



USER MANUAL



Information in this manual is subject to change without notice and does not represent a commitment on the part of Applied Acoustics Systems DVM Inc. The software described in this manual is furnished under a license agreement. The software may be used only in accordance of the terms of this license agreement. It is against the law to copy this software on any medium except as specifically allowed in the license agreement. No part of this manual may be copied, photocopied, reproduced, translated, distributed or converted to any electronic or machine-readable form in whole or in part without prior written approval of Applied Acoustics Systems DVM Inc.

Copyright © 2006 Applied Acoustics Systems DVM Inc. All rights reserved. Printed in Canada.

Program Copyright © 2004-2006 Applied Acoustics Systems, Inc. All right reserved.

Ultra-Analog is a Trademark of Applied Acoustics Systems DVM Inc. Windows 98, 2000, NT, ME, XP and DirectX are either trademarks or registered trademarks of Microsoft Corporation. Macintosh, Mac OS, QuickTime and Audio Units are registered trademarks of Apple Corporation. VST Instruments and ASIO are trademarks of Steinberg Soft Und Hardware GmbH. RTAS is a registered trademarks of Digidesign. Adobe and Acrobat are trademarks of Adobe Systems incorporated. All other product and company names are either trademarks or registered trademarks of their respective owner. Unauthorized copying, renting or lending of the software is strictly prohibited.

Visit Applied Acoustics Systems DVM Inc. on the World Wide Web at

www.applied-acoustics.com

Contents

1	Introduction	8
1.1	System requirements	8
1.2	Installation	9
1.3	Authorization and Registration	9
1.3.1	Step 1: Generating the challenge key	10
1.3.2	Step 2: Generating the Response key and Registering your Product	10
1.3.3	Step 3: Completing the unlock process	13
1.3.4	Obtaining your response key and registering by fax or over the phone:	14
1.4	Getting started	14
1.4.1	Using <i>Ultra Analog VA</i> in standalone mode	14
1.4.2	Exploring the factory presets	15
1.4.3	Using MIDI Links	16
1.4.4	Using MIDI program changes	16
1.4.5	Using <i>Ultra Analog VA</i> as a Plug-in	16
1.5	Getting help	16
1.6	Forum and User Library	17
1.7	About this manual	17
2	Presets and MIDI maps	18
2.1	Presets	18
2.1.1	The Preset Library	18
2.1.2	The Program list	18
2.2	Playing and Changing Presets	19
2.3	Editing and Saving Presets	20
2.4	Saving the Program List	21
2.5	Organizing the Preset Library	21
2.5.1	Creating Folders	21
2.5.2	Copying and Moving Presets and folders	21
2.5.3	Renaming Presets and folders	22
2.5.4	Deleting Presets and Folders	22
2.5.5	Documenting Presets	22

2.5.6	Locating a Preset in the Browser	22
2.5.7	Resizing the Browser	23
2.6	MIDI maps	23
2.7	Exporting and Importing Presets and MIDI maps	23
2.8	Backuping Presets and MIDI maps	23
2.9	Restoring the Factory Presets and MIDI Links	24
3	Architecture of the <i>Ultra Analog</i>	25
3.1	General Signal Flow	26
3.2	Modulation Sources	27
3.3	Output Effect	27
4	Parameters	28
4.1	General Functioning of the Interface	28
4.1.1	Tweaking Knobs and Sliders	28
4.1.2	Buttons	28
4.1.3	Drop-down menus and Displays	28
4.1.4	Inverting a Signal	29
4.1.5	Bypassing a Module	29
4.1.6	Resetting a Module and Copying Settings	29
4.1.7	Modulation Signals	29
4.2	The Oscillator Module	30
4.2.1	Waveform	30
4.2.2	Pitch and Pitch Modulation	30
4.2.3	Sub Oscillator	31
4.2.4	Synchronization	31
4.2.5	The Mixer	32
4.3	The Filter Module	33
4.3.1	Resonant Low-Pass Filter	33
4.3.2	Resonant High-Pass Filter	34
4.3.3	Band-Pass Filter	34
4.3.4	Notch Filter	35
4.3.5	Formant Filter	36

4.3.6	Filter Drive	36
4.3.7	Slave Filter 2	37
4.3.8	Series/Parallel	37
4.4	The Amplifier Module	38
4.5	The Noise Generator Module	39
4.6	The LFO Module	39
4.6.1	Wave Shape	39
4.6.2	Rate	39
4.6.3	Phase and Reset Mode	40
4.6.4	Fade-In	40
4.7	The Envelope Module	41
4.7.1	Shape of the Envelope Segments	42
4.7.2	Free Run Mode	42
4.7.3	Legato Mode	42
4.7.4	Loop Modes	43
4.8	The Keyboard Module	44
4.8.1	Tuning	44
4.8.2	Mode and Priority	44
4.8.3	Unison	45
4.9	The Portamento Module	45
4.10	The Vibrato Module	45
4.11	The Arpeggiator Module	46
4.11.1	Arpeggio Patterns	46
4.11.2	Rhythmic Patterns	47
4.11.3	Rate and Synchronization	47
4.11.4	Latch mode	47
4.12	The Output Effect Section	47
4.12.1	The Clock Module	48
4.12.2	The Chorus Module	48
4.12.3	The Delay Module	48
4.12.4	The Reverb module	49
4.12.5	Topology	49

4.12.6	The Output Module	50
4.12.7	The Recorder Module	50
5	Toolbar	51
5.1	Program Display	51
5.2	MIDI map	51
5.3	CPU meter	51
5.4	Value Display	51
6	Audio and MIDI Settings	52
6.1	Audio Settings	52
6.1.1	Selecting a Audio Device	52
6.1.2	Audio Control Panel	52
6.2	MIDI Settings	52
6.2.1	Selecting a MIDI Device	52
6.2.2	Creating MIDI Links	53
6.2.3	Editing MIDI Links	53
6.2.4	Deleting MIDI Links	54
6.2.5	Creating a MIDI Map	54
6.2.6	Default MIDI Map	54
6.2.7	MIDI Program Changes	55
6.3	Latency Settings	55
7	Using the <i>Ultra Analog VA</i> as a Plug-In	56
7.1	Window Size	56
7.2	Audio and MIDI parameters	56
7.3	Automation	56
7.4	Multiple Instances	56
7.5	Saving Projects	56
7.6	MIDI channel	57
7.7	MIDI program change	57
7.8	Performance	57
8	Quick reference to commands and shortcuts	58

CONTENTS

7

9 Appendix

64

10 License Agreement

65

1 Introduction

The *Ultra Analog VA* is a virtual analog synthesizer. With this product, we have not attempted to emulate a specific vintage analog synthesizer but rather to combine into a modern instrument, different features of legendary vintage synthesizers. The *Ultra Analog VA* generates sound by simulating the different components of the synthesizer through physical modeling. This technology uses the laws of physics to reproduce how an object or system produces sound. In the case of *Ultra Analog VA*, mathematical equations describing how analog circuits function are solved in real-time. The *Ultra Analog* uses no sampling or wavetable, it just calculates the sound as you play in accordance with the controls it receives. This sound synthesis method ensures unmatched sound quality, realism, warmth and playing dynamics.

Before discussing the synthesizer in more detail, we would like to take this opportunity to thank you for choosing an Applied Acoustics Systems product. We sincerely hope that this product will bring you inspiration, pleasure and fulfill your creative needs.

1.1 System requirements

The following computer configuration is necessary to run the *Ultra Analog VA*:

Mac OS :

- Mac OSX 10.2 (Jaguar) or later.
- G4 733 MHz Processor
- 256 MB RAM
- 1024 x 768 or higher screen resolution
- MIDI Keyboard (recommended)
- Ethernet Port
- Quicktime 4.0 or later

Windows :

- Windows 98SE/ME/2000/XP
- PIII 800 MHz
- 128 MB RAM
- 1024 x 768 or higher screen resolution
- DirectX or ASIO supported sound card
- MIDI Keyboard (recommended)

Keep in mind that the computational power required by the *Ultra Analog VA* depends on the number of voices of polyphony and the sampling rate used. These computer configurations will enable you to play the factory presets with a reasonable number of voices.

1.2 Installation

Mac OS

Insert the *Ultra Analog VA* program disc into your CD-ROM drive. Open the CD icon once it appears on your desktop. Click on the *Ultra Analog VA* Install icon and follow the instructions of the installer.

If you purchased this software online, simply double-click on the installer file that you have downloaded and follow the instructions of the installer.

Windows

Insert the *Ultra Analog VA* program disc into your CD-ROM drive. Launch Explorer to view the content of the CD-ROM and double-click on the installer file to launch the installer.

If you purchased this software online, simply double-click on the installer file that you have downloaded and follow the instructions of the installer.

1.3 Authorization and Registration

The *Ultra Analog VA* uses a proprietary challenge/response copy protection system which requires authorization of the product. A *challenge key* is a long string of capital letters and numbers that is generated uniquely for each machine during the registration process. In other words, for each machine you install this program on, a different challenge key will be generated by the program. The *response key* is another unique string of capital letters and numbers generated from the data encrypted in the challenge key. In order to obtain a response key, you will need to connect to the A|A|S website and provide the following information:

- A valid email address
- Your product serial number (on the back of the sleeve of your CD or in your confirmation email for downloads)
- The challenge key generated by the program

Note that it is possible to use the program during 15 days before completing the authorization process. This period can be convenient if you are installing the program on a computer which is not connected to the internet. After that period, the program will not function unless it is supplied with a response key.

In the following sections we review the different steps required to generate the challenge keys and obtain the response key. The procedure is similar on Windows XP and Mac OS systems.

1.3.1 Step 1: Generating the challenge key

After launching the installer for the first time, a pop-up window will appear asking you if you wish to authorize your product now or later. If you are ready to authorize *Ultra Analog VA* now, click on the **Next** button otherwise click on the **Authorize Later** button. If your computer is connected to the internet, we recommend that you authorize your product now.

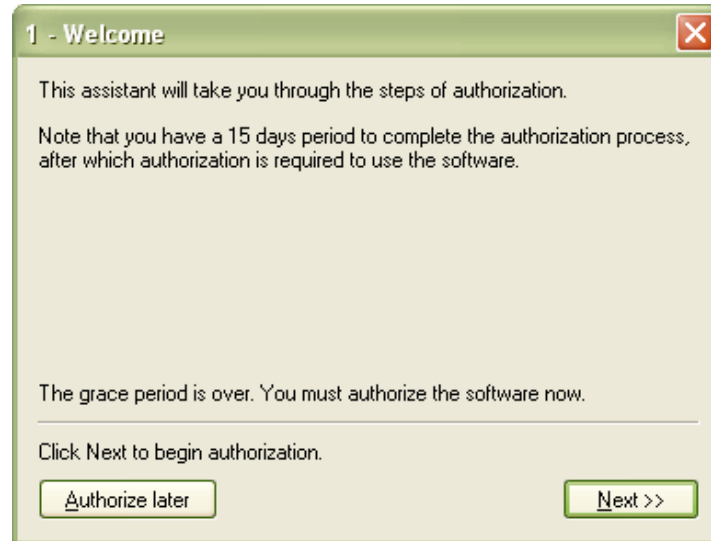


Figure 1: Choosing to authorize *Ultra Analog VA* now or later.

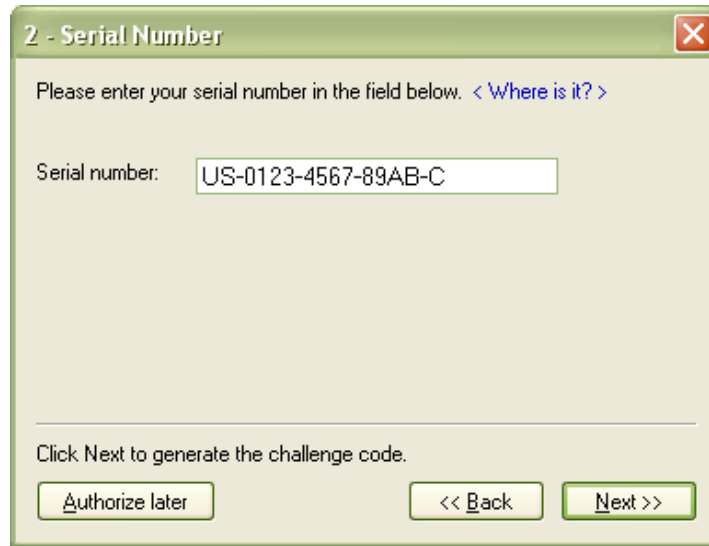
When you click on the **Next** button, a second window appears asking you to enter your serial number. Type your serial number as it appears on the back of the sleeve of the *Ultra Analog VA* CD-ROM. If you purchased *Ultra Analog VA* online, an email with your serial number will have been sent to you at the address which you provided during the purchase process.

After entering your serial number, click on the *Next* button and your challenge key will appear automatically in the next pop-up window.

1.3.2 Step 2: Generating the Response key and Registering your Product

If your computer is connected to the internet, click on the link to the A|A|S web server appearing in the pop-up window. This will launch your web browser and connect you to the unlock page of the A|A|S web server. Enter your email address, serial number and challenge key in the form as shown below and click on the *Submit* button.

The next form asks you to provide additional information about yourself including your mailing address and phone number. This information will be used to register your product. Note that only a valid email address is required to register your product. We nevertheless recommend this information be provided to ensure our support team is able to contact you to resolve any future



2 - Serial Number

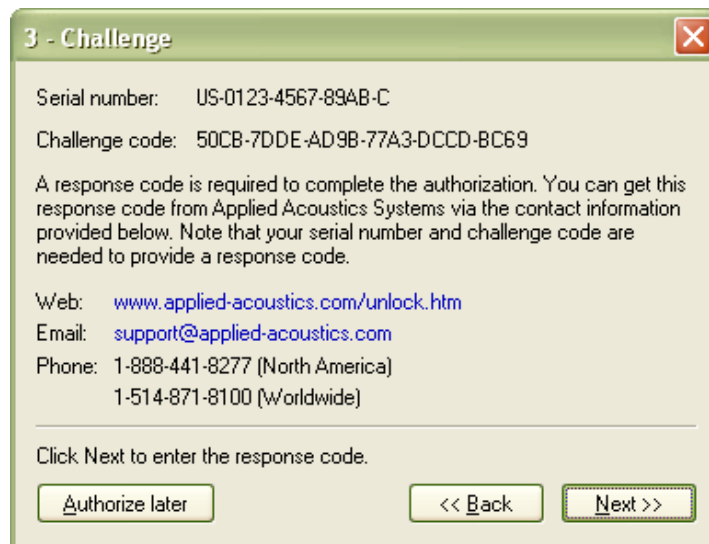
Please enter your serial number in the field below. < Where is it? >

Serial number: US-0123-4567-89AB-C

Click Next to generate the challenge code.

Authorize later << Back Next >>

Figure 2: Enter your serial number in the pop-up window.



3 - Challenge

Serial number: US-0123-4567-89AB-C

Challenge code: 50CB-7DDE-AD9B-77A3-DCCD-BC69

A response code is required to complete the authorization. You can get this response code from Applied Acoustics Systems via the contact information provided below. Note that your serial number and challenge code are needed to provide a response code.

Web: www.applied-acoustics.com/unlock.htm
Email: support@applied-acoustics.com
Phone: 1-888-441-8277 (North America)
1-514-871-8100 (Worldwide)

Click Next to enter the response code.

Authorize later << Back Next >>

Figure 3: Challenge key appears automatically after entering the serial number.

support issues, and notify you of product updates promptly. This information is kept completely confidential. Registration of your product will entitle you to receive support and download updates when available, as well as take advantage of special upgrade prices offered from time to time to registered A|A|S users. Note that if you already purchased or registered another A|A|S product, the information that you have already supplied under the same email address will appear in the form. Feel free to update this information if it is outdated. Click on the *Submit* button and your response

The screenshot shows the 'COMMUNITY' page of the Applied Acoustics Systems website. The navigation bar includes links for PRODUCTS, SUPPORT, BUY, NEWS / PRESS, ABOUT US, COMMUNITY, and UNLOCK. The main heading reads 'Please enter your email address for registration of your product.' Below this, there is a form with three input fields: 'Email Address' (empty), 'Serial Number' (filled with 'US-0123-4567-89AB-C'), and 'Challenge Key Question' (filled with '50CB-7DDE-AD9B-77A3-DCCD-BC69'). A 'Submit' button is located below the form.

Figure 4: Enter your registration information on the A|A|S webserver.

key will appear on-screen.

The screenshot shows the 'COMMUNITY' page of the Applied Acoustics Systems website after registration. The navigation bar is the same as in Figure 4. The main heading reads 'Thank you for your registration.' Below this, the 'Challenge' key is displayed as '689E-D9FF-D9BF-33B2-A3B3-0335' and the 'Response' key is displayed as '6D88-771C-A809-E274-51BE'. A message states 'A copy of this information will be sent to you by email.' The 'COMMUNITY' page title is visible at the bottom.

Figure 5: Generation of the response key on the A|A|S server.

If your computer is not connected to the internet, take note of your serial number and *challenge key* and proceed to an internet connected computer. Launch your browser and go to the unlock page of the A|A|S website at:

<http://www.applied-acoustics.com/unlock.htm>

Enter your email address, serial number, and challenge key, and click next. You will then receive your response code on-screen as described above.

1.3.3 Step 3: Completing the unlock process

The *response key* corresponding to your serial number and *challenge key* will be printed in your browser window. In order to complete the unlock process, copy the response key and paste it into the corresponding field of the installer window of *Ultra Analog VA*. If you obtained your response key from another computer, type the response key by hand in the installer window.

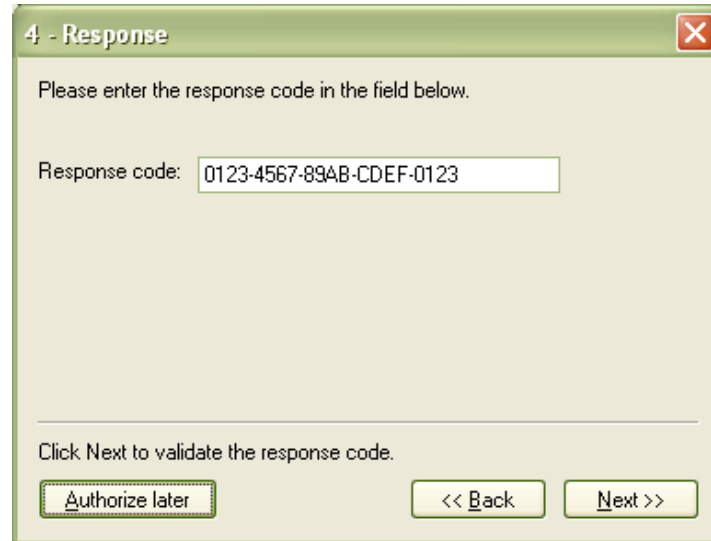


Figure 6: Final step of the unlock process. Enter your response key in the window.

Click on the *Next* button and a pop-up window will appear informing you that the authorization process has been successful. Click on the **Finish** button to complete the process and launch *Ultra Analog VA*.

You will normally only need to go through this process once for a given computer except for some special cases. On Windows computers you will need to unlock again if:

- You change your computer
- You reformat or upgrade your hard drive
- You change or upgrade your operating system

On Mac OS computers, this will only be necessary if:

- You change your computer
- You change the motherboard of the computer

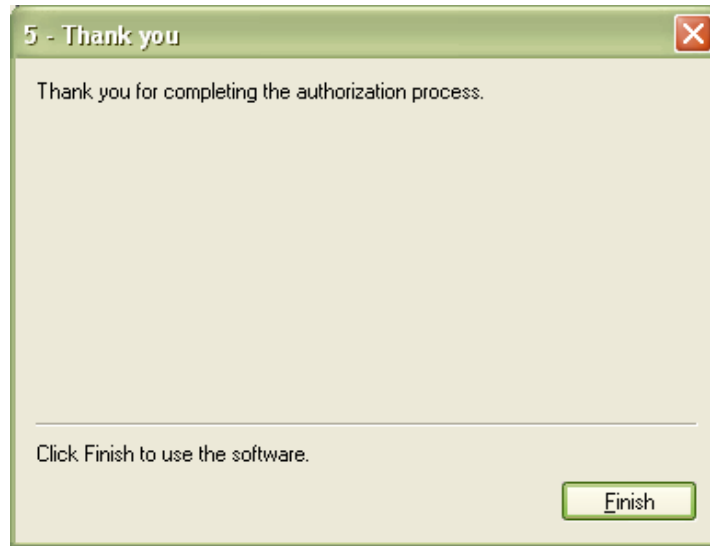


Figure 7: Authorization has been successful.

1.3.4 Obtaining your response key and registering by fax or over the phone:

Should you not have access to the internet, A|A|S support representatives are available to assist you in the unlock and registration process Monday to Friday, 9am to 6pm EST. You may contact us by phone at:

- North America Toll-free number: 1-888-441-8277
- Outside North America: 1-514-871-8100
- Fax Number: 1-514-845-1875
- Email: support@applied-acoustics.com

1.4 Getting started

1.4.1 Using *Ultra Analog VA* in standalone mode

The *Ultra Analog VA* comes with a wide range of factory presets right out of the box which amounts to a huge range of sounds before you have even turned a single knob. As you would expect, the best way of coming to grips with the possibilities *Ultra Analog VA* offers is simply to go through the presets one at a time. We recommend that you first start using the *Ultra Analog VA* in standalone mode.

- **Windows** - Double-click on the *Ultra Analog VA* icon located on your desktop or select *Ultra Analog VA* from the **Start > All Programs >** menu.

- **Mac OS** - Double-click on the *Ultra Analog VA* icon located in the Applications folder.

Before you start exploring the factory presets, take a moment to set up you audio and MIDI configuration as explained below.

Audio Configuration

Audio configuration tools are available from the **Audio** menu. The **Audio Settings** function allows you to select an audio output device from a list, organized by driver type, of those available on your computer. On Windows, if you have ASIO drivers available, these should be selected for optimum performance. Multi-channel interfaces will have their outputs listed as stereo pairs.

- Select your sound card port from the list in the **Audio Configuration** dialog from the **Audio > Audio Settings ...** menu.

For more detailed information on audio configuration, sampling rate selection and latency adjustments, please refer to section 6.3.

MIDI Configuration

MIDI configuration tools are available from the **MIDI** menu.

- Select your MIDI input device from the list in the **MIDI Configuration** window available from the **MIDI > MIDI Settings ...** menu.

For more detailed information on Audio and MIDI configuration, MIDI links and MIDI maps, please refer to Chapter 6.

1.4.2 Exploring the factory presets

Factory presets can easily be accessed using the ‘+’ and ‘-’ buttons in the lower left corner of the toolbar. These buttons are used to navigate through a list of 128 numbered presets called programs. The content of this program list can be viewed by clicking on the ▼ button of the toolbar. The number of the current program used and the name of the associated preset appear on the right of this button. Programs can also be changed by using the ‘+’ and ‘-’ keys from the computer keyboard or by selecting programs directly from the list displayed after clicking clicking on the ▼ button.

Presets can also be accessed using the browser appearing on the left of *Ultra Analog VA*. This browser is similar to the browser your operating system generates to display the contents of your hard disk, or your email program uses to organize your mail and address book. When launching the

application for the first time, this “tree view” will include a destination folder for imported presets as well as a **Library** folder. To open a folder, click on the “+” symbol on Windows or ► symbol on Mac OS which will reveal the folder content.

The preset library is different from the program list and can be viewed as a repository containing all the presets available to the application. Presets are loaded into the synthesis engine by copying them from the library into the program list. To load a preset, double-click on a preset icon (blue knob) or preset name. This will insert the preset into the program list at the position of the current program. You can also use the arrow keys on the computer keyboard in order to navigate in the preset list and then the Enter key to load a preset. For additional information on presets and programs, please refer to Chapter 2 of this manual.

1.4.3 Using MIDI Links

Every parameter on the *Ultra Analog VA* interface can be linked to an external MIDI controller. To assign a MIDI Link, right-click (control-click on Mac) on a control (knob, button or slider) and a contextual menu will appear. Select **Learn MIDI Link** and move a knob or slider on your MIDI controller to activate the link. To deactivate the link, right-click (control-click on Mac) on the control and choose the **Forget MIDI Link** command. Refer to section 6.2 for more details on MIDI links.

1.4.4 Using MIDI program changes

The synthesizer responds to MIDI program changes. When a program change is received, the current program is changed to the program having the same number as that of the program change message received by the application.

1.4.5 Using *Ultra Analog VA* as a Plug-in

The *Ultra Analog VA* integrates seamlessly into the industry’s most popular multi-track recording and sequencing environments as a virtual instrument plug-in. The *Ultra Analog VA* works as any other plug-in in these environments so we recommend that you refer to your sequencer documentation in case you have problems running the *Ultra Analog VA* as a plug-in.

1.5 Getting help

A|A|S technical support representatives are on hand from Monday to Friday, 9am to 6pm EST. Whether you have a question on *Ultra Analog VA*, or need a hand getting it up and running as a plug-in in your favorite sequencer, we are here to help. Contact us by phone, fax, or email at:

- North America Toll Free: 1-888-441-8277

- Worldwide: 1-514-871-8100
- Fax: 1-514-845-1875
- Email: support@applied-acoustics.com

Our online support pages contain downloads of the most recent product updates, and answers to frequently asked questions on all A|A|S products. The support pages are located at:

www.applied-acoustics.com/faq.htm

1.6 Forum and User Library

The A|A|S community site contains the *Ultra Analog VA* user forum, a place to meet other users and get answers to your questions. The community site also contains an exchange area where you will find presets for your A|A|S products created by other users and where you can make your own creations available to other users.

<http://community.applied-acoustics.com/php/community/>

<http://community.applied-acoustics.com/php/forum/>

1.7 About this manual

In the next chapter, the use of presets and the browser are described in detail. Chapter 3 describes the general architecture of *Ultra Analog VA*. In Chapter 4, the different modules and controls are reviewed in detail. Chapter 5 describes the different functionalities available from the toolbar while Chapter 6 explains the different functionalities related to Audio and MIDI and their settings. General issues involved in the use of *Ultra Analog VA* as a plug-in in different host sequencers is covered in Chapter 7. Finally a list of available commands and shortcuts is given in Chapter 8.

Throughout this manual, the following conventions are used:

- Bold characters are used to name modules, commands and menu names.
- Italic characters are used to name controls on the interface.
- Windows and Mac OS keyboard shortcuts are written as Windows shortcut/Mac OS shortcut.

2 Presets and MIDI maps

Ultra Analog VA comes with several factory presets covering a wide range of sounds. This collection of presets lets you play and familiarize yourself with this synthesizer without having to tweak a single knob. Soon, however, you will be experimenting and creating your own sounds and projects that you will need to archive or exchange with other users. You may also want to control the parameters of *Ultra Analog VA* with a specific MIDI controller. In this chapter, we will review the management of presets and MIDI maps.

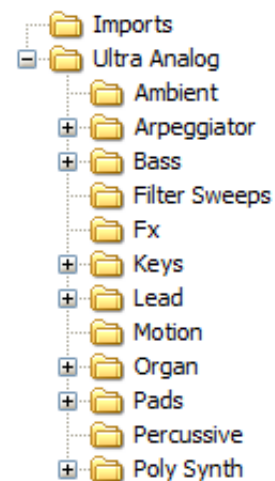
2.1 Presets

There are two concepts involved in the management of presets, the preset library and programs.

2.1.1 The Preset Library

The preset library contains the factory presets, modified versions of the factory presets you might have made or any other new presets you might have saved. The library may also contain imported presets as well as MIDI maps as explained in Section 2.6 and 2.7. In other words, the preset library is a repository of all the presets and MIDI maps available to *Ultra Analog VA*.

All the operations on the preset library are conveniently managed with the help of the *Ultra Analog VA* browser, similar to those found in most email programs which use a hierarchical tree structure and a visually intuitive, drag and drop approach. To explore the different presets available in the library, open the different folders by clicking on the “+” icon Windows or ► symbol on Mac OS to the left of folders. Each preset is represented by a blue knob icon followed by its name.



2.1.2 The Program list

Presets are loaded into the synthesis engine of *Ultra Analog VA* from a list of 128 numbered presets called programs. The name of the current program and its number are displayed in the left of the toolbar at the top of the application window. The entire list of programs can be viewed by clicking on the ▼ button left of the program number.



It is important to note that presets in the program list and in the preset library are stored in different locations. They are in fact different copies of the same presets which may, as explained below, differ even if they share the same name. The version of a preset available in the program

list should be viewed as temporary or as a ‘working copy’ of the preset whereas the version in the library should be viewed as permanent or as the ‘reference version’.

When you start the application for the first time, the program list contains a selection of presets from the factory preset library. At that point, the presets in the program list are identical to their version in the library.

2.2 Playing and Changing Presets

Presets are always played from the program list. The name of the current program, in other words the one currently loaded in the synthesis engine, as well as its number are displayed in the left part of the toolbar. Its number and name are also preceded by a check mark in the program list. The current program can be changed in different ways:

- scroll up or down in the program list by clicking on the ‘+’ and ‘-’ buttons located on the left of the program name or use the ‘+’ and ‘-’ keys from the computer keyboard,
- Display the content of the program list by clicking on the ▼ button and select a program by clicking on its name.
- Use the **Switch to Program** command from the **Programs** menu and enter a specific program number. This command can also be activated by using the Ctrl-P/Apple-P keyboard shortcut.
- Send MIDI program changes from your MIDI controller. *Ultra Analog VA* will load the program having the same number as the program change number received by the application.

A Preset can also be loaded from the preset library. It is then stored in the current program replacing the preset that was already stored in this location. It then becomes immediately available to the synthesis engine. Different options are available to load a preset from the preset library into the current program:

- In the browser, double-click on a preset icon.
- Drag and drop presets from the browser onto the *Ultra Analog VA* interface.
- Select a preset by clicking on its icon and use the Enter key from the computer keyboard. Once a preset has been selected in the library, it is possible to navigate in the library using the Arrow keys from the computer keyboard. A preset is selected when its name is highlighted.
- Select a preset and use the **Open Preset** command from the **File** menu or the Ctrl-O/Apple-O keyboard shortcut.

Note that when a preset is loaded from the preset library to the list of programs, the program name displayed in the toolbar changes but not its number. This indicates that the current program number used by the synthesis engine is still the same but that the preset corresponding to that

program has changed. The 128 programs can therefore be customized by selecting different program numbers (by using the ‘+’ and ‘-’ buttons from the toolbar or selecting programs from the program list) and loading presets from the library.

2.3 Editing and Saving Presets

Moving the different controls on the *Ultra Analog VA* interface modifies the preset loaded in the current program. As soon as the current program is modified, the preset icon located on the left of the program name in the toolbar changes color and a ‘*’ sign is appended to its name in the program list. In this state, the preset loaded in the current program is different from its original version stored in the preset library even if they share the same name. If you wish to keep a permanent copy of the modifications, you must save this new version in the preset library.

- To save the new version in the preset library, use the **Save Preset** command from the **File** menu or the Ctrl-S/Apple-S shortcut. Be careful, however, as using this command will overwrite the original preset. If you are not certain of which preset will be overwritten in the library, first use the **Locate Program in Browser** command from the **Programs** menu or the Ctrl-L/Apple-L shortcut in order to locate it in the browser.
- To create a new preset, use the **Save Preset As** command from the **File** menu. A window will appear asking for a name for the new preset. Once the preset is saved using this command, a new preset icon will appear in the browser directly under the **Library** folder.
- To create a new preset, it is also possible to rename the program using the **Rename Current Program** from the **MIDI** menu (or the Ctrl-R/Apple-R keyboard shortcut) and use the **Save Preset** or **Save Preset As** commands.

When editing presets, it is very helpful to go back and forth between the different stages of your modifications and adjustments. To move back step by step through every modification that was applied to a preset, use the **Undo** command from the **Edit** menu or the Ctrl-Z/Apple-Z shortcut. Once the **Undo** command has been used, it is also possible to move up again through the modifications by using the **Redo** command from the **Edit** menu or the Ctrl-Y/Apple-Y command. The number of **Undo** levels is unlimited and that this command is effective on any control of the interface but not on the different **Save** commands.

Once a preset has been modified, it is also possible to move back and forth between the current state of the preset in the program list and its original version archived in the preset library. To hear the original preset, simply click on the *Compare* button at the top of the interface or use the **Compare** command from the **Edit** menu. Once this button has been pressed, the original settings of the preset are loaded. In this mode, the graphical interface is frozen and it is therefore not possible to modify the preset. To further modify the preset, click on the *Compare* button again or uncheck the **Compare** command in the **Edit** menu to revert to the modified version of the preset and unfreeze the interface. To reload the original version, use the **Locate Preset in Browser** command

from the **View** menu, or the Ctrl-L/Apple-L shortcut and double click on its icon in order to reload this version into the current program.

Ultra Analog VA will make sure that you do not lose modifications to a preset. In the case where a program holds a modified version of a preset and when trying to load a new preset from the library into this program, the application will ask you if you want to save the modified preset in the library. This behavior might not always be convenient and it is possible to deactivate it by deselecting the **Ask to save preset before opening another** option in the **Preferences** command from the **Edit** menu.

2.4 Saving the Program List

When you open *Ultra Analog VA*, the application always loads the same program list. This implies that, by default, the program list will always contain the same presets when you open the application and that your modifications to presets will be lost unless they have been saved in the preset library.

- To save the current list of programs and replace the default program list, use the **Save All Programs** command from the **Programs** menu.

This command is helpful if you wish to modify the program list or if you wish to restart the application in exactly the same state as when you left it.

Note that this operation is not necessary when using *Ultra Analog VA* as a plug-in in a host sequencer as the program list is always saved with a project. The default program list will be loaded only if a new project is started or if a new instance of *Ultra Analog VA* is opened within a project.

2.5 Organizing the Preset Library

2.5.1 Creating Folders

Sub-folders can be created by first selecting a folder by clicking on it and using the **New Folder** command from **File** menu.

2.5.2 Copying and Moving Presets and folders

Presets and folders can be copied and moved from one location to another. First select an item by clicking on its icon and use the **Copy** command from the **Edit** menu (Ctrl-C/Apple-C shortcut) in order to copy it. Then click on the destination folder and use the **Paste** command from the **Edit** menu (Ctrl-V/Apple-V shortcut) in order to paste it. Groups of items can be copied and pasted at the same time. In order to select many items at once, click on different icons while keeping the Control/Apple key depressed. Alternatively to select, within a folder, all the presets located

between two presets, click on the first one and then on the second one while keeping the Shift key depressed. Once a group of items has been selected, use the **Copy** and **Paste** functions as explained above.

2.5.3 Renaming Presets and folders

On Windows systems, to rename a preset or folder, click a first time on the corresponding icon in the browser in order to select it. Then click a second time to enter in name edition mode. Note that this sequence of operation is different from double-clicking on the icon which loads the preset in the case of a preset icon or opens a folder in the case of a folder icon. In other words, there must be a pause between the two clicks.

On Mac systems, first select the item to be renamed and then use the **Rename** command from the **Edit** menu. It is also possible to ctrl-click on the selected item and then choose the **Rename** command.

2.5.4 Deleting Presets and Folders

To delete a preset or folder, first select it by clicking on its icon in the browser, then use the **Delete** command from the **Edit** menu or use the Del key from the computer keyboard. In order to select and then delete many items at once, click on different icons while keeping the Control/Apple key depressed. Alternatively to select, within a folder, all the presets located between two presets, click on the first one and then on the second one while keeping the Shift key depressed. Once the group of items has been selected, use the **Delete** function as explained above.

2.5.5 Documenting Presets

It is possible to document a preset and view related information. To view or edit information on a preset, first select it in the browser and choose the **Preset Info** command from the **Edit** menu or use the Ctrl-I/Apple-I shortcut. It is also possible to right-click/control-click on the preset icon and choose the **Preset Info** command. Information on a preset includes the author's name, copyright notice, date of creation, last modification date and a text description.

2.5.6 Locating a Preset in the Browser

It might sometimes be helpful to locate in the preset library the preset currently being played or in other words, that corresponding to the current program. To rapidly locate the current preset in the browser, use the **Locate Program in Browser** command from the **Programs** menu or the Ctrl-L/Apple-L shortcut. The **Locate** command will automatically expand the folder containing the currently used preset and select the preset.

2.5.7 Resizing the Browser

In standalone mode, the browser can be resized. In order to change the size of the browser, position the mouse cursor on the line separating the browser from the *Ultra Analog VA* control panel. When the cursor changes to a double-headed arrow, click-hold and move the mouse to the left or right as desired. In order to hide the browser completely, move the double-headed arrow cursor fully to the left. Note that when *Ultra Analog VA* is used as a plug-in, the browser size is fixed and can not be modified.

2.6 MIDI maps

MIDI maps containing information about MIDI links between the MIDI controllers and the *Ultra Analog VA* interface can easily be created as will be explained in Section 6.2. MIDI maps are represented in the browser with a MIDI connector icon. MIDI maps are treated exactly the same way as presets in the browser and are saved using the **Save MIDI Links** or **Save MIDI Links As** commands from the **File** menu.

2.7 Exporting and Importing Presets and MIDI maps

The **Import** and **Export** commands, found in the **File** drop down menu, allow one to easily exchange presets and MIDI maps with other *Ultra Analog VA* users. This feature can also be used to decrease the number of elements in the browser by archiving older or rarely used ones elsewhere, on CD-R, or a second hard disk for example. Files containing *Ultra Analog VA* presets and MIDI maps are equivalent in size to short text file, making it easy to send presets to other users via email.

To export a folder, a group of folders, presets or MIDI maps within a folder, select the elements to export in the browser and use the **Export** command from the **File** menu. When the **Export** window appears, choose a file name and a destination location on your hard disk. *Ultra Analog VA* export files will be saved with an “lls” extension.

Importing presets and MIDI maps is just as easy. Simply click on the **Import** command from the **File** drop down menu, and select the file to import. A new folder will then appear under the **Imports** directory in the browser, containing all of the files contained within the imported package. These can then be dragged and dropped to a new folder, or remain in the Imports directory.

2.8 Backuping Presets and MIDI maps

There are basically two ways to backup your presets and MIDI maps: exportation and database backup. The database backup is more efficient when there is a large number of elements to backup.

The exportation methods consists in using the **Export** command from the **File** menu as explained in section 2.7. Once you have exported the elements you wish to archive, just save the export file(s) to your usual backup location or medium.

The second backup method will enable you to archive the entire material present in the browser. The content of the browser, including presets, MIDI maps and folders is saved into a database file. This second backup method simply consists in archiving this file. The database file location is different whether you are working on a Mac OS or Windows system.

- On **Windows** systems: C:\Documents and Settings\[User]\Application Data\Applied Acoustics Systems\Ultra Analog 1.0.
- On **Mac OS** systems: [System Drive]:Users:[User]:Library:Application Support:Applied Acoustics Systems:Ultra Analog 1.0.

The name of the database file is UltraAnalog.tdb. In order to archive your database, just copy this file to your usual backup location or medium. In order to restore a database, replace the version of the UltraAnalog.tdb file with a previously archived one. It is also possible to synchronize different systems by copying this file on different computers where *Ultra Analog VA* is installed.

2.9 Restoring the Factory Presets and MIDI Links

If necessary, it is possible to restore the original factory library and program list by using the **Restore Factory Library** from the **File** menu. This operation makes a backup of your current database file in the preset database folder as explained in Section 2.8 and creates a new preset database containing only the factory presets and MIDI maps. The next time you open *Ultra Analog VA*, both the browser and the program list will be in exactly the same state as when you first installed the application.

Note that restoring the factory library should be done with caution as you will lose all the work you might have saved into the library and that this operation can not be undone easily. If you wish to recuperate a certain number of presets and MIDI maps after restoring the factory library, we recommend that you first export all the material you wish to keep using the **Export** command as explained in Section 2.7. After re-installation of the factory library, you will easily be able to re-import this material using the **Import** command.

If you forgot to export material before restoring the factory library or if you wish to bring back the preset library to its state before restoring the factory library, it is still possible to recover material from the backup file of the preset database which was created automatically when restoring the factory library as explained in Section 2.8. This method should be considered as a last resort, however, as recovering material from this backup file will remove the factory library which you have just installed and force you to redo the operation. Using the Export command before restoring the factory library is much simpler.

Note that the restore of the factory library is actually performed the next time you re-open the application. It is still possible to cancel this operation before exiting the application by using the **Cancel Library Restore** command from the **File** menu.

3 Architecture of the *Ultra Analog*

The *Ultra Analog* is a very adaptable and versatile two-oscillator synthesizer. The different control elements of the synthesizer have been grouped into three sections in the graphical user interface shown in Figure 8.

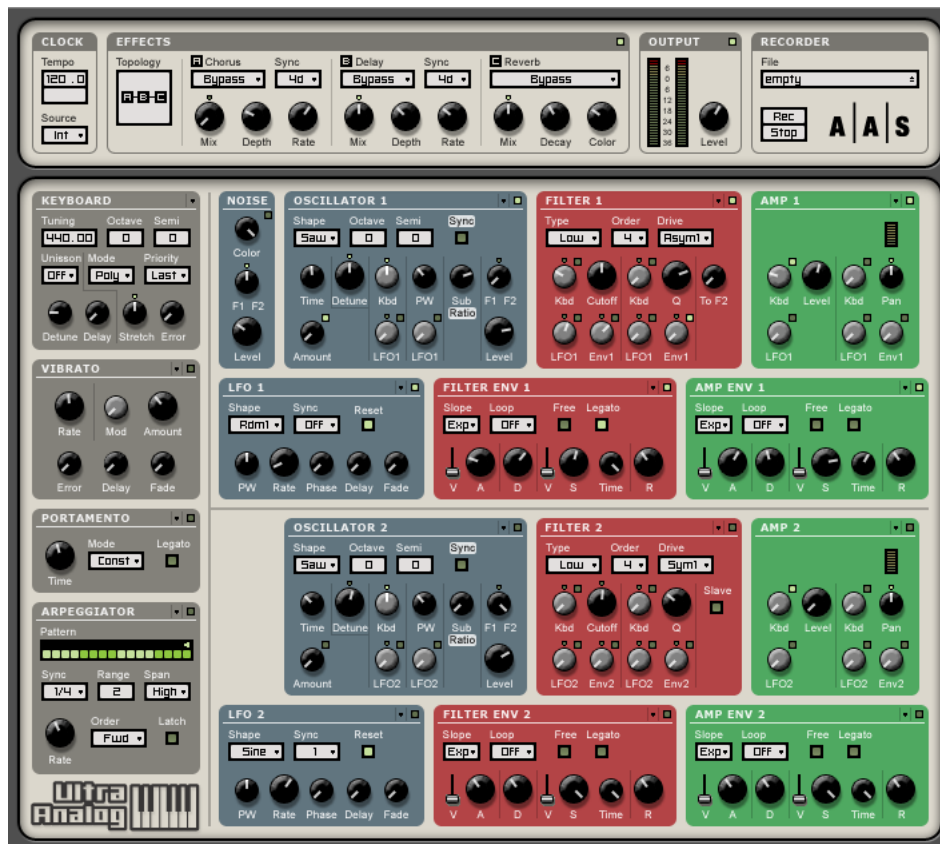


Figure 8: Graphical user interface of the *Ultra Analog* Synthesizer.

The main section of the interface, the synthesis section, is related to the main sound generating and processing modules including two oscillators, a noise source, two multi-mode filters, two LFOs, four envelope generators and two amplifiers. These modules have been laid out into two symmetrical rows on the interface following the general internal signal flow of the synthesizer as will be described below. The column to the left of the main section is the control section which includes the modules related to performance and the processing of MIDI events. Finally, the top row of the interface is an output effect stage which includes a multi-effect module, a master clock module, a master level control, and a recorder module.

The individual modules and controls of the user interface will be described in detail in Chapter 4. We will now take a closer look “under the hood” at how the different modules are connected

together, as well as the multiple signal paths available.

3.1 General Signal Flow

The general signal flow of *Ultra Analog* is shown in Figure 9 and in a more detailed schematic in Figure 22 of the Appendix to this manual. The primary sound sources of the synthesizer are two oscillators and a noise generator. These sources are mixed by a two output pre-filter mixer which redirects the signal from each oscillator, or a combination of both and the noise source, to two different multi-mode filter modules in series with an amplifier.

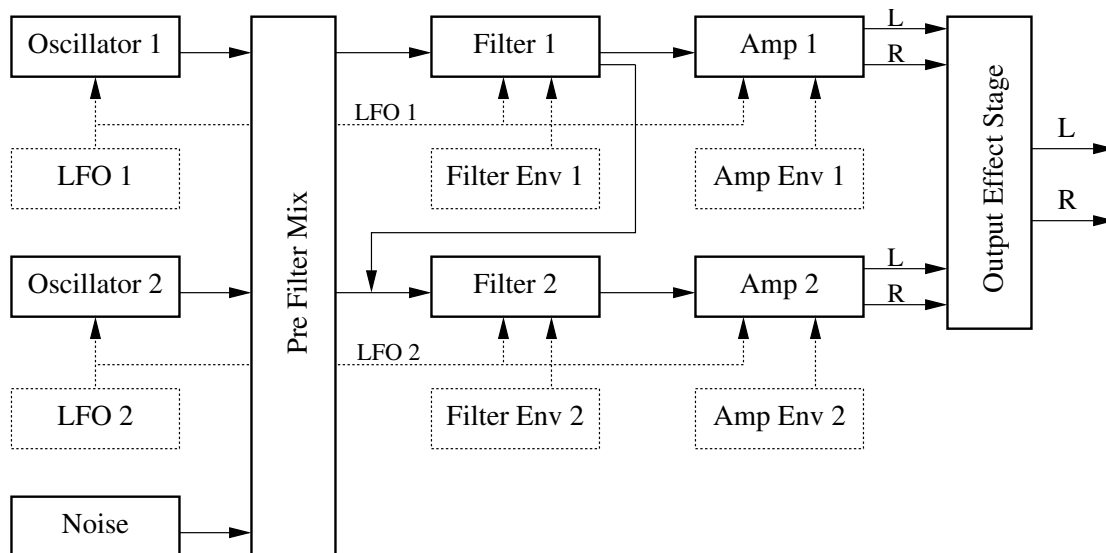


Figure 9: General signal flow of the *Ultra Analog*.

This configuration is very flexible because, depending on the type of mixing applied, it allows one to treat the sources from each oscillator separately or to combine them. When filters 1 and 2 only receive signal from one oscillator, the source section behaves as a dual oscillator-filter-amplifier system and left and right information from each source is preserved until the very end of the signal path. This allows, for example, to position and move sources in the stereo space independently with the panning control on each of the amplifier modules. On the other hand, combining the sources at the mixer level will allow one to obtain rich and complex tonal textures.

The signal path between **Filter 1** and **Filter 2** allows the use of the filter modules in a parallel or series configuration giving more processing possibilities. Sending signal only through the first output of the mixer and using this signal route will result in a series configuration while sending signal to both filters and closing this signal path will result in a parallel configuration.

3.2 Modulation Sources

The two rows of the main section of *Ultra Analog* are equipped with multiple modulation sources illustrated by dotted lines in Figure 9. On each line, one finds a low-frequency oscillator (LFO), used as a modulation source for its respective oscillator, filter and amplifier module, and two loopable and velocity-sensitive envelope generators connected to the filter and amplifier module respectively. In addition to the sources illustrated in Figure 9, the oscillator, filter and amplifier modules can also receive pitch and velocity modulation signal from the keyboard. Also note that a vibrato module (see section 4.8) can be considered as an extra pitch modulation source for the oscillators.

3.3 Output Effect

After filtering and panning, the stereo signal from both source lines is sent to the output effect stage for further processing. A **Reverb**, **Delay**, and **Chorus** module are available in this effect stage allowing for a wide range of processing possibilities. Effects can be applied before or after mixing of the signal from each line as will be explained in greater detail in Section 4.12.

4 Parameters

The *Ultra Analog* is based on two similar module rows each containing an oscillator, a multi-mode filter, an amplifier, a low-frequency oscillator and two envelope generators. Except for very slight differences, the modules on each line are identical and so the description of the modules, unless otherwise stated, is assumed to apply to the modules on each line.

4.1 General Functioning of the Interface

4.1.1 Tweaking Knobs and Sliders

All the knobs and sliders on the interface are selected by clicking on them. Once selected, they can be controlled in different ways depending on the effect you want to achieve.

- For coarse adjustment click-hold on a knob and drag the mouse upwards or downwards to move it clockwise or counter-clockwise.
- For fine adjustment, use the left or down arrow of the computer keyboard to move the counterclockwise and the right or up arrow to move it clockwise. The **Page Up** and **Page Down** keys give the same result with slightly faster action.
- To move a control to a given position, place the mouse at this position and Shift-click (Windows) or Option-click (Mac OS). To reach this position slowly, do the same, but use the middle button of the mouse (Windows only).
- Knobs with a green LED above can be moved directly to their center position by clicking on the LED.

Remember that the keyboard shortcuts affect only the most recently selected control. The value of the control currently selected is displayed on the toolbar at the top of the *Ultra Analog* window. The number displayed on the counter is a value corresponding to the setting of the control currently selected. For knobs and sliders, the reading is a value between 0 (turned fully to the left) and 127 (turned fully to the right).

4.1.2 Buttons

Buttons are switched *on* or *off* by clicking on them. The value appearing in toolbar and corresponding to a button is 1 when the button is *on* and 0 when it is *off*.

4.1.3 Drop-down menus and Displays

Clicking on a control represented by a display with a down-pointing triangle on its right, such as the *Shape* control of the **Oscillator** module, reveals a drop-down menu with a set of possible settings

for the control. Adjustment of the control is obtained by clicking on a selection or using the up and down arrows and the **Enter** key of the computer keyboard.

The other controls represented by a display, such as the *Tempo* control of the **Clock** module, are adjusted by click-holding on them and dragging the mouse upward or downward. Selection of these controls is possible when the mouse is positioned on the display and a double pointing arrow appears.

4.1.4 Inverting a Signal

The different modulation signals acting on the **Oscillator**, **Filter**, and **Amp** modules can easily be inverted by clicking on the small button appearing on the upper right of the corresponding gain knob. The signal is inverted when the button is *on* (LED on and value of 1).

4.1.5 Bypassing a Module

The different modules of the *Ultra Analog* can be turned *on* or *off* by clicking on the button appearing on their upper right corner. A module is active when the button is in its *on* position or in other words when it is lit and has a value of 1. Note that when a module is **not** activated, calculations associated with this module are not performed, reducing CPU usage.

4.1.6 Resetting a Module and Copying Settings

The modules of *Ultra Analog* can be reset to their default value by clicking on the down pointing triangle appearing in their upper right corner (left of the *Bypass* button) and selecting the *Default Settings* command.

It is also possible to adjust the different controls of a module with the settings from a similar module by clicking on this same down-pointing triangle and selecting the source module from which the settings should be copied.

4.1.7 Modulation Signals

The modulation signals from the **Keyboard**, **LFO** and **Env** modules are controlled with knobs labeled *Kbd*, *LFO* and *Env* respectively. These knobs are in fact gain knobs that are used to multiply the modulation signal by a certain factor. When these knobs are in their leftmost position, the modulation signals are multiplied by zero which has the effect of turning off the modulation source. Turning the knobs clockwise increases the gain factor and therefore the influence of the corresponding modulation source.

4.2 The Oscillator Module

The **Oscillator** module offers the features of the most reputed analog oscillators. It provides a fine control on the pitch, standard waveforms, a sub-oscillator, and a hard sync. The **Oscillator** module is implemented using precise modeling algorithms rather than wave tables providing alias free sources with clean pulse width modulation and synchronization.



4.2.1 Waveform

The *Shape* drop down menu is used to choose the wave form generated by the oscillator. Wave forms include sine wave, saw tooth, rectangular and white noise as shown in Figure 10.

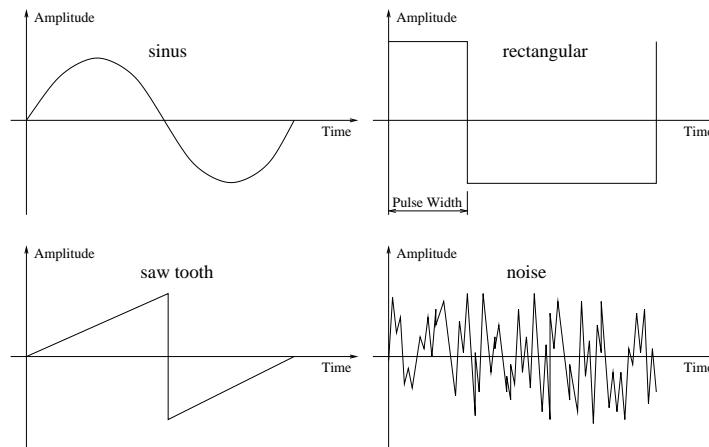


Figure 10: Choice of wave forms provided by the **Oscillator** module.

When the *Shape* is set to rectangular, one has additional control on the waveform through the use of the *PW* and *LFO* knob just below. The *PW* knob is used to adjust the pulse width of the rectangular wave. In its leftmost position the pulse is very narrow while in its rightmost position the wave is perfectly square and only the odd harmonics are heard. The pulse width of the rectangular waveform can be modulated with the signal received from the **LFO** module. The *LFO* knob is used to control the amount of modulation around the value set with the *PW* knob.

4.2.2 Pitch and Pitch Modulation

The pitch of the **Oscillator** module can be adjusted using the *Octave* control, *Semi* control and the *Detune* knob. The *Octave* control allows one to transpose the pitch by octaves (upper or lower), the *Semi* control is used to transpose the pitch by semitones while the *Detune* knob is used to to

slightly detune the oscillator. When the *Detune* knob is in its center position, there is no detune while turning it clockwise or anti-clockwise increases or decreases the pitch respectively.

The pitch of the **Oscillators** module can be modulated by the signal from the **Keyboard** module and/or the **LFO** module. The amount of modulation from these sources is adjusted by using the *Kbd* and the *LFO* gain knobs. In order for the oscillator to respond to the keyboard with an equal tempered scale, the *Kbd* knob of the **Oscillator** module must be set to its center position. In the case of the *LFO* knob, the center position corresponds to a variation of plus and minus one octave around the pitch of the oscillator.

The **Oscillator** module includes a ramp generator which allows one to obtain a pitch variation when a key is depressed. The *Amount* knob is used to set the starting pitch of the oscillator while the *Time* knob determines the time for the pitch to glide from this starting value to the effective pitch. When the LED of the inverter button next to the *Amount* knob is *on*, the starting pitch will be below that of the note played and will then rise after the note is played. When the LED of the inverter button is in its *off* position, the initial pitch will be higher than the pitch of the note played and will then fall to the correct pitch. When the *Amount* knob is in its leftmost position there is no pitch variation at the beginning of a note.

4.2.3 Sub Oscillator

The **Oscillator** module is equipped with a sub-oscillator which generates a wave one octave below the pitch of the oscillator. The shape of the sub-oscillator signal is a square wave when the wave shape of the **Oscillator** is set to *Rect* or *Saw* and a sine wave when it is set to *Sine*. The amount of this sub-oscillator signal in the output signal of the oscillator is adjusted with the *Sub* knob. When this knob is fully turned to the left, the sub-oscillator is muted. Note that when the oscillator is used in its **Sync** mode (see section 4.2.4 below), the sub-oscillator becomes unavailable and the *Sub* knob is then used to fix the frequency *Ratio* between the synchronization frequency and the oscillator frequency.

4.2.4 Synchronization

The **Oscillator** module features a hard synchronization mode which is toggled *on* or *off* with the help of the *Sync* switch. In this mode, the signal from the **Oscillator** is reset, or in other words restarted, at each cycle of a synchronization or master clock signal as shown in Figure 11. In this mode the perceived pitch is the same as that of the synchronization signal while the frequency of the synced oscillator only affects the harmonic content of the resulting signal.

In sync mode, the frequency of the master clock is determined by the settings of the *Octave*, *Semi* control and *Detune* controls as well as the pitch signal from the **Keyboard** module. The frequency of the signal to be synced is determined with respect to the frequency of the master clock signal with the help of the *Ratio* knob. The ratio between these two frequencies can vary by a factor of 1 to 20 and is increased by turning the *Ratio* knob clockwise. The frequency of

the original signal can also be modulated with the signal coming from the **LFO** module which is controlled with the *LFO* knob located just below the *Kbd* knob.

Note that the sync mode is only effective when the waveform is set to rectangular or saw tooth and that in this mode the sub-oscillator is disabled. Also, when the oscillator is in *Sync* mode, the *Time* and *Amount* knobs, instead of acting on the pitch of the master clock, act on the pitch of oscillator. In other words, when a note is played, a ramp is generated between a starting value of the pitch of the oscillator and the value determined by the position of the *Ratio* knob. The duration of this ramp is adjusted with the *Time* knob while the starting pitch is determined by the settings of the *Amount* knob. Again, the starting pitch of the ramp can be located above or below the final pitch depending whether the inverter button next to the *Amount* knob is in its *on* or *off* position.

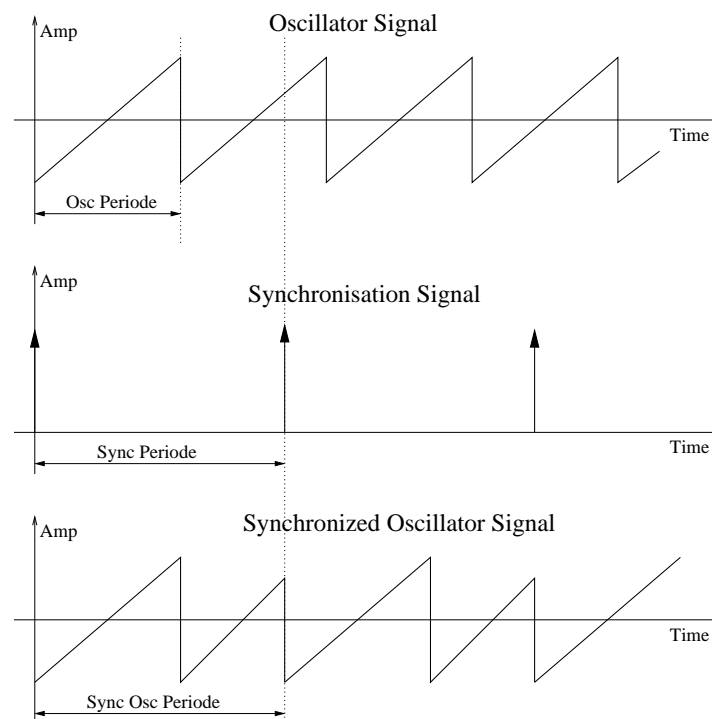


Figure 11: Synchronization of the oscillator.

4.2.5 The Mixer

The mixer section on the right of the **Oscillator** module is used to set the amplitude of the signal and the amount sent to the **Filter 1** and **Filter 2** modules. The amplitude of the signal is set with the *Level* knob while the *F1/F2* knob is used to pan the output of the **Oscillator** module between the **Filter 1** and **Filter 2** modules. When the *F1/F2* knob is in its center position, equal amounts of signal will be sent to both filters. When fully turned to the left or right, signal will only be sent to **Filter 1** or **Filter 2** respectively.

4.3 The Filter Module

Ultra Analog is equipped with two multi-mode filters. The filters are patched in a flexible way in order to allow their use in parallel, in series or any combination of both. For even more flexibility, the cutoff frequency of the **Filter 2** can also be locked to that of **Filter 1**.

Each of the multi-mode filters include a resonant low-pass, band-pass, high-pass, notch and a formant filter which can be selected using the *Type* drop-down menu. The order of the filters can be adjusted to 2 (-12 dB/oct for low-pass and high-pass and -6 dB/oct for band-pass) or 4 (-24 dB/oct for low-pass and high-pass and -12 dB/oct for band-pass) with the help of the *Order* drop-down menu. Furthermore, different saturation algorithms selected with the *Drive* drop-down menu can be applied to the filters. The resonance frequency of the filters is adjusted with the *Cutoff* knob while its resonance is controlled with the *Q* knob. When the formant filter is used, the *Q* knob is used to cycle between the vowels (a, e, i, o, u).



The cutoff frequency and resonance of the filters can be modulated with different modulation sources. The modulation sources are the **Keyboard**, the **Filter Env** and **LFO** modules which are each controlled by the *Kbd*, *Env* and *LFO* gain knob respectively. Modulation signals with a positive value will increase the cutoff frequency and Q-factor of the filters while a negative value will decrease them. Note that the filter parameters can further be modulated by the velocity signal from the keyboard through the use of the velocity modulation parameter of the **Filter Env** modules.

The three gain knobs associated with the cutoff frequency can be adjusted to their center position by clicking on the green LED located above the knob. In this position, the cutoff frequency will exactly follow the pitch of the note played on the keyboard in the case of the *Kbd* modulation, it will vary exactly one octave higher and lower in the case of the LFO modulation and will vary one octave higher or lower depending on the position of the *inv* switch with the *Env* modulation. Let's now have a closer look at the different filter types available.

4.3.1 Resonant Low-Pass Filter

A low-pass filter is used to remove the higher spectral components of the signal while leaving the lower components unchanged. The frequency at which attenuation begins to take effect is called the *cutoff* frequency. In a resonant filter, frequencies located around the cutoff frequency can also be emphasized by an amount called the *quality factor* or *Q-factor* of the filter as illustrated by Figure 12. The higher the Q-factor, the louder and sharper the response of the filter around the cutoff frequency. When the Q-factor is set to 1 (*Q* knob fully turned to the left), there is no emphasis around the cutoff frequency and the attenuation is -3dB at the cutoff frequency. The attenuation for frequencies located above the cut-off frequency depends on the order of the filter which is set by the *Order* menu, a slope of -12dB/Oct corresponding to a second order filter and a slope of -24dB/Oct to a fourth order filter.

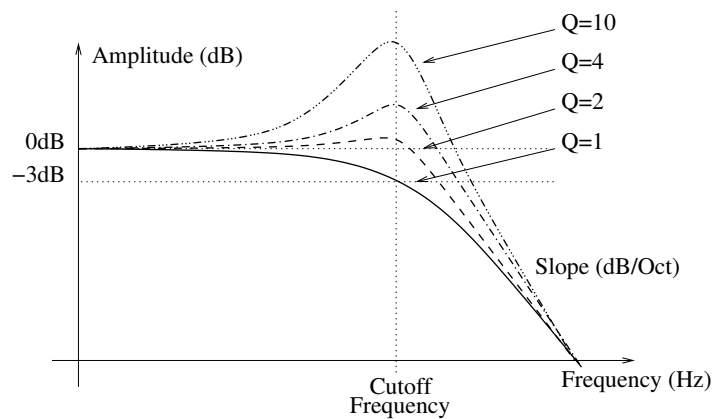


Figure 12: Frequency response of the low-pass filter.

4.3.2 Resonant High-Pass Filter

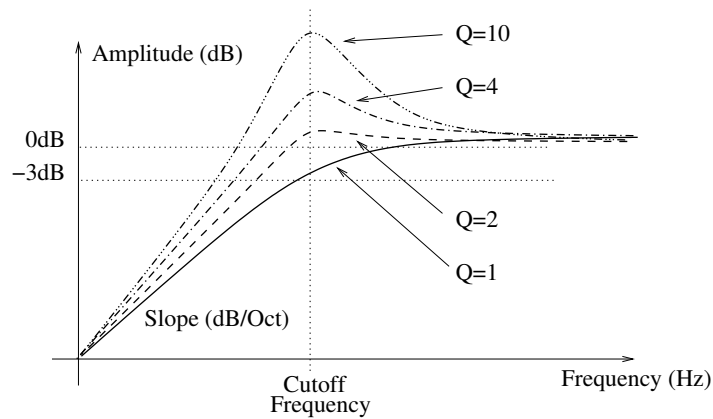


Figure 13: Frequency response of the high-pass filter.

The high-pass resonant filter works exactly in the opposite manner as the low-pass resonant filter by removing the frequency component of a signal located below the cutoff frequency while leaving those above the cutoff frequency unchanged. Similarly to the low-pass filter, the *Q-factor* controls the emphasis of frequencies located around the cut-off frequency.

4.3.3 Band-Pass Filter

The behavior of a band-pass filter is to let the frequencies in a band located around a center frequency and to attenuate the frequencies outside of this band as shown in Figure 14. The bandwidth of the band-pass filter is set with the *Q* knob while the center frequency is set with the *Cutoff* knob. The *Order* control sets the order of the filter. This parameter affects the slope of the roll-off on

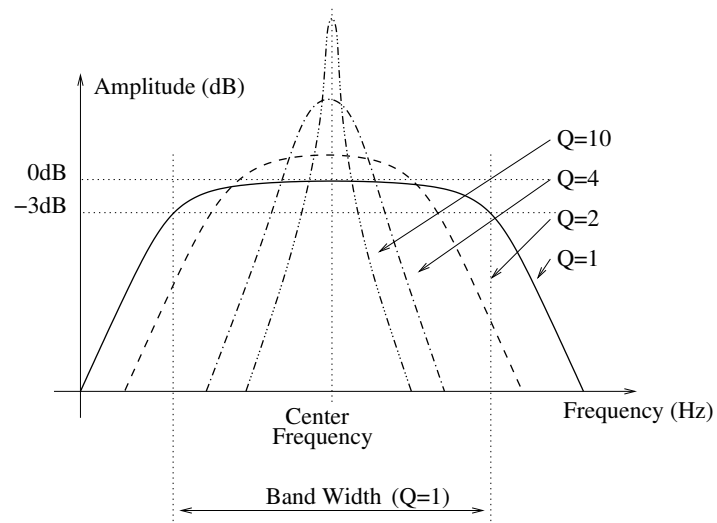


Figure 14: Frequency response of the band-pass filter.

both sides of the center frequency. For a second order filter the slope is -6dB/Oct while for a fourth order filter it is -12dB/Oct .

4.3.4 Notch Filter

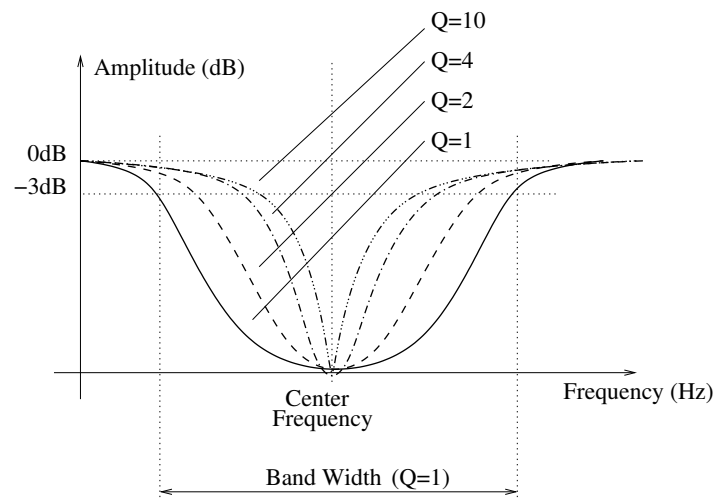


Figure 15: Frequency response of the notch filter.

The notch filter, does essentially the opposite of the band-pass filter. It attenuates the frequencies in a band located around the center frequency and leaves those outside of this band unchanged

as shown in Figure 15. The *Cutoff* knob is used adjust the center frequency and the *Q* knob sets the bandwidth of the notch. Note that the center frequency is totally removed from the spectrum of the output signal of the filter.

4.3.5 Formant Filter

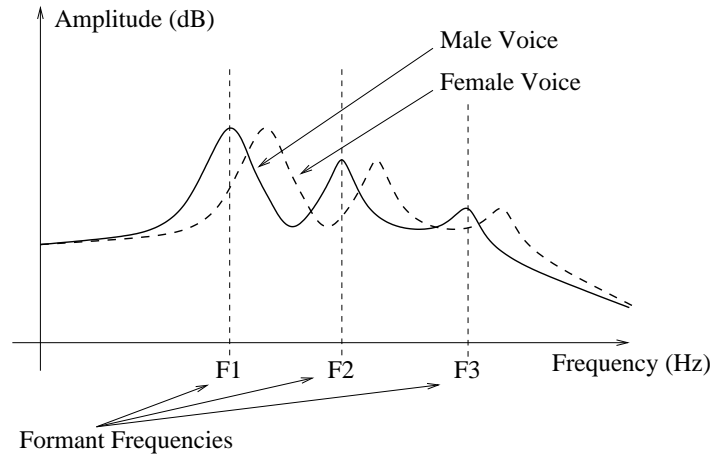


Figure 16: Frequency response of the formant filter.

The formant filter reproduces the filtering effect of the vocal tract in the human voice. By changing the position of the tongue, the opening of the mouth and opening or closing the nasal cavities one can change the filter applied to the glottal signal and thus produce the different vowels. Measurements have shown that this filter can be modeled by three peaking EQ filters corresponding to the three main cavities of the vocal tract as shown in Figure 16 and also known as formants. By moving the parameters of these three filters (frequency, amplitude and Q-factor) one can cycle between all the vowels. The effect of the *Cutoff* knob on the formant filter is to offset all the formants by the same factor and it is used to switch between male voice (left position), female voice (center) and child (right position). The *Q* knob is used to cycle between vowels. Note that changing these parameters can be automated by using the different modulation signals.

4.3.6 Filter Drive

As seen in the preceding sections, some filters can boost the signal in some regions of the spectrum. Theoretically, with a high Q-factor the amplification can reach up to 50dB, but in real life, electronic components will saturate before this level is reached and saturation will be introduced in the signal. In other words, the output signal of a circuit can raise linearly up to a certain value but will then begin to raise more slowly up to a value where the output is clipped to the maximum output value allowed by the circuit. This effect is typical of the sound signature of vintage circuits and is implemented in *Ultra Analog* through the *Drive* control as shown in Figure 17. There are 6 different

saturation patterns implemented, the three first being symmetrical, meaning that the saturation is the same for positive and negative values of the signal while for the three remaining the distortion pattern applied is not the same for positive and negative values of the signal.

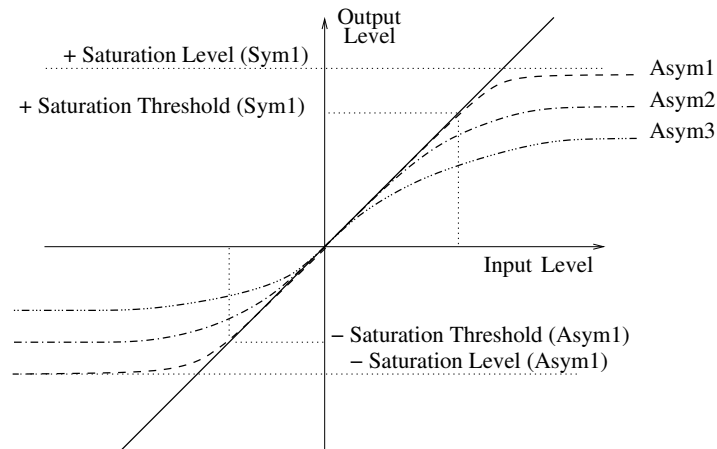


Figure 17: Saturation curves of the resonant filters. For asymmetrical curves, the saturation level and threshold are different for positive and negative values of the input level.

The distortion algorithms are selected with the *Drive* drop-down menu and are numbered from one to three for both symmetrical and asymmetrical saturation. These distortion algorithms range from very low distortion (clean circuit) to very high distortion.

4.3.7 Slave Filter 2

The **Filter 2** module can be enslaved to the **Filter 1** module. This can be done by clicking the *Slave* toggle switch on the **Filter 2** front panel. In this mode, the frequency of the **Filter 2** module follows exactly that of the **Filter 1** module. The *Cutoff* knob on the **Filter2** module is then used to adjust the offset frequency between the **Filter 1** and **Filter 2** modules. When slaved, the cutoff frequency of **Filter 2** module will follow exactly that of the **Filter 1** module including the effects of the modulation signals from the keyboard, LFO or envelope generator acting on the **Filter 1** module. Note that the modulation entries on the **Filter 2** module are kept active so do not forget to disable them (modulation knobs in the left position) in order to have the desired effect.

4.3.8 Series/Parallel

Even if the two filters are patched in parallel, there is an additional signal path used to route the output of the **Filter 1** module into the input of the **Filter 2** module. This feature enables one to put the two filters in series.

The amount of signal from the **Filter 1** module injected into the **Filter 2** module is adjusted with the help of the *To F2* knob on the **Filter 1** module front panel. In order to put the two filters

in series, this knob must be fully turned to the right and the level of the **Amp 1** set to zero as the output of the first filter is hard wired into the input of the **Amp 1** module. In this way, the output signal will only come out from the second amplifier after going through the two filters.

4.4 The Amplifier Module

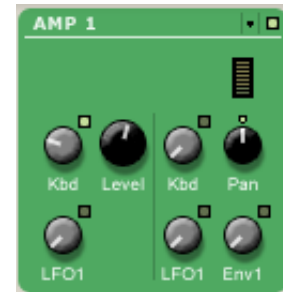
After filtering, the signal is routed to an amplifier in order to add an amplitude envelope and panning effect to the sound. Both the **Filter 1** and **Filter 2** modules have their own amplifier section, the **Amp 1** and **Amp 2** modules, which allows one to keep the signal coming from each filter totally independent from the other.

The two main controls of the amplifier module are the *Level* knob and the *Pan* knob. The *Level* knob is used to adjust the overall level of the amplifier while the *Pan* knob is used to locate the sound in the stereo field. The source can be positioned from left to right by turning the *Pan* knob clockwise and it will be centered when the knob is in its center position.

The level of the sound is always modulated by the signal from the **Amp Env** module which is hard-wired to the **Amp** module. The level of the sound can also be modulated with the pitch signal from the **Keyboard** module, which is very handy when it is necessary to adjust the level of a sound across the overall range of the keyboard. When the inverter button next to the *Kbd* knob is in its *off* position, turning the *Kbd* knob clockwise will boost high notes and decrease the amplitude of low notes. Switching the inverter button to its *on* position will reverse the effect of the *Kbd* knob and boost low notes while decreasing the amplitude of high notes when turning the knob clockwise. When the *Kbd* knob is in its leftmost position, the amplitude of notes is the same across all the keyboard. Note that the middle C key (reference note) will always sound at the same level regardless of the position of the *Kbd* knob. The output signal from the **LFO** module can be used for adding a tremolo effect to the sound.

The pan value can be modulated by signals from the **LFO**, the **Amp Env** and the **Keyboard** modules. The modulation signals will move the source relative to the source position determined by the settings of the *Pan* knob. Negative values of the modulation signal will move the source to the left of the source while positive values will move it toward the right. The amplitude of the motion is determined by the amplitude of the modulation signal multiplied by a gain factor controlled with the *LFO*, *Kbd* and *Env* knobs. In their leftmost position, the knobs will turn off their respective modulation source while it will be fully effective when the knob is completely turned to the right.

Using the **LFO** module as a modulation source will move the signal from left to right at the frequency of the signal from the **LFO** module. Using the signal from the **Env** module as the modulation source will move the source to one side of the source and bring it back to its original position. Note that since the sign of the envelope signal is always the same, the source would need to be positioned completely to the left or to the right (*Pan* knob in its leftmost or rightmost position) in order for the source to sweep the entire space. Finally, the pitch signal from the keyboard will



position notes depending on their pitch, low notes to the left and high notes to the right where the middle C is the reference note positioned at the location determined by the *Pan* knob.

4.5 The Noise Generator Module

The **Noise** module generates white noise and is followed by a -6dB/Oct low-pass filter used to adjust the frequency content of the noise. The *Color* knob is used to vary the cutoff frequency of the built-in low-pass filter. Turning this knob to the right increases this frequency and therefore increases the high frequency content of the noise until, in its rightmost position, the filter is fully opened. The *F1/F2* knob controls the amount of noise sent to the **Filter 1** and **Filter 2** modules. In its center position, the same signal will be sent to both filters. Moving the knob counter-clockwise or clockwise will send a greater amount of noise to either the **Filter 1** or *Filter 2* modules respectively until when in its leftmost or rightmost position, signal is only sent to one of the filters. Finally, the *Level* knob is used to adjust the overall level of the noise signal.



4.6 The LFO Module

The LFO module is used as a modulation source for the **Oscillator**, **Filter** and **Amplifier** modules. On the **LFO** module, one can adjust the waveform, the phase of the signal and fade-in behavior.



4.6.1 Wave Shape

The waveform of the **LFO** is selected with the *Shape* drop-down menu. The possible values are *Sine* for sinus, *Tri* for triangular, *Rect* for rectangular and *Rdm1* and *Rdm2* for the two random modes. In the case of the triangular and rectangular waves, the *PW* (Pulse Width) knob is used to control the symmetry of the wave. This allows you to go from a pulse to a square wave when a rectangular waveform is selected, and from a saw-tooth to a perfectly triangular wave when the triangular waveform is selected. Note that the *PW* knob has no effect on the *Sine*, *Rdm1* and *Rdm2* waveforms. When the *Shape* control is set to *Rdm1*, the LFO outputs random values at the rate determined by the *Sync* control or the *Rate* knob. In this case, the output value from the LFO remains constant until a new random value is introduced. The *Rdm2* mode reacts almost like the preceding mode except that the **LFO** module ramps up or down between successive random values instead of switching instantly to the new value.

4.6.2 Rate

There are two ways to adjust the rate, or frequency, of the output of the **LFO** module. If the *Sync* control is in its *off* position, the rate is set with the *Rate* knob. When the *Sync* control is *on*, the

frequency of the oscillator is fixed relative to the frequency (tempo) of the master clock (see 4.12.1) and the value displayed in the *Sync* control. Sync values range from 1/8 of a quarter note (a thirty-second note) to 16 quarter notes (4 whole notes) where the duration of the whole note is determined by the value (in BPM) appearing in the *Tempo* display of the **Clock** module. The **LFO** module can also be synced to a triplet (t) or a dotted note (d). Note that when the *Sync* control is depressed, the *Rate* knob has no effect.

4.6.3 Phase and Reset Mode

The LFO module behaves in a polyphonic way which means that a low frequency oscillator is associated with each voice of the polyphony. This allows the LFO module to control notes played on the keyboard individually. The gate signal received from the keyboard is used to reset the **LFO** waveform when a note is played on the keyboard. The specific point in the waveform where the **LFO** module will start generating signal is determined by the position of the *Phase* knob and whether or not the **LFO** is in reset mode.

The reset mode is enabled by clicking on the *Reset* button. In this mode, the phase of the output signal of the LFO corresponding to a polyphonic voice is fixed and adjusted with the *Phase* knob. This means that every time a note is depressed on the keyboard and a gate signal is received from the **Keyboard** module, the **LFO** module will start generating signal for this specific voice starting at a specific point in the cycle of the waveform. The initial phase of the signal is determined with the *Phase* knob which enables one to select values over a full period of the waveform. The value of the phase lag is increased by turning the knob clockwise and is equal to 0, 180 degrees and 360 degrees when the knob is in its leftmost, center and rightmost positions respectively. This feature enables, for example, the triggering of filter sweeps or panning effects that always start at the same point every time a note is played.

When the **LFO** is not in *Reset* mode (*Reset* button off), the phase of the signal is random and determined within a range fixed by the *Phase* knob. Turning this knob clockwise will increase the range to values located at different point of the wave period as explained above. The main interest of this mode is to keep voices uncorrelated when chords are played. Indeed, the LFO modulation signals corresponding to the different voices will then start at different points even if all the notes are triggered at the same time. Note that when the **LFO** module is not in *Reset* mode and the *Phase* knob is fully turned to the left (phase of 0 degree), the synthesizer behaves as if the *LFO* was monophonic and all the voices played were following this single *LFO*.

4.6.4 Fade-In

One more feature of the **LFO** module is the possibility to add a fade-in effect to its output signal. The duration of this fade-in can be adjusted within the range of 0 to 5 seconds, as determined by the *Fade* knob. Turning this knob fully to the left results in a value of 0 which is equivalent to removing the fade-in effect. The time at which the LFO signal is introduced can even be controlled by adding a delay to the fade in. This parameter can also be set to values varying between 0 and 5

seconds, as determined by the *Delay* knob. Note that this knob is effective even if the *Fade* value is adjusted to zero. In this case, the signal from the **LFO** module will simply be delayed.

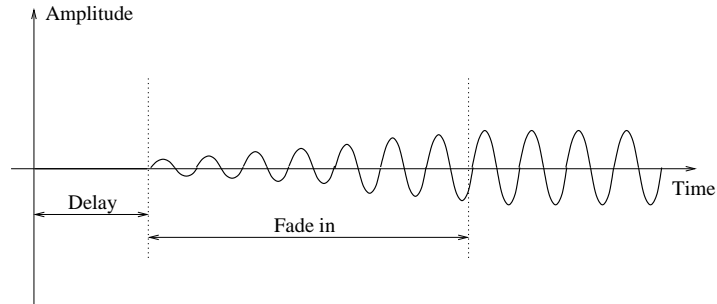


Figure 18: Fade in feature of the LFO.

4.7 The Envelope Module

Each row of the *Ultra Analog* is equipped with two envelope generators, the **Filter Env** and **Amp Env** modules which are used to modulate the **Filter** and **Amp** modules. Both envelope generators have the same user interface and offer the same functions. Envelopes are generated through the use of a standard ADSR (attack, decay, sustain, release) approach including velocity modulation and looping capabilities.

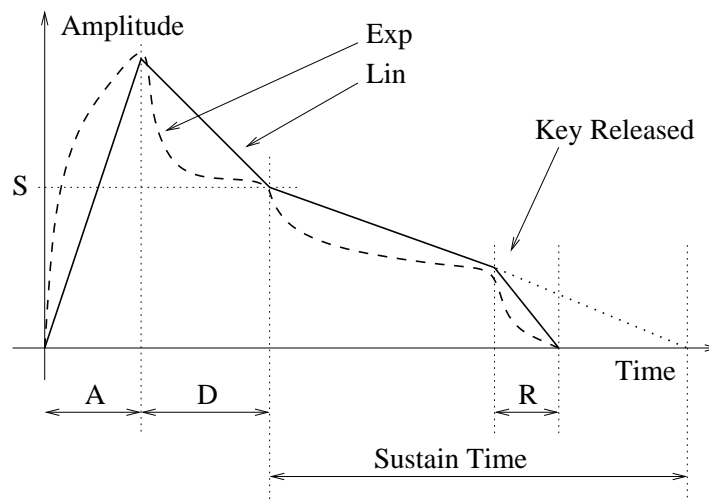


Figure 19: Response curve of an envelope generator. Broken line: exponential, full line: linear.

The envelope modules generate a four segment envelope: attack, decay, sustain, release. The attack time is adjusted using the *A* knob. The attack time can also be modulated with the velocity signal received from the **Keyboard** in such a way that that the higher the velocity signal the shorter the attack time will be, the intensity of this effect being controlled using the *V* slider on the left of the *A* knob. When the slider is in its lower position, the attack is only determined by the value of the *A* knob, increasing the value of *V* will increase the influence of the velocity signal until the attack time is strictly determined by the inverse of the velocity signal when *V* reaches its maximum value. The decay time is set with the *D* knob. The sustain phase of the envelope generator lasts from the end of the decay phase until the key is released. When the *S* knob is fully turned to the left, the sustain level is zero and there is no sustain phase while fully turned to the right, the sustain level is at maximum and there is no decay phase. When the key is released, the envelope generator toggles to the release phase and the envelope signal will decrease from the value at the end of the sustain phase to zero in a time set by the *R* knob.

Note that during the sustain phase, the envelope signal can be made to decrease even if a key is still depressed. The time taken to go from the level set by the *S* knob to a value of zero is then determined by the value of the *Time* knob located to the right of the *S* knob. When the *Time* knob is fully turned to the left, the envelope signal will fall to zero right after the end of the decay phase when the knob is in its rightmost position, the sustain level will be held as long as the key is depressed. Finally, the overall level of the envelope can be controlled with the velocity signal from the keyboard through the *V* slider located to the left of the *S* knob and behaves in exactly the same way as the *V* slider located near the *A* knob.

4.7.1 Shape of the Envelope Segments

We have so far determined the shape of the envelope by adjusting the duration of the different phases as well as their level. The envelope signal can further be modified by adjusting the shape of the envelope segments which can be set to linear or exponential as shown in Figure 19. The shape is selected with the *Slope* drop-down menu.

4.7.2 Free Run Mode

The *Free* button sets the envelope into free-run mode. This allows one to bypass the sustain phase of the envelope or in other words, to go directly from the decay phase to the release phase regardless of the amount of time a key is depressed.

4.7.3 Legato Mode

This mode is used to choose how the envelope generator reacts when a new note is played before the end of the preceding one. When this occurs, two strategies are possible. The first one consists in triggering a new envelope, from the attack phase, when the new note is played. The second consists in applying the current envelope signal of the first note to the second note which produces

a legato effect. The default strategy is the first one while the second one will be applied when the *Legato* button is depressed (green light on). Note that when the **Keyboard** is in polyphonic mode and the envelope generator in legato mode, the envelope generator behaves in a monophonic manner, reacting to a logical OR between all the gates signal from the different notes played on the keyboard. In other words the envelope generator will only be triggered by the first note played on the keyboard and then remain in the sustain stage until the last note is released.

4.7.4 Loop Modes

The envelope generator features three loop modes: *AD*, *ADR* and *Once*. These modes allow the envelope to cycle between several stages of the envelope until the key is released and are selected from the *Loop* drop-down menu.

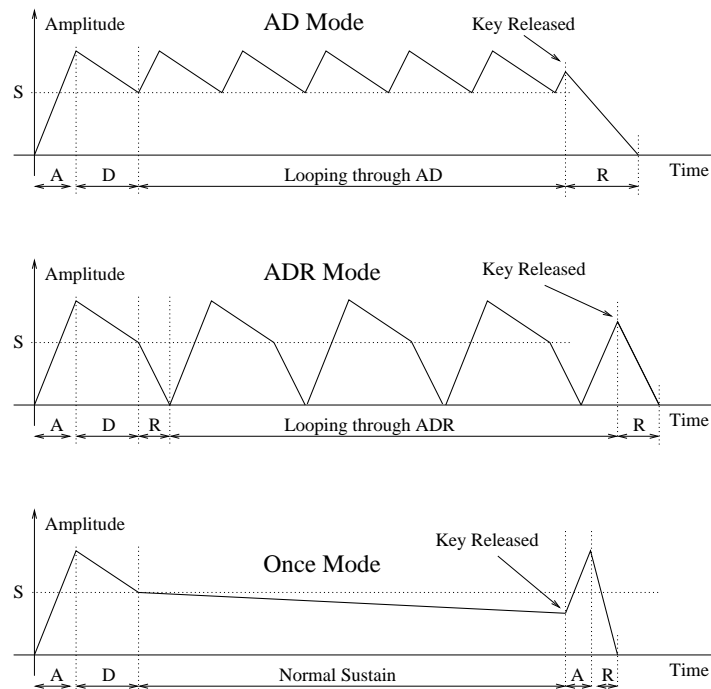


Figure 20: Loop mode of an envelope generator.

In the *AD* mode, the envelope begins with the attack and decay phases as usual, but rather than holding the sustain level, it repeats the attack (from the sustain level) and the decay phases until the note is released. When the note is released the envelope signal returns to zero following the release phase. The *ADR* mode is quite similar to the preceding mode and only differs in that the looping is done by cycling through the attack, decay and release phases. Finally, in the *Once* mode, the envelope is played normally but the envelope generator cycles once more through the attack and release phase when the key is released.

4.8 The Keyboard Module

The **Keyboard** module controls how the synthesizer voices respond to the events coming from an external MIDI keyboard or from a MIDI sequencer.

The first row of controls (*Tuning*, *Octave*, *Semi*) is used to fix the pitch of the keyboard, and transpose the overall keyboard by octaves or semi-tones. The *Stretch* and *Error* knobs, on the bottom row, allow one to stretch the octaves and/or add a random error on each note played. The second line of parameters allows one to turn unison *on* or *off*, select polyphonic or monophonic mode of operation, and choose the note priority. The first two knobs on the third row, *Detune* and *Decay*, are used to set the detune amount and the time delay respectively between voices of a note when the *Unison* mode is selected.



Note that the sustain pedal (MIDI controller number 64) is always active on the **Keyboard** module.

4.8.1 Tuning

The pitch of A4 (normally 440 Hz) is adjusted, in Hertz, in the *Tuning* display. The pitch can be transposed by -3 to $+3$ octaves and -12 to $+12$ semi-tones by using the *Octave* and *Semi* drop-down menus. Once the tuning of the keyboard has been determined through the use of these three controls, one can slightly alter it with the *Stretch* and the *Error* knobs. The *Stretch* knob sets the value of a semi-tone. When in the center position, the semi-tone interval corresponds to that of the equal-tempered scale. Turning the knob to the left shrinks the interval while turning it to the right increases it. The main effect of the *Stretch* control is that when it is not in the center position, an interval of one octave will not sound perfectly in tune and therefore beating will be heard when playing perfect octaves. The *Error* knob adds a random error to each note played; the more the knob is turned clockwise, the larger is the error. This will make all the notes play slightly out of tune.

4.8.2 Mode and Priority

The keyboard can be monophonic, allowing one to play only one note at a time, or polyphonic, allowing one to play chords. This behavior is adjusted with the *Mode* drop-down menu. The *Priority* control, located on the right of the *Mode* control, sets the behavior of the keyboard when several notes are depressed at the same time in monophonic mode or when the maximum number of polyphonic voices has been reached in polyphonic mode. In monophonic mode, the *Priority* determines which of the lower, last, or higher note has precedence when several notes are played. In polyphonic mode, this control determines which of the lowest, highest, or oldest note is muted in order to replace it with the newest note played once the maximum of polyphonic voices has been

reached. Note that since this parameter determines the note priority, the stolen note will be the opposite of what appears in the control display.

4.8.3 Unison

The unison mode allows one to stack voices, in other words, play two or four voices for each note played on the keyboard. This mode creates the impression that several instruments are playing the same note together, adding depth to the sound.

Each voice can be slightly detuned up or down relative to the others by moving the *Detune* knob clockwise and counter-clockwise respectively from its center position. Furthermore, voices can be desynchronized by adding a small time lag between their triggering with the *Delay* knob. This delay is nil when the knob is in its leftmost position and increased by turning it clockwise.

4.9 The Portamento Module

The portamento effect is used to make the pitch slide between notes rather than changing immediately from note to note. The *Time* knob sets the amount of time it will take for the pitch to slide over one octave. The *Mode* drop-down menu enables one to choose between the *Constant* or *Proportional* mode. When in *Constant* mode, the time necessary for the pitch to slide from one note to another will always be the same regardless of the interval between the notes. When set to proportional, the slide time will be proportional to the width of the interval between the two notes. When the portamento is on, the slide effect occurs between every note.



Clicking on the *Legato* button will switch the module into legato mode and the sliding between two notes will only occur if the second note is played before the first one is released. When a note is played staccato, or in other words if a key is released before the next one is depressed, there will be no portamento effect. Note that even though the portamento effect is available when the **Keyboard** module is in polyphonic mode, it is mostly dedicated to monophonic playing. In polyphonic mode, the same rules will apply to individual voices and the overall result will be less predictable.

4.10 The Vibrato Module

The vibrato effect is equivalent to a periodic low frequency pitch modulation. This effect is generally obtained by using an LFO to modulate the pitch signal of an oscillator. In *Ultra Analog*, a dedicated module is provided for this effect. The vibrato module is hard wired and affects the pitch of both oscillators.



The *Rate* knob sets the frequency of the vibrato effect from 0.5 Hz to 5 Hz. The *Amount* knob sets the depth of the effect, or in other words the amplitude of the frequency variations. In its leftmost position, there is no vibrato and turning the

knob clockwise increases the amount of pitch variation. The *Mod* gain knob is used to determine the effect of the keyboard modulation wheel on the depth of the vibrato. When this knob is fully turned to the left, the modulation wheel has no effect but when it is turned clockwise the depth of the vibrato will increase when the modulation wheel is used. The increase is always relative to the position of the *Amount* knob and will be greater as the *Mod* knob is turned clockwise.

The vibrato can be adjusted to not start at the beginning of a note but with a little lag. This lag is set by the *Delay* knob. The *Fade* knob allows you to set the amount of time taken by the amplitude of the vibrato effect to grow from zero to the amount set by the *Amount* knob.

The last parameter is used to add liveness to the sound. When several musicians play together, they do not necessarily start their vibrato exactly at the same time, speed and amplitude. The *Error* knob is used to produce this effect by adding an error to the *Rate*, *Amount*, *Delay* and *Fade* parameters of the vibrato of each polyphonic voice. The more the *Error* knob is turned toward the right, the larger will be the difference between the vibrato effect applied to each voice. When turned fully to the left there is no added error and all the voices are played with exactly the same vibrato effect.

4.11 The Arpeggiator Module

The **Arpeggiator** module allows one to play sequentially all the notes that are played on the keyboard. In other words, arpeggios are played rather than chords. The module allows one to produce a wide range of arpeggios and rhythmic patterns and to sync the effects to the tempo of an external sequencer.

4.11.1 Arpeggio Patterns

The arpeggio pattern is set by the combination of the value of the *Range*, *Span* and *Order* controls. The *Range* control is used to select the number of octaves across which the pattern will be repeated. When the range is set to 0, there is no transposition and only the notes currently depressed will be played. If set to a value between 1 and 4 (its maximum value), the notes played will be transposed and played sequentially, over a range of one or more octaves depending on the value of the *Range* parameter. The direction of the transposition is set with the *Span* drop-down menu. This parameter can be adjusted to *Low* for downwards transposition, to *High* for upwards transposition or *wide* for transposing both upwards and downwards. Finally, the *Order* control sets the order in which the notes are played, therefore determining the arpeggio pattern. When set to *Forward*, the notes are played from the lowest to the highest. When set to *Backward* the notes will be played from the highest to the lowest. In the two last modes, *Rock and Roll exclusive* and *Rock and Roll inclusive*, the note will be played forward from the lowest to the highest and then backward from the highest down to the lowest. When using the *RnR exclusive* mode, the highest and the lowest notes will



not be repeated when switching direction but in RnR inclusive mode these notes will be repeated. Finally, in *Chord* mode, all the notes are played at once.

4.11.2 Rhythmic Patterns

The rhythmic pattern is shown on the *Pattern* display. Different rhythmic presets are available through the utility menu. Notes will be played as the 16-step display is scanned and the corresponding step is selected (green button on). The little arrow on the top of the display is used to fix looping points from which the rhythmic pattern will start being played again from the beginning. Note that when a preset pattern is edited and then the **Save Preset** command from the **File** menu is used, the modified pattern will be saved and reloaded when the corresponding preset is later selected.

4.11.3 Rate and Synchronization

The rate at which the arpeggiator pattern is scanned is set by the *Rate* knob or can be synced to the master clock of the *Clock* module. The *Rate* knob will only be effective when the *Sync* control is set to *off*. When the *Sync* control in *on*, the rate is fixed relative to the frequency (tempo) of the master clock (see 4.12.1) and the value displayed in the *Sync* control. Sync values range from 1/8 of a quarter note (a thirty-second note) to 16 quarter notes (4 whole notes) where the duration of the whole note is determined by the value (in BPM) appearing in the *Tempo* display of the **Clock** module. This effect can also be synced to a triplet (t) or a dotted note (d).

4.11.4 Latch mode

The **Arpeggiator** module is toggled in latch mode by clicking the *Latch* button to the *on* position. In this mode, the **Arpeggiator** will keep playing its pattern when the notes on the keyboard are released and until a new chord is played.

4.12 The Output Effect Section



The output effect stage is located at the top row of the *Ultra Analog*. This effect stage allows one to add effects to the sound and record performances on the fly as wave or aiff files and as well, control the tempo **LFO** and **arpeggiator** modules.

4.12.1 The Clock Module

This module is used to control the tempo of the different effects of the output section as well as that of the **LFO** and **Arpeggiator** modules. The *Source* drop down menu is used to determine if the sync signal comes from an external source or from the internal clock of the module. The *Tempo* display indicates the value of the tempo in BPM (beats per minute). When the *Ultra Analog* is used as a plug-in in a host sequencer and the *Ext* source is chosen, the clock signal will be that sent by the host sequencer while in standalone mode the clock will be the one received on the MIDI channel selected in the toolbar.

When the *Int* source is chosen, the tempo is determined by the value of *Tempo* display. The tempo can also be changed by clicking repeatedly on the *Tap* pad of the *Tempo* display which will update the value of the tempo in the *Tempo* display.

4.12.2 The Chorus Module

This module implements both a chorus and a flange effect. It consists of four variable delay lines in parallel with a cross-feedback matrix between the lines. A wide range of effects is obtained by modulating the length of the lines and varying the amount of cross-feedback.

The *Chorus* drop down menu is used to choose between different chorus and flanger algorithms. The effect can be synchronized to the **Clock** module with the *Sync* drop-down menu. Sync values range from 1/8 of a quarter note (a thirty-second note) to 16 quarter notes (4 whole notes) where the duration of the whole note is determined by the value (in BPM) appearing in the *Tempo* display of the **Clock** module. The effect can also be synced to a triplet (t) or dotted note (d).

The different chorus algorithms can be controlled with the three knobs appearing at the bottom of the module. The *Mix* knob is used to adjust the ratio of “dry” and “wet” in the output signal of the module. When the knob is adjusted in the left position, only the original or “dry” signal is sent to the output while in the right position only the processed or “wet” signal is sent to the output. In its center position there will be equal amounts of “dry” and “wet” signal in the output signal. The *Depth* knob is used to adjust the amount of variation of length in the delay lines which controls the amplitude of the effect while the *Rate* knob is used to fix the frequency of the modulation.

4.12.3 The Delay Module

This module is a standard ping pong delay which is used to generate echo. It is based on two delay lines each including a low-pass filter. The effect is obtained by feeding back the signal at the end of each delay line into the input of the other line with an attenuation coefficient. The result is a signal traveling from one channel to the other, each time attenuated and filtered in the high frequencies due to the gain factor and the presence of the low-pass filter.

The *Delay* drop down menu is used to choose between different delay algorithms. The effect can be synchronized to the **Clock** module with the *Sync* drop-down menu. Sync values range from

1/8 of a quarter note (a thirty-second note) to 16 quarter notes (4 whole notes) where the duration of the whole note is determined by the value (in BPM) appearing in the *Tempo* display of the **Clock** module. The effect can also be synced to a triplet (t) or dotted note (d).

The different delay algorithms can be controlled with the three knobs appearing at the bottom of the module. The *Mix* knob is used to adjust the ratio of “dry” and “wet” in the output signal of the module. When the knob is adjusted in the left position, only the original or “dry” signal is sent to the output while in the right position only the processed or “wet” signal is sent to the output. In its center position there is in equal amounts of “dry” and “wet” signal in the output signal. The *Depth* knob is used to adjust the amount of signal re-injected from the output of a line into the other one while the *Rate* knob controls the length of the delay lines and therefore the delay between echoes.

4.12.4 The Reverb module

The **Reverb** module is used to recreate the effect of reflections of sound on the walls of a room or hall. These reflections add space to the sound and make it warmer, deeper, as well as more realistic since we always listen to instruments in a room and thus with a room effect.

The *Reverb* drop down menu is used to choose between different reverb algorithms representing different types of rooms or halls. Each algorithm can be adjusted with the knobs located at the bottom of the module. The *Mix* knob is used to set the relative amount of “dry” and “wet” signal which is related to the proximity of the sound source. The *Decay* is used to control the reverberation time of the room. In a real room, the reverberation time is not constant across the whole frequency range because the walls of the hall are generally more absorbent at high frequencies which results in a shorter reverberation time for these frequencies. This effect is controlled with the *Color* knob which sets the reverberation time of high frequencies relatively to the value of the *Decay* knob.

4.12.5 Topology

The three effects of the output section can be used in four different configurations as shown in Figure 21 and where the **Chorus**, **Delay** and **Reverb** modules are labeled **A**, **B**, and **C** respectively.



Figure 21: The four topologies in which the effects can be applied after the **Amp** module of the two module rows; **A** = **Chorus** module, **B** = **Delay** module and **C** = **Reverb** module.

In the first two configurations, the left and right channels of both source lines are mixed before being sent to the output stage. In the first configuration, the **Chorus** module is first applied, then the **Delay** and finally the **Reverb** module. In the second configuration, the signal is first processed

by the **Delay**, then by the **Chorus** and the **Reverb** module. In the third and fourth configurations, a different effect is applied after the **Amp** module at the end of the two module rows, mixing occurs and the resulting signal is fed to the **Reverb** module. In the third configuration, the **Chorus** and **Delay** modules are applied to the first and second row respectively while in the fourth configuration the order is reversed.

Note that each of the effects can be muted by selecting the *Bypass* preset in its respective algorithm selection drop down menu.

4.12.6 The Output Module

This module is used to monitor levels of the left and right channels. The overall level is adjusted with the *Level* knob. The best dynamic range is obtained when the level meters are around 0 dB for loud sounds.

4.12.7 The Recorder Module

This module is used to record the output of the *Ultra Analog* to a stereo 16-bit wave or aiff file. The *File* display, is used to choose the name and location of the destination file. One should always use this before starting a recording. The *Rec* and *Stop* buttons are used to start or stop the recording. On Windows systems the sampling rate will match that of the **Audio Settings** of the **Preferences** command of the **Edit** menu. On Mac systems, the specific settings are determined by QuickTime.

5 Toolbar

The toolbar at the top of the *Ultra Analog VA* interface allows you to monitor important information related to your current set-up.



5.1 Program Display

Displays the number and name of the program currently loaded in the synthesis engine. The + and – buttons on the left of the program number, or alternatively the + and – keys on the computer keyboard, are used to navigate upwards and downwards in the program list. The complete list of 128 programs can be viewed by using the ▼ button located on the left of the program number. When the preset associated with the current program is different from the version saved in the preset library, the preset icon to the left of the buttons changes color in order to indicate that saving is necessary in order not to lose the changes that have been applied.

5.2 MIDI map

Displays the name of the currently opened MIDI map. For more information on MIDI maps, please refer to Section 6.2.

5.3 CPU meter

Displays the percentage of the total CPU resources currently used by *Ultra Analog VA*.

5.4 Value Display

Displays the value of the currently selected control on the interface. The values range from 0 to 127 for knobs and 0 or 1 for buttons depending on whether they are in their *on* or *off* position. For some controls, the value is displayed in the appropriate units.

6 Audio and MIDI Settings

This chapter explains how to select the audio and MIDI devices used by *Ultra Analog VA* as well as how to create and edit MIDI links and MIDI maps. When referring to commands that are different on Windows and Mac OS systems, the commands are listed in the following order: Windows command/Mac OS command.

6.1 Audio Settings

6.1.1 Selecting a Audio Device

To select the audio device used by *Ultra Analog VA*:

- Go to the **Audio** menu and choose the **Audio Settings** options. A list of the audio devices installed on your computer will appear in the **Audio Configuration** window.
- Click on the audio device you wish to use and click on the **OK** button.

6.1.2 Audio Control Panel

To launch the audio configuration panel, choose **Audio Control Panel** under the **Audio** menu. This command allows you to select the bit depth sample rate (22.05, 44.1, 48, or 96 kHz) and buffer size, which affects how quickly *Ultra Analog VA* responds to the control information it receives. The smaller the buffer size, the shorter the latency, and vice versa.

On Windows systems using ASIO drivers, this command opens the control panel provided with the driver and the content of the dialog depends on the driver. Some sound cards also require that you close all programs before making changes to the buffer size or sampling rate. If you discover this is the case with your sound card, please refer to the manufacturer's documentation for details on configuring it for optimum performance. Most sound card manufacturers also update their drivers regularly. It is strongly recommended that you visit your sound card manufacturer's website regularly to ensure you are using the most up to date drivers and support software.

On Mac OS systems, this command launches the **Audio MIDI Setup** configuration application.

6.2 MIDI Settings

6.2.1 Selecting a MIDI Device

To select the MIDI device used by *Ultra Analog VA*:

- Go to the **MIDI** menu and choose the **MIDI Settings** option. A list of the MIDI devices installed on your computer will appear in the **MIDI Configuration** window.
- Select the MIDI device you want to use and click on the **OK** button.

6.2.2 Creating MIDI Links

Every control on the *Ultra Analog VA* interface can be manipulated by an external MIDI controller. In most cases this is much more convenient than using the mouse, especially if you want to move many controllers at once. For example, you can map the motion of a knob on the interface to a real knob on a knob box or to the modulation wheel from your keyboard. As you use the specified MIDI controllers, you will see the controls move on the *Ultra Analog VA* interface just as if you had used the mouse.

To assign a MIDI link to a controller:

- On the interface, right-click/Control-click on a control (knob, button), a contextual menu appears. Select **Learn MIDI Link**.
- Move a knob or slider on your MIDI controller (this can be a keyboard, a knob box, or any device that sends MIDI). This will link the control of the *Ultra Analog VA* to the MIDI controller you just moved.

MIDI links can also be created by right-clicking/Control-clicking on a control and choosing the **Add MIDI Link** command which will open the **Add MIDI Link** window.

6.2.3 Editing MIDI Links

MIDI links can be edited in the MIDI Links window, which lists all the currently available MIDI links.

- To edit the MIDI link, right-click/Control-click again on the control and choose **Edit MIDI Link** to open the MIDI links window. You can also use the **Edit MIDI Link** command from the **MIDI** menu.
- Click on the MIDI link you wish to modify and then on the **Edit** button to launch the **EDIT MIDI Link** window.
- Specify the MIDI controller number and MIDI channel of the physical controller you wish to link to the parameter in the corresponding drop-down menus.
- You can also adjust the **Minimum Value** and **Maximum Value** of the controller, which are used to limit the range of MIDI controllers. The **Minimum Value** slider is used to determine the position on the *Ultra Analog VA* control which corresponds to the minimum value sent by the MIDI controller; the **Maximum Value** slider determines the position which corresponds to the maximum value sent by the MIDI controller. The leftmost position of the slider corresponds to the *Ultra Analog VA* control minimum position (left position for a knob) while the rightmost position of the slider corresponds to the *Ultra Analog VA* control maximum position (right position for a knob).

- Note that the range of a knob can be inverted by setting the value of **Maximum Value** to a smaller value than that of **Minimum Value**.
- Click on the **OK** button and the link appears in the list of controllers linked to the control.
- Click on the **OK** button again to confirm the change and to leave the MIDI Links window.
- Note that the **Minimum Value** and **Maximum Value** of a MIDI link can also be set by right/control clicking on the corresponding control and selecting the **Set MIDI Link Minimum Value** or **Set MIDI Link Maximum Value** command. The value corresponding to the control position will then be saved as the minimum or maximum value of the MIDI link.

6.2.4 Deleting MIDI Links

- To remove a MIDI link, right-click/Control-click again on the control and choose **Forget MIDI Link** or choose the **Forget MIDI Link** command from the **MIDI** menu.
- MIDI links can also be removed from the MIDI Links window by clicking on the MIDI link to be removed to select it, then by clicking on the **Remove** button and the **OK** button to confirm the change.

6.2.5 Creating a MIDI Map

A set of MIDI links can be saved into a MIDI map by using the **Save MIDI Link As** from the **File** menu. Different MIDI maps corresponding to different MIDI controllers can thereby be saved for *Ultra Analog VA*. A MIDI map can be loaded by double clicking on the corresponding MIDI connector icon that appears in the browser when a MIDI map is saved. Furthermore a MIDI map can be loaded automatically when an instrument is launched.

- To assign a default MIDI map, right-click/Control-click on the MIDI map icon and choose the **MIDI Link Info** command. In the **Edit Information Window**, select the **Set as default MIDI Links** option.

6.2.6 Default MIDI Map

It is possible to define a default MIDI map which is automatically loaded when *Ultra Analog VA* is launched.

- To define a default MIDI map, first select a MIDI map by clicking on its icon in the browser and choose the **MIDI Link Info** command from the **Edit** or the Ctrl-I/Apple-I keyboard shortcut. One can also right-click/control-click on the MIDI map icon and choose the **MIDI Link Info** command.
- To change the default MIDI map select the **Mark As Default** option.

6.2.7 MIDI Program Changes

MIDI program changes can be used to switch between programs while playing. Ultra Analog VA will change the number of the current program used by the synthesis engine to the number corresponding to the MIDI program change received by the application.

6.3 Latency Settings

The latency is the time delay between the moment you send a control signal to your computer (for example when you hit a key on your MIDI keyboard) and the moment when you hear the effect. Roughly, the latency will be equal to the duration of the buffers used by the application and the sound card to play audio and MIDI. To calculate the total time required to play a buffer, just divide the number of samples per buffer by the sampling frequency. For example, 256 samples played at 48 kHz represent a time of 5.3 ms. Doubling the number of samples and keeping the sampling frequency constant will double this time while changing the sampling frequency to 96 kHz and keeping the buffer size constant will reduce the latency to 2.7 ms.

It is of course desirable to have as little latency as possible. *Ultra Analog VA* however requires a certain amount of time to be able to calculate sound samples in a continuous manner. This time depends on the power of your computer, the preset played, the sampling rate, and the number of voices of polyphony used. Note that it will literally take twice as much CPU power to process audio at a sampling rate of 96 kHz as it would to process the same data at 48 kHz, simply because you need to calculate twice as many samples in the same amount of time.

Depending on your machine you should choose, for a given sampling frequency, the smallest buffer size that allows you to keep real-time for a reasonable number of voices of polyphony. To adjust these parameters:

- Launch the **Audio Control Panel**
- Choose the sampling frequency and the audio format (16, 24, 32 bits)
- Adjust the buffer size

Note that this might not be possible on Mac OS or with ASIO drivers on Windows.

In order to optimize the resources allocated to the calculation of audio by *Ultra Analog VA*, it is possible to decrease the ratio of resources devoted to the calculation of graphics for the interface in favor of audio related calculations. To adjust this ratio, choose the **Preferences** command under the **Edit** menu and adjust the *Performance* slider to the desired value between **better audio performance** and **smoother graphics**. This setting may have little noticeable effect on recent computers.

7 Using the *Ultra Analog VA* as a Plug-In

Ultra Analog VA is available in VST, DXi, AudioUnit and RTAS (for Mac OS only) formats and integrates seamlessly into the industry most popular multi-track recording and sequencing environments as a virtual instrument plug-in. The plug-in versions will work exactly the same way as the standalone version, except for the audio, MIDI, and latency configurations that will be taken care of by the host sequencer. Furthermore *Ultra Analog VA* works as any other plug-in in these environments so we recommend that you refer to your sequencer documentation in case you have problems running *Ultra Analog VA* as a plug-in. We review here some general points to keep in mind when using a plug-in version of *Ultra Analog VA*.

7.1 Window Size

The size of the *Ultra Analog VA* window is fixed when it is used as a plug-in.

7.2 Audio and MIDI parameters

When *Ultra Analog VA* is used as a plug-in, the audio and MIDI ports, sampling rate, buffer size, and audio format are determined by the host sequencer.

7.3 Automation

Ultra Analog VA supports automation functions of host sequencers. Automation can usually be done by using MIDI links and recording MIDI events, or by recording the motion of controls on the interface.

7.4 Multiple Instances

Multiple instances of *Ultra Analog VA* can be launched simultaneously in a host sequencer.

7.5 Saving Projects

When saving a project in a host sequencer, the program list is saved with the project in order to make sure that the instrument will be in the same state as when you saved the project when you re-open it even if the preset library of the instrument was modified. MIDI links are also saved.

Note that the default program list (the same as that loaded in standalone mode) appears when *Ultra Analog VA* is opened in a new project or if a new instance of the plug-in is opened in an existing project. To change the default program list, use the **Save All Programs** command from the **Programs** menu in an instance of the instrument which displays the desired program list.

7.6 MIDI channel

Make sure that the MIDI controller, sequencer and *Ultra Analog VA* all use the same MIDI channel. If you are not certain of the channel used by your controller or sequencer, set the MIDI channel of *Ultra Analog VA* to *Omni*.

7.7 MIDI program change

MIDI program changes are supported in the plug-in versions of *Ultra Analog VA*. When a MIDI program change is received by the application, the current program used by the synthesis engine is changed to that having the same number as that of the MIDI program change message.

7.8 Performance

Using a plug-in in a host sequencer requires CPU processing for both applications. The load on the CPU is even higher when multiple instances of a plug-in or numerous different plug-ins are used. To decrease CPU usage, remember that you can use the **freeze** or **bounce to track** functions of the host sequencer in order to render to audio the part played by a plug-in instead of recalculating it every time it is played.

8 Quick reference to commands and shortcuts

File Menu

Command	Windows	Mac OS	Description
New Folder. . .		Apple+Shift+N	New Folder in the Browser
Open Preset	Ctrl+O	Apple+Option+O	Open the selected preset
Save Preset	Ctrl+S	Apple+S	Save the current preset
Save Preset As. . .			Save the current preset under a new name
Save MIDI Links	Ctrl+Shift+S	Apple+Shift+S	Save the current MIDI links
Save MIDI Links As. . .			Save the current MIDI links under a new name
Import. . .			Import a .lks file
Export. . .			Export a .lks file
Restore Factory Library . . .			Restore factory library and programs. Everything else in the browser is deleted.
Exit (Quit on Mac)			Quit the application

Edit Menu

Command	Windows	Mac OS	Description
Undo	Ctrl+Z	Apple+Z	Undo last command
Redo	Ctrl+Y	Apple+Shift+Z	Redo last command
Copy	Ctrl+C	Apple+C	Copy selected item
Paste	Ctrl+V	Apple+V	Paste
Delete	Del		Delete selected item
Info...	Ctrl-I	Apple+I	Edit information about a selected item (browser)
Compare			Compare modified preset with original settings
Preferences			Display the Edit General Preferences window

Audio

Command	Windows	Mac OS	Description
Audio Settings			Display the Audio Settings window
Audio Control Panel			Display the Latency Settings window if DirectSound is used, the ASIO control panel when ASIO drivers are used and the Audi MIDI setup configuration tool on Mac OS systems

MIDI

Command	Windows	Mac OS	Description
MIDI Settings			Display the MIDI Settings window
Learn MIDILink			MIDI link learn mode for the last control touched
Add MIDI Link			Enables one to add a MIDI link on the last controlled touched
Forget MIDILink			Drop a MIDI link
Set MIDI Link Minimum Value			Limit the value of a MIDI link to a minimum value
Set MIDI Link Maximum Value			Limit the value of a MIDI link to a maximum value
Edit MIDIlinks			Display the Edit MIDI links window
Edit Program Changes...			Associate presets with MIDI program changes
All Notes Off			Send an all note off signal

Programs Menu

Command	Windows	Mac OS	Description
Locate Program in Browser	Ctrl-L	Apple-L	Locate the current program in the browser and select it
Rename Program	Ctrl-R	Apple-R	Rename the current program in the program list
Switch to Program	Ctrl-P	Apple-P	Change the current program
Save All Programs			Save the entire program list including modifications to programs. The list will be in exactly the same state the next time you open the application

Help Menu

Command	Windows	Mac OS	Description
About Ultra Analog ...			Display the About Ultra Analog window
User Manual	F1		Display the user manual
Authorize Ultra Analog ...			Display the Authorization window. Active only if the application has not been authorized.
Visit www.applied-acoustics.com ...			Launch the browser and go to the AAS website.
Join the user forum ...			Launch the browser and go to the AAS forum.
Get support ...			Launch the browser and go to the support section of the AAS website.

9 Appendix

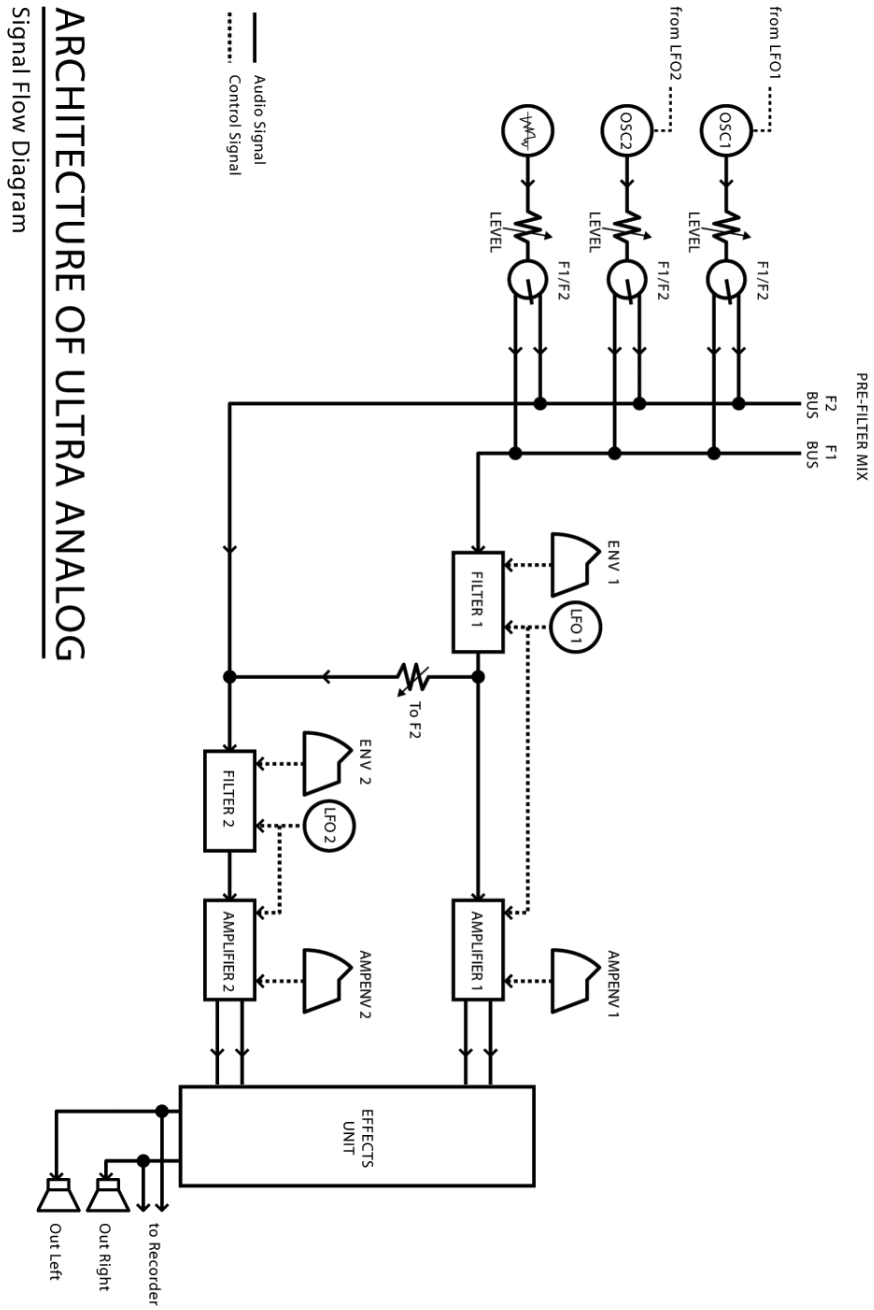


Figure 22: Schematic of the *Ultra Analog* Synthesizer.

10 License Agreement

IMPORTANT! CAREFULLY READ ALL THE TERMS AND CONDITIONS OF THIS AGREEMENT BEFORE OPENING THIS PACKAGE. OPENING THIS PACKAGE INDICATES YOUR ACCEPTANCE OF THESE TERMS AND CONDITIONS. IF YOU DO NOT AGREE WITH THE TERMS AND CONDITIONS OF THIS AGREEMENT, PROMPTLY RETURN THE UNOPENED PACKAGE AND ALL COMPONENTS THERETO TO THE PARTY FROM WHOM IT WAS ACQUIRED, FOR A FULL REFUND OF ANY CONSIDERATION PAID.

This software program, any printed materials, any on-line or electronic documentation, and any and all copies of such software program and materials (the “**Software**”) are the copyrighted work of Applied Acoustics Systems DVM Inc. (“**AAS**”), its subsidiaries, licensors and/or its suppliers.

1. **LICENSE TO USE.** The Licensee is granted a personal, non-exclusive and non-transferable license to install and to use one copy of the Software on a single computer solely for the personal use of the Licensee. Use of the Software is subject to this Agreement.
2. **RESTRICTIONS ON USE.** The Licensee may not nor permit third parties to (i) make copies of any portion of the Software, other than as expressly permitted under this Agreement; (ii) modify, translate, disassemble, decompile, reverse engineer or create derivative and/or competitive products based on any portion of the Software; (iii) provide use of the Software in a network, timesharing, interactive cable television, multiple CPU service bureau or multiple user arrangement to users not individually licensed by AAS, other than as expressly permitted by the terms of this license. The Software is licensed to you as a single product. Its component parts may not be separated for use on more than one computer.
3. **OWNERSHIP.** AAS retains title to the Software, including but not limited to any titles, computer code, themes, objects dialog concepts, artwork, animations, sounds, audio effects, methods of operation, moral rights, any related documentation and “applets” incorporated into the Software. AAS retains ownership of and title to all intellectual property rights in the Software, underlying technology, related written materials, logos, names and other support materials furnished either with the Software or as a result of this Agreement, including but not limited to trade secrets, patents, trademarks and copyrights therein. Licensee shall not remove or alter any copyright or other proprietary rights notices contained on or within the Software and shall reproduce such notices on all copies thereof permitted under this Agreement or associated documentation.
4. **LIMITED WARRANTY.** Except for the foregoing, THE SOFTWARE IS provided “AS IS” without warranty or condition of any kind. AAS disclaims all warranties or conditions, written or oral, statutory, express or implied, including but not limited to the implied warranties of merchantable quality or fitness for a particular purpose, title and non-infringement of rights of any other person. AAS does not warrant that THE SOFTWARE will meet the Licensee’s requirements or that the operation of the software will be uninterrupted or ERROR-FREE.

5. **LIMITATION OF LIABILITY.** TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT WILL AAS BE LIABLE TO THE LICENSEE OR ANY THIRD PARTY FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, INCIDENTAL OR EXEMPLARY DAMAGES WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOSS OF REVENUE OR PROFIT, LOST OR DAMAGED DATA, BUSINESS INTERRUPTION OR ANY OTHER PECUNIARY LOSS WHETHER BASED IN CONTRACT, TORT OR OTHER CAUSE OF ACTION, EVEN IF AAS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, EXCEPT IN RELATION TO GROSS NEGLIGENCE OR WILFUL BREACH OF THIS AGREEMENT BY AAS. NO AAS AGENT, REPRESENTATIVE OR DEALER IS AUTHORIZED TO EXTEND, MODIFY OR ADD TO THIS WARRANTY ON BEHALF OF AAS. THE TOTAL LIABILITY OF AAS FOR DAMAGES, WHETHER IN CONTRACT OR TORT, UNDER OR RELATED IN ANY WAY TO THIS AGREEMENT SHALL BE LIMITED TO THE LICENSE FEES ACTUALLY PAID BY LICENSEE TO AAS, OR IF NO FEES WERE PAID, AAS' LIST PRICE FOR THE SOFTWARE COVERED BY THIS LICENSE. THE EXCLUSION OF IMPLIED WARRANTIES AND/OR THE LIMITATION OF LIABILITY IS NOT PERMITTED IN SOME JURISDICTIONS, AND SOME OR ALL OF THESE EXCLUSIONS MAY THEREFORE NOT APPLY.
6. **TERMINATION.** This License also shall extend to the Software and any updates or new releases thereof obtained by the Licensee, if any, subject to any changes to this License made by AAS from time to time and provided to the Licensee, provided AAS is under a separate obligation to provide to Licensee such updates or upgrades and Licensee continues to have a valid license which is in effect at the time of receipt of each such update or new release. This License shall remain in effect until terminated. The Licensee may terminate this Agreement at any time, upon notification to AAS. This Agreement will terminate immediately without notice from AAS if the Licensee fails to comply with any provision of this License. Any such termination by AAS shall be in addition to and without prejudice to such rights and remedies as may be available, including injunction and other equitable remedies. Upon receipt of notice of termination from AAS, the Licensee must (a) immediately cease to use the Software; (b) destroy all copies of the Software, as well as copies of all documentation, specifications and magnetic media relating thereto in Licensee's possession or control; and (c) return all original versions of the Software and associated documentation. The provisions of Sections 1, 3, and 5 shall survive the termination of this Agreement.
7. **GOVERNING LAW.** This Agreement shall be governed by and construed in accordance with the laws of the Province of Quebec, without regard to the United Nations Convention On Contracts for the International Sale of Goods and conflict of laws provisions, if applicable, and the parties hereby irrevocably attorn to the jurisdiction of the courts of that province. Les parties sont d'accord à ce que cette convention soit rédigée en langue anglaise. The parties have agreed that this agreement be drafted in the English language.
8. **SEVERABILITY.** If any of the above provisions are held to be illegal, invalid or unenforceable, such provision shall be severed from this Agreement and this Agreement shall not be

rendered inoperative but the remaining provisions shall continue in full force and effect.

9. ENTIRE AGREEMENT. This Agreement is the entire agreement between AAS and the Licensee relating to the Software and: (i) supersedes all prior or contemporaneous oral or written communications, proposals and representations with respect to its subject matter; and (ii) prevails over any conflicting or additional terms of any quote, order, acknowledgement, or similar communication between the parties during the term of this Agreement except as otherwise expressly agreed by the parties. No modification to the Agreement will be binding, unless in writing and signed by a duly authorized representative of each party.
10. NON-WAIVER. No delay or failure to take any action or exercise any rights under this Agreement shall constitute a waiver or consent unless expressly waived or consented to in writing by a duly authorized representative of AAS. A waiver of any event does not apply to any other event, even if in relation to the same subject-matter.

Index

- adsr, 27, 41
- amplifier, 26, 38
- architecture, 25
- arpeggiator, 46
 - latch, 47
 - pattern, 46
 - rate, 47
 - rhythmic pattern, 47
 - synchronization, 47
- ASIO drivers, 52
- audio, 52
 - configuration, 15, 52
 - device, 52
 - format, 52
- band-pass filter, 33, 34
- browser, 15, 18
 - customizing, 23
 - hide, 23
 - resize, 23
- buffer size, 52, 55
- buttons
 - tweaking, 28, 29
- challenge key, 9, 10
- chorus, 47, 48
- clock, 48
- commands, 58
- community, 17
- compare, 21
- contact, 16
- database
 - backup, 24
 - restoring, 24
- delay, 47, 48
- display, 28
- documenting presets, 22
- driver, 52
- edit, 21
- effect, 47
- envelope, 27, 41
 - free run-mode, 42
 - legato mode, 42
 - loop mode, 43
 - shape, 42
- export, 23
- factory presets, 15, 24
- fade-in, 40
- filter, 26, 33
 - band-pass, 34
 - band-pass filter, 33
 - drive, 36
 - formant, 36
 - formant filter, 33
 - high-pass, 34
 - high-pass filter, 33
 - locking, 37
 - low-pass, 33
 - low-pass filter, 33
 - notch, 35
 - notch filter, 33
 - parallel, 37
 - saturation, 36
 - series, 37
- folder
 - copying, 21
 - creating, 21
 - deleting, 22
 - renaming, 22
- formant filter, 33, 36
- forum, 17
- free run mode, 42
- getting started, 14
- help, 16
- high-pass filter, 33, 34
- import, 23

- installation, 9
- interface, 25
- keyboard, 44
 - monophonic, 44
 - polyphonic, 44
 - priority, 44
 - sustain pedal, 44
 - tuning, 44
 - unison, 45
- knobs, 28
 - tweaking, 28
- latency, 52, 55
- legato, 45
- level, 38, 50
- lfo, 27, 39
 - fade-in, 40
 - phase, 40
 - rate, 39
 - reset mode, 40
 - wave shape, 39
- low-pass filter, 33
- master clock, 48
- MIDI, 52
 - device, 52
 - settings, 52
- MIDI configuration, 15
- MIDI controller, 53
- MIDI links, 16
 - creating, 53
 - editing, 53, 54
 - factory, 24
- MIDI links range, 53
- MIDI map, 23, 51, 54
 - default, 23, 54
 - documenting, 23
 - preset, 23
- MIDI program change, 16, 19, 55
- modulation, 27, 29, 39
- module, 28
 - bypassing, 29
 - copying settings, 29
 - resetting, 29
- multi-mode filter, 26, 33
- noise, 30
- noise generator, 26, 39
- notch filter, 33, 35
- oscillator, 26, 30
 - sync, 31
 - modulation, 30
 - noise, 30
 - pitch, 30
 - pulse-width, 30
 - rectangular, 30
 - routing, 32
 - saw-tooth, 30
 - sine, 30
 - square, 30
 - sub-oscillator, 31
- oscillator sync
 - modulation, 32
 - transient, 32
- output effect, 27
- output effect stage, 47
 - chorus, 48
 - delay, 48
 - level, 50
 - master clock, 48
 - recorder, 50
 - reverb, 49
 - topology, 49
- panning, 38
- parameters, 28
- performance, 8
- phase, 40
- physical modeling, 8
- pitch modulation, 30
- plug-in, 16
 - audio parameters, 56
 - automation, 56
 - MIDI channel, 57

- MIDI parameters, 56
- MIDI program change, 57
- multiple instances, 56
- performance, 57
- saving projects, 56
- window size, 56
- polyphony, 8
- portamento, 45
- preset, 15, 18, 51
 - backup, 23
 - browser, 18
 - changing, 19
 - compare, 21
 - copying, 21
 - database, 23
 - deleting, 22
 - documenting, 22
 - edit, 21
 - editing, 20
 - exporting, 23
 - factory, 24
 - importing, 23
 - library, 18, 21
 - locating, 22
 - moving, 21
 - name, 51
 - playing, 19
 - program, 18
 - renaming, 22
 - saving, 20
- preset library, 15
- program, 18
 - saving, 21
- program list, 15
- pulse-width modulation, 30
- recorder, 47, 50
- rectangular, 30
- redo, 20
- registration, 9, 10
- reset mode, 40
- response key, 10, 13
- reverb, 47, 49
- sampling rate, 8, 52
- saturation curve, 36
- saw-tooth, 30
- schematic, 64
- shortcuts, 58
- signal flow, 25
- sine, 30
- slider, 28
- square, 30
- standalone mode, 14
- sub-oscillator, 31
- sustain pedal, 44
- synchronization, 31, 47, 48
- system requirements, 8
- toolbar, 51
- transposition, 44
- tremolo, 38
- tuning, 44
- undo, 20
- unlocking, 9
- user library, 17
- vco, 26, 30
- vibrato, 27, 45
- voltage controlled oscillator, 30
- waveform, 30
- website, 17