

Note Gate 2 Audio Unit

User Manual

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Table of Contents

Preface	4
About this manual	4
About Audiowish	4
Note Gate 2 Audio Unit	5
Introduction	5
System requirements	5
Installation	6
Trial version limitations	6
Using Note Gate 2	7
Interface overview	7
Basic usage	8
Getting started	8
Transposition group	8
Volume group	9
Timing group	9
Gate Monitor group	9
Pitch Tracking group	10
Congratulations!	10
Usage Examples	11
Introduction	11
Simple volume swells	11
Backing volume swells	11
Fake reverse delay	12
Selective effect	12
Selective harmonizer	13
Audio Unit Parameters	14
Overview	14
Transposition group	14
Key	14
Master volume	14
Volume group	15
Unison ... Major seventh	15
Timing group	15
Attack time	15
Release time	15
Gate monitor group	15
Current volume	15

Current note	15
Accuracy	16
Pitch tracking group	16
A4 frequency	16
Accuracy threshold	16
Jitter threshold	16
Troubleshooting	18
Note Gate 2 does not show up in host software	18
Audible pops and clicks	18
Pitch tracking is incorrect or unstable	18
Known Issues	19
Parameter groups not shown in Carbon interface	19
Third-party graphical interface imperfections	19
General	19
Absolute note names are not updated	19
Master volume does not update note volumes interactively	19
Gate monitor is not shown	19
Gate monitor displays “Trial, muted” message	19
Version History	20
Acknowledgments	20
Stephan M. Bernsee	20
Tim Bruniges	20
Philippe Gruchet	20
Revision History	21
Disclaimer	21

Preface

About this manual

You are reading the Note Gate 2 Audio Unit user manual, which covers installation and usage of the Note Gate 2 software effect. After reading this manual you will be able to use the software in a variety of Audio Unit hosts and know the purpose of each of the Audio Unit's processing parameters.

To obtain the latest revision of the Note Gate 2 user manual, please visit the Audiowish website at <http://www.audiowish.com>. You will find an up-to-date version of the manual in PDF format ready for download.

The manual you are reading now was last modified on November 21, 2007. For a brief overview of revisions, consult the "[Revision History](#)" section of this manual.

About Audiowish

Audiowish is a young software company dedicated to developing high quality Audio Unit sound effects. Thanks to our enthusiasm and continued interest in providing robust tools for musicians, producers and sound engineers we're able to offer exciting products at very low prices.

Audiowish started in 2006 under the Forever For Now umbrella and became a dedicated effort in the third quarter of 2007.

For the latest news and software updates, visit the Audiowish website at <http://www.audiowish.com>.

Note Gate 2 Audio Unit

Introduction

Note Gate 2 is a real-time¹ pitch-based Audio Unit volume filter effect.

By leveraging existing technologies like CoreAudio, AltiVec and SSE², Note Gate 2 offers a unique audio experience. Key features of the Audio Unit include:

- low latency processing for live performances
- robust real-time diatonic pitch tracker with integrated visual pitch monitor
- dedicated filter attack and release time settings for maximum flexibility

Additionally, Note Gate 2 makes use of the industry standard generic Cocoa and Carbon graphical interface views for Audio Units offering a seamless integration into host applications like Logic Express and Pro, Garageband, Final Cut Express and Pro and Soundtrack.

System requirements

To use the Note Gate 2 Audio Unit, you will need at least the following configuration:

- Apple Macintosh computer with a PowerPC G4 or G5 or Intel processor³
- Mac OS X Tiger (10.4) or higher⁴
- 5 Mb of free disk space⁵
- Audio Unit version 2 host software

Almost all existing Apple G5 and Intel computers will conform to these requirements and should have no problems running the Note Gate 2 Audio Unit.

¹ In this manual *real-time* refers to internal processing latencies lower than 2 milliseconds.

² AltiVec will only be used on PowerPC-based computers, SSE will only be used on Intel-based computers.

³ Note Gate 2 is packaged as a Universal Binary, it performs equally well on PowerPC and Intel based computers.

⁴ Although Note Gate 2 has not been extensively tested on Mac OS X Leopard (10.5) yet, initial user reports indicate no problems on the platform.

⁵ Disk space requirement is estimated, actual required disk space may vary.

Installation

To install the Note Gate 2 Audio Unit on your computer, drag the “NoteGate.component” file from the disk image to the “Install (All users)” folder link in the disk image.

Please note that Note Gate 2 will replace any previous versions of the Note Gate Audio Unit. Make sure to back up previous versions of the Audio Unit and document your user presets before replacing the old version.

If you want to make sure you performed the installation correctly, refer to the “[Note Gate 2 does not show up in host software](#)” section in the troubleshooting chapter.

Trial version limitations

The Note Gate 2 Audio Unit trial version is fully functional and will continue to function indefinitely, but every few minutes the output will be muted for a short period of time. The trial version of Note Gate 2 may not be used for commercial purposes.

To obtain a fully functional version of the Note Gate 2 Audio Unit, visit its product page on the Internet:

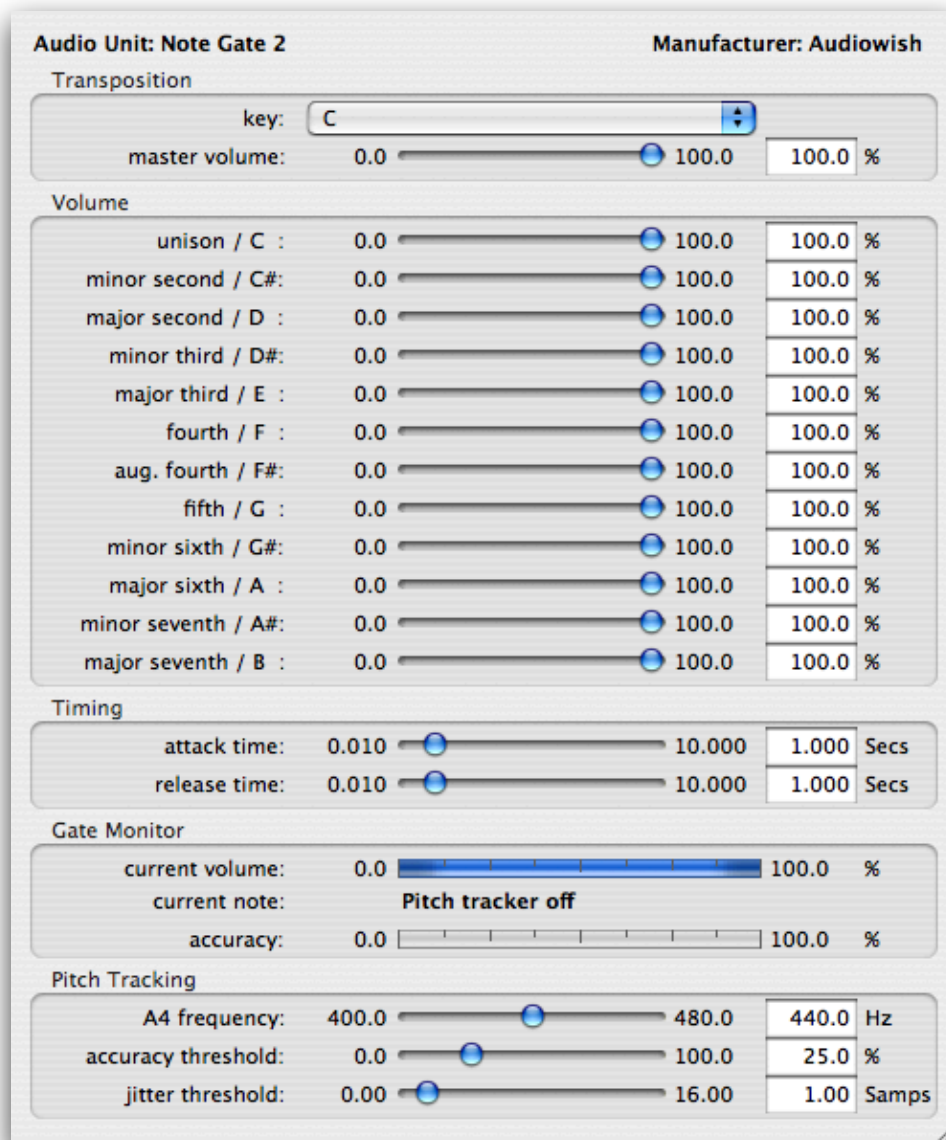
<http://www.audiowish.com/audio-units/note-gate.html>

Using Note Gate 2

Interface overview

Note Gate 2 is an Audio Unit effect, not a stand alone application. You will need an Audio Unit version 2 compliant host application⁶ to be able to use Note Gate 2 in your effects chain. Please refer to your host software’s manual on how to add Audio Unit effects to your projects.

In this manual we will look at Note Gate 2 in Apple’s AU Lab host application, using the generic Cocoa interface, or *view*:



Note Gate 2 generic Cocoa view in AU Lab.

Like other Audio Units, you can adjust Note Gate 2’s processing settings by manipulating the on-screen parameters using your mouse or keyboard.

⁶ Popular Audio Unit host applications are Logic (Pro), Garageband and AU Lab. You can find more Audio Unit host software on Apple’s Mac OS X Downloads page at <http://www.apple.com/downloads/macosx/>.

Basic usage

Getting started

The first time seeing the Note Gate 2 Audio Unit might feel a bit overwhelming, but don't be intimidated by the sheer number of parameters and settings. You will feel at home in no time by following this brief tutorial.

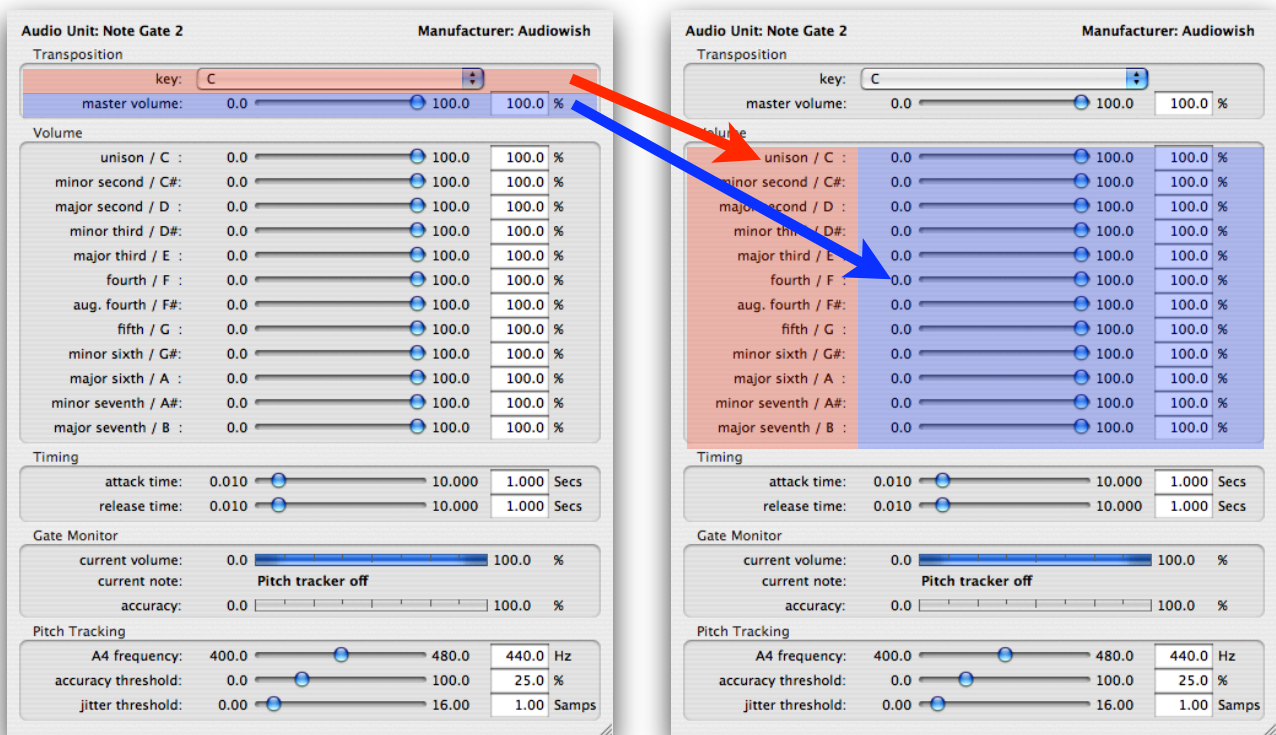
Note Gate 2 is a volume filter effect that changes the output volume based on the notes in the input signal. By using the attack and release time parameters in the timing parameter group you can achieve lots of different effects.

Take a deep breath and relax as we now take a look at each of the parameter groups in the interface.

Transposition group

At the top of the interface is the transposition group which allows you to set both the key of the musical piece you are playing and a master volume for every note in the scale.

Try changing each parameter and observe the changes in the interface, visualized below:



Influence of the Note Gate 2 key (in red) and master volume (in blue) parameters.

As you can see, the key parameter sets the scale root note, unison, but retains the scale volume pattern which allows you to use a scale volume pattern in different keys.

The master volume adjusts each of the individual note volume sliders by the same amount. This allows you, for example, to raise the volume of the output signal by a certain amount using only a single parameter.

Volume group

The volume group contains the target volume parameters for each one of the twelve notes in the twelve-tone equal temperament⁷. These volume parameters let you set a different target volume per note, ranging from total silence, 0%, to full volume at 100%.

The parameter name of each note consists of the relative interval to the root note and the absolute note name as based on the key.

To get a feel for Note Gate 2, set the volume parameter for the F note to 0% and play a melody in C-major. You'll notice that all notes sound as usual, but as soon as you play the F the volume starts to fade out, play a different note and the volume gradually fades in again.

Experiment with the different note volume sliders, the master volume and the key parameter to get a feel for interacting with Note Gate 2. Once you feel comfortable with the volume fading concept, move on to the next section.

Timing group

As you have experienced, Note Gate 2 gradually fades the signal volume in or out. The parameters in the timing group let you control the speed at which Note Gate 2 fades.

The attack time parameter controls the speed of volume increases while the release time parameter controls the speed of decreasing the volume. Both times are entered in seconds and are based on the time it takes to fade from 0% to 100% (attack) or from 100% to 0% (release).

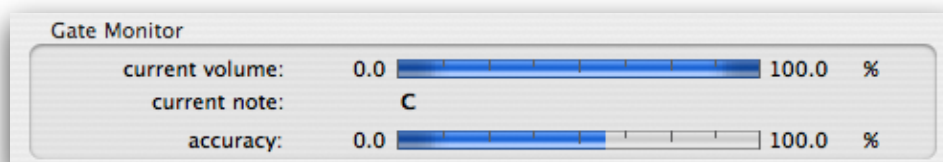
Again it would be wise to experiment a bit with both timing parameters to see which effects you can achieve with Note Gate 2.

Gate Monitor group

The gate monitor group contains all information about Note Gate 2 internals at a glance. You can instantly see the currently applied gate volume, the note you are playing and the accuracy of the pitch detection.

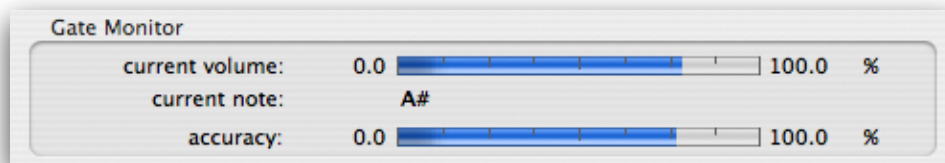
Note Gate 2 features a real-time pitch tracker which analyzes the incoming audio signal and determines which note is being played. The current note and accuracy parameters let you inspect the pitch tracker so you can easily adjust the threshold parameters in the pitch tracker parameter group.

Sample gate monitor values are displayed in these screenshots:



Note Gate 2 detects the note C being played with 55% confidence, current volume is at 100%.

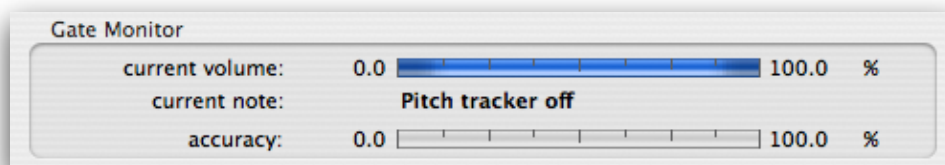
⁷ See the Wikipedia article on equal temperament: http://en.wikipedia.org/wiki/Equal_temperament.



Note Gate 2 detects the note A# being played with 75% confidence, current volume is at 75%.

Of course the higher the score within the accuracy meter, the better the pitch tracker follows your melody. Accuracy values of 25% or higher are sufficient for successful pitch tracking.

Besides indicating which note is being played along with the accuracy and current volume, the pitch monitor can indicate that the pitch tracker is off, as in this screenshot:



Note Gate 2 indicates the pitch tracker is turned off.

The main reason for this indication is that the Note Gate 2 Audio Unit is being bypassed or muted from within the Audio Unit host application.

Pitch Tracking group

The A4 frequency parameter sets the frequency of the A4 note in Hertz. In almost all cases⁸ the default value of 440 Hertz is correct. Only set this parameter to a different value if you are playing in a non-standard tuning or if your instrument is known to be slightly de-tuned.

The pitch tracking threshold parameters fall outside of the scope of this basic usage tutorial. See the "[Parameter Overview](#)" section for a technical explanation of these advanced parameters.

Congratulations!

If you have made it this far, pat yourself on the back as you now know how to apply Note Gate 2 for automatic note based volume fades. Explore the rest of this manual for additional creative ideas and technical details.

⁸ See the A440 entry on Wikipedia for a historical overview of this frequency: <http://en.wikipedia.org/wiki/A440>.

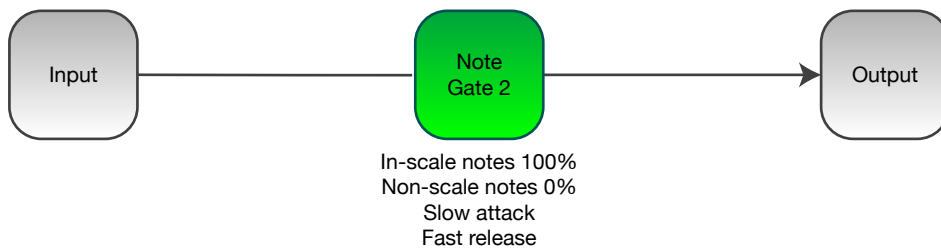
Usage Examples

Introduction

Note Gate 2 can be applied for lots of different effects, this chapter provides examples in which Note Gate 2 is integrated into an audio effects chain. Be creative and explore the possibilities!

Simple volume swells

While Note Gate 2 is best applied on a separate bus, it's entirely possible to use it as the main effect on your melody for volume swells. This diagram shows how to set up your effects chain:



Effects chain for simple volume swells with Note Gate 2.

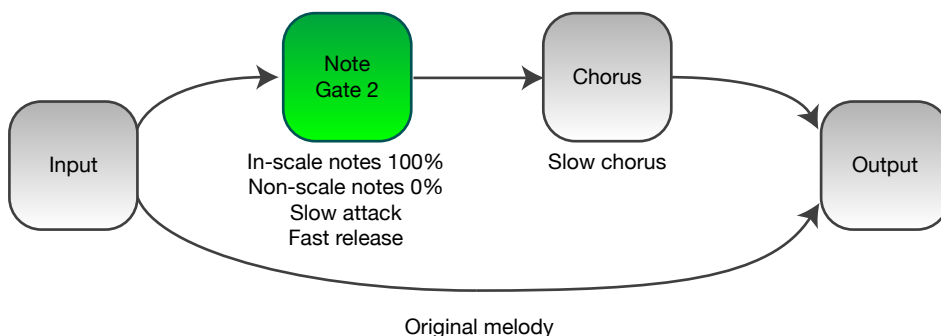
Set up the Note Gate 2 scale volume pattern to allow all notes to pass at 100% volume in the desired scale and set all other notes to 0%. Use a moderate to long attack time (two to ten seconds) and a short release time (one tenth of a second).

When you play chords or melodies in the scale you set up, each chord or note you strike will now gradually fade in. On a guitar, slide your hands on the neck between each stroke to generate fret noise which will reset the gate volume.

These automatic volume swells sound great in combination with a long reverb or delay applied after Note Gate 2. Experiment with different settings to find a sound you love. As you'll soon find out, volume swells using Note Gate 2 are much easier than turning the volume knob on your instrument.

Backing volume swells

Taking the simple volume swells a step further, we can apply Note Gate 2 to a parallel bus and combine it with an effect you like. This diagram shows Note Gate 2 powering a slow chorus backing swell:



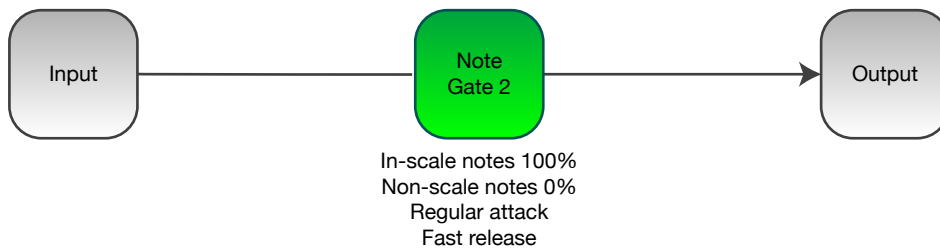
Effects chain for effected backing swells using Note Gate 2.

Note Gate 2 is set up just like the example before, except it has been added to a parallel bus in front of a chorus effect. Of course you can replace the chorus with any effect you'd like to gradually fade in when playing.

To add extra punch to the backing swell, increase the volume of the parallel bus on which Note Gate 2 resides. As your instrument's volume naturally fades after a few seconds, the bus volume boost will allow the backing swell to sound as loud, or louder than, the original dry signal.

Fake reverse delay

Note Gate 2 can be used to imitate a reverse delay effect like Reverse Sampler 2⁹ without actually playing your melodies in reverse. Use Note Gate 2 as the main effect on your effects chain, as depicted in this diagram:



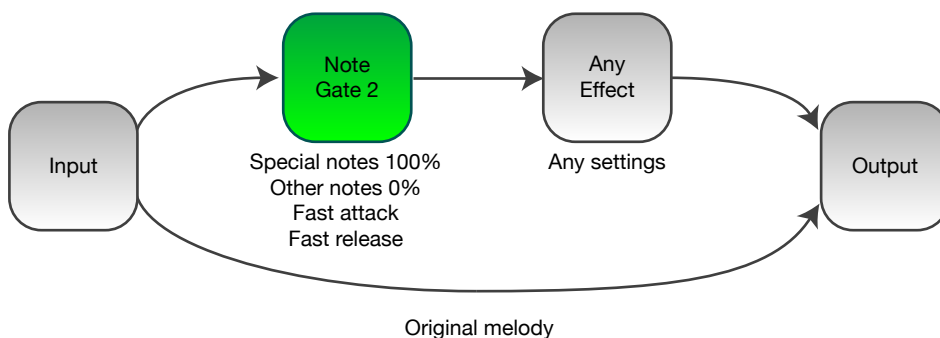
Effects chain for the fake reverse delay effect using Note Gate 2.

Combine a regular attack time like half a second to one full second with a short release time like one hundredth of a second and set all in-scale notes to 100% volume and the others to 0%.

As you play short phrases with a bit of dissonant noise in between, Note Gate 2 will fade in each section, dampening the initial attack of each note or chord which makes it sound like a reverse delay is actually producing the sound.

Selective effect

Another application of Note Gate 2 is to apply a distinct effect to specific notes in a melody. This diagram shows a simple effects chain using Note Gate 2:



Effects chain for applying an effect selectively using Note Gate 2.

⁹ Reverse Sampler 2 is a real-time reverse delay Audio Unit developed by Audiowish. See <http://www.audiowish.com/audio-units/reverse-sampler.html> for details and a trial version.

Use a short attack and release time to make sure your custom effect is only applied to the notes of the melody you want, without affecting other notes which are played shortly beforehand or afterwards.

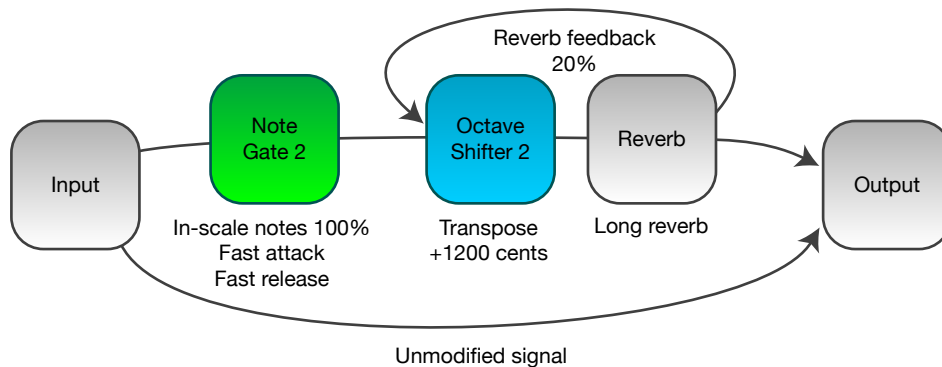
This selective effects chain can be *stacked*, meaning you can add as many parallel buses with different effects on them as your computer allows.

On each bus, add a Note Gate 2 instance and another effect and make sure each Note Gate 2 instance filters different notes, or allow some overlap.

Using the stacked approach and Diatonic Shifter 2¹⁰, you can easily create complex harmonies that are still played on a single instrument. Using the right Audio Unit host software, the possibilities are near endless.

Selective harmonizer

Zooming in on the selective effect effects chain, we can replicate a selective harmonizer using Note Gate 2, Octave Shifter 2¹¹ and a generic reverb effect. The following diagram shows the effects chain for this idea:



Effects chain for creating a selective harmonizer using Note Gate 2 and Octave Shifter 2.

Again, you can create lots of additional buses containing different gate settings and effects.

The four ideas listed in this section are hardly exhaustive and there are lots of ways to use Note Gate 2 to achieve great sounds. Keep your mind and ears open looking for inspiring settings.

¹⁰ Diatonic Shifter 2 is a real-time diatonic pitch shifting Audio Unit developed by Audiowish. See <http://www.audiowish.com/audio-units/diatonic-shifter.html> for details and a trial version.

¹¹ Octave Shifter 2 is a free-ware Audio Unit developed by Audiowish optimized for pitch shifting an audio signal by a fixed amount. See <http://www.audiowish.com/audio-units/octave-shifter.html> for details and downloads.

Audio Unit Parameters

Overview

Note Gate 2 offers numerous parameters for controlling the audio processing. The following table lists individual parameters, their group, range, default value and unit of measurement. An elaborate description of each parameter is included below the table.

Group	Parameter	Range	Default	Unit
Transposition	Key	C, C# ... B	C	Note
	Master volume	0 ... 100	100	Percent
Volume	Unison ... Major seventh	0 ... 100	100	Percent
Timing	Attack time	0,01 ... 10	1	Seconds
	Release time	0,01 ... 10	1	Seconds
Gate monitor	Current volume	0 ... 100	100	Percent
	Current note	C, C# ... B and Pitch tracker off	Pitch tracker off	Note
	Accuracy	0 ... 100	0	Percent
Pitch tracking	A4 frequency	400 ... 480	440	Hertz
	Accuracy threshold	0 ... 100	25	Percent
	Jitter threshold	0 ... 16	1	Samples

Transposition group

Key

Sets the root note of the scale you are playing in.

Since the Note Gate 2 scale transposition pattern is entered relative to the scale's root note, unison, you can easily change the modality you are playing in by setting the key parameter while maintaining the relative scale transposition pattern.

For consistency, always create your scale transposition pattern with the key parameter set to the root note of the equivalent major scale. Do not set the key parameter to A when working in A-minor, instead set it to C because of the equivalent C-major scale.

Master volume

Controls all individual scale volume parameters at once. Use the master volume slider to easily raise or lower the volume for every individual note.

Note that the lower and upper boundaries of the individual volume parameters will always be maintained – you can not raise a note's volume to a value above 100% or lower than 0% using the master volume slider.

If setting the master volume to a new value would cause an individual note volume to exceed its boundaries, the value will be clipped to fit within the boundaries. As long as Note Gate 2 is active, the master volume slider can be used to undo this clipping.

Volume group

Unison ... Major seventh

Controls the target volume of each note in the scale. Note Gate 2 labels each individual note with its interval relative to the root note, like major second or perfect fifth, as well as the absolute note name based on the key, like D or G.

The target volume for each note is defined in percent, with 0% being total silence and 100% equaling the original signal's volume.

Because Note Gate 2 is a dynamic, diatonic volume changing effect, the actually applied volume change at any given point in time is dependent on the note being played in the incoming audio signal and the value of the attack and release time parameters, see the "[Current volume](#)" parameter.

Timing group

Attack time

Sets the amount of time the volume gate should take to increase the volume from 0% to 100%. A long attack time will result in gentle, slow fade ins, while a short attack time almost instantly fades in the signal.

Please note that the actual fade in duration for a given played note is dependent on the target volume for that note and the current volume of the gate. A high current gate volume and a low target volume can both shorten the fade in time.

Release time

The release time parameter works exactly opposite of the attack time parameter, it controls the amount of time the gate takes to decrease the volume from 100% to 0%. A long release time will result in a smooth fade out, while a short release time makes for quick fades.

Like the attack time parameter, the actual duration of the fade out depends on both the target volume for the played note and the current volume of the gate. A high target volume and low current volume can both shorten the fade out time.

Gate monitor group

Current volume

Shows the current volume of the gate.

The current volume parameter shows you the inner workings of Note Gate 2 at a glance. You can easily see the influence of the Note Gate 2 volume gate by watching the current volume change in real time.

Use the current volume display to tweak the attack and release time parameters to your liking.

Current note

Shows the note that the pitch tracker currently detects in the input signal.

Although the current note parameter can not be manipulated, it provides useful information for tweaking and troubleshooting the pitch tracker which is built into the Note Gate 2 Audio Unit.

Accuracy

Displays the current confidence of the pitch tracker on a scale of zero to one-hundred percent. The accuracy meter is your main instrument for tuning the pitch tracker if results are flaky.

High accuracy values indicate that the incoming audio signal clearly carries a key note. Low accuracy values are an indication of a noisy or strongly polyphonic input signal.

Refer to the “[Pitch tracking is incorrect or unstable](#)” section for applications of both the current note and accuracy parameters.

Pitch tracking group

A4 frequency

Sets the base frequency of the middle A note in Hertz. Change the A4 frequency parameter if your musical instrument is known to be tuned to a different frequency. Most instruments and musical performances are based around the A4 note having a frequency of 440 Hertz.

Accuracy threshold

Controls the minimally required pitch tracking accuracy for recognizing a note.

As the name implies, the Note Gate 2 pitch tracker will only pick up new notes if the confidence of the tracker is above the accuracy threshold. This threshold will prevent stray harmonics and noise from influencing the note recognition.

The default accuracy threshold suits most instruments like guitars, keyboards, flutes and even vocals. If you find that the pitch tracking isn't working properly for you, read the “[Pitch tracking is incorrect or unstable](#)” section first.

Determine an optimal value for the accuracy threshold by playing notes all along the full range of the instrument and checking the “[Pitch monitor accuracy](#)” as the note changes. Note the lowest accuracy you see when playing different notes.

Use this lowest accuracy minus twenty-five percent as a starting point for tweaking the accuracy threshold. You will want to find a value that is comfortably low enough for each note to be recognized while preventing small imperfections from accidentally triggering a note change.

Jitter threshold

Stabilizes the pitch tracker's note recognition¹².

The jitter threshold allows you to guard yourself against short bursts of odd harmonics and noise by setting a minimal threshold on the duration of a note, forming a useful safety net.

Stray harmonics and noise typically last only a few milliseconds which you can filter out by increasing the jitter threshold. The jitter threshold depends on the sample rate for time measurement so you will usually want to increase this parameter as the sample rate increases.

¹² Note that the jitter threshold is applied after the accuracy threshold. The Note Gate 2 pitch tracker will only take sufficiently accurate samples into account when considering the jitter threshold.

Experiment with the jitter threshold to find the lowest value which does not cause the transposed melody to jitter while playing a melody.

If you are able to comfortably set the accuracy threshold to a value of twenty-five percent or higher without the pitch tracker skipping notes, you can typically set the jitter threshold to a very low value of zero or one. The default settings are set up this way.

Troubleshooting

Note Gate 2 does not show up in host software

If you did not follow the installation instructions in this manual, please read and follow the “[Installation](#)” section first.

Note Gate 2 not showing up in your Audio Unit compatible host software can have multiple causes. Please follow the following steps to make sure your computer is set up correctly:

- Verify that your host software supports version 2 Audio Units¹³
- Make sure that “NoteGate.component” is installed correctly by double clicking the “Install (All users)” link in the disk image and checking if it is listed there
- Use Apple’s “auval” tool¹⁴ to verify the Audio Unit is working correctly, open up the Terminal application and copy and paste the following command:

```
auval -v aufx ntgt Awsh
```

Press the Enter key to execute this command. Please send the output of this command to frank@audiowish.com for further troubleshooting the problem.

Audible pops and clicks

Pops and clicks are usually the results of one of three causes:

- Verify that the original, incoming audio signal does not contain pops or clicks – Note Gate 2 will only alter the volume of the incoming signal and won’t correct imperfections
- Using Activity Monitor, verify your computer’s CPU usage for spikes or constant high load¹⁵ – if the Audio Unit host application cannot process its audio signals within a short amount of time it will generate a pop or click

Pitch tracking is incorrect or unstable

If the pitch monitor built into Note Gate 2 consistently reports incorrect or inaccurate notes, please check the following conditions:

- Make sure that the Note Gate 2 Audio Unit receives a monophonic instrument signal with proper volume and try raising or lowering the volume of the incoming signal
- Check if the “[A4 frequency](#)” parameter corresponds with the current tuning of the instrument you are playing and check the tuning of your instrument, retuning it if necessary

¹³ Consult your application’s manual, documentation or contact the manufacturer of the software.

¹⁴ If your system does not have the “auval” utility installed (indicated by a “command not found” message) you can get it as part of the Xcode suite. Consult Apple’s developer website, <http://developer.apple.com>, on how to obtain Xcode.

¹⁵ On multi-processor or multi-core systems like a Dual or Quad G5 system or Intel Core Duo, check for spikes or high load on single processors or cores.

If these actions do not solve the issue, follow the instructions listed under the “[Pitch tracking group](#)” in the parameter overview to set the accuracy and jitter thresholds to their optimal values.

Known Issues

Parameter groups not shown in Carbon interface

The generic Carbon Audio Unit interface provided by Apple does not support parameter groups for Audio Units. There is currently no known workaround, but Note Gate 2 will perform normally despite the minor graphical differences compared to the Cocoa interface.

Note that the generic Carbon Audio Unit interface inserts small horizontal separators between parameter groups to visually distinguish them.

Third-party graphical interface imperfections

General

Third-party Audio Unit host applications are known to provide custom, but not fully compliant, graphical interfaces for Audio Unit effects. While the graphical interface might show minor imperfections, audio processing is unaffected.

Known issues and workarounds for third-party graphical interfaces are listed below.

Absolute note names are not updated

Apparently the Audio Unit host application does not support live changes of parameter information when the key parameter changes. Either use the relative note names as a guide for setting up the scale transposition pattern or try closing and reopening the Note Gate 2 view or the host application itself after changing the key.

Master volume does not update note volumes interactively

This problem is caused by the Audio Unit host application not reacting on interactive changes of the master volume parameter. Instead of just dragging the parameter slider, try releasing it frequently, the note volume parameters will be updated accordingly as you release the slider.

Gate monitor is not shown

The Audio Unit host application does not support read-only parameters like the current volume, current note and accuracy meters.

Use a different host application like Garageband or Logic to determine correct values for your instrument and apply these as a guideline in the third-party host application.

Gate monitor displays “Trial, muted” message

The trial version of Note Gate 2 will mute its output for a short period of time every few minutes. See the “[Trial version limitations](#)” section for more information.

Version History

Date	Version	Remarks
November 21, 2007	2.0	Initial release of the Note Gate 2 Audio Unit.

Acknowledgments

Stephan M. Bernsee

The Note Gate 2 Audio Unit builds on the work and tutorials written by Stephan M. Bernsee, posted on his website called DSP Dimension¹⁶. Thanks to Stephan for answering questions and explaining audio concepts.

Tim Bruniges

Tim Bruniges, musician behind The Dead Sea¹⁷, offered valuable real-life experience and feedback which has helped improve the live playability and usability of Note Gate 2 a lot. Thanks to Tim for his enthusiasm and communications.

Philippe Gruchet

Philippe Gruchet, author of Open Tuning¹⁸, has offered a lot of suggestions, ideas and testing on the PowerPC platform. Thanks to Philippe for all communications and efforts which have helped make Note Gate 2 what it is today.

¹⁶ See <http://www.dspdimension.com> for Stephan M. Bernsee's tutorials and examples.

¹⁷ See <http://www.thedeadsea.org> for more information on Tim Bruniges' music.

¹⁸ See <http://www.open-tuning.com> for more information on Philippe Gruchet's Open Tuning software.

Revision History

Date	Remarks
November 21, 2007	Current document revision.
November 21, 2007	Minor update to the “ Acknowledgments ” section.
November 20, 2007	Added the “ Fake reverse delay ” usage example.
November 19, 2007	Minor updates to the “ Introduction ” and “ Version History ” sections.
November 15, 2007	Initial draft for internal use.

Disclaimer

First of all, thank you for your interest in the Note Gate 2 Audio Unit. We hope you will enjoy the continued use of this software product.

The Note Gate 2 Audio Unit has been designed, programmed and extensively tested for use in a great diversity of operating conditions. Even though a lot of care and testing went into the user interface and algorithms in this product, we can not guarantee flawless operation under every condition imaginable.

Under no circumstances including negligence shall the author be liable for any incidental, special or consequential damages that result from the use or inability to use the Note Gate 2 Audio Unit even if the author has been advised of the possibility of such damages.

You may not redistribute versions of the Note Gate 2 Audio Unit other than the “Trial” version without the author's prior written consent.

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