/or voices are added.
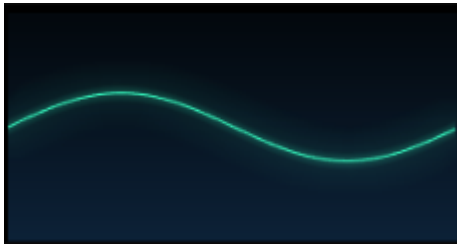
A simple sine waveform

A complex waveform

6.8. DAC Resolution

The earliest version of the DX-7 used a 12-bit DAC (digital-to-analog converter) and analog companding circuitry in its final output stage. This is very low-resolution audio by today's standards, but nevertheless has a certain appeal. So in the interest of recreating the exact experience of owning one of the original DX-7 synthesizers we have included Vintage and Modern options for the final output stage.
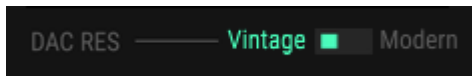
Here's a basic description of the two options:

- In **Vintage** mode we emulate the original 12-bit DAC and analog companding circuitry, including multiplexing noise.

- In **Modern** mode each voice has its own dedicated 16-bit DAC, so there is no

multiplexing noise.

7. ADVANCED MODE: ENVELOPES

7.1. Operator/envelope selection

The window on the left side of this page is used to select an operator or one of the dedicated envelopes for editing. As with the Overview window and the Algorithm window, a right-click on the OP button will mute or unmute an operator. You will see that operator's color change in the Algorithm window too.

7.1.1. Operator envelopes

These envelopes are the same as those seen on the Overview tab. Use the sliders to control the output level of the selected operator. An adjustment to the operator output basically acts as a scaling factor for the envelope.
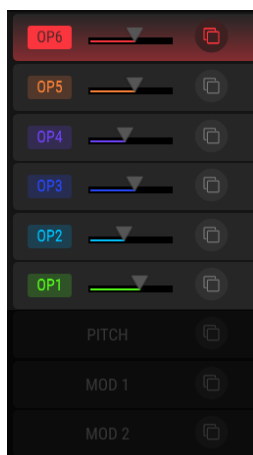
Operator selection
window, Envelopes tab

From this window it is possible to adjust the output levels of the operators one at a time. However, the Multi-edit [p.51] capability of the Overview tab is not available on the Envelopes tab.

Note that on this tab the envelopes are color-coded in the center window to match the colors of the operators themselves. The selected envelope is outlined brightly.

Envelopes have a bright outline when selected

However, as the cursor hovers over another matching envelope type its shadow will be superimposed upon the selected envelope. The envelopes pictured below are all MSEG envelopes [p.76]:
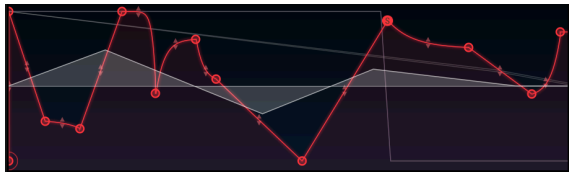
Hover over an envelope to see its shape

The hovering technique can be used to compare the shape of the selected envelope to that of other envelopes.

> ♪: When selecting or hovering over an envelope, only matching envelope types will be visible in the center window simultaneously. In other words, DX7 envelopes will be visible with DX7 envelopes, DADSR with DADSR, and MSEG with MSEG.

7.1.2. Pitch / Mod envelope selection

The three envelopes on the bottom of the selection window are global envelopes, which means they are available on other editing tabs. But the Envelopes tab is where the most detailed editing occurs.
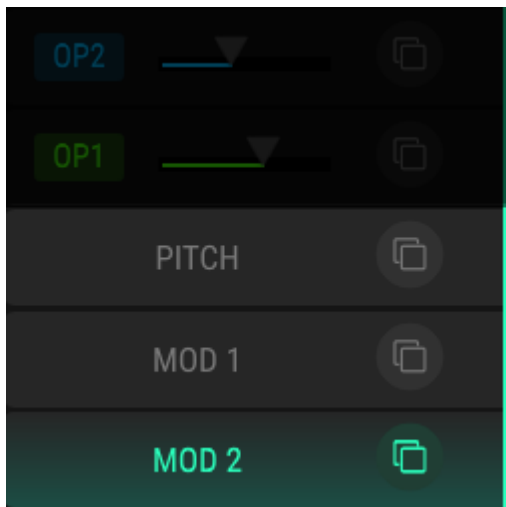
The global envelopes

Click on the name field to select one of the global envelopes for editing.

7.1.3. Copy/paste envelope settings

To duplicate the envelope settings, click the copy/paste icon of the source envelope and paste it to the destination envelope as described in the previous chapter [p.52].

7.2. Editing envelopes

The largest portion of the Envelopes tab window is dedicated to editing the envelopes themselves. There are many options!

7.2.1. Select the envelope type

There's a pull-down menu which can be used to select one of the three envelope types: DX7, DADSR, or MSEG.
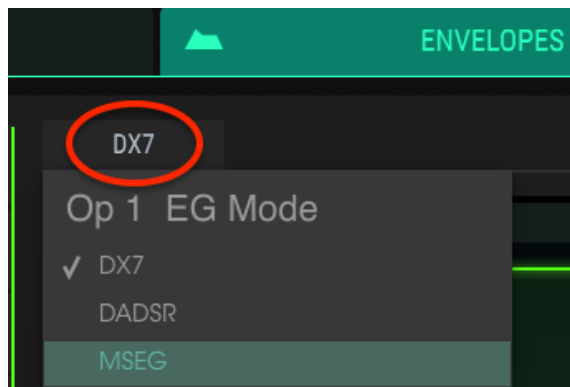
The EG Mode menu

Each type has its own capabilities:

- DX7: The original envelope, with four sets of Rates and Levels
- DADSR: A 6-stage envelope (Delay, Attack, Peak, Decay, Sustain, Release)
- MSEG: A multi-segment envelope with up to 16 points, adjustable slopes, and templates, plus looping and synchronization features

Each operator and each of the three global envelopes can use any one of the three envelope types.

7.2.2. Envelope types: Common features

No matter which envelope type has been selected, these two features are always available.

| KEYBOARD RATE SCALING | 7 | RATE MULTIPLIER | 0.429 |
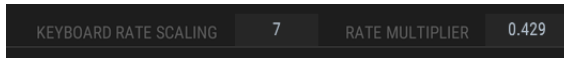
Each envelope type has these features

7.2.2.1. Keyboard Rate Scaling

This parameter affects the overall duration of the envelope. When the value is above zero the envelope duration will decrease as higher notes are played. The higher the value of this number, the greater the difference will be between the lower notes and the higher notes.

The maximum value is 7, with a value of O having no effect. Double-click the field to reset to O.

> ♪: The Keyboard Rate Scaling parameter has no effect on a synced MSEG envelope.

7.2.2.2. Rate Multiplier

The Rate Multiplier can be used to speed up or slow down the entire envelope. A value of 1.OOO has no effect, while values lower than 1.OOO slow down the envelope and values higher than 1.OOO will speed up the envelope.

The minimum value is O.1OO, or ten times slower. The maximum value is 1O.O, or ten times faster. Double-click the field to reset the value to 1.OOO.

> ♪: Fewer values are available for the Rate Multiplier parameter when an MSEG envelope is synced. These are rhythmic multiples of the tempo: O.125, O.25, O.5, O.75, 1, 2, 4, and 8.

7.2.2.3. Zoom and Drag

As described with the Envelope and Level Scaling windows on the Overview tab, it is possible to zoom in/out and move left/right on longer envelopes [p.57]. The exception is the DADSR envelope type, which fits inside the window completely.

7.3. DX7 envelopes

The original DX-7 had envelopes that were unusual when introduced to the world. In retrospect they are quite simple, having only four points. But they proved to be surprisingly flexible, especially considering that each operator had an independent output level envelope.
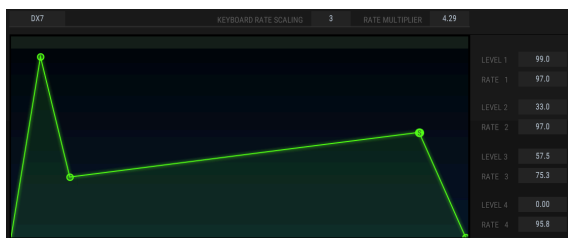
The DX7 envelope

Each of the four points has a value for Level and Rate. Values may be changed in one of two ways:

- Click a point and drag it to the desired value.
- Click a value field and drag it up/down to the desired value.

Double-click the field to restore a parameter to its default value.

> ♪: Inverted envelopes are easy to make. Simply drag Level 4 to a higher value than Level 1.

7.4. DADSR envelopes

The DADSR envelope provides another simple sound-shaping tool. It is common on analog synthesizers.
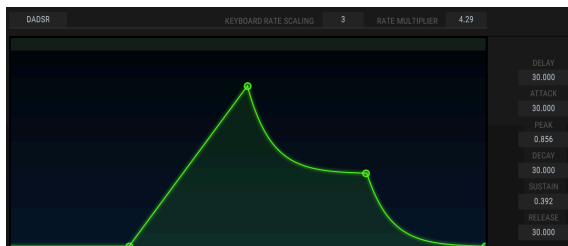
The DADSR envelope

Here's what each component of the DADSR envelope does, as listed from top to bottom on the right side:

- D = Delay the attack stage of the envelope for up to 30 seconds from the moment the note is triggered.
- A = Attack time. This is the amount of time it takes for the envelope to reach the Peak level.
- P = Peak level. Hundreds of values between 0 and 1.000 are available.
- D = Decay time. This is the amount of time it takes for the envelope to reach the Sustain level.
- S = Sustain level. Hundreds of values between 0 and 1.000 are available. S can be higher than P.
- R = Release time. This is how long it will take for the envelope to decay to 0 after the note is released.

As with the DX7 envelope, parameter values may be changed in one of two ways:

- Click a point and drag it to the desired value.
- Click a value field and drag it up/down to the desired value.

Double-click the field to restore a parameter to its default value.

7.5. MSEG envelopes

The MSEG (Multi-segment) envelopes are the most flexible envelopes of all. They can contain up to 16 points, with independent time, level, and slope values for each stage. They also can be looped and synchronized to a master clock.

7.5.1. Templates

A quick way to learn about the power of the MSEG envelope type is to experiment with the preset MSEG templates included with DX7 V. These presets are also great starting points for creating your own presets.

Templates are located inside the Envelopes tab, at the top of the inner window. Two sets of templates are available: one for unsynced envelopes, and one for synced envelopes. (Synced envelopes are explained here [p.84].)
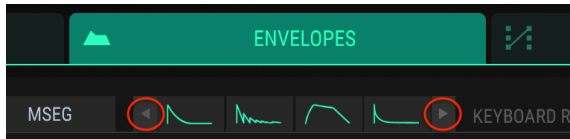
MSEG template selection arrows

Click the left/right arrows to scroll through the options.

7.5.1.1. Unsynced MSEG templates

There are eight templates available when the MSEG envelopes are not synced:
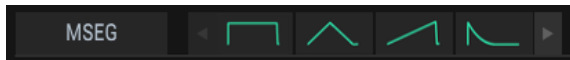
Unsynced MSEG templates 1-4
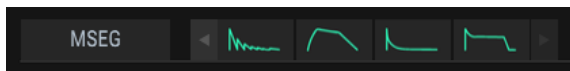
Unsynced MSEG templates 5-8

These provide basic envelope shapes as well as some other useful shapes that would take longer to create.

7.5.1.2. Synced MSEG templates

There are seven templates available when the MSEG envelopes are synced. Click the Sync button to reveal the preset options:

Synced MSEG templates 1-4

MSEG templates 5-7

These envelopes could be used as part of a rhythm track. They also are great starting points for your own rhythmic explorations.

> ♪: The synced MSEG templates are fully adjustable, but the timing of any relocated points will be forced to a location within the grid resolution.

7.5.2. Edit the envelope

The round circles are called "points". They may be clicked and dragged to make changes. For more precise edits, click and drag the appropriate value field on the right side.

7.5.2.1. Points

Click a point to select it, or click the Point number field and drag it up and down to select the point to be edited. To add another point, click anywhere in the envelope field. Up to 16 points are possible.

Right-click a point to remove it. If you double-click a point, it will become the Sustain point.

To zoom in and out, drag the ruler in the upper part of the window up and down. Drag the ruler left and right to access points outside the viewing area.

7.5.2.2. Adjust the Time

This sets the length of time it will take to reach this point from the previous point in the envelope. Changing this value will also affect the length of time it will take to reach the next point in the envelope from the current point.

> ♪: A synced envelope only allows choices that fall within the grid resolution.

When moving an MSEG point, or changing the value in the Time field on the right, the position of other points is not altered.

However, if you press the shift button on your computer keyboard and click the desired point in the editing window, you will be able to offset the position of all the points that are located to the right of the point being modified.

> ♪: The shift + click adjustment technique works only in the editing window. It is not allowed in the Time field window on the right side.

Double-click the numeric Time field to reset it to the default value.

7.5.2.3. Levels

The relative strength of the selected point is set using this parameter. The graphic will change as the level is moved.

Double-click the numeric Level field to reset it to the default value.

7.5.2.4. Slopes

Each point has an adjustable slope that governs the shape of the transition into the next point. Positive values are exponential; negative values are logarithmic.

Click and drag the small arrows to change the slope:
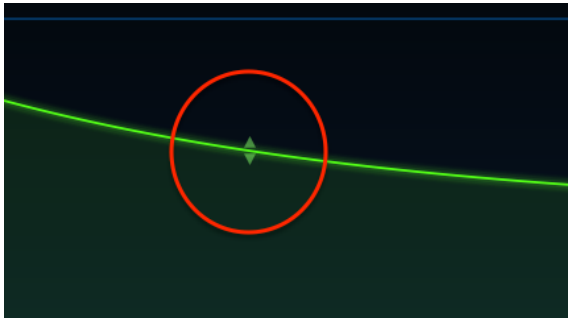
The slope adjustment arrows

Double-click the numeric Slope field to reset it to a linear slope.

7.5.2.5. Bipolar (Pitch and Mod envelopes only)

The Bipolar button sets a center point for an envelope. Values above that point are positive, and values below that point are negative.

For example, here's a Pitch envelope which is not bipolar:

A non-bipolar pitch envelope

The level of each point in a non-bipolar envelope will always be a value between 0.00 and 1.00.

In contrast, here is the same Pitch envelope with the Bipolar button pressed:

A bipolar pitch envelope

Now the same Pitch envelope has points that are both above and below the center point. Values can be anywhere from -1.00 to +1.00.

> ♪: The Bipolar button is not available for operator envelopes.

7.5.3. Segment Counts

This box displays the total number of points within an MSEG envelope.

7.5.4. Looping envelopes

An envelope can be looped between any two points. When the Loop button is pressed the Sustain point of the non-looping envelope will become the end point of the loop. If the end point of the loop is moved, it will become the new Sustain point after Loop is disabled.

A non-looping envelope, sustain point indicated

A looping envelope. The start and end points have movable flags.

Click the Loop button, press a key, and then watch the progress indicator. The envelope will start from the beginning, progress to the end point of the loop, return to the start point of the loop, and repeat that cycle until the key is lifted. After this the envelope will continue beyond the sustain stage and through the release stage.

The start and end points of the loop may be changed by moving the flags or by clicking the value field and dragging it up or down.

The loop start point has been moved.

In the above picture the envelope will start at point 1, progress to point 5 (the second flag), return to point 3 (the first flag), and then loop between points 3 and 5 until the key is released.

> ♪: It is not possible to use the same point for both the start and end points of a looping envelope. It is also not possible to place the start point beyond the end point.

7.5.5. Sync

When the Sync button is clicked several changes happen to the envelope editing window:

- The time ruler shows tempo divisions instead of durations.
- A grid appears in the envelope editing area.
- A different envelope will appear. The unsynced envelope parameters are preserved, but hidden.

This is what you will see the first time the Sync button is pressed. We have masked the parameters we will not discuss in this section:
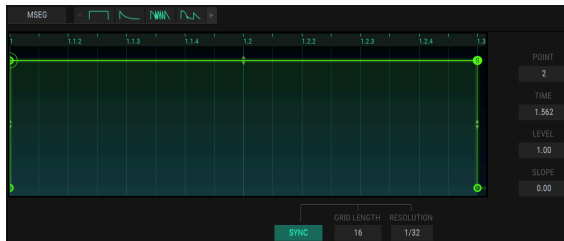
The default sync envelope

The default envelope will become very interesting when more points are added! The same procedures are used to add points [p.78] and adjust their times [p.78], levels [p.78], and slopes [p.79] as were used with the other envelope types.

However, a synced envelope is different in one way: the placement of new points is affected by the Grid Length and Resolution settings.

7.5.5.1. Grid Length

The Grid Length determines how much of the synced envelope is active. The easiest way to see what this parameter does is to grab the time ruler and zoom out until an entire measure of 4/4 time is visible, like so:

The default sync envelope after zooming out

The shaded area on the left is the grid length, and the unshaded area is not active.

Next, grab the Grid Length value field and move the number to 32.
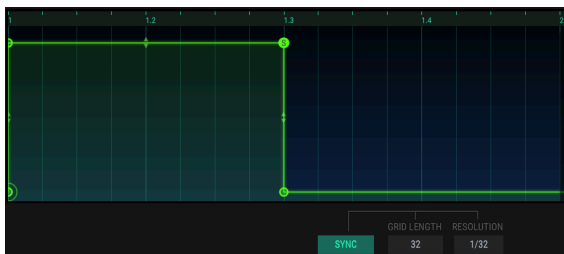
The Grid Length at 32

The shaded area has been extended to include an entire measure of 4/4 time. This has become the active Grid area.

Additional points may be placed anywhere inside the active Grid area. The new points pictured below will not be reached until after the note is released, though, because they were placed after the Sustain Level point (the circled 'S').

Four new points within the active Grid area

> ♪: It is possible to place new points outside the active Grid area, but they will have no effect unless the Grid Length includes them.

The Grid Length value can be as low as 4 and as high as 128. But only certain values are available, depending on the Resolution setting.

7.5.5.2. Resolution

Each stage of a synced envelope corresponds to a rhythmic value. If you are using DX7 V as a plug-in, these values are derived from the master tempo of your DAW. What the Resolution parameter does is determine where points can be placed within the editing window.

For example, if the Resolution is set to 1/32, there are 32 locations in the space of one quarter note where a new point can be added. But if the Resolution is set to 1/8, there are only 2 locations within a quarter note where a new point can be added.

Once a point has been added it can be dragged to any one of the 32 locations within a quarter note. The Resolution parameter merely makes it easier to add a note exactly where you want it within the rhythm.

> ♪: Changing the resolution does not affect the timing of the current envelope. It only affects where new points can be added.

Here's an example. Starting with the default sync envelope, change the Resolution to 1/4.
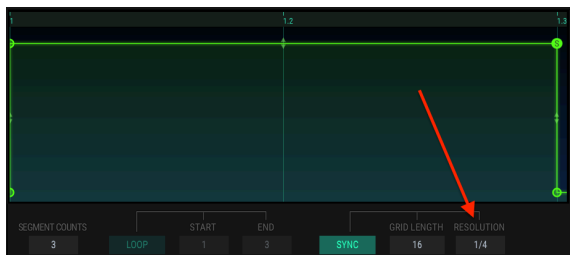
The Resolution is set to 1/4.

Notice that the time ruler and the editing window now have only one division in the middle, at the second quarter note.

Now click a spot in the editing window, roughly above the darkened Loop button, as if you were trying to add an eighth note prior to beat 1.2. Since the resolution has been set to 1/4 note, DX7 V will place the new point at either the downbeat (1) or at the next quarter note (1.2). You might see something like this:

An added point will be quantized to the nearest quarter note when the Resolution is 1/4.

Start again with the default sync envelope, but this time change the Resolution to 1/8 before adding a new point.
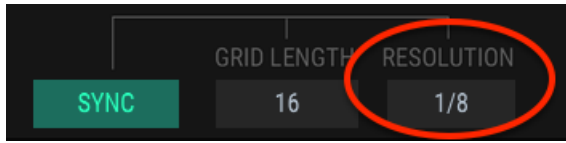
The Resolution is now 1/8.

Now add a point at the same location. Since the Resolution is higher, the results should be more like this:

An added point will be quantized to the nearest eighth note when the Resolution is 1/8.

Now you are able to add more points and quickly construct something like this:

A multi-point, synced envelope with Loop enabled

Click the Loop button and hold a note. You'll hear the synced envelope speed up and slow down while you change the tempo of your DAW.

> ♪: Remember to try the synced envelope templates we have provided! When selected the Loop button is enabled automatically, so you will hear some cool rhythmic effects immediately.

8. ADVANCED MODE: MODS

The Overview and Envelopes tabs contain parameters that were mostly present in the original DX family of synthesizers. But the Mods tab is loaded with features and concepts that were only found in the most massive modular analog synthesizers of the day. These include a modulation matrix that rivals the most extensive patch bays ever built, highly configurable LFOs, and a step sequencer that puts the '70s to shame.
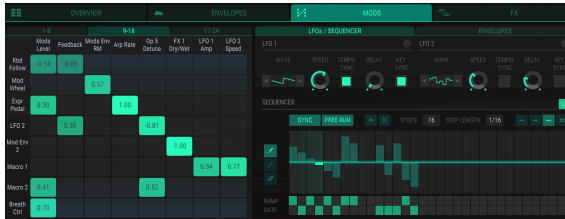
The Mods tab

The Mods tab is the perfect combination of power and possibility, and yet it is very simple to use.

8.1. Modulation matrix

A modulation matrix is basically a software "patch bay" that allows you to route one or more sources to one or more destinations. DX7 V offers 24 sets of modulation routings on three different tabs, with 8 mod routings available per tab.
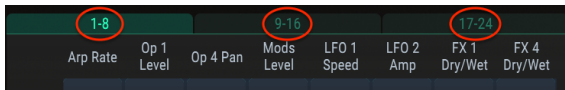
The mod group tabs: 1-8, 9-16, and 17-24

Each of the 24 mod routings allows up to 8 different sources to be routed to a single destination, or as many as 8 destinations to be modulated by a given source.

The mod sources are listed along the left side of the mod matrix:
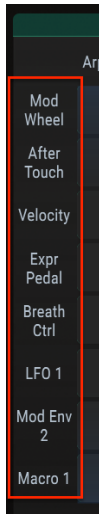
Mod sources are listed vertically

The mod destinations are listed along the top of the mod matrix:

Mod destinations are listed horizontally

The screen shots merely show examples of potential sources and destinations. There are many possibilities for each.

8.1.1. Mod sources

Click on one of the mod sources along the left side of the mod matrix and a selection window will open.
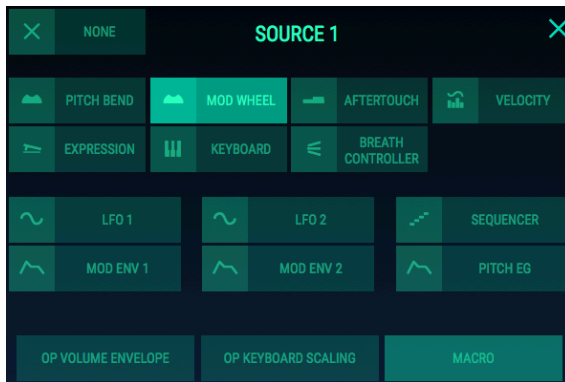
The mod source selection menu

The current selection is highlighted. As the cursor hovers over a selection it will be slightly illuminated also, like the Macro button pictured above. Make a selection or click an X and the window will close.

The bottom row of buttons contain additional selections that will make the mod routing more specific.
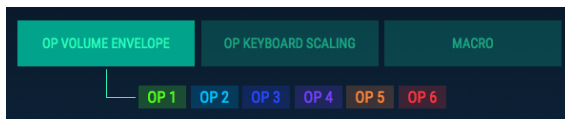
Selecting the output level of an operator as a mod source

In the example above a particular operator must be selected to complete the mod source selection. The same thing is true for the OP KEYBOARD SCALING button and for the MACRO button: you must select an operator or one of the four Macros in order to complete the mod source selection.

Once the mod routing is complete, click and hold the square in the matrix that represents the connection between the two routings. As you drag the cursor up and down the mod routing value will be adjusted.
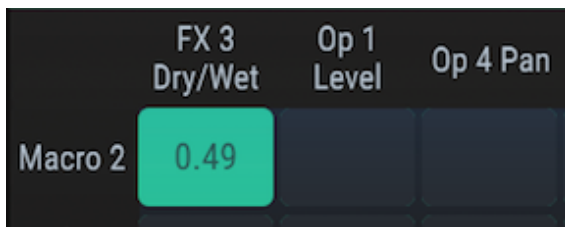
Adjusting the modulation amount

In the example below, the Macro 2 slider is controlling three different destinations.

A source can be routed to multiple destinations

In this example, as the Macro 2 slider is moved upward operators 1 and 4 will be sent in opposite directions in the stereo field. This is because one mod routing is positive and the other negative. At the same time the slider will increase the speed of LFO2.

8.1.2. Mod destinations

Click on one of the mod destinations along the top of the mod matrix and a selection window will open.

The mod destination selection menu

The current selection is highlighted. As the cursor hovers over a selection it will be slightly illuminated also, like the Resonance button pictured above. Make a selection or click the X and the window will close.

The bottom row of buttons contain additional selections that will make the mod routing more specific.

Selecting an LFO2 parameter as a mod destination

In the example above a particular parameter of LFO2 must be selected to complete the mod source selection. The same thing is true for the Operator buttons, and for the Sequencer button: you must select a specific operator parameter or one of the three Sequencer destinations in order to complete the mod destination selection.

When selecting an Operator as a destination there may be two additional levels of specificity needed:

Selecting the DADSR envelope attack for Operator 2 as a mod destination

Some Operator parameters such as the Filter Cutoff do not have additional parameters that must be selected, so when you select them the menu will close.

> ♪: MSEG envelope points are not available as sources or destinations in the mod matrix.

Once the mod routing is complete, click and hold the square in the matrix that represents the connection between the two routings. As you drag the cursor up and down the mod routing value will be adjusted.
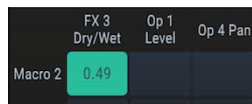
Adjusting the modulation amount

In the example below, the speed of LFO 1 is being controlled by three different sources.

A destination can be modulated by multiple sources

In this example the modulation wheel will decrease the speed of LFO 1 and keyboard aftertouch will increase its speed. Mod Envelope 2 will cause the speed of LFO 1 to rise and fall slightly as it follows the shape of the envelope.

8.1.3. Multiple sources/destinations: keeping track

The mod matrix is a grid that indicates the connections between the sources and the destinations; i.e., it shows what the sources are modulating, and also displays which destinations are being modulated by certain sources.

It can be confusing at first glance to figure out what is connected to what, though. It may be helpful at first to follow the path starting with the source, using one hand to trace from left to right, and using the other hand to trace from top to bottom, until the two hands connect in the middle of the grid.

This diagram may also be helpful:

Mod routing connection diagram

In the previous picture the Mod Wheel is controlling the Arpeggiator Rate, Velocity is affecting the wet/dry balance of FX 1, and LFO 1 is modulating the speed of LFO 2.

8.2. LFOs

The LFOs and the Sequencer share a tab, but we'll cover them separately.
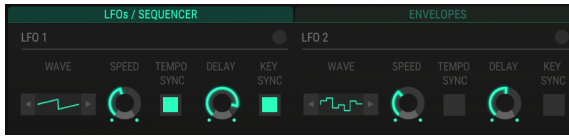
The LFO view

The parameters for LFO 1 and LFO 2 are identical, so the description of each parameter applies equally to both LFOs.

8.2.1. Wave

The LFO waveform may be selected by clicking on the waveform graphic and making a selection from the menu.
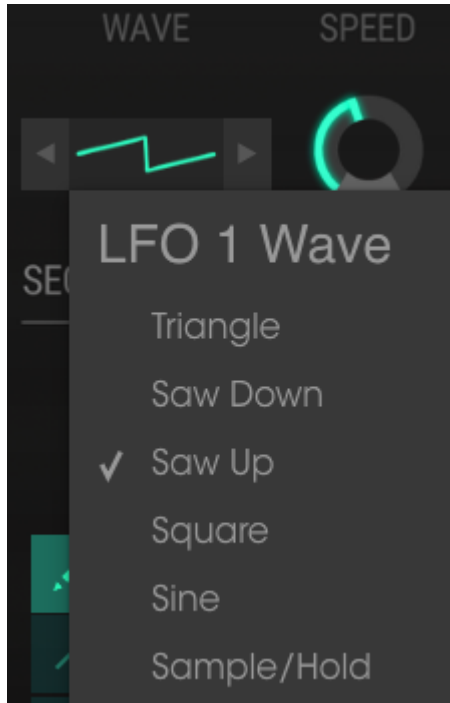
The LFO waveform menu

Alternately, you can use the arrows on either side of the waveform graphic to select the next waveform. A check mark indicates the current selection.

8.2.2. Speed / Tempo Sync

Click and drag the Speed control to increase or decrease the LFO speed.
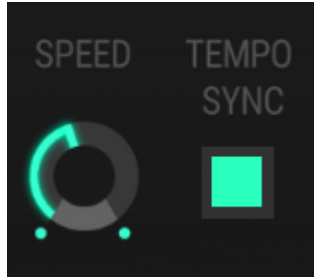
LFO speed and Tempo Sync controls

When the button is lit, Tempo Sync is active. In this case the LFO speed selections will be multiples of the current tempo of your DAW.

8.2.3. LFO Delay

Click and drag the Delay control to introduce a gradual fade-in of the LFO level.
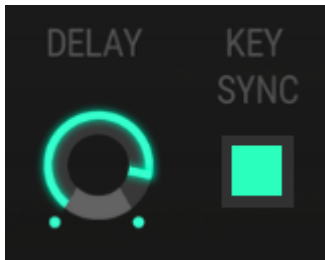
LFO Delay and Key Sync controls

8.2.4. Key Sync

When the Key Sync button is lit, the phase of an LFO will be reset to the beginning when a new note is played. When it is not lit the LFO for each note that is played will rise and fall independently.

8.3. Sequencer

DX7 V provides a step sequencer for use as a modulation source. It can be routed through the modulation matrix to any available destination, such as the frequency of an operator, the filter resonance of another, even one of the sequencer's own parameters.
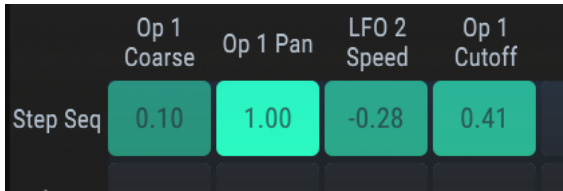
Route the sequencer through the modulation matrix

Up to 8 destinations at one time are possible per routing. The possibilities are endless!

> ℹ !: The sequencer must be routed through the modulation matrix in order to be heard.

8.3.1. Sequencer on / off button

To enable or disable the sequencer, toggle the button on the right side of the sequencer area.
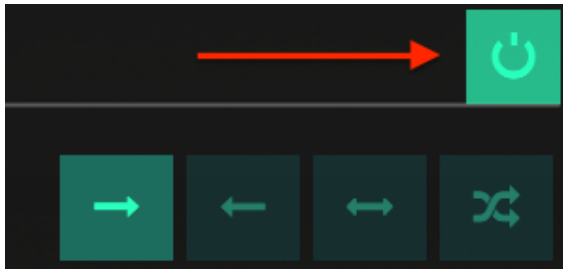
The sequencer on/off button

When the button is lit, the sequencer is active.

8.3.2. Sync button

When the Sync button is lit the sequencer tempo will follow that of your DAW. This selection limits the Step Length choices so that only rhythmic subdivisions may be selected.
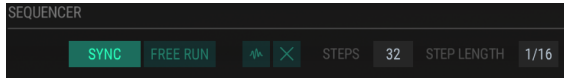
Sequencer sync affects Step Length options

There's a wide variety of Step Length settings when the sequencer is synced: they range from 1/32 notes to 8/1 (eight whole notes).

When the Sync button is not lit the sequencer tempo is determined by the Step Length setting, which is measured in milliseconds.
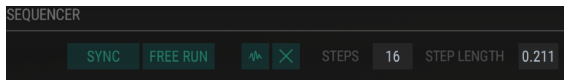
Unsynced sequencer Step Length options are units of time

There's a huge range available when the sequencer is not synced too: Step Length values range from 10 msec to 10 seconds. The space between the values increases as the value is increased, with initial values 1 msec apart and the largest values being 60-70 msec apart.

8.3.3. Free Run

When the Free Run button is not lit the sequencer will reset every time a new note is played.

When the Free Run button is lit the sequencer will run freely, and new notes will be affected by the values of the current sequencer step.

8.3.4. Randomize

> ⓘ !: Clicking the Randomize button will change all sequencer steps to a new value. If you want to be able to recall the work you have done, save the preset first.

If you're feeling adventurous and have nothing to lose, click the Randomize button. Every step in the sequence will be set to a new value. You can then adjust individual step values [p.100] as described below.
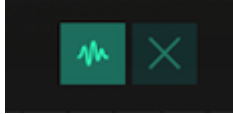
The Randomize button

The Randomize button will not change any of the other sequencer settings (Sync, Free Run, Direction, etc.). Only the step values will be changed.

> ⓘ ♪: The Randomize function places values in all 32 steps. If the Steps value is set to a lower number than that, these values will not be reached.

8.3.5. Clear all steps

This button will reset the values of all sequencer steps to the zero line. It will not change any of the other sequencer settings (Step count, Step Length, etc.). Only the step values will be affected.

8.3.6. Steps

The Steps parameter determines the number of active steps in the sequence. Sequences can be anywhere from 2 to 32 steps long.
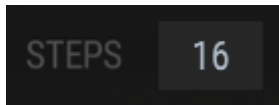
The number of steps in the current sequence

If the Step Count is made shorter, previously active steps will be darkened somewhat, but their values will be retained. That way you can preserve a longer sequence for later use, or even access them at will by selecting the Step Count as a destination in the mod matrix [p.106].

8.3.7. Step Length

The setting of the Sync button determines which values are available in the Step Length window.

8.3.7.1. Synced: note value sub-divisions

This selection limits the Step Length choices so that only rhythmic subdivisions may be selected.
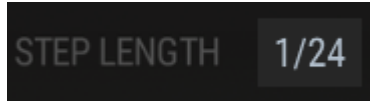
There's a wide variety of Step Length settings when the sequencer is synced: they range from 1/32 notes to 8/1 (eight whole notes). Many triplet values are available, too.

8.3.7.2. Unsynced: msec to seconds

When the Sync button is not lit the timing between the sequencer steps is determined by the Step Length setting, which is measured in seconds.
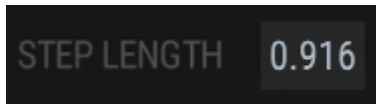
There's a huge range of available values when the sequencer is not synced: from 0.010 to 10.00 seconds. The space between the values increases as the value is increased, with initial values 1 msec apart and the largest values being 60-70 msec apart.

8.3.8. Direction buttons

These four buttons make a significant contribution to the behavior of the sequencer, as they determine the order in which the steps will be played.

The playback direction buttons

> ♪: Only one direction button may be selected at a time (all are lit above to make them more visible).

From left to right, they are:

- Forward
- Reverse
- Alternate (forward and then backward)
- Random

When a direction button is selected it will become lit.

Changing the playback direction can be a great way to discover music you didn't know you'd written!

8.3.9. Editing the steps

The values of steps can be altered individually or as a group using the tools on the left side of the sequencer editing area.
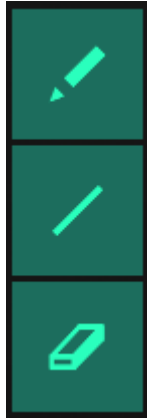
The step editing tools

> ♪: Only one editing method may be used at a time. (All are lit above to make them more visible.)

From top to bottom, these three buttons are known as the Pencil, Line, and Eraser tools, respectively.

> ♪: Use the lower tool bar to observe the sequencer step values as they are changed.

8.3.9.1. Pencil

The Pencil tool may be used in two different ways:

- To edit individual steps, click anywhere within the vertical space occupied by that step
- To edit many steps quickly, drag the cursor across those steps and draw the desired outline.

For example, the Pencil tool is useful for turning a curved line into a sequence.
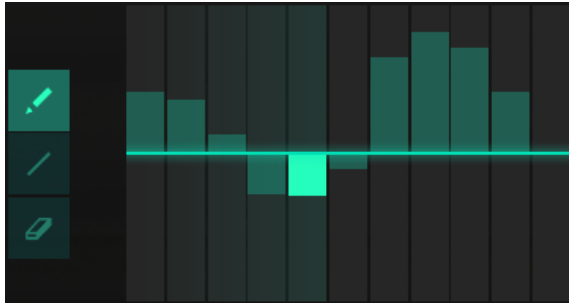
A "curved line" sequence drawn by the Pencil tool

After drawing a curve rapidly, you can click on individual steps to adjust their levels. Right-click on a step and it will be reset to zero.

8.3.9.2. Line

The Line tool can be used to create gradual changes in successive steps. For example,

- Draw a gradual fade-in from the zero line
- Draw a long fade-out to the zero line
- Draw across the zero line for positive and negative values

You can also create a "V" shape like this:
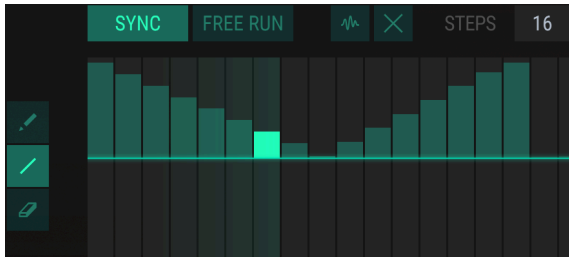
Draw multiple lines to make other shapes

To make a similar shape, follow these steps:

- Click and hold the first step
- Draw downward across the desired number of steps
- Release the cursor
- Click on a different step
- Draw upward across the desired number of steps

After drawing a line you can click on individual steps to adjust their levels.

> ♪: As long as you continue to hold the last step, the values of multiple steps can be raised or lowered at the same time.

8.3.9.3. Eraser

To reset the value of an individual step, select the Eraser tool and click anywhere within the vertical space occupied by that step.

8.3.10. Ramp / Gate

The Ramp and Gate checkboxes affect the transitions between the steps in the sequence.
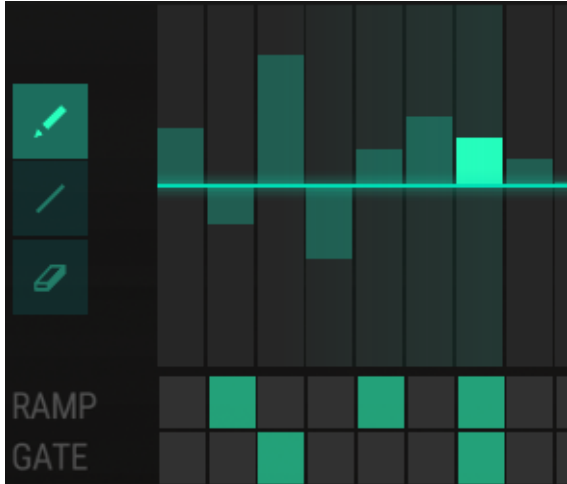
The Ramp and Gate features

The boxes may be toggled individually. It's also possible to click and drag across the Ramp row or the Gate row to enable or disable several boxes at one time.

8.3.10.1. Ramp

Sometimes also known as "slew", the Ramp feature adjusts the value gradually between steps instead of allowing the values to jump suddenly. If a Ramp box has been enabled for step X, the ramp effect will happen between step X-1 and step X.

So in the example pictured above, the value will be adjusted gradually between steps 1 and 2, and again between steps 4 and 5, and once more between steps 6 and 7.

8.3.10.2. Gate

If the Gate box has been enabled for a given step, the envelopes of all operators will be retriggered when this step is entered.

The Gate feature will also reset the phase of an oscillator if the Osc Sync [p.56] parameter is enabled for that oscillator.

8.3.11. The Sequencer as a Mod Destination

There are three destinations in the modulation matrix that affect the step sequencer.
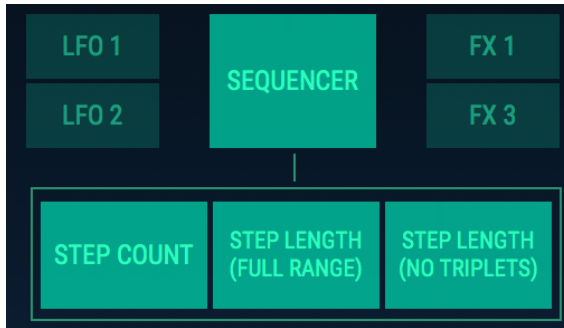
The sequencer destinations

> ♪: Only one sequencer destination may be selected at a time per mod routing. (All are lit above to make them more visible.)

8.3.11.1. Step Count

When selected as a destination, the input source can modify the number of active steps in a sequence. For example, if the sequence length is currently 16 steps, it could be shortened to 12 steps or lengthened to 30 steps depending on the amount of modulation applied to this parameter.

8.3.11.2. Step Length (Full Range/No Triplets)

Both of the Step Length options will work whether the Sync button has been pressed or not. The difference is that there will be a sudden jump between values when the sequencer is synced to your DAW, because the response is limited to rhythmic subdivisions of the tempo. When the sequencer is *not* synced the step length will be adjusted gradually.

When synced, the Step Length (Full Range) option will sweep through all of the rhythmic options, including the triplet subdivisions.

If you would like to limit the modulation response to exclude the triplet subdivisions, select the Step Length (No Triplets) option as the destination instead.

9. ADVANCED MODE: EFFECTS

DX7 V provides up to four simultaneous effects, including pitch and distortion effects, delays, equalizer, filters, and reverb. To start using or editing the effects, click the FX tab in Advanced mode.
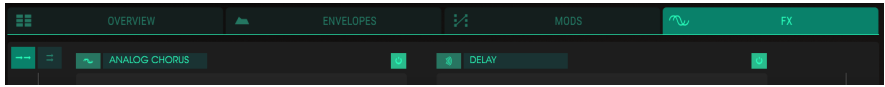
The FX tab

The effects are arranged in a 2x2 block, and the effects may be run in series or in parallel chains with 2 effects each.

9.1. FX signal flow

There are two small buttons on the upper left side of the FX window that toggle the effects between series mode or parallel mode.
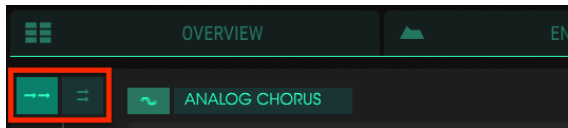
The FX routing buttons: series mode selected

Any of the effects modules can be placed anywhere in the signal path, and the same effect can be used more than once if desired.

9.1.1. Series

When the FX are routed in series the audio signal runs counter-clockwise, like this: top left -> bottom left -> bottom right -> top right.

Signal flow of the FX chain in series mode

In the picture above the audio is routed through an analog chorus, then through a parametric EQ, through an overdrive unit, and finally into a delay.

> ♪: It may be necessary to adjust the Wet/Dry balance of an effect in order to hear it or the original signal all the way through the FX signal path.

9.1.2. Parallel

When the FX are routed in parallel the audio signal is split into two halves: one runs left to right in the top row, and the other runs left to right in the top row.

Signal flow of the FX chain in parallel mode

In the picture above the audio signal is routed through an analog chorus, through a delay, and directly to the output. An identical copy of the audio is being routed through a parametric EQ, through an overdrive unit, and directly to the output.

The two paths have separate mix controls (Mix 1, Mix 2) which function as level controls for the effect returns.

> ♪: The Mix 1 and Mix 2 controls are only available when the FX are routed in parallel. ♪: It may be necessary to adjust the Wet/Dry balance of an effect or the Mix knob of a chain in order to hear the effects or the original signal.

9.1.3. Enabling / disabling an effect

To enable or disable an effect, toggle the on/off button to the right of the effect name. This is sometimes referred to as a "bypass" switch.
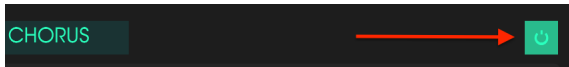
The FX on/off button

Audio will still pass through the disabled effect to the next effect or the mix output, but the effect itself will not affect the audio signal.

9.2. Selecting an effect

To select an effect, click the name field immediately above the desired FX slot. A menu will appear from which you may choose the effect you want.
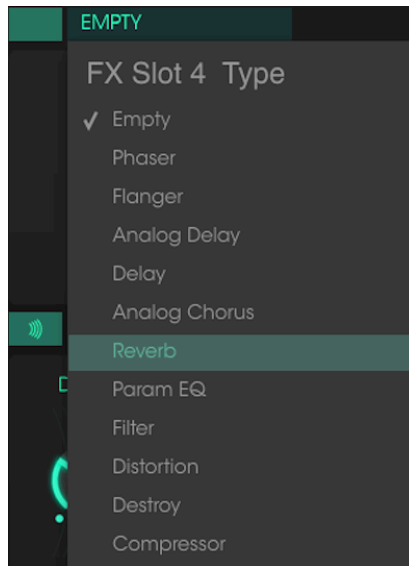
The FX selection menu

A check mark indicates the current selection. After an effect is selected the menu will close automatically.

To remove an effect from the signal path, either disable it with its on/off button or select Empty for that FX slot.

9.3. Editing the effects

Each effect has its own parameters, which will be described in the following sections.

♪: When you change an effect control the numerical value for the parameter is displayed in the lower tool bar on the left side of the application window.

9.3.1. Phaser
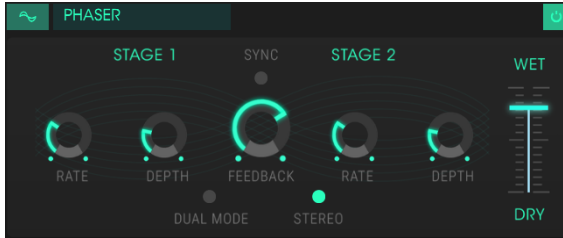
Phase shifting is a sweeping effect that was first popularized in the 1960s. It adds motion and a swirling character to the sound. It works by splitting the incoming signal, changing the phase of one side, and recombining it with the unaffected signal. This creates a notch-comb filter which can be swept through the frequency spectrum, causing the signature "whooshing" sound of the phase shifter.

The sweep is caused when the phase of the affected half is modulated by an oscillator, with the frequency determined by the Rate control. The Depth dial sets the amplitude for the action of the filtering, while Feedback amplifies certain harmonics.

DX7 V offers a two-stage phaser: the two stages can operate independently or in sync with each other.

The controls are:

- Stage 1 Rate: Sets the speed of the modulation for Stage 1
- Stage 1 Depth: Sets the depth of the modulation for Stage 1
- Stage 2 Rate: Sets the speed of the modulation for Stage 2
- Stage 2 Depth: Sets the depth of the modulation for Stage 2

Stages 1 and 2 share these parameters:

- Sync: Locks both stages to the tempo of the DAW and/or the rate of the delay. (These are the only two FX modules with a Sync button.)
- Feedback: Controls the amount of phaser resonance.
- Dual Mode: When disabled, Stage 1 is on the left side and Stage 2 is on the right. When enabled, both stages process both sides; the Phaser output is mono.
- Stereo: When enabled, maintains the stereo position of the input signal and each phaser stage outputs a stereo signal. A mono input signal will begin to "swirl" through the stereo field.
- Wet / Dry mix: Controls the balance between the input signal and the effected signal for this effect.

9.3.2. Flanger
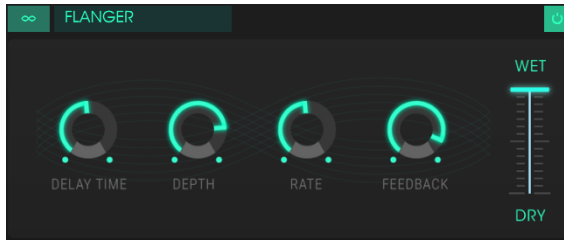
Flanging works by mixing two identical signals together, with one signal delayed by a small and gradually changing period. This produces a swept "comb filter" effect.

Flanging can create both subtle and extreme effects, depending on the Rate and Depth of the modulation. With higher Depth settings you will begin to hear changes to the pitch of the sound. This is how the circuits in an analog flanger work, and we have taken care to recreate these conditions.

The controls for the effect are:

- Delay Time: Controls the length of the delay, which changes the harmonic content.
- Depth: Sets the modulation depth. This is set to "max out" at less than 100% to limit runaway feedback.
- Rate: Sets the modulation rate for the delay time.
- Feedback: Adds positive or negative feedback for a harsher or "ringing" sound.
- Wet / Dry mix: Controls the balance between the input signal and the effected signal for this effect.

9.3.3. Analog Delay
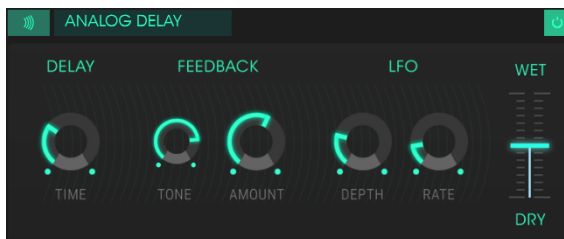
This delay reproduces the sound of the old solid state units and is LFO-controlled. The controls are:

- Delay Time: Sets the time distance between original and delayed signal.
- Feedback Tone: Increases or decreases the high frequency content in the feedback.
- Feedback Amount: Sets the amount of feedback. When fully clockwise the feedback will take a long time to die out.
- LFO Rate: This will cause a slight pitch variation.
- LFO Depth: Sets the speed of the pitch variation.
- Wet / Dry mix: Controls the balance between the input signal and the effected signal.

9.3.4. Delay
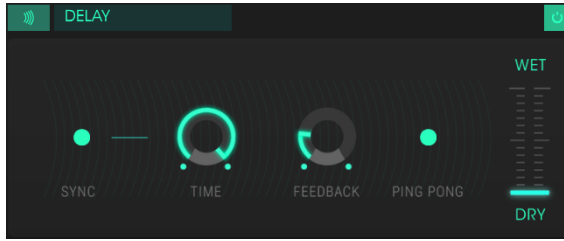
A delay can increase the spaciousness of a sound without making the sound "swim" the way some reverbs do. It can also be used as a rhythmic counterpoint to accentuate a groove.

This digital delay repeats the input signal and creates an "echo", giving it more space and depth. The Time dial offers a range of settings from 9 milliseconds to a full second.

The controls:

- Sync: Locks the delay to the current tempo of the DAW and/or the rate of the Phaser. (These are the only two FX modules with a Sync button.)
- Time: Turning the knob clockwise increases the delay time; turning in the opposite direction shortens it.
- Feedback: Adjusts the Feedback amount. Larger values cause the delay to be heard longer.
- Ping Pong: Hard-pans the effected signals so they "bounce" from left to right.
- Wet/Dry mix: Controls the balance between the input signal and the effected signal for this effect.

9.3.5. Analog Chorus
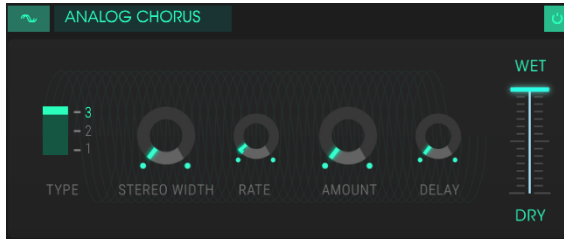
A Chorus effect is similar to a flanger in that it splits the signal, delays one side, varies the delay time gradually, and mixes the two signals back together. The difference is that the length of the delay time is longer than that of a flanger, which results in a more subtle but still very interesting effect.

The controls are:

- Type: Select one of three chorus types: simple, medium, or complex.
- Stereo Width: Controls the width of the stereo effect.
- Rate: Adjusts the speed of the chorus.
- Amount: Controls the depth of the chorus.
- Delay: Sets the amount of delay applied to the input signal.
- Wet / Dry mix: controls the balance between the input signal and the effected signal for this effect.

9.3.6. Reverb

The Reverb effect

A Reverb effect creates a large number of echoes that gradually fade or "decay". It simulates how the input would sound in a room or a large space.

- Pre-delay: Sets the amount of time before the input signal is affected by the reverb.
- Room Size: Controls the size of the room: counter-clockwise is smaller, clockwise is larger.
- Width: Adjusts the reverb from mono to an increasingly wide stereo space.
- Tone: Knob positions to the left roll off high frequencies; knob positions to the right scoop out low frequencies.
- Tame button: Reduces low-end rumble and increases the high frequency output.
- Gain: Controls the output level of the reverb.
- Wet / Dry mix: controls the balance between the input signal and the effected signal for this effect.

9.3.7. Param EQ

The Parametric EQ: standard view

DX7 V offers a three-band Parametric equalizer. An equalizer selectively amplifies or attenuates frequencies in the frequency spectrum. The controls are:

- Lo Freq: Decreases or increases the low frequency band.
- Mid Freq: Decreases or increases the mid frequencies.
- High Freq: Decreases or increases the high frequencies.
- Lo Gain: Decreases or increases the gain of the low frequency band.
- Mid Gain: Decreases or increases the gain of the middle frequency band.
- Mid Width: Sets the width of the mid frequency band.
- Hi Gain: Decreases or increases the gain of the high frequency band.
- Wet / Dry mix: Controls the balance between the input signal and the effected signal for this effect.

9.3.7.1. Standard view / graphic view

There's also a button that toggles the Parametric EQ from standard view (with knobs) to a graphic representation of the EQ curve.
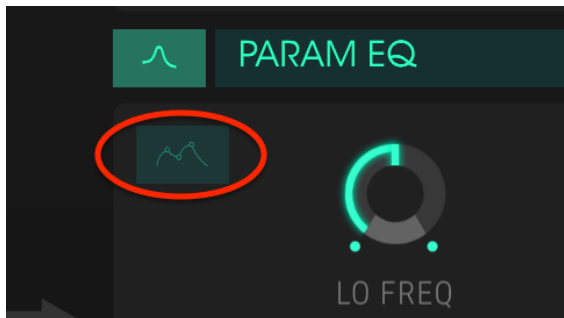
The EQ view toggle button

When this button is clicked, it reveals a visual graph that corresponds to the EQ curve.

The Parametric EQ: graphic view

The three circles in the picture correspond to the high, mid, and low frequency controls from the standard view. The circles may be dragged around, which adjusts the frequency and the gain of that band at the same time. A right-click on the middle circle will adjust the mid frequency width as you drag the cursor up and down.

9.3.8. Filter
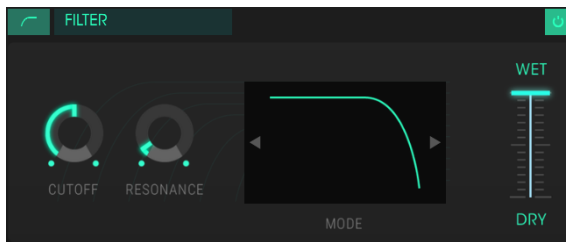
The Filter effect

The Filter effect is very similar to the filters each operator has on the Overview tab.

- Cutoff: Controls the corner frequency or frequencies for the selected filter mode.
- Resonance: Increases or decreases the amount of emphasis at the corner frequency.
- Mode: Click the window to reveal the filter mode choices: Low-Pass, High-Pass, or Band-Pass. The left/right arrows can be used to select a new filter choice too.
- Wet / Dry mix: controls the balance between the input signal and the effected signal for this effect.

9.3.9. Overdrive
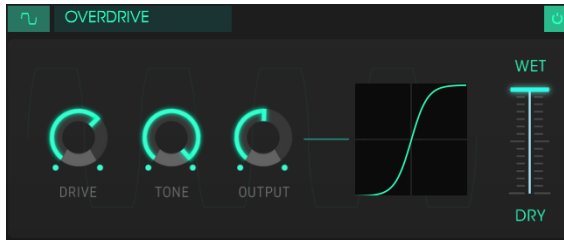
The Overdrive effect

Overdrive will add anything from a slight amount of grit to flat-out distortion to a sound. The controls are:

- Drive: Sets the overdrive amount.
- Tone: Controls the high frequencies of the sound, smoothing it or adding a harsher edge.
- Output: Sets the overall level of the overdrive. It allows you to compensate for increased output gain caused by the other settings.
- Wet / Dry mix: controls the balance between the input signal and the effected signal for this effect.

9.3.10. Destroy
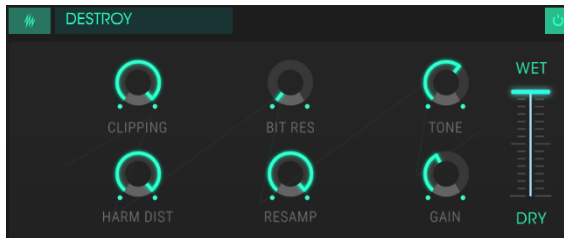
The Destroy effect

This bit-reducing effect offers several ways to deconstruct the sound. As the number of bits used to express the sound is reduced, details will gradually disappear. The controls are:

- Clipping: Sets the level where clipping will occur.
- Bit Resolution: Reduces the number of bits used to render the input signal.
- Tone: Controls the amount of high frequency content in the signal.
- Harmonic Distortion: Alters the balance of the harmonics contained in the signal.
- Resample: Resamples the already bit-reduced signal. At lower settings this will destroy the coherence of the input signal.
- Gain: Allows you to compensate for the loss or gain in amplitude caused by the resample and bit-crushing operations.
- Wet / Dry mix: controls the balance between the input signal and the effected signal for this effect.

9.3.11. Compressor
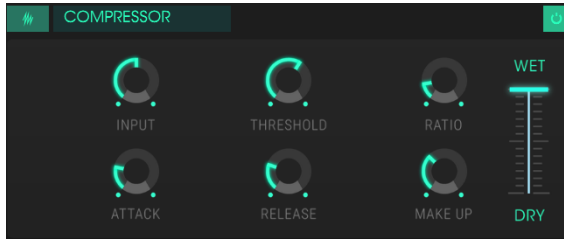
The Compressor effect

A compressor is generally used to help maintain a consistent level of sound, though there are many other ways to use one.

For example, it can keep the attack transients of a sound from overloading the input of the next effect. It can also help a sound which would normally decay quickly not to fade away as quickly. The controls are:

- Input: Controls the level of the signal being input to the compressor.
- Threshold: Sets the level where the compression will kick in.
- Ratio: Determines the amount of compression to be applied once the threshold is reached.
- Attack: Adjusts the speed with which the compression will kick in once the threshold is reached.
- Release: Sets the release curve of the compressor.
- Make Up: Controls the final output level of the compressor.
- Wet / Dry mix: controls the balance between the input signal and the effected signal for this effect.

10. SOFTWARE LICENSE AGREEMENT

In consideration of payment of the Licensee fee, which is a portion of the price you paid, Arturia, as Licensor, grants to you (hereinafter termed "Licensee") a nonexclusive right to use this copy of the SOFTWARE.

All intellectual property rights in the software belong to Arturia SA (hereinafter: "Arturia"). Arturia permits you only to copy, download, install and use the software in accordance with the terms and conditions of this Agreement.

The product contains product activation for protection against unlawful copying. The OEM software can be used only following registration.

Internet access is required for the activation process. The terms and conditions for use of the software by you, the end-user, appear below. By installing the software on your computer you agree to these terms and conditions. Please read the following text carefully in its entirety. If you do not approve these terms and conditions, you must not install this software. In this event give the product back to where you have purchased it (including all written material, the complete undamaged packing as well as the enclosed hardware) immediately but at the latest within 30 days in return for a refund of the purchase price.

1. Software Ownership Arturia shall retain full and complete title to the SOFTWARE recorded on the enclosed disks and all subsequent copies of the SOFTWARE, regardless of the media or form on or in which the original disks or copies may exist. The License is not a sale of the original SOFTWARE.

2. Grant of License Arturia grants you a non-exclusive license for the use of the software according to the terms and conditions of this Agreement. You may not lease, loan or sub-license the software. The use of the software within a network is illegal where there is the possibility of a contemporaneous multiple use of the program.

You are entitled to prepare a backup copy of the software which will not be used for purposes other than storage purposes.

You shall have no further right or interest to use the software other than the limited rights as specified in this Agreement. Arturia reserves all rights not expressly granted.

3. Activation of the Software Arturia may use a compulsory activation of the software and a compulsory registration of the OEM software for license control to protect the software against unlawful copying. If you do not accept the terms and conditions of this Agreement, the software will not work.

In such a case the product including the software may only be returned within 30 days following acquisition of the product. Upon return a claim according to § 11 shall not apply.

4. Support, Upgrades and Updates after Product Registration You can only receive support, upgrades and updates following the personal product registration. Support is provided only for the current version and for the previous version during one year after publication of the new version. Arturia can modify and partly or completely adjust the nature of the support (hotline, forum on the website etc.), upgrades and updates at any time.

The product registration is possible during the activation process or at any time later through the Internet. In such a process you are asked to agree to the storage and use of your personal data (name, address, contact, email-address, and license data) for the purposes specified above. Arturia may also forward these data to engaged third parties, in particular distributors, for support purposes and for the verification of the upgrade or update right.

5. No Unbundling The software usually contains a variety of different files which in its configuration ensure the complete functionality of the software. The software may be used as one product only. It is not required that you use or install all components of the software. You must not arrange components of the software in a new way and develop a modified version of the software or a new product as a result. The configuration of the software may not be modified for the purpose of distribution, assignment or resale.

6. Assignment of Rights You may assign all your rights to use the software to another person subject to the conditions that (a) you assign to this other person (i) this Agreement and (ii) the software or hardware provided with the software, packed or preinstalled thereon, including all copies, upgrades, updates, backup copies and previous versions, which granted a right to an update or upgrade on this software, (b) you do not retain upgrades, updates, backup copies und previous versions of this software and (c) the recipient accepts the terms and conditions of this Agreement as well as other regulations pursuant to which you acquired a valid software license.

A return of the product due to a failure to accept the terms and conditions of this Agreement, e.g. the product activation, shall not be possible following the assignment of rights.

7. Upgrades and Updates You must have a valid license for the previous or more inferior version of the software in order to be allowed to use an upgrade or update for the software. Upon transferring this previous or more inferior version of the software to third parties the right to use the upgrade or update of the software shall expire.

The acquisition of an upgrade or update does not in itself confer any right to use the software.

The right of support for the previous or inferior version of the software expires upon the installation of an upgrade or update.

8. Limited Warranty Arturia warrants that the disks on which the software is furnished is free from defects in materials and workmanship under normal use for a period of thirty (30) days from the date of purchase. Your receipt shall be evidence of the date of purchase. Any implied warranties on the software are limited to thirty (30) days from the date of purchase. Some states do not allow limitations on duration of an implied warranty, so the above limitation may not apply to you. All programs and accompanying materials are provided "as is" without warranty of any kind. The complete risk as to the quality and performance of the programs is with you. Should the program prove defective, you assume the entire cost of all necessary servicing, repair or correction.

9. Remedies Arturia's entire liability and your exclusive remedy shall be at Arturia's option either (a) return of the purchase price or (b) replacement of the disk that does not meet the Limited Warranty and which is returned to Arturia with a copy of your receipt. This limited Warranty is void if failure of the software has resulted from accident, abuse, modification, or misapplication. Any replacement software will be warranted for the remainder of the original warranty period or thirty (30) days, whichever is longer.

10. No other Warranties The above warranties are in lieu of all other warranties, expressed or implied, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. No oral or written information or advice given by Arturia, its dealers, distributors, agents or employees shall create a warranty or in any way increase the scope of this limited warranty.

11. No Liability for Consequential Damages Neither Arturia nor anyone else involved in the creation, production, or delivery of this product shall be liable for any direct, indirect, consequential, or incidental damages arising out of the use of, or inability to use this product (including without limitation, damages for loss of business profits, business interruption, loss of business information and the like) even if Arturia was previously advised of the possibility of such damages. Some states do not allow limitations on the length of an implied warranty or the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.