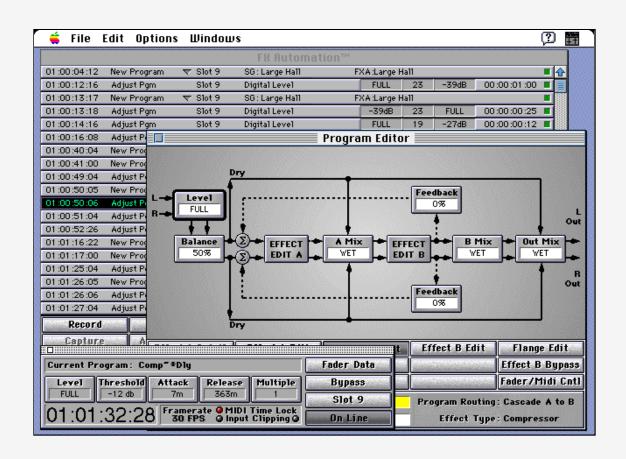


NuVerb

Digital effects card for Macintosh®



User Guide

Unpacking and Inspection

After unpacking NuVerb, save all packing materials in case you ever need to ship the unit. Thoroughly inspect NuVerb and packing materials for signs of damage. Report any damage to the carrier at once; report equipment malfunction to your dealer.

Notice

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designated to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment OFF and ON, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient the receiving antenna

Relocate the computer with respect to the receiver

Move the computer away from the receiver

Plug the computer into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to identify and Resolve Radio/TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

This triangle, which appears on your component, alerts you to the presence of uninsulated, dangerous voltage inside the enclosure... voltage that may be sufficient to constitute a risk of shock.





This triangle, which appears on your component, alerts you to important operating and maintenance instructions in this accompanying literature.

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NuVerb

Digital effects card for Macintosh®

User Guide

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Getting Started

Introduction

Congratulations on your purchase of NuVerb — and welcome to the next generation of effects processing technology. NuVerb provides the first comprehensive approach to effects creation and automation, and brings Lexicon's world-class digital signal processing technology to the exciting arena of the desktop.

NuVerb's graphic interface allows you to create custom programs faster and easier. FX AutomationTM frees you from dealing with effects as static events and lets you enter the world of true real-time effects processing.

NuVerb provides a palette of sophisticated effects, each containing a wide assortment of parameters which can be adjusted to customize each sound. Parameters can also be automated via time code. You can easily create a wide range of effects — from halls and chambers to totally wild spaces — the possibilities are endless.

The Operating Modes

NuVerb contains two DSP processors which can be configured to run in three different modes: Single, Dual Mono, or Cascade. All NuVerb programs are designed to run in one of these three modes. In the Single mode, the two processors are run as a single, unified machine. The Dual Mono mode assigns one processor to each input. In the Cascade mode, the two processors are arranged in a chain, so that processor A feeds processor B. This allows for a wide range of interesting and useful sounds to be created, by mixing different effects together.

Getting Started Lexicon

The Programs

NuVerb programs are specifically designed to run in the single mode or in one of the "split" modes (Dual Mono or Cascade). The programs available in Single Mode are: Random Hall, Random Ambience, Rich Plate, and Stereo Adjust.

Random Hall is a reverb program with a random element which allows a far more realistic hall simulation than any conventional reverb.

Random Ambience creates early reflection simulation, with similarly brilliant results.

Rich Plate is a classic Lexicon plate effect, which is denser, smoother, and less colored than conventional plates.

Stereo Adjust has been optimized for achieving perfect level, EQ, and Balance in a mastering facility.

In the Dual Mono and Cascade modes, the available programs are: Split Chamber, Dual Delay, Compressor, and PONS.

Split Chamber is a reverb program which provides a wide range of control over room characteristics.

Dual Delay includes multiple stereo delay lines with two all-pass filters (diffusers).

The Compressor provides true digital look-ahead compression and expansion.

PONS (Psychoacoustically-Optimized Noise Shaping) provides tools for properly truncating and dithering 20-bit program material for distribution via 16-bit media.

Nu Verb User Guide Getting Started

The Interface

NuVerb features the most user-friendly interface available in any digital effects processor. Each program is presented as an on-screen diagram, with dynamic control available within the diagram elements. Start with any program, and edit Input Level, Balance, and wet/dry Mix. Then select the Effect Edit button to call up a diagram that lets you fine tune all of the effect parameters. Depending on the program, these parameters include basic elements such as delay time, feedback, decay time, and reverb level, and details such as room size, shape, diffusion, and more. Each parameter is clearly marked and easily accessible: simply click to open an onscreen fader that lets you change the value of any parameter. An edit/compare feature makes it easy to hear your changes next to the original. A "Hot Palette" lets you assign your five most frequently used parameters to faders that are always within easy reach.

For MIDI users, an extensive MIDI implementation is provided. Each NuVerb program can have as many as ten parameters controlled via MIDI in real-time, and MIDI asignments can be different for each NuVerb program. Reverse scalings can be assigned, and MIDI control can be mapped across multiple NuVerb cards. NuVerb is compatible with both Apple MIDI Manager and Opcode OMS.

FX Automation™

NuVerb revolutionizes the process of effects automation. This capability, which we call FX Automation, $^{\text{TM}}$ gives you unprecedented, real-time control across multiple NuVerb cards. Far beyond simple program changes, FX Automation $^{\text{TM}}$ makes any parameter, in any program, available for real-time control. NuVerb offers not only extraordinary reverb and effects, but also the ability to automate room ambience and effects changes via MIDI time code.

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Desktop Digital Reverb and Effects

Desktop production systems provide remarkable power and performance within a very small working space, but, before NuVerb, they required sending audio out of a recorder, into an effects system, and then back into the recorder. With NuVerb, the integrity of your signal is never compromised by leaving the digital domain. Using multiple NuVerb cards with the interface software offers massive control and automation, centralized in one system. NuVerb offers greater flexibility, faster and easier programming, and world-reknowned Lexicon sound — all accessible from the desktop.

How to use this manual

The manual is organized into four sections: Getting Started, Learning to Use NuVerb, Reference, and Appendix.

Getting Started provides instructions for installing software and hardware, and for connecting an audio source.

Learning to Use NuVerb contains a series of tutorials which introduce you to all of the features of NuVerb.

These sections provide step-by-step guidance through procedures, with **basic information presented in bold text**, followed by a more detailed explanation.

Reference contains a summary of keyboard shortcuts, illustrations of NuVerb windows and menus, detailed descriptions of the NuVerb effects and their parameters, as well as MIDI Implementation and time code data.

The Appendix contains a troubleshooting guide and product specifications.

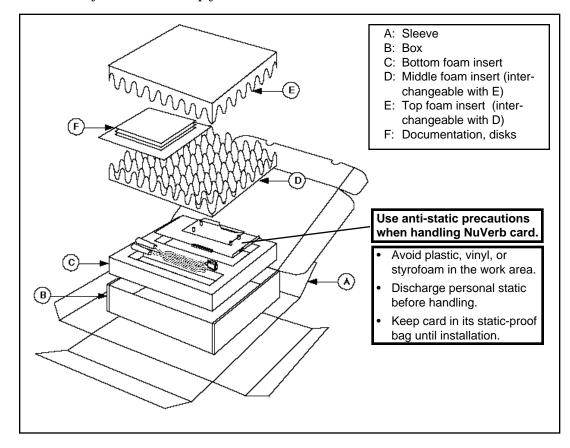
For those who don't read manuals: go to the Reference section and look at the examples of NuVerb screen graphics for quick definitions of window and menu controls. See NuVerb and MIDI to configure NuVerb to work with your system.

Nu Verb User Guide Getting Started

Unpacking

Contents of Shipment

Your NuVerb package should contain a p.c. board, a cable, documentation, and two Macintosh disks. Please note the manner in which these items are packed, and keep all packing materials, in the event you need to re-ship your unit.



Getting Started Lexicon

Installation

Setting Up

Setting up your Macintosh to run NuVerb requires the following steps:

- Installing the NuVerb Digital Reverb Effects Card into a NuBus slot
- Installing NuVerb software
- Connecting an AES digital audio source
- Setting up NuVerb to work with your MIDI system

Installing the NuVerb Digital Reverb Effects Card

Installing the Effects Card into a NuBus or Macintosh Expansion slot

- 1. Turn off the computer, and disconnect it from the power source.

 The computer should remain unplugged for the entire installation procedure.
- 2. Place the computer on a clean, nonabrasive surface.
- 3. Place the anti-static bag containing the NuVerb card next to the computer.

 Don't walk around with the card once it's removed from its anti-static bag, as moving your feet may generate static electricity which can damage the card.
- 3. Follow the instructions provided with your particular computer model for removing the cover.
- 4. Push out the plastic cover plate behind the expansion slot you want to use. (It doesn't matter which slot you choose.) Set the cover plate aside.
 - Press down on the clip at the top of the cover plate to release the plate. If you have difficulty releasing the plate, use a screwdriver to press the clip.
- 5. Touch the metal part of the power supply case inside the computer to discharge any static electricity that might be on your clothes or body.
 - Always do this before you touch any parts, or install components inside the computer.

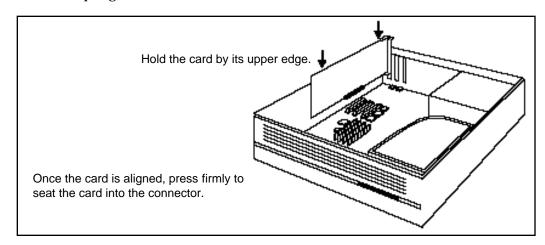
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6. Remove the NuVerb Effects Card from its static-proof bag.

Hold the card by its top edge. Avoid touching the connector on the bottom of the card. If you lay the card down, make sure to place it on its static-proof bag.

7. Align the card over the Expansion slot.

You may have to push the card toward the back of the computer chassis to do this, as there are small, spring-loaded metal tabs on the slots.



8. Press down firmly on the card until the connector is seated.

Don't force the card. If you meet a lot of resistance, pull the card out, and inspect the connector to make sure that none of the pins are bent. Try seating the card again.

To see if the card is properly connected, lift it gently. If it resists and stays in place, it's connected.

9. Replace the cover on the computer.

Refer to the instructions provided with your particular Macintosh model. Do not operate the system without the cover.

Getting Started Lexicon

Installing NuVerb Software

System Requirements

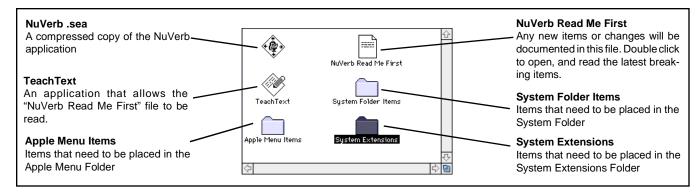
NuVerb requires at least 8 megabytes of RAM. The application itself uses only 4 megabytes, but the Macintosh operating system also requires memory. Any software you run along with NuVerb will have additional memory requirements. Refer to the manufacturer's specifications.

The behavior of NuVerb screens and faders is affected by the speed of your Macintosh. Note that black and white monitors tend to run the NuVerb graphic interface faster than color monitors. If you have a slower computer and/or a demanding application, you may want to run NuVerb in black and white.

Installing the Application

- 1. Insert the NuVerb application disk into your drive.
 - As with all applications, it is recommended that you make a copy of this disk and work from the copy, keeping the original in a safe place.
- 2. Create a new folder and name it "NuVerb."
- 3. Insert the Program disk and double click on it.

The window should look like this:



NuVerb User Guide Getting Started

- 3. Select all of the items on the disk and copy them to the NuVerb folder you created.
- 4. Eject the NuVerb disk and store it safely, as this is your original master copy.
- 5. Open the NuVerb folder and double click on the NuVerb .sea icon.

This starts the installation process. During the installation, you will be asked to select a location for the application. Although the application can be located anywhere you like, we recommend selecting the newly-created NuVerb folder as the destination, in order to keep all your NuVerb items together.

Installing MIDI Manager

NuVerb uses **MIDI Manager** for Automation to support the communication of real-time information such as MTC (MIDI Time Code) between applications. As MTC is necessary for control of NuVerbFX Automation,[™] the use of MIDI Manager is required.

Although Apple provides a driver with MIDI Manager, a number of manufacturers whose software uses MIDI Manager provide their own drivers. NuVerb supports the use of most of these. Check for updated information shipped with the NuVerb package, or included in the **NuVerb Read Me First** file which is part of the NuVerb software package.

To install MIDI Manager:

- 1. Open the folder labeled **Apple Menu Items**. Select all of the items in this folder, and copy them to the Apple Menu Folder.
- 2. Open the folder labeled **System Folder Items**. Select all of the items in this folder, and copy them to the System Folder.
- 3. Open the folder labeled **System Extensions**. Select all of the items in this folder, and copy them to the System Extensions Folder.

If you encounter problems in installing NuVerb software, refer to *Troubleshooting* in the Appendix.

Getting Started Lexicon

Connecting an AES Audio Source

Cables/Connections

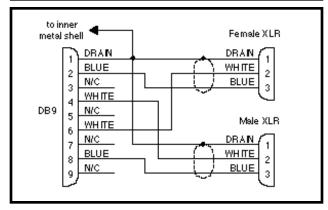
1. Use the cable provided with NuVerb.

NuVerb is supplied with a cable with aDB-9 connector for attachment to your Mac and an XLR connector for attachment to your AES/EBU source.

2. If you do not have the correct cable, contact Lexicon or your NuVerb dealer for a replacement.

To insure the integrity of digital communications, audio cable extenders or adapters should be made using Belden #9271, or Manhattan #M4159.

DB9 PIN	FEMALE XLR	MALE XLR	FUNCTION
1	1	1	CHASSISGROUND
2	3	-	AES IN (-)
3		-	N/C
4	•	2	AES OUT (+)
5		-	N/C
6	2	-	AES IN (+)
7	•	-	N/C
8	-	3	AES OUT (-)
9	-	-	N/C



Nu Verb User Guide Getting Started

Connecting an Analog Audio Source

NuVerb can be used with a traditional analog mixing console using an analog-to-digital/digital-to-analog converter that provides an AES output from analog and also converts AES back to analog. These are available from several manufacturers. Also, check for updated information shipped with the NuVerb package, or included in the **NuVerb Read Me First** file which is part of the NuVerb software package.

The connection between your Macintosh and any A/D-D/A converter is via AES connectors. See *Cables/Connections* as well as the information provided by the converter manufacturer for specific cable requirements.

Note that NuVerb is slave device and will use the AES sample clock supplied to its input from the A/D converter.

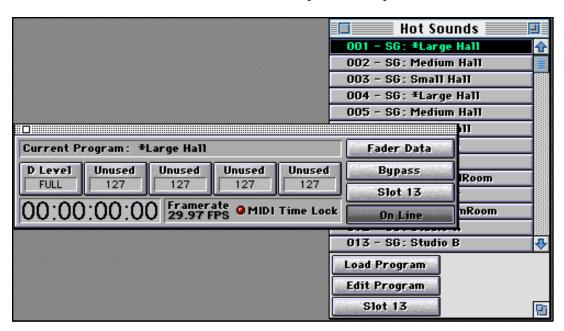
Getting Started Lexicon

2

Learning to Use NuVerb

Tutorial 1: Starting NuVerb

Once you have successfully completed hardware and software installation, you are ready to open NuVerb. This tutorial assumes you have an audio source connected directly via AES, or via an analog converter, and are monitoring the output of NuVerb. Select a piece of program material to audition while doing this tutorial. If you have any questions about audio connections, refer to the *Audio Connections* section in the previous chapter.

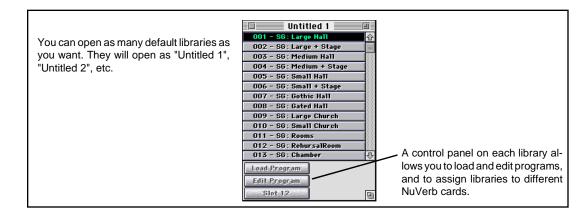


Open NuVerb

To open NuVerb, double click on the NuVerb program icon.



When opened, NuVerb will create a default library of programs and open them in a Library window on your screen. If this does not happen, select **Create Default Library** from the **Options** menu. The default library will open with *Large Hall* selected.



NuVerb User Guide Learning to Use NuVerb

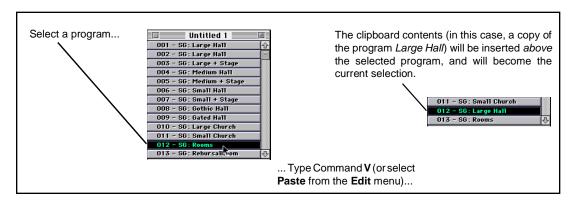
Creating and Loading Programs

A new program is created simply by copying one of the factory default programs, editing it and renaming it.

Highlight *Large Hall* and select **Copy** from the **Edit** menu. This places a copy of the program into the Macintosh clipboard. Next, select **Paste** from the **Edit** menu. This pastes a copy of *Large Hall* above the original selection in the Library listing.

(Note that the NuVerb Cut, Copy, and Paste commands are also available via the familiar Macintosh keystrokes: Command X, Command C, and Command C.)

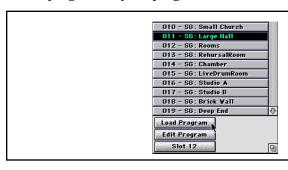
Now, select any other program in the Library listing (in our example, we've selected *Rooms*), and type Command **V** again.



Another copy of *Large Hall* is pasted above the program you selected, and becomes the selected program. Copied items are always inserted above the currently selected program. If no program is selected, copied items are pasted at the end of the library.

To load a selected program, click on the Program Load button, or click on the program you want loaded.

For example, with one of your new copies of *Large Hall*. highlighted, click on the **Load Program** button at the bottom of the library . This loads the program, and lets you hear the sound of this reverb program on your program material.

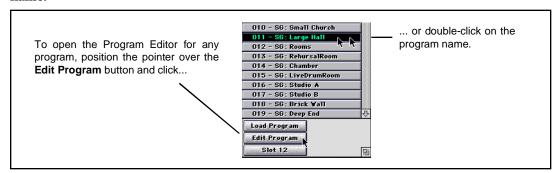


To load a program, position the pointer over the **Load Program** button and click.Loading on a single click is an option which we have selected for you. This can be disabled under Preferences.

Edit a program

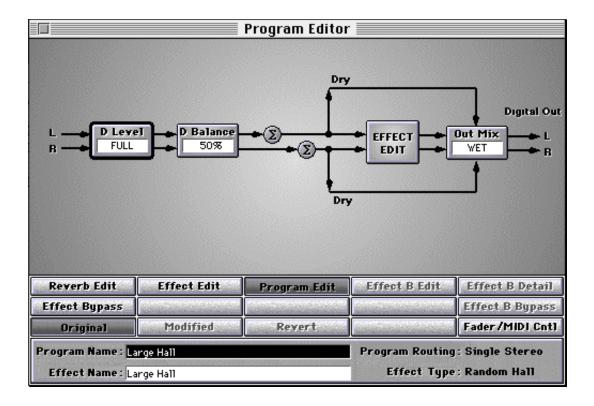
The Program Editor

Open the Program Editor to change the program name, to edit effect parameters, or to set up MIDI and the Hot Palette. Click on the Edit Program button, or double click on the program name.



Nu Verb User Guide Learning to Use NuVerb

The Program Editor opens to show a graphic overview of the program, and a panel of edit buttons. The overview shows only the general program type (single, dual mono, or cascade) and allows basic level and balance adjustments to be made within the diagram's parameter boxes. This Program Edit view is the most general view of the program and its effects, presenting the least detail about them. Note that clicking on the **Program Edit** button on the control panel will always return you to this view.



Select a parameter

To select a parameter, position the pointer over a parameter box and click.

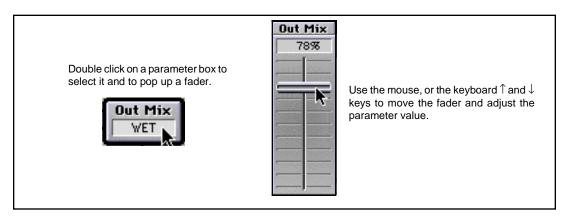
For this example, click and hold on "Out Mix". A heavy black outline around the "Out Mix" parameter box indicates that it is selected.

Change the value of a parameter

Click on a selected parameter to pop up a fader. Double click on any unselected parameter to select it and open a fader.

Single click on the selected parameter, in this case, "Out Mix". A fader will pop up. Position the pointer over the head of the fader control fader adjustment with the mouse. (Click and drag also works for fader manipulation — the fader disappears when you release the mouse.)

The parameter value changes as the fader is moved with the mouse. Once you have selected a value, click once, or press *enter* on the keyboard, to hide the fader.

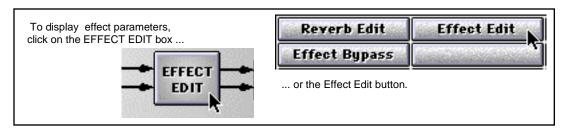


Holding *option* while adjusting with the \uparrow and \downarrow keys on the keyboard gives you fine control of certain parameters with large value ranges, such as delay time.

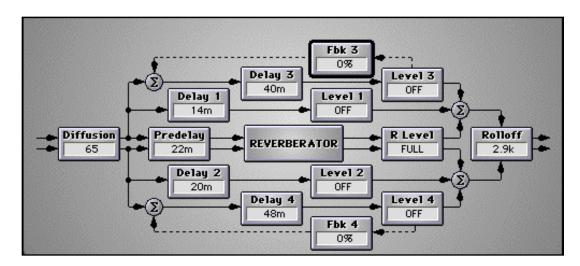
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Viewing Effects

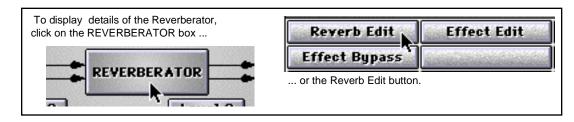
To look at the currently running effect in greater detail, click on the box labeled "EFFECT EDIT", or click on the Effect Edit button on the Control Panel.



When you select Effect Edit, the view changes to show a second level of detail, with additional parameters, any of which can be altered with a fader as described earlier.

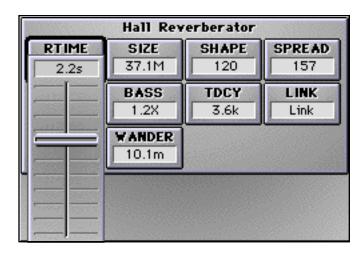


Note the box in the middle of the display, labeled REVERBERATOR. To access the reverb parameters within this box, click on it, or on the Reverb Edit button on the Control panel.



The view changes once again to display a third level of detail.

The Reverberator parameters are also available for fader adjustment. This is the deepest level of detail of this effect.



Click on Effect Edit to return to the previous view.

NuVerb User Guide Learning to Use NuVerb

The available views depend on the number of parameters in any given effect. For some effects one level of detail is sufficient to represent all of the parameters. Others require a deeper level of detail.

Dual Mono and Cascade programs contain two effects, labeled "A" and "B." These programs have a duplicate set of Control Panel buttons available for accessing the parameters of the second effect. The techniques for viewing and editing either effect are identical.

Naming Programs and Effects

Program and Effect names can be changed in the Program Editor.

Effect names can be changed in the Effect Edit view of the Program Editor; program names can be changed in the Program Edit view. In either view, the name which is available for alteration is highlighted. Click on the name to display a standard text insertion tool.

Names can have as many as 32 characters (including spaces). New names will be saved when the program is stored in a library.

Saving a Program

Click on the Edit window close box to call a dialog box that allows you to save the program in its current state.

Select a program, open the Edit window, and alter any parameters you want. Once you have completed the changes you want, click on the close box in the upper left hand corner of the Edit window. A dialog box will appear allowing you to choose **Don't Save** (Command **N**), **Cancel**, or **Save**.

For this example, click on **Save** (or press *enter* on the keyboard). This saves the changes you have made to the current library.

Saving a Library

The standard Macintosh save command calls up a dialog box allowing you to save a library.

When working with libraries, it is a good idea to save the library regularly as you modify and save programs within the library. To do this press Command S, or select **Save** from the **Edit** menu. The dialog box allows you to save the library with a new name.

Library Management

New libraries are easy to create with the familiar Macintosh Cut, Copy and Paste commands. Libraries can be assembled from any combination of existing libraries, including the factory default library. Let's look at how this works.

The Default Library

Selecting **Create Default Library** from the **Options** menu, creates a copy of a bank of factory-designed programs. The library, which opens as "Untitled," is used as a template for creating your own "custom" NuVerb program. You can open multiple copies of the default library. These will open as "Untitled 2," "Untitled 3," etc. You can make as many changes as you like to any of these libraries, the actual default programs are always stored and available in NuVerb memory.

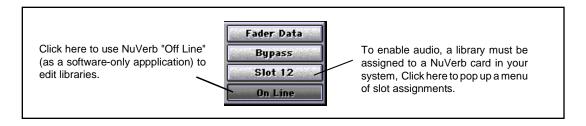
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Working with Multiple Libraries

NuVerb allows only one library at a time to be assigned to any NuVerb card. The Slot number on the Library Control Panel indicates to which NuVerb card a particular library is assigned.

The first library opened is automatically assigned to the lowest slot number in your system. Subsequent libraries will open with the slot location "Unassigned." Although you can perform all editing functions on an unassigned library (including saving your edits), you will not be able to load programs. Assigning the library to a card enables the audio for that library.

An On Line/Off Line toggle button is provided to allow you to use NuVerb as a software-only application to edit libraries.



To Create a New, Empty Library

Select Create New Library from the File menu.

To Copy a Program

Select a program by clicking on it, then select **Copy** from the **File** menu. The program can now be pasted into any open library, or into any new library you open.

To Paste a Program

Select **Paste** from the **File** menu. If a program is highlighted, the new program is pasted *above* it. If no program is highlighted, the program is pasted at the end of the library.

Learning to Use NuVerb

To Cut a Program

Select a program by clicking on it, then select **Cut** from the **File** menu. The highlighted program is removed. Cut programs can be pasted into another location within the same library, or into another library. The program will be saved on the clipboard until another **Cut** or **Copy** command overwrites it.

Cutting, Copying, and Pasting Multiple Programs

The selection of multiple programs for cutting or copying to a library is accomplished by using either the *shift* or the Command key as follows:

The *shift* key: To select a group of adjacent programs, click on the first program in the group. Then press and hold the *shift* key while selecting the last program in the group. All of the programs between the first program selected and the second will be highlighted.

The Command key: To add a non-adjacent program to a highlighted group, hold down the Command key while clicking on the program you want to add.

Programs pasted from the clipboard are inserted *above* any program which is highlighted. If no program in the list is highlighted, programs are inserted at the end of the list. The original order of multiple programs is maintained when they are cut, copied, or pasted.

NuVerb User Guide Learning to Use NuVerb

Keyboard commands for selecting parameters, changing values, and selecting views

The following keyboard commands can be used as a substitute for mouse control within the Edit window:

1. To cycle though the parameters displayed in any Edit window view:

Press tab

2. To pop up a fader on a selected parameter:

Press enter

3. To hide the fader:

Press enter

3. To adjust any selected parameter's value:

Press \uparrow or \downarrow

4. To move to a more detailed view:

Press Command ↓

To move up to a more general view:

Press Command ↑

4. To move from Effect A to Effect B:

 $Press\ Command \rightarrow$

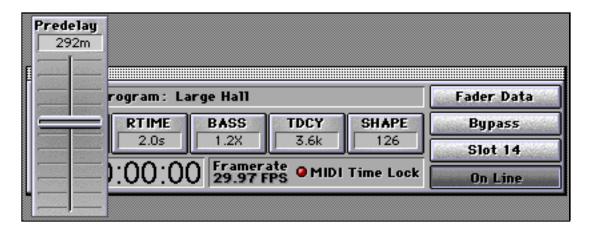
To move from Effect B to Effect A:

 $Press\ Command \leftarrow$

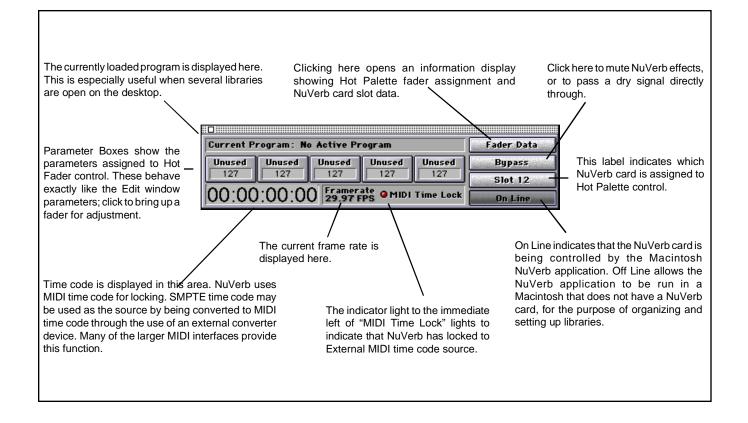
Tutorial 2: The Hot Palette

The Hot Palette provides status information and selectable real-time controls for NuVerb. Like a Toolbox in a graphics program, the palette always stays in front of other windows, as it provides important, regularly-used information and control. When the NuVerb application is opened, any NuVerb cards in your system are automatically located, and the card with the lowest number is identified here under "Slot #."

The Hot Palette allows you to control parameters without opening the edit window. Each program can be assigned to have your five favorite parameters appear for immediate control whenever the program is loaded. Faders on the Hot Palette can be assigned to control more than one parameter within a program. If you have more than one NuVerb audio card, faders on the Hot Palette can also be assigned to control programs running on different cards. Before starting the tutorial, familiarize yourself with the parts of the Hot Palette, as shown on the following page, and connect an audio source, as described in Tutorial 1.



NuVerb User Guide Learning to Use NuVerb



Open NuVerb

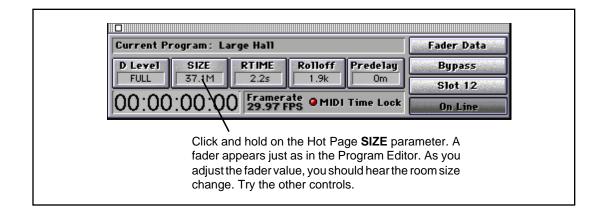
To open NuVerb, double click on the NuVerb program Icon.

When opened, NuVerb creates a default library of programs and opens a Program Library window on your screen. If this does not happen select **Create Default Library** from the **Options** menu. The default library opens with *Large Hall* selected.

Load a Program, change a Hot Palette parameter

Click on the Load Program button (or double-click on a Program name) to load it. Select a parameter on the Hot Palette, then click on the selected parameter to pop up a fader for adjustment of parameter value.

Click on the Library window Load Program button and observe the Hot Palette. Note that Large Hall appears as the "Current Program". Play your audio source to confirm that Large Hall is loaded. The Hot Palette contains five parameter boxes. These can be assigned to any parameter, but have been preset to those shown for the purposes of these tutorials.



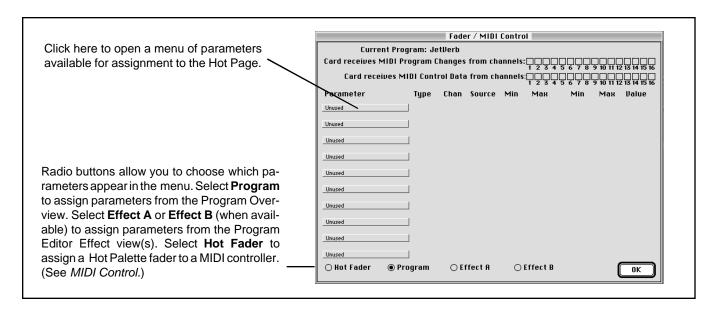
Nu Verb User Guide Learning to Use NuVerb

Editing Hot Palette Parameters

From the Program Editor, click on the Fader/MIDI Cntl button to open a dialog box for Hot Palette control assignments.

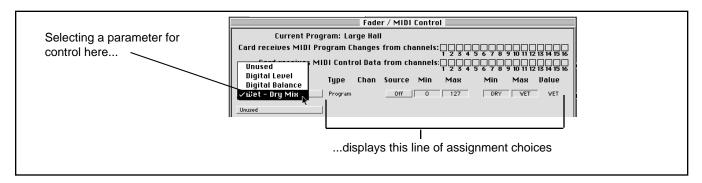


Now, let's look at how program faders are assigned to parameters. Select any program in your library. (Don't select *Large Hall*, as we've already assigned Hot Palette parameters for you in that program.). Open the Program Editor for the program you've selected. Click on the **Fader**/**MIDI Cntl** button in the Program Editor control panel to open a Hot Fader Editor dialog.



Note the radio buttons at the bottom of the Hot Fader Editor. The selection you make here will determine which parameters are available as menu choices under **Parameter**. For now, make sure that **Program** is selected.

Click on the first display under the label **Parameter**. A pop-up menu appears, allowing selection among the available program parameters. Select Wet-Dry Mix and assign it by releasing the fader. Now that you have selected a parameter for control, a row of selectable assignment boxes should appear.



Next, select a control source for the Wet-Dry Mix parameter by clicking on the assignment box labeled **Source**, and selecting "Fader 1." This assigns the first parameter box on the Hot Page, and its fader will now control the output mix of this program.

Click **OK** and return to the Program Editor. Note that the first parameter box on the HotPalette is now labeled **OutMix**. Click on this box to pop up a fader, then make adjustments to the value. Notice that the value displayed in the Program Editor moves as the Hot Fader is moved.

Let's go back to the Fader/MIDI Cntl window and examine the action of some of the other controls.

To the right of the **Source** selection are the source Min(imum) and Max(imum) values. These allow you to select any portion of the source controller's full range to be used for control. These are selected and controlled by a pop up fader, exactly as the source field. Any value from 0-127 can be assigned to either field, making inverse control possible.

The next set of Min and Max controls adjust the range of the selected parameter available for the source to control. As an example, this might be used to give a MIDI controller fine control of a value range, where a range of 1000ms is available for predelay, and you are only interested in fine control from 1ms-150ms. To do this, set Min to 1ms, and Max to 150ms. Set your source Min and Max controls to 0 and 127, respectively. This would give you fine control of all predelay values between 1ms and 150ms.

The Value display on the far right shows the current value of the control and its setting on program load. To change this value, select it from the Program Editor.

Multi-parameter and Inverse Fader/MIDI Control

Hot Palette faders can be configured to control multiple parameters. They can also be configured to provide "inverse control."

Hot Palette faders can be configured to control more than one parameter. To see how this is done, select the Radio button labeled **Effect A**.

Now, select the next Parameter display (just below the one we've assigned to Out Mix), and select RTIME. Assign Fader 2 as the source controller. In the next Param display, select PDLY and assign "Fader 2" as the source controller for it as well. Now, when this fader is moved, you will be simultaneously controlling both Reverb Time and Predelay.

Hot Palette parameters can also be configured for inverse control, i.e. the parameter value is reduced as a fader is moved upward (and vice-versa). To illustrate this, click on the assignment box labeled "MIN" for the RTIME parameter. Set the value to 127. Select "MAX" and set its value to 0. Now, when fader 2 on the Hot Palette is moved to its lowest position, you will get the maximum reverb time, and reverb time will be decreased as the fader is moved upward.

Let's listen... Select OK to exit the Hot Fader Editor dialog. Note that the second Hot Palette parameter box is now labeled Multiple and moving its fader will control both RTIME (with negative scaling) and PDLY. Start your audio source and play with the faders to confirm this.

MIDI Controllers and the Hot Palette

MIDI controllers can be assigned to parameters with the same method used to assign fader control.

To assign a MIDI controller to a parameter, you will need a keyboard (or any device that generates MIDI controllers), and a MIDI interface for your computer. For the purposes of this tutorial, we'll assume that you are using a MIDI keyboard.

Connect your MIDI keyboard to the computer via your MIDI interface. Start NuVerb, select a program, and open its Program Editor. Click on the **Fader/MIDI Cntl** button on the Control panel to open the Hot Fader Editor dialog.

Click on the first Param display, and select Wet-Dry Mix. Assign "Mod Wh" as the Source. Now, your keyboard Mod wheel will control the output mix of this program. Check to see what MIDI channel your keyboard is transmitting on, and assign the same channel number under "Chan." Click on **OK** to exit the Hot Fader Editor dialog. MIDI channel (including OMNI) is also adjustable with a pop up fader. Click on "Chan."

MIDI Program Change and Control Data are displayed here for reference only. These selections can be changed by selecting **MIDI Setup** in the **Options** menu.

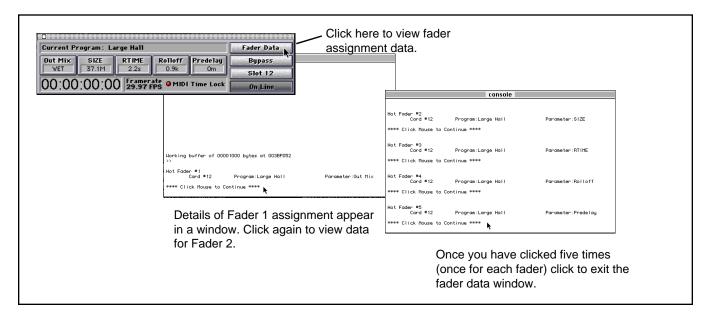
Move the keyboard Mod wheel and watch the program's OutMix value change. As with Hot Palette faders, MIDI controllers can employ negative scaling, and control multiple parameters on more than one NuVerb card. Hot Faders are also available for MIDI control. This allows you to select a single parameter or a group of parameters for control by the on-screen fader, and also remotely control the fader via MIDI.

Viewing Fader Assignments

The Fader Data button on the Program Editor control panel shows current Hot Palette fader assignments.

When a Hot Fader is assigned to more than one parameter, its Hot Palette label changes to **Multi**. If you forget which parameters are assigned to it, you can click on the **Fader Data** button to find out. This button also provides a useful check when using multiple NuVerb cards, as each Hot Fader will control all parameters assigned to that fader on all assigned cards. To view your Hot Fader assignments, click on the Hot Palette **Fader Data** button.

An information window will appear, showing data for the first fader. Click anywhere to scroll to the next fader entry. Continue clicking through the list — your sixth click will exit the window.



Saving Hot Palette Parameter Changes

Changes made from the Fader/MIDI Control window can be saved by selecting Snapshot from the Edit menu.

After a program is loaded from a library, you can make changes to the program "live" via the Hot Faders, or via MIDI. Having made changes, you may want to save this new version of the program. To do this, first make sure that the program you are using is in a library assigned to the Hot Palette, then select **Snapshot** from the **Edit** menu. This places a copy of the current version of the program at the end of the library. This new version will have the same name as the original, so we recommend that you open the Program Editor to rename it. Of course, this new program can now be cut/copied and pasted anywhere in this, or in any other library.

The Hot Palette and Multiple NuVerb Cards

On opening a program, the Hot Palette is immediately assigned to the first NuVerb card in your system. This appears as "Slot #" on the Hot Palette Control Panel. If you have multiple NuVerb cards, you may want to change the Hot Palette slot assignment to get a quick look at what programs are running on other cards. (If you have no NuVerb card installed, the Hot Palette will come up <u>unassigned.)</u>

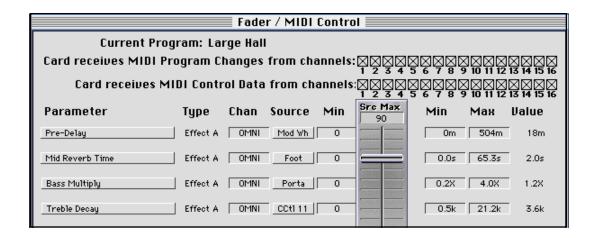
An On Line/Off Line toggle button is provided on the Control Panel to allow you to use NuVerb as a software-only application to edit libraries.

Tutorial 3: NuVerb and MIDI

NuVerb's MIDI implementation suggests many exciting possibilities for controlling and shaping the sound. Multiple parameters can be controlled with a single MIDI controller, or Hot Fader. Multiple cards can be controlled simultaneously. Parameters can be "inverse mapped" so that, from the same control, one increases in value another decreases.

NuVerb's MIDI setup is tied to your NuVerb card, *not* to a library. This makes it easy to change libraries without a lot of setup work. You need to define the MIDI control setup for each NuVerb card in your system. This requires identifying the MIDI operating system you are using, the MIDI device you are using for control, and the MIDI Channel for each NuVerb card.

Before we get into examples of how to create these setups, let's look at configuring NuVerb to work with your MIDI system, and get familiar with the windows we will be using.

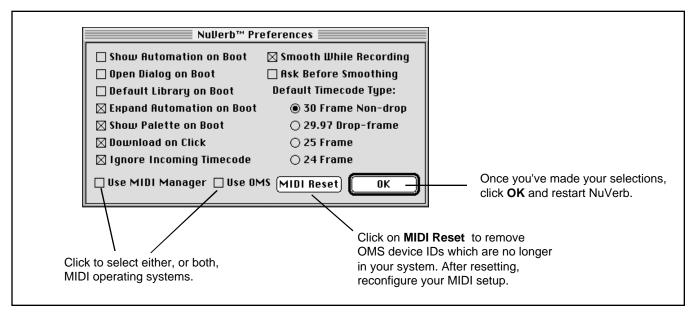


Selecting the MIDI Operating System

Select MIDI Manager and/or OMS under Preferences in the Edit menu.

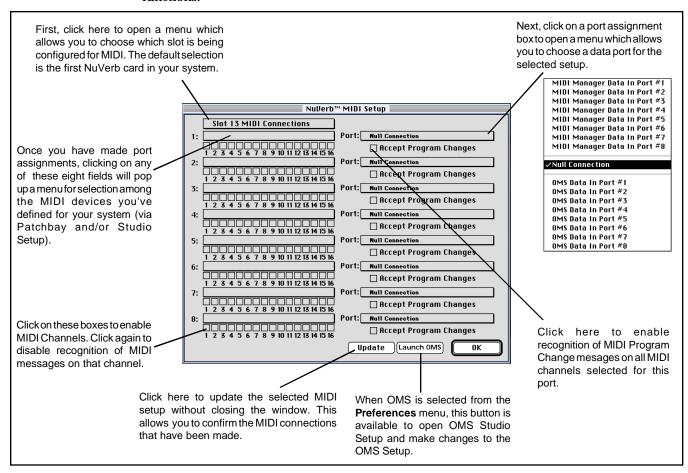
The MIDI operating system you use with NuVerb (MIDI Manager and/or OMS) must be selected under **Preferences** from the **Edit** menu. Once you have selected one of these operating systems, and clicked on **OK**, you will be asked to quit and restart NuVerb.

With two MIDI interfaces, it is possible to use both MIDI Manager and OMS at the same time. If you are doing this, refer carefully to the instructions from the manufacturer of the MIDI interface, and make sure each is using a *different* serial port: one on the printer port, and one on the modem port.



The MIDI Setup Window

The MIDI Setup window is used to select the MIDI drivers/devices that NuVerb will recognize. Below is an example of this window. Familiarize yourself with its parts and functions.



Working with MIDI

Select a MIDI Driver

MIDI drivers are selected under Preferences in the Edit menu. Select Apple MIDI Manager, Opcode OMS, or both.

In order to work with MIDI, you must first enable MIDI Manager and/or OMS. Select **Preferences** from the **Edit** menu and make your selection. Once you have made your sleection and clicked **OK**, you will be instructed to re-start NuVerb. Click **OK**, quit, and restart NuVerb.

Note:

If both MIDI Manager and OMS are used, you will want to use two MIDI interfaces — one for each driver. Each interface will require the use of one Macintosh serial port (printer or modem). Refer to the manufacturer's instructions included with the interface.

The MIDI Setup Window

Once you have rebooted NuVerb with your MIDI driver selections, the MIDI menu items under **Options** — **MIDI Setup** ... (Command **M**) and **Open MIDI Input Window** (Command **I**) will be enabled.

Open MIDI Input Window (Command I) opens a status window where you can verify the current status of your MIDI configuration.

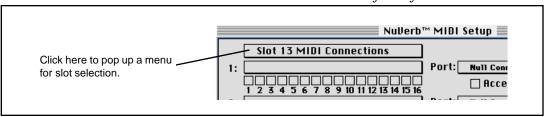
MIDI Setup ... (Command **M**) opens the MIDI Setup window shown on the previous page.

Open the MIDI Setup window.

Select a NuVerb Card

NuVerb automatically selects the first card in your system. If you have more than one NuVerb card, click on the Slot assignment box in the MIDI Setup window to select the location of the NuVerb card you want to configure.

Each NuVerb card in your system is identified by a Slot number. To specify which card you want to configure, click on the Slot assignment area of the MIDI Setup window to pop up a menu of slot numbers. The default selection is the first card in your system.



Note:

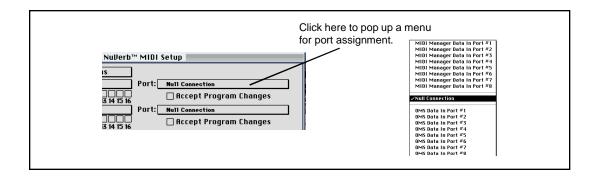
You can have as many NuVerb cards in your Macintosh as you have NuBus slots. (This will vary with Macintosh type.) A NuBus expansion chassis increases the number of slots available to your Mac. Digidesign manufactures an expansion chassis which is certified by Lexicon for use with NuVerb. (For information, contact either Lexicon or Digidesign)

Learning to Use NuVerb

Assign a MIDI port

Click on a port assignment box and select a port for MIDI data input. Eight ports are provided to accommodate the eight inputs supported by OMS, and to allow simultaneous use of MIDI Manager.

NuVerb provides eight ports for incoming MIDI data for each NuVerb Card. Eight MIDI Manager, and eight OMS ports are provided. One (and only one) MIDI device can be assigned to each port. If a port has a device assigned, it appears wherever that port is selected. When a device assigned to a port is changed, all other places that port is used are affected. The maximum number of devices allowed is sixteen: eight on the MIDI Manager ports, and eight on the OMS ports.



MIDI Source Assignment

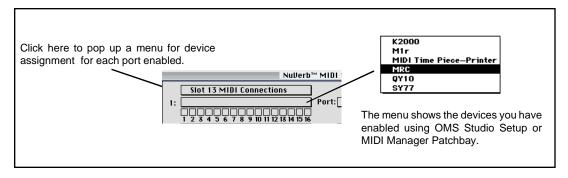
Click on a device assignment box to pop up a menu of MIDI devices available for assignment.

The next step is to select the MIDI Device for each assigned port. The MIDI devices available fall into two types: OMS type devices and MIDI Manager type devices.

All the OMS devices that are defined in your OMS Studio Setup appear in a popup menu when you click on the device setup menu. Select one by highlighting it with the mouse. If you would like to control NuVerb with more than one OMS device, enable OMS on an additional port, set MIDI channel and program change options, and select the additional device. Select one device per NuVerb port (as many as eight)

The Macintosh serial ports (printer and modem) that you have enabled using MIDI Manager appear here, along with other software which addresses the MIDI Manager, such as sequencer programs, and drivers for MIDI interfaces. These ports are enabled using the PatchbayTM desk accessory in the Apple menu. Select the desired MIDI Manager device from the pop up menu.

Note: NuVerb works with MIDI Manager drivers from Opcode and Mark of the Unicorn, as well as with Apple MIDI Manager. Contact the manufacturer for driver-specific information, as each has different options.



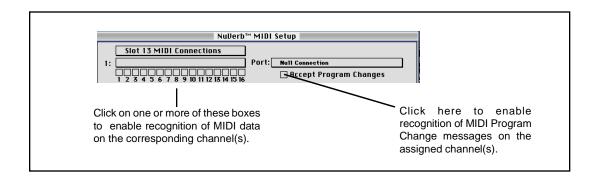
Learning to Use NuVerb

Selecting MIDI Channel and Accepting Program Change Messages

Click on the box beneath a port assignment to enable recognition of MIDI Program Change messages. Click on the channel assignment box(es) beneath the device assigned to that port to enable recognition of MIDI data on the selected channel(s).

NuVerb allows you to filter out MIDI information by specifying the MIDI channels on which you want to receive information. Click MIDI Channel assignment box to enable the MIDI channel. Click again to disable the channel assignment.

Clicking on the port assignment box labeled "Accept Program Changes" to enable MIDI Program Change messages to be recognized on all MIDI channels selected for that port.



The Launch OMS Button

Click on Launch OMS to make quick changes in your OMS setup. (This button is only available if you have selected OMS under Preferences.)

For those using Opcode OMS, this button launches the OMS application so that you can make quck changes in the configuration of your OMS Studio setup. After making changes, you must quit the OMS application before returning to NuVerb. If you do not quit the application before returning to NuVerb, your changes may not be updated within NuVerb. When devices are removed from you MIDI setup, you must use select **Preferences** from the **File** menu and press **MIDI Reset**.

The Update Button

Click on Update to update MIDI configuration changes without leaving the MIDI Setup window.

Clicking on the **Update** button allows you to update changes made to your MIDI configuration within the MIDI Setup window. If you have opened the MIDI Manager Patch Bay or the OMS Studio Setup to make change there, pressing **Update** updates those changes in NuVerb. This allows you to send ProgramChange messages, and "move" controllers to verify that they are working correctly without leaving the window.

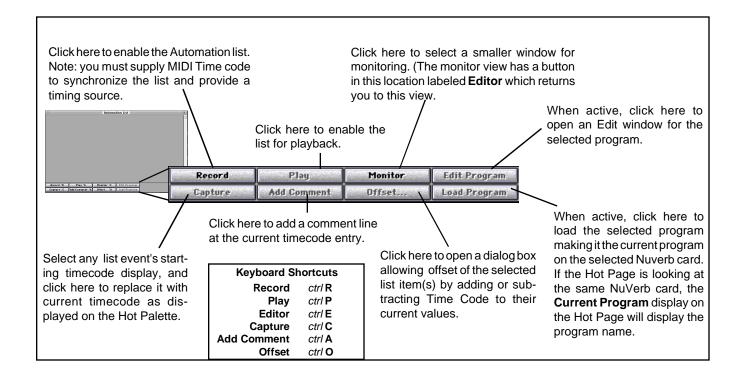
Note that the **OK** button, which allows you to exit the MIDI Setup window, also updates any changes made to the MIDI configuration. When leaving the window, it is not necessary to hit **Update** in addition to **OK**.

Tutorial 4: Automation

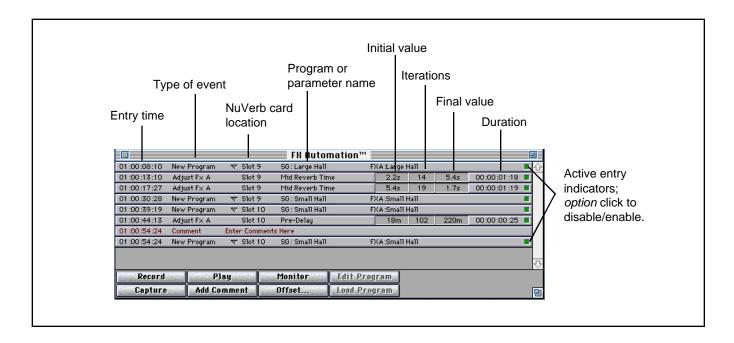
NuVerb's Automation list provides an unprecedented degree of effects control in a suprisingly easy interface. The Automation list is opened from the **Windows** menu, and can be configured under **Preferences** to automatically open when the program is booted. Basically, you input MIDI time code, put the list into record and click on programs to load them and move the faders to adjust the parameters — all the same things you've already been doing. An FX AutomationTM list is freestanding, and does not need any libraries to run. This makes automation easier in NuVerb than in sequencer-based automation.

			FX Automat	on™ ====				
00:57:00:00	New Program	Slot 14	DM: Comp/Comp	FXA:Vocal 9	Smash	FXB :G	uitar Comp 4:1	■
00:57:06:24	Adjust Fx A	Slot 14	Comp Slope	2.57	51	6.89	00:00:00:25	
00:57:07:23	Adjust Fx A	Slot 14	Comp Slope	7.8	24	3.7	00:00:00:11	
00:57:10:13	Adjust Fx A	S1ot 14	CmpThreshold	-12 db	9	-20 db	00:00:02:23	
00:57:14:29	Adjust Fx A	S1ot 14	Comp MaxGain	9 db	2	8 db	00:00:01:05	
00:57:16:16	Adjust Fx A	Slot 14	Comp MaxGain	8 db	3	10 db	00:00:00:19	
01:00:08:26	New Program	♥ Slot 14	SG: Large Hall	FXA:Lange I	Hall .			
01:00:11:28	Adjust Parms	Global	Hot Fader #1	69	32	100	00:00:01:11	
01:00:13:21	Adjust Parms	Global	Hot Fader #1	100	26	75	00:00:00:20	
01:00:15:28	Adjust Parms	Global	Hot Fader #2	79	28	106	00:00:00:27	
01:00:18:22	Adjust Parms	Global	Hot Fader #3	71	29	43	00.00.00.20	

The Automation List Window



Program and parameter changes are recorded as Automation List events. Create a program change event by clicking on the **Record** button, starting the timecode source, and clicking on programs in an active library. Once a program is entered into the list, parameters can be entered in one of three ways: via Hot Fader adjustment, via MIDI, or by changing parameters In the Program Editor. List events appear as shown below.



Recording an Automation List

Let's try recording and playing back a simple "pass" of Automation. We'll need:

- An audio source
- A source of MIDI timecode (locked to the audio source)

Connect the MIDI timecode source to NuVerb through our MIDI interface using the MIDI Manager Patchbay™. (Questions? See *Time Code Aplications* and *About Midi Manager* in the Reference section.)

Make sure **Ignore Incoming Timecode** under the **Options** menu is *not* selected. If it is, deselect it.

Make sure that the library you want to use, and the Hot Palette are both assigned to the same slot#/NuVerb card.

Once audio source and Timecode connections are made, we can create a list.

- 1. Click on the **Record** button on the Automation List control panel.
- 2. Start playing your Audio/timecode source.
- 3. Select a program in your Library and load it (by clicking on the **Load** button, or by double-clicking on the program name). You will see the program appear as an entry on the Automation List.
- Click on the first Hot Palette parameter, and adjust its value with the fader. When the fader is put away, you will see new events which represent the parameter adjustments you just made drop into the list.
- 5. Click on **Record** to stop recording, and to rewind the audio/timecode source.

Remember — when you open the Program Editor in Automation, you are using it as a *control* surface. If you want to leave the program in its original condition, select **Don't Save** when closing the window.

Now, you have a simple event list. You can, of course, record more moves, more parameter changes, and longer sequences using this basic procedure. Automation data to multiple cards can be simultaneously recorded using external MIDI controllers for control of multiple cards.

Playback

Click on the Play button to start playback of the list.

Click on the Automation List **Play** button to enable the list, and start the audio/timecode source. You will hear the changes made and see the list change to indicate the events played.

Note that when an EDL is recorded using one time code frame rate, then played back at a different frame rate, NuVerb recalculates the position of the events to maintain their relationship to the picture or other material used for synchronization. The Hot Palette display will change to reflect incoming time code, as will the display in the **Options** menu. Note that the speed difference between 29.97 and 30 is not supported in MIDI, and that all calculations of frame position in NuVerb take into account only frame count.

Saving an Automation List

Select Save from the File menu to bring up a dialog box that allows you to name your list and file it.

The programs necessary to play back the list are stored with the list. This makes the list "free standing" and not dependent on any of the libraries from which you may have selected the original programs. Select **Save** from the **File** menu to bring up a dialog box that allows you to name and file your list.

Go ahead and save the list we just created. Make sure it is not Play-enabled, and click the close box in the upper left hand corner to close the list.

Editing Commands

Before we begin editing, let's take a look at the techniques used for editing lists, including selection and manipulation of events.

Single Event

Click on any event entry to select it for editing.

Contiguous Events

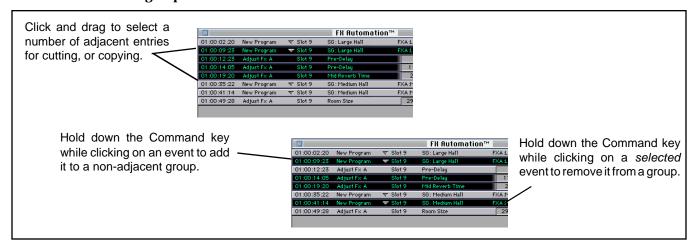
Hold down the shift key, and click and drag to select a group of adjacent events.

Discontiguous Events

Add discontiguous events to your selection by clicking on an event entry while holding down the Command key.

Removing a highlighted item from the group of selected events.

Hold down the Command key and click on the event entry you want removed from the group.



Now, let's take a look at the Automation editing commands.

Editing Commands found in the **Edit** menu

Cut

This command removes any selected event(s) from your list. (Cut items are temporarily saved. A paste command will insert these in a new location. Another cut or copy command will erase them and replace them with new temporally stored items.)

Copy

This command copies any selected event(s) from your list — leaving your list intact. Copied items are temporarily saved, and will replace any other temporarily stored items temporarily cut or copied.

Clear

This command deletes any selected event(s).

Paste At

This command calls up a dialog box which allows you to enter a numerical location for insertion of the selected item(s). If more than one item is being pasted, the first event in the group will appear at this number. This is sometimes referred to as "head sync".

Editing via the Automation window Control Panel

Offset

This command appears as a button at the bottom of the FX AutomationTM window. Clicking on it calls up a dialog box which allows you to add to or subtract from the starting time of the selected event(s). All of the selected events will be moved by the amount you type in here.

Note that selecting **Add** will make the selected events appear later in the program; selecting **Subtract** will make the selected events appear earlier in the program.

Changing the values of list events

To change the value of a list event, press *option* while clicking on the value. This will display a fader for value adjustment.

Changing Start Time and Duration of an Event

Press *option* while clicking on the event start time or duration. The number will be highlighted, indicating that the value can be trimmed.

Note that, when typing a number, digits are entered from right to left. This makes trimming convenient. If, for example, the start time is 01:00:40:26 and you want the event to start at 01:00:40:05, you only have to type 05, and then press *enter*. It's that easy! The same applies to trimming the duration.

Changing Slots

The slot, or NuVerb card, on which an event occurs can also be changed. Press *option* while clicking on the Slot number to display a menu of slot selections.

WARNING

Use with caution. Changing the slot assignment of a Program Change event will change all of the parameters with that slot number from that point to the next Program Change event in the list.

Editing an Automation List

Let's go ahead and do some editing on the list you made in the previous section.

- Open your list. To do this, select Open from the File menu. Among the listings, you should see the list we just created. When you select it, it will open in the smaller "Monitor" view.
- Click on any program to select it.
- Copy , then Paste using the standard Macintosh techniques.
- Enter the time code location where you want this program to start, then click **OK**. A copy of the program will be pasted into the list at the time code location you have selected.

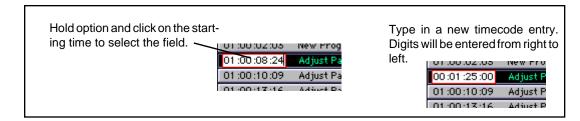
(Using **Cut** and **Paste** is identical, except that the original you select is removed from the list and pasted into the new location.)

Trimming

Hold *option* and click on the start time or duration value field. Typed in values are entered from right to left.

To select either the start time or the duration of list entries, hold *option* while clicking on the number. Once the number is selected, just type in the amount you want to change. For example, if the start time is 01:00:12:26, and you want to make it 10 frames earlier, you only have to type "10" (the number of frames), not the whole number.

If you want to type in a new location that is less than the current location you must type a complete timecode entry, including any leading zeros. This is also true for entering offsets.



Offsets

Click on the Offset button to open a dialog box allowing you to enter offset amounts.

Click on the Offset button at the bottom of the FX Automation $^{\text{TM}}$ window to call up a dialog box that allows you to add to or subtract from the starting time of the selected event(s). All of the selected events will be moved by the amount you type in here. Selecting "Add" will make the selected events appear later in the program; selecting "Subtract" will make the selected events appear earlier in the program.

Highlight one or more entries in the list and experiment with them to get a feel for where the offset command will move them.

WARNING: It is possible, using Paste, Offset, and trimming, to move parameters into places in the list that contain programs that do not use them! Be careful to keep track of which program they belong with. We give you the flexibility... be creative, but be careful!

Changing Parameter values

Hold down *option* and click on any of the three parameter value fields (start value, iterations, or final value) to pop up a fader for value adjustment.

There are three parameter value fields: one for the start value, one for iterations, and one for final value. When the list is played, and each event is highlighted, you will see the start value field move to the final value field. This animation provides visual verification of the change. To alter any value field, press *option* and click on the field to pop up fader.

The iterations value is the maximum number of values available for the parameter during the duration of the event. This value is dependent on the frequency with which the Macintosh is able to sample a fader. Using Smooth, all changes are linear, played back with millisecond accuracy. When Smooth is turned off, the boundary is 128 values (as often as the Mac can get them). Adjusting the iterations to a lower value will make the change less smooth, which may be desirable. A lower iteration setting is also recommended when the Macintosh is very busy.

Editing the program in the list

Click on the Program Edit button with a program name on the Automation List selected, or double click on any unselected Automation list program name to open the Program Editor.

To change the program loaded in the list, either highlight the program change in the list and then select the Edit Program button, or double click on the program open the Program Editor. When the window is closed you will be prompted to save. Selecting **Save** will place the program into the automation list. Changes made will not affect the library the program was taken from.

Comments

Click on the Comment button to insert a text area into the list. Hold down the *option* key and click to the right of the label to open a text field. Type in your comments, then click anywhere outside the comment area to close the comment field.

Comment lines are entered into the list by pressing the **Comment** button. This can be done record enabled while moving or stopped. To enter text into a comment field, hold *option* and click to the right of the word "Comment." Type whatever you like, then click elsewhere in the list to close the comment field.

Click on the **Comment** button to add a line for text entry. Hold down the *option* key and click to the right of the word "Comment" in the text line to open the text field.

01:00:20:22	Adjust Parms	Global	Hot Fader #1	5	75
01:00:22:04	Adjust Parms	Global	Hot Fader #1	94	44
01:00:23:00	Comment	Option Click he	re to Enter Comments		
01:00:25:12	Adjust Parms	Global	Hot Fader #2	79	24
01:00:26:13	Adjust Parms	Global	Hot Fader #2	102	43

Click anywhere off the comment area to stop adding comments.

More on Recording Lists

Recording from MIDI

MIDI can be used for automation. Simply select a program and assign MIDI controllers to the parameters you want to control. When recording a list, parameters remotely controlled via MIDI go right into the list, as do program changes.

Recording from a Program Editor

Any Program Editor can be opened, and any parameter directly adjusted. This is useful when you want to adjust a parameter on the fly, but have not selected that parameter for control via the Hot Faders or via MIDI.

Recording while Stopped

Recording a program change into the list is possible while list is stopped at a Time Code number. Note, however, that recording parameter changes this way is *not* recommended.

Recording Multiple parameters

Multiple parameters can be simultaneously recorded into the list by grouping them for control from a Hot Fader or a MIDI controller. Different levels of change, from this single grouped control, may be done by setting up the scaling on each control. (See MIDI Control.)

Learning to Use NuVerb

Automation lists and timing accuracy

The timing accuracy of entry into the Automation list is dependent on the clock speed of your Mac, other programs you are running at the time (how busy your Mac is), and the method of entry you choose. The timing accuracy of effect changes is inherently "softer" than the placement of sound sources. Nevertheless, there will be times when the accuracy of changes is critical. Let's look at the factors governing this and some of the techniques available in NuVerb to achieve your goals.

- Clock Speed The faster the clock speed of your Macintosh, the more accurate the timing
 of entries.
- Programs running at the time The more things your Macintosh is trying to do, the slower the updates to the list will be.
- Entry method The fastest method is MIDI entry of program and parameter changes.
 This is followed is speed by on-screen use of the Hot Faders for parameter changes, then by library entry of program changes. While using the Program Editor to enter parameter changes is the most immediate, putting all parameters at your finger tips, it is also the slowest.

Making timing adjustments

Timing adjustments are easy to make, whether they involve trimming the start time, or offsetting a range of moves. (See Editing an Automation List.) These two methods offer local or global methods of refining the timing of moves and are a powerful feature of FX Automation.TM

Program Changes

Many of the things you used to have to change programs to do can now be achieved by changing multiple parameters in the same program!

NuVerb offers some new ways of dealing with the age old problem of loss of audio between program changes. Using the "dual machine" Cascade programs, the output level control of Effect A and Effect B can be assigned to a Hot Fader or a MIDI Controller with their respective MIDI controls set in opposition. This causes one program to fade out while the other fades in, all controlled from one fader. The obvious example is two different types of reverb, but you can work with any of the Cascade programs.

The Single programs are large programs that use both of NuVerb's internal processors as a single unified engine. When a program change happens, both processors must be loaded with new information. This happens quickly, but it does take time. If you want to make changes using Single programs, remember to take advantage of parameter changes. Often, doing this is all that is needed. Experiment!

List overload

There are times when your Macintosh may be very busy, and your list very full. At times like this, it is important to understand that NuVerb will always try to execute all list moves with 1/2 frame accuracy. If the system becomes overloaded, the program has been designed to skip moves in order to preserve time flow and prevent freezing or bogging down.

Tutorial 5: Working with Other Systems

NuVerb is compatible with a variety of software packages. In fact, many leading manufacturers of both hard disk recording systems and sequencers are NuVerb Development Partners. This reflects a commitment to work with Lexicon to achieve and maintain NuVerb compatibility with their software currently on the market.

Hardware Considerations

Your first consideration when running NuVerb with other systems is the amount of available RAM in your computer. NuVerb requires at least 8 megabytes of RAM. The application itself uses only 4 megabytes, but the Macintosh operating system also requires memory. Any software you run along with NuVerb will have additional memory requirements. Refer to the manufacturer's specifications.

For example, Digidesign specifies that ProTools (4 tracks) will run with 8 megabytes of RAM. Likewise, Lexicon specifies that NuVerb will run with 8 megabytes of RAM. In both cases, allowances are being made for memory requirements of Macintosh system software, so the amount of memory actually required to run both NuVerb and ProTools is probably closer to 12 megabytes than 16 megabytes. Both of us, however, would probably recommend you get the 16 megabytes, as there is really no point in skimping on RAM.

Faster is better. After memory, the next consideration when running NuVerb with other software is the speed of the central processing unit of your computer. Although speed is important, note that accelerator boards are notorious for creating software conflicts. If you are planning on an accelerator board as a cost effective way to upgrade the power of your current computer, make sure you can return the board if it causes problems with your applications.

The behavior of NuVerb screens and faders is affected by the speed of your Macintosh. Note that black and white monitors tend to run the NuVerb graphic interface faster than color monitors. If you have a slower computer and/or a demanding application, you may want to run NuVerb in black and white.

Connection

NuVerb uses AES to send and receive audio. Any system capable of sending or receiving an AES signal can theoretically interface with with NuVerb. This might occur in a variety of system configurations:

- A desktop production system that provides digital mixing, such as Pro Tools
- A system using a desktop disk audio card as a source, and a DAT deck for recording/ monitoring, with NuVerb inserted between the two for mastering
- A system incorporating a digital mixer (with NuVerb on an auxiliary send, and the output returned to an effects return
- A system using an outboard A to D/D to A converter. This makes the NuVerb fully functional in the analog world with conventional analog mixers.

Most of the larger hard disk recorders have digital outputs. These can be used in a variety of ways. If the system has internal digital busing, the output may be able to be configured as an auxiliary send on a traditional mixing console, with the NuVerb output being returned to the device to be recorded or monitored only.

Some systems, large and small, do not provide a digital send, and their output is analog to conventional analog consoles. In such cases, using an outboard A to D/D to A converter integrates NuVerb with the analog mixer.

Software Considerations

As mentioned earlier, Lexicon is committed to maintaining compatability with widely available software in both the disk recording and the sequencer markets. Find out if the manufacturer of your software is a NuVerb Development Partner. In certain cases, as with ProTools, a certain software revision may be required.

MIDI

MIDI can be used to control NuVerb program parameters. In addition, NuVerb uses MIDI Time Code (MTC) for FX Automation™ timing and synchronization.

NuVerb is compatable with Apple MIDI Manager, Opcode OMS, and Mark of the Unicorn MIDI Manager Driver. You must verify that one of these are able to "find" your MIDI interface. NuVerb will appear as a device that receives MIDI. NuVerb does *not* transmit MIDI. Refer to the instructions provided with your interface by its manufacturer.

Applications

NuVerb can be used in a number of applications during the production process. A few examples:

- On an individual instrument while recording the track.
- To process and re-record a track. This allows a very specialized use of NuVerb to create some suprising effects on an individual track, while making NuVerb avaliable for more general applications on mutiple tracks during the mix.
- As a general processor in the mix, providing, for example, world-class reverb.
- As a mastering tool, using programs like PONS, Stereo Adjust and the Digital Compressor.

Example: Connection to a Digidesign ProTools System

Pro Tools Setup

Hardware

- 1. Connect NuVerb via AES to ProTools Digital IN.
- 2. Connect the audio monitors to analog outputs 3 and 4. (1 and 2 are going to be used as sends/returns to and from NuVerb.) Note that ProTools allows using either the digital inputs and outputs or the analog inputs and outputs 1 and 2.
- 3. If using the expansion chassis, observe the card ordering specified by Digidesign: system accelerator (SCSI Card), ProTools cards, sample cell cards, NuVerb.

Software

Before you start, make sure you are running ProTools version 2.03 or higher.

- 1. Start the ProTools application. Open a session, for example, the demo session.
- 2. Configure the outputs to use 3 and 4 OUT.
- 3. From the Setups menu:
 - Under Hardware..., select AES/EBU format, and Digital for CH 1,2 inputs.
 - When you are done, note that the "Sync Mode" will change to "Digital." You must change the sync mode to "Internal." Click OK.
 - Under Return Routing..., select inputs 1-2 as returns, and press the radio button selecting "route to output 3-4." Click **OK**.
- 4. In the Display menu, select Show Sends and Show Mix Window.

Send 1 and 2 controls are now configured as a pre-fader send to NuVerb. The return from the NuVerb (set in step 3) is to analog outputs 3 and 4. Note that Pro Tools does not provide controls for return level, but this can be set in NuVerb.

8. From the ProTools Options menu, select Play in Background. This allows ProTools to play audio while NuVerb is running (in the foreground).

- 9. From the ProTools Display menu, select Show Mix Window. Turn up the send controls at the top of this window.
- 10. Now, open NuVerb, create a default library, and select a NuVerb program.
- 11. Return to ProTools and select Play. You may get a message box saying, "The Modem Port is in use now, and cannot be used by this application." Ignore this message, click **OK** and proceed.

Other Considerations

- 1. If you want to use MIDI, make sure there are no conflicts between NuVerb and ProTools in your serial port selection. Either have one of the two use the printer port and the other use the modem port, or turn off the serial ports in ProTools.
- 2. Neither ProTools nor NuVerb like Apple Talk, so disable Apple Talk while using these applications.

3

Reference

Summary of Keyboard Shortcuts

In the Edit Window:

tab steps through displayed parameters

enter toggles fader display

Command ↓ selects a more detailed view

Command ↑ selects a more general view

Command → moves from Effect A to Effect B

Command ← moves from Effect A to Effect B

In the Automation List Window:

ctrl
 ctrl
 P toggles record enable/disable
 ctrl
 E toggles play enable/disable
 toggles edit and monitor views

ctrl C captures incoming timecode and enters

it in place of selected start timecode
 ctrl A opens a text line at current timecode entry
 ctrl O calls dialog box for entry of offset amount

With the Fader:

 \uparrow \downarrow adjust parameter value

home sets fader to its minimum value end sets fader to its maximum value page up moves fader up with coarse control page down moves fader down with coarse control

option ↑ moves fader up with fine control option ↓ moves fader down with fine control

In the Menus:

File

Command **N** opens new library

Command O calls dialog box for opening files, folders and

applications

Command W closes active window

Command **S** saves changes to library or event list

Command Q quits current application

Edit

Command X cuts selected text or graphics

Command C copies selected text or graphics

Command V In libraries, inserts contents of clipboard

above selection; if no selection, inserts at end of list. In Automation, calls a dialog box for

timecode entry

Command B deletes selected text or graphics

Options

Command L opens default library

Command **T** toggles recognition of incoming timecode Command **G** toggles Macintosh internal timer on/off

Windows

Command F toggles display of Hot Palette

Command E toggles display of Automation List window

Reference Lexicon

NuVerb Screen Graphics

Window Controls

General Information

Most windows consist of an active viewing and entry portion with a series of buttons in a control panel at the bottom of the window. In general, clicking on a button will activate it, and activated buttons will appear as shaded.

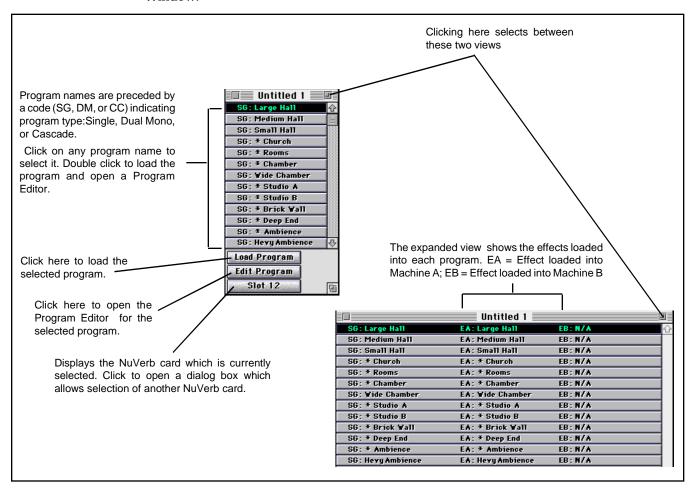
Text entry, where appropriate, as in program naming, etc. behaves in a standard Macintosh fashion, with insertion point/keyboard text entry.

Nuverb graphics allow dynamic changes to overall program parameters. Expanded views of the effect(s) running in a program are available from the Program Editor control panel, or by clicking on labeled non parameter-type boxes.

Nu Verb User Guide Reference

Program Library Window

Under **Options** in the menu, select Create Default Library to open the Program Library Window.

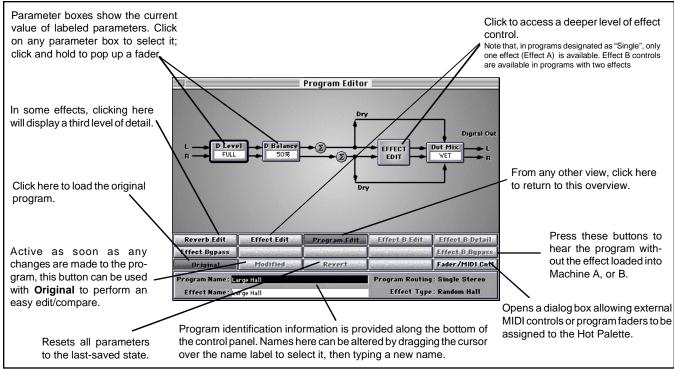


Reference Lexicon

Program Editor

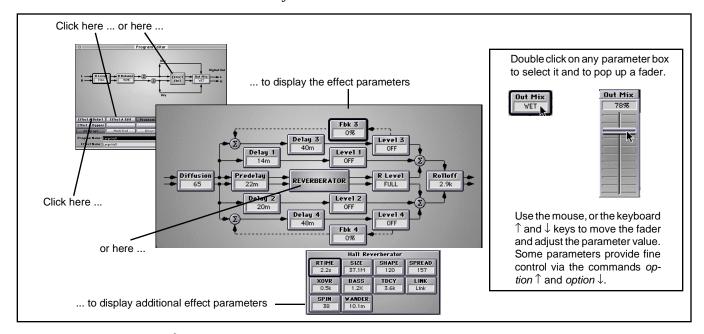
The view/entry area of the Program Editor shows a diagrammatic representation of the program. Each program has as many as two additional views, enabling you to "zoom in" on the details of the effect(s) in any program. A panel of buttons beneath the viewing area provides easy access to other views and other control windows.

Within the viewing area, clicking on any parameter will select it. Clicking on a selected parameter (or double clicking on an unselected parameter) will open a graphic fader which can be used to adjust the parameter over its entire range of values. (See Fader.) In the control panel, shaded buttons are active.



Expanded Views

From the Program Edit view, clicking on the EFFECT EDIT box, or on the Effect A (or B) Edit button provides a second level of detail. Only the viewing area of the Program Editor is modified. Some effects have a third level of detail which is viewed by clicking on a non parameter-type box in the viewing area, or on Effect Detail buttons (such as the one labeled "Reverberator" below) in the Control Panel. Highlighted buttons on the Control Panel indicate which view is currently selected, and what other views are available.

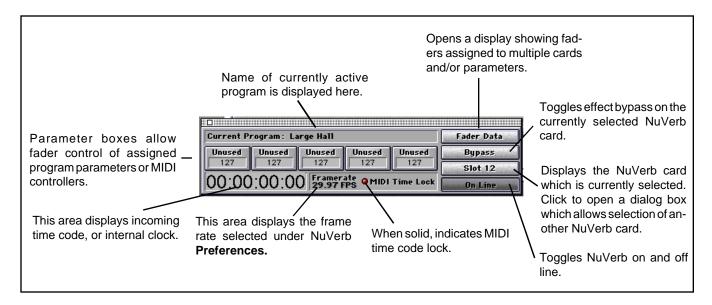


Fader

When the fader is visible on the screen, the slider will respond to mouse control, changing values through the entire available range. Alternatively, you can use the keyboard up and down arrowed keys to increment or decrement values. Click the mouse, or press *enter* on the keyboard to assign a value to the parameter, and hide the fader.

The Hot Palette

Parameters are assigned to the Hot Palette via the Program Editor **Fader/MIDI Cntl** button. Faders are available for Hot Palette parameter boxes, just as in the Edit window.



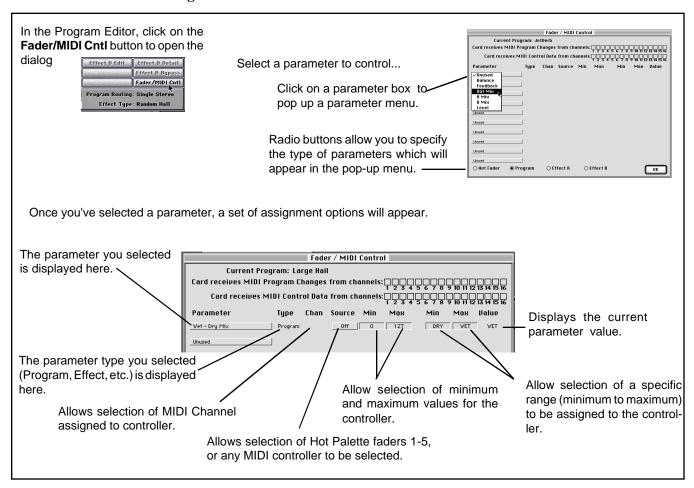
Fader Data



A dialog box is available from the Hot Palette **Fader Data** button which displays Hot Palette program parameter, MIDI controller, and NuVerb card data as you have currently assigned it.

The Fader/MIDI Control Dialog

A dialog box is available from the Program Editor **Fader/MIDI Cntl** button which allows you to configure the Hot Faders.

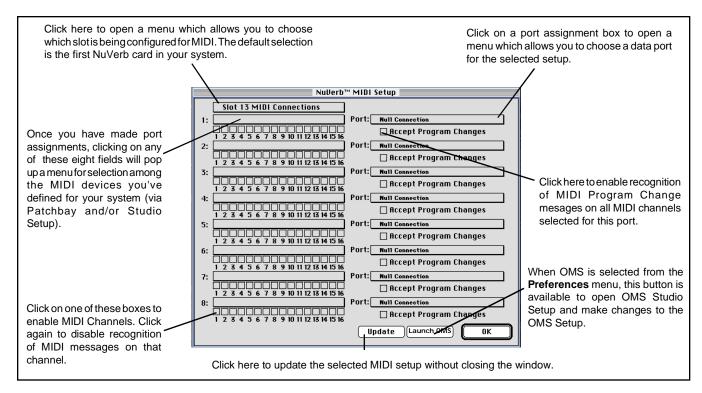


The MIDI Setup Window

Once you have rebooted NuVerb with your MIDI driver selections, the MIDI menu items under **Options** — **MIDI Setup** ... (Command **M**) and **Open MIDI Input Window** (Command **I**) will be enabled.

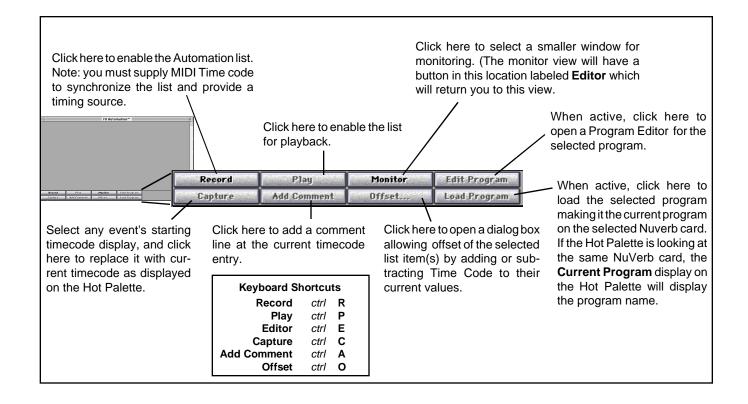
Open MIDI Input Window (Command I) opens a status window where you can verify the current status of your MIDI configuration.

MIDI Setup ... (Command **M**) opens the MIDI Setup window where you can select the MIDI drivers/devices that will send MIDI control information to NuVerb.



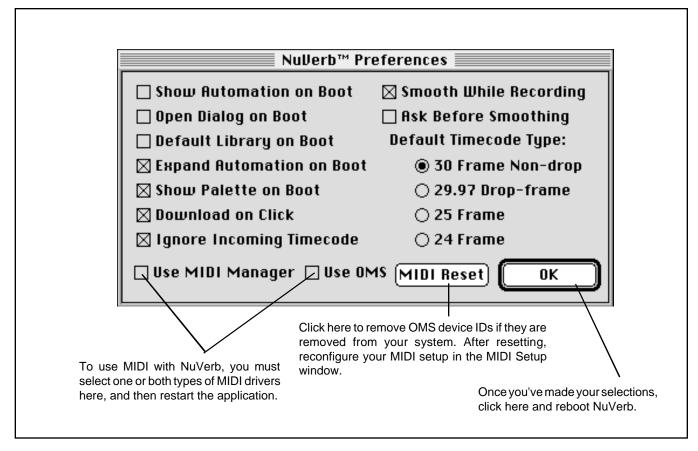
The Automation List

The Automation List is opened from the **Windows** menu, and can be configured under **Preferences** to automatically open when the program is booted.



NuVerb Preferences

As with most Macintosh programs, **Preferences** (in the **Edit** menu) allows you to specify certain application restrictions. In NuVerb, these options are extensive, and involve, among other things, assignment of MIDI channels, and selection of audio formatting. Reboot NuVerb after setting preferences.



NuVerb Menus

File

New Library Command N

Opens a library window titled **Lib: 1**. Subsequent new libraries will be named 2, 3, etc.

Open... Command O

Opens a dialog box allowingyou to open disks, files, folders and applications

Close Command W

Closes the active window

Save Command S

Saves any changes made to the current document since the last save operation

Save As...

Opens a dialog box allowing a copy of the current document to be saved with a different name, to a different location, or in a different format

Revert

Removes all changes to the current document since the last save operation

Quit Command Q

Closes the current application. If no Save operation has been performed, opens a dialog box providing for the options: **Don't Save** (Command **N**), **Cancel**, or **Save**.

Edit

Cut Command X

Cuts selected text or graphics and temporarily stores it in the Clipboard

Copy Command C

Copies selected text or graphics and temporarily stores the copy in the Clipboard

Paste Command V

In libraries, inserts contents of Clipboard above selection; if no selection, inserts at end of list. In Automation, calls a dialog box for timecode entry

Clear Command B

Removes selected text or graphics without storing it

Select All Command A

Selects all objects in the active window or on the desktop

Preferences...

Opens a dialog box allowing selection of system configuration items

Snapshot

Available in the Fader/MIDI Cntl window. Saves changes as a new program listing at the end of the library currently assigned to the Hot Palette. (New listing will have same name as the current program.)

Options

Create Default Library Command L

Opens a library listing of NuVerb preset programs. Multiple Default Libraries can be opened. They will be titled: **Untitled 1**, **Untitled 2**, etc.

MIDI Setup . . . Command M

Opens a status window for viewing current MIDI configuration

Open MIDI Input Window Command I

Opens a setup window for configuring MIDI devices

Ignore Incoming Timecode Command T

Toggles selection of NuVerb recognition of an external timecode source ${\bf Set\ Timecode\ Start\ ...}$

Opens a dialog box allowing timecode entry.

Start/Stop Internal Timer Command G

Toggles start/stop of timecode from the Macintosh internal timer.

Smooth While Recording

Toggles selection of smoothing.

Ask Before Smoothing

Toggles dialog box for each instance of smoothing

Download on Click

Toggles option of having library programs load when clicked

30 Frame Non-Drop

29.97 Drop-Frame

25 Frame

24 Frame

Windows

Hot FadersCommand FToggles display of the NuVerb Hot PaletteFX Automation™Command E

Toggles display of the NuVerb Automation window

Effects and Parameters

Effects available in the Single Mode: Random Hall

General Description

NuVerb incorporates the results of a great deal of research into acoustics and reverberation. Reverberation, or reflected sound energy, gives recorded music a sense of being performed in a real acoustic location.

In NuVerb, the SIZE, SPREAD and SHAPE controls allow adjustment of the buildup and decay of the initial part of the reverberation envelope. SHAPE controls the shape of the envelope, while SPREAD and SIZE set the time over which this shape is active.

In the Random Hall effect, SIZE acts as a master control for the apparent size of the space being created by NuVerb. Both SPREAD and RTIM vary linearly with the setting of SIZE. Thus maximum reverb time and spread require high settings of SIZE. To find an appropriate reverb sound, start with a preset with a similar sound to what you want to end up with. Simply varying SIZE is often sufficient to arrive at the exact sound you are seeking.

Once a size has been selected, SPREAD and SHAPE are used to adjust the shape and duration of the initial reverb envelope, which together provide the major sonic impression of room size.

When SHAPE is at minimum, the reverberation envelope builds up very quickly to a maximum amplitude, and then dies away quickly at a smooth rate. This envelope is characteristic of small reverberation chambers and reverberation plates. There are few (if any) size cues in this envelope, so it is ineffective in creating ambience. With this SHAPE setting, SPREAD has no effect. The density is set by the size control, and the rate of decay is set by RTIM. This reverberation envelope is typical of many of the popular digital reverberators of the last few years.

As SHAPE is raised to about 1/8 of its range, the initial sharp attack of the reverberation is reduced, and reverberation builds more slowly. The envelope then sustains briefly before it begins to die away at the rate set by RTIM. SPREAD has little or no effect on this shape.

When SHAPE is at 1/4 of its range, buildup is even slower and the sustain is longer. Now SPREAD affects the length of both the buildup and the sustain. As a rough estimate, the sustain will be approximately the time value indicated by the SPREAD display (in milliseconds).

As SHAPE is raised further, the buildup and sustain remain similar, but now a secondary sustain appears in the envelope, at a lower level than the first. This secondary plateau simulates a very diffused reflection off the back wall of a hall, and is effective in creating a sense of size and space. This reflection becomes stronger and stronger, reaching an optimal loudness when SHAPE is at about 1/2 of its range.

The highest SHAPE settings are typically used for effects. Near the top of the scale the back wall reflection becomes stronger than the earlier part of the envelope, resulting in an inverse sound.

NOTE None of these shape effects are audible unless RTIM is set short enough. Generally, RTIM should be set to a value of about 1.2 seconds for small rooms, and up to 2.4 seconds or so for halls. SIZE should also be set to a value appropriate to the desired hall size (note, however, that small sizes color the reverberation).15 meters makes a very small room, and 38 meters is useful for a large hall.

Used with care SHAPE and SPREAD allow NuVerb to produce superior ambience—a sound which is spacious and has great depth—without the long reverberation of a church.

Random Delays

The Random Hall effect in NuVerb incorporates random delay elements. These elements have several effects. First, there is a reduction of long-lived modes in the reverberant decay, which makes the decay less metallic and reduces the apparent reverb time. The random elements also improve the steady-state timbre of the effect.

The speed at which the delay elements move is controlled by SPIN. Values of SPIN which are higher than about 38 can cause audible pitch wobble in very critical material (such as classical guitar or piano and can also cause noise on pure tones. This noise is not audible in speech, however, and, for mixed music or speech, values up to 48 will give an improved sound. WANDER is typically set to about 10ms at larger settings of SIZE. The effect of WANDER is reduced for small SIZEs.

Creating a Realistic Sound

When you set out to create a sound, the first and most important decision is how big a space you want. The best way to start is to listen to several presets and choose the one which sounds closest to what you have in mind. If necessary, use SIZE to make a slightly larger or smaller sound, as needed.

Next use RTIM to fine-tune the amount of time the reverberation takes to die away at the end of musical phrases. Actual halls vary a great deal in their actual RTIM values. The setting of the BASS is also critical in matching the sound of an existing hall. An ideal concert hall would have a BASS setting of 1.2. It is rare when actual physical spaces exceed 1.5. Many (if not most) good recording environments have values of BASS of 1.0 or less, so a value of 0.8 could be tried when attempting to match an existing hall.

There are two additional controls to deal with. SHAPE and SPREAD adjust the effective reverb time when the music is running. Higher values of SHAPE and SPREAD produce a longer effective reverb time. Longer effective reverb times give greater spaciousness to the sound.

The NuVerb reverberation effect offers the option of adding early reflections (pre-echoes) which have been made into diffused clusters of pre-echoes. The density of the cluster is set by the DIFFUSION control. We recommend that these pre-echoes be used with caution, unless you are trying to match the sound of the reverberation to a particular location where such reflections are strong.

Random Hall Parameters

The Reverberator

RTIM (Reverb Time) .02 - 60.49s

RTIM sets the reverb time for mid-frequency signals. Because low-frequency reverb time (BASS) is a multiplier of RTIM, RTIM acts as a master control for the reverb time.

SIZE 4.0 - 39.4M

SIZE sets the rate of buildup of diffusion after the initial period (which is controlled by DIFF). It also acts as a master control for RTIM and SPREAD. The SIZE control changes a reverb sound from very large to very small. Generally, you should set the SIZE control to approximate the size of the acoustic space you are trying to create, before adjusting anything else. The size in meters is roughly equal to the longest dimension of the space. Moving SIZE while a signal is present may cause audible transients on critical material.

The apparent size of the space created is actually a combination of the settings of the SIZE, SHAPE, and SPREAD controls. Small acoustic spaces are characterized by a rapid buildup of diffusion. However, both small and large spaces frequently have an uneven buildup of initial reverberation. This uneven buildup is controlled by the SPREAD and SHAPE controls.

SHAPE 0 - 255 SPREAD 0 - 250

SHAPE and SPREAD work together to control the overall ambience of the reverberation created by NuVerb. SHAPE determines the contour of the reverberation envelope. With SHAPE all the way down, reverberation builds explosively, and decays quickly.

As SHAPE is advanced, reverberation builds up more slowly and sustains for the time set by SPREAD. With SHAPE in the middle, the buildup and sustain of the reverberation envelope emulates a large concert hall (assuming that SPREAD is at least halfway up, and that SIZE is suitably large—30 meters or larger.)

SPREAD works together with SHAPE to control the duration of the initial ambience created by NuVerb. Low SPREAD settings result in a rapid onset of reverberation at the beginning of the envelope, with little or no sustain. Higher settings spread out both the buildup and sustain.

XOVR (Bass Crossover) 0.1 - 26.5kHz

XOVR sets the frequency at which the transition from RTIM to BASS takes place. XOVR should be set at least two octaves higher than the low frequency you want to boost. For example, to boost a signal at 100 Hz, set XOVR to 400 Hz (This setting works well for classical music). XOVR works best around 400 for boosting low frequencies, and around 1.5 kHz for cutting low frequencies.

BASS (Bass Multiply) 0.2x - 4.0x

BASS sets the reverb time for low-frequency signals, as a multiplier of the RTIM parameter. For example, if BASS is set to 2X, and RTIM is set to two seconds, the low frequency reverb time will be four seconds. For a natural-sounding hall ambience, we recommend values of 1.5X or less.

TDCY (Treble Decay) 0.5 - 21.2kHz

TDCY sets the frequency above which sounds decay at a progressively faster rate. It filters all the sound except the pre-echoes. When set relatively low, it gives a darker tone to the reverberation, simulating the effect of air absorption in a real hall. TDCY also helps keep the ambience generated by the effect from muddying the direct sound.

LINK Link/Unlink

When LINK is set, the reverb time and spread values scale linearly as the SIZE control is varied. For some special effects, RTIM and SPRD can be unlinked.

SPIN (Randomization) 0 - 48

SPIN affects the rate of change of the timbre. The object of SPIN (and WAND) is to continuously alter the timbre of the reverberant sound. This makes the result more natural, without making the position of instruments unstable. SPIN should typically be 20 or higher. High values may make the pitch of piano or guitar unstable.

WAND (Wander)0µs - 37.1ms

WAND sets the distance in time that the reverb tail will move relative to the rate of SPIN. For best results WAND should be about 10ms at larger sizes.

Diffusion, Predelay, Reverb Level, and Rolloff DIFF (Diffusion) 0 - 99

DIFF controls the degree to which initial echo density increases over time. High settings of DIFF result in high initial buildup of echo density, and low settings cause low initial buildup. Echo density is also affected by SIZE; smaller spaces will sound denser. To enhance percussion, use high settings of diffusion. For clearer and more natural vocals, mixes, and piano music, use low or moderate settings of diffusion.

PDLY (Predelay) 0 - 1000ms

PDLY adjusts an additional time delay between the input of signal and the onset of reverberation. The control is not intended to mimic the time delays in natural spaces. In real rooms the build-up of reverberation is gradual, and the initial time gap is usually relatively short. Natural spaces are best emulated by setting SHAP at a middle value and adjusting SPRD for the desired effective pre-delay.

Additional delay added with the PDLY control can increase the initial time gap slightly, emulating a situation where reverberant pick-up microphones are located much further from the source than the main microphones. If less than about 30ms of pre-delay is added, this additional delay can add clarity with some music, but it can also sound unnatural. Large pre-delays can be useful for slap-echo effects.

RLVL (Reverb Level) Off - 48dB - Up Full

RLVL sets the amount of reverberation in the processed signal. It is normally FULL, but may be reduced for effects where the pre-echoes should dominate.

ROLL (High Frequency Rolloff) 0.1 - 26.5kHz, Flat

ROLL sets the frequency above which a 6 dB/octave low-pass filter attenuates the processed signal. It attenuates both pre-echoes and reverberant sound. High frequencies are often rolled off with this parameter, resulting in more natural sounding reverberation.

Pre-Echoes and Feedback Pre-Echoes

The Random Hall effect contains four pre-echo taps with delay and level controls. The taps are fed directly to the output wet signal rather than into the reverberator.

Pre-echoes can best be understood by visualizing a stage where the early reflections are the sounds emanating from the rear and side stage walls directly after the sound from the stage. Usually the rear stage wall reflection is earlier and louder than those from the two side walls. The pre-echoes are actually clusters of echoes, with the density of the cluster set by DIFF.

The pre-echo delay parameters change the perceived locations of reflecting surfaces surrounding the source. Level adjusts the loudness of the reflection. For each of the Lvl (Pre-echo level) parameters, there is a corresponding Dly parameter. Each of these sets the delay time in ms for one of the pre-echoes. These are not affected by PDLY, so pre-echoes can be placed to occur before the reverberation starts.

The Dly pre-echo delay parameters have a resolution of 2 milliseconds. (0 - 1000ms)

The Lvl pre-echo level parameters have sixteen steps, calibrated in decibels. (Off - 24dB - Up Full)

The Fbk feedback parameters (for Delays 3 and 4 only) are adjustable in 6% increments from -93% to +93%.

DLY1, **LVL1** Pre-Echo 1, one second maximum to left channel.

DLY2,LVL2 Pre-Echo 2, one second maximum to right channel.

DLY3, LVL3, FBK3 Pre-Echo 3, 2.8 seconds maximum to left channel, with feedback.

DLY4, LVL4, FBK4 Pre-Echo 4, 2.8 seconds maximum to right channel, with feedback.

Random Ambience

General Description

The NuVerb Random Hall effects are designed to add a cushion of reverberance to recorded music, while leaving the clarity of the direct sound unaffected. Random Ambience is different. It is intended to become a part of the direct sound — to give it both better blend and a definite position in space. Random Ambience gives warmth, spaciousness and depth to a performance without coloring the direct sound at all.

Random Ambience generates primarily the strong reflections which appear in the first few hundred milliseconds of the reverberation process. These early reflections constitute the primary audible effect, giving you the impression of a hall surrounding you while the music is playing. To avoid any coloration from these strong reflections, the time delays and amplitudes are random functions.

Random Ambience is very useful for adding a room sound to recorded music or speech. It is particularly easy to match a studio recording of dialog to a typical room environment. In music recording, using Random Ambience is an effective way of realistically adding distance to a close-miked signal. If an ensemble has been recorded with close-mikes and pan pots, Ambience can provide the missing blend and depth. The apparent position of the instruments is preserved in the reverb while the apparent distance is increased. Random Ambience is also useful in matching a closely miked accent microphone to the overall ambience of a recording. This allows a soloist to be increased in level without changing the apparent distance. Random Ambience can be used in a recording situation any time a close-miked sound is undesireable.

Set the SIZE to the desired room size. RLVL adjusts the amplitude of reverberation defined by RTIM, and can be trimmed to get exactly the effect you need.

To use the effect with a console, it is best to use a stereo send to NuVerb, carefully matching the panning of the various close-miked sources to their positions in the mix. Leave the MIX control at 100%. The apparent distance of each source can be controlled by the level of its feed.

Random Ambience Parameters

The Ambience Generator

SIZE 4.0 - 39.4M

SIZE allows you to vary the apparent size of the space over a wide range. SIZE is the most dramatic control, and must be selected to match the music or effect material. It should be the first control that you adjust to tailor the desired space. SIZE also affects the reverb time, in a similar way to the standard reverb effects.

RTIM (Reverb Time) 0.18 - 47.82s

RTIM adjusts the reverberation time of the independent reverberator. The range of action is limited. Be careful — both long and short reverb times may sound unnatural. If a much longer or shorter reverb time than the preset provides is desired, SIZE should be changed first.

RLVL (Reverb Level) Off, -48 - 1dB, Up Full

RLVL sets the amount of reverberation in the processed signal. It is normally FULL, but may be reduced for effects where the pre-echoes should dominate.

SPIN (Randomization) 0 - 48

SPIN affects the rate of the movement of many of the early reflections. The object of SPIN (and WAND) is to continuously alter the timbre of the reverberant sound. This makes the result more natural, without making the position of instruments unstable. SPIN should typically be 20 or higher. High values may make the pitch of piano or guitar unstable.

WAND (Wander)0 - 37.1ms

WAND sets the distance in time that the early reflections will move. For best results WAND should be about 10ms at larger sizes.

Diffusion, Predelay, Rolloff and Dry Delay DIFF (Diffusion) 0 - 99

DIFF controls the degree to which initial echo density increases over time. High settings of DIFF result in high initial buildup of echo density; low settings cause low initial buildup. Echo density is also affected by SIZE; smaller spaces will sound denser. To enhance percussion, use high settings of DIFF. For clearer, more natural vocals, mixes, and music, use low or moderate settings.

PDLY (Predelay) 0 - 99.9ms

PDLY adds an additional delay to the reflections and to the reverberation. This control may be useful in a sound reinforcement situation, or for ambience effects. Both DDLY and PDLY have 4-sample (approximately 0.1msec) resolution.

ROLL (High Frequency Rolloff) 0.5-21.2kHz

ROLL sets the frequency above which a 6 dB/octave low-pass filter attenuates the processed signal. It attenuates both pre-echoes and reverberant sound. High frequencies are often rolled off with this parameter, resulting in more natural sounding reverberation.

DDLY (Dry Delay) 0 - 99.9ms

DDLY provides a delay for the "dry" audio path.

Rich Plate

General Description

The Rich Plate effect is denser, smoother, and more colored than other reverb effects. When used with the SIZE control at around 16 meters, the sound is dense and tight — ideal for percussion. Larger sizes and longer reverb times are suitable for vocals and brass.

Rich Plate Parameters

The Reverberator

RTIM (Reverb Time) 0.15 - 40.46s

RTIM adjusts the reverberation time of the independent reverberator. The range of action is limited. Be careful — both long and short reverb times may sound unnatural. If a much longer or shorter reverb time than the preset provides is desired, SIZE should be changed first.

SIZE 4.0 - 39.4M

SIZE allows you to vary the apparent size of the space over a wide range. SIZE is the most dramatic control, and must be selected to match the music or effect material. It should be the first control that you adjust to tailor the desired space. SIZE also affects the reverb time, in a similar way to the standard reverb effects.

SHAPE 0-255 SPREAD 0-250

SHAPE and SPREAD work together to control the overall ambience of the reverberation created by NuVerb. SHAPE determines the contour of the reverberation envelope. With SHAPE all the way down, reverberation builds explosively, and decays quickly.

As SHAPE is advanced, reverberation builds up more slowly and sustains for the time set by SPREAD. With SHAPE in the middle, the buildup and sustain of the reverberation envelope emulates a large concert hall (assuming that SPREAD is at least halfway up, and that SIZE is suitably large—30 meters or larger.)

SPREAD works together with SHAPE to control the duration of the initial ambience created by NuVerb. Low SPREAD settings result in a rapid onset of reverberation at the beginning of the envelope, with little or no sustain. Higher settings spread out both the buildup and sustain.

XOVR (Bass Crossover) 0.1 - 26.5kHz

XOVR sets the frequency at which the transition from RTIM to BASS takes place. XOVR should be set at least two octaves higher than the low frequency you want to boost. For example, to boost a signal at 100 Hz, set XOVR to 400 Hz. (This setting works well for classical music.) XOVR works best around 400 for boosting low frequencies, and around 1.5 kHz for cutting low frequencies.

BASS (Bass Multiply) 0.2x - 4.0x

BASS sets the reverb time for low-frequency signals, as a multiplier of the RTIM parameter. For example, if BASS is set to 2X, and RTIM is set to two seconds, the low frequency reverb time will be four seconds. For a natural-sounding hall ambience, we recommend values of 1.5X or less.

TDCY (Treble Decay) 0.5 - 21.2kHz

TDCY sets the frequency above which sounds decay at a progressively faster rate. It filters all the sound except the pre-echoes. When set relatively low, it gives a darker tone to the reverberation, simulating the effect of air absorption in a real hall. TDCY also helps keep the ambience generated by the effect from muddying the direct sound.

LINK Link/Unlink

When LINK is set, the reverb time and spread values scale linearly as the SIZE control is varied. For some special effects, RTIM and SPRD can be unlinked.

RAND (Randomization) Off, -48dB - Up Full

RAND sets the rate of randomization of the reverb tail.

Diffusion, Predelay, Reverb Level, and Rolloff DIFF (Diffusion) 0 - 99

DIFF controls the degree to which initial echo density increases over time. High settings of DIFF result in high initial buildup of echo density; low settings cause low initial buildup. Echo density is also affected by SIZE; smaller spaces will sound denser. To enhance percussion, use high settings of DIFF. For clearer, more natural vocals, mixes, and music, use low or moderate settings.

PDLY (Predelay) 0 - 1000ms

PDLY adds an additional delay between the input signal and the onset of reverberation. This control may be useful in a sound reinforcement situation, or for ambience effects. Both DDLY and PDLY have 4-sample (approximately 0.1msec) resolution.

RLVL (Reverb Level) Off, -48dB - Up Full

RLVL sets the amount of reverberation in the processed signal. It is normally FULL, but may be reduced for effects where the pre-echoes should dominate.

ROLL (High Frequency Rolloff) 0.1 - 26.5kHz, Flat

ROLL sets the frequency above which a 6 dB/octave low-pass filter attenuates the processed signal. It attenuates both pre-echoes and reverberant sound. High frequencies are often rolled off with this parameter, resulting in more natural sounding reverberation.

Rich Plate Delays and Feedback Pre-Echoes

Rich Plate provides control over three stereo delay pairs. All three are summed with the output of the reverberator. Many, many different echo combinations are possible.

DLY1 (Delay 1), DLY2 (Delay 2) 0 - 2000ms

DLY1 and DLY2 are recirculating delay lines to the left and right channel inputs. The path of either is picked off after the diffusor with the amount of recirculation defined by the adjustment of FBK1 (for DLY1) and FBK2 (for DLY2). DLY1 and DLY2 are the only delays which effectively feed back (recirculate) into the reverberator.

FBK1 (Feedback 1), FBK2 (Feedback 2) 0 - 93%

FBK1 and FBK2 determine the amount of recirculation passed back through to the left and right inputs.

DLY3 (Delay 3), DLY4 (Delay 4) 0 - 1000ms

DLY3 (and DLY4 are also picked off after the diffusor. The level of each is controlled by LVL3 and LVL4, respectively.

LVL3 (Level 3), LVL4 (Level 4) Off - 24dB, Up Full

LVL3 and LVL4 determine the loudness of DLY3 and DLY4.

DLY5 (Delay 5), DLY6 (Delay 6) 0 - 2800ms

DLY5 and DLY6 allow you to build non-diffused recirculating echoes independant of the reverberator. Each has a feedback control (FBK5 and FBK6).

FBK5 (Feedback 5), FBK6 (Feedback 6) 0 - 93%

FBK5 and FBK6 provide feedback control for DLY5 and DLY6.

LVL5 (Level 5), LVL6 (Level 6) Off, -48dB - Up Full

LVL5 and LVL6 determine the loudness of DLY5 and DLY6. Remember, these are undiffused pre-echoes.

Stereo Adjust

General Description

The Stereo Adjust effect offers fine adjustments of level and equalization during digital mastering. Its stereo digital fader permits 0.25dB trimming and provides full fades to digital zero at the end of a track. Its two sets of shelving treble EQ can be set for different 3dB points and gains. BASS and SPEQ permit adjustment of stereo width, enhancing the spaciousness and depth of the recording.

Stereo Adjust Parameters

The Equalizer

BXVR (Bass Crossover) 0.1 - 26.5kHz

BXVR sets the crossover point for BASS and SPEQ. When BASS is set to full cut, the level is - 3 dB at the frequency set with BXOV.

BASS+ (Bass EQ)Cut, -18dB - +12dB

BASS is a 6dB/octave shelving EQ control with a range of +6 dB boost and -18dB cut. It moves in .50 dB steps from +6 to -6 dB. The crossover point is adjusted with BXVR. BASS acts on both stereo channels equally.

SPEQ (Spatial EQ) Cut, -6 - +6dB

SPEQ sets the amount of a crossfeed between channels. The signal first goes through a 6 dB/octave low-pass filter whose frequency is set with BXVR.

When SPEQ is set positive (above 0) the crossfeed has a negative sign. When SPEQ is set negative (below 0), the crossfeed has a positive sign. When the control is set to either maximum or minimum, the gain in the crossfeed circuit is unity.

The result of this control is to change the separation of low frequency stereo signals. When the control is raised, low frequencies in the sum (mono) channel are reduced, and low frequencies in the difference (stereo) channel are raised. With the control at maximum, low frequency

mono signals are completely removed. This represents an extreme setting which should seldom be needed in practice.

With material which has stereo bass information, or which contains some reverberation, the effect of raising SPEQ is to increase the sense of spaciousness and depth of the sound. It is particularly useful on material recorded with panpots, or coincident and semi-coincident microphone technique.

When most of the bass in a recording is in the sum (mono) channel, raising SPEQ may reduce the bass level. This effect can be compensated for by raising the overall bass level with BASS. Since both controls use the same BXVR setting, this compensation will be quite accurate as long as SPEQ is set to less than 3 dB boost.

TRXVR (Stereo Treble Crossover) 0.1 - 26.5kHz

TRXVR sets the crossover point for TREB. When TREB is set to full cut, the level is -3 dB at the frequency set with TXOV.

TREB+ (Treble EQ) Cut, -18 - +6dB

TREB \pm is a 6 dB/octave shelving EQ controls with a range of +6 dB boost and -18dB cut. It moves in .50 dB steps from +6 to -6 dB. The crossover point is adjusted with TXRXVR. TREB \pm acts on both stereo channels equally.

D-EM (De-emphasis) On/Off

When D-Em is On, the incoming signal is digitally de-emphasized. This should not be used unless the material has been emphasized in the record process— such as a PCM-F1 tape.

When digital de-emphasis is applied, the CD mastering lab must be informed that the tape is not emphasized, and the CD emphasis bit should be manually set to Off. Mastering labs are happy to do this, but they must be informed!

L/RXVR (Independent Treble Crossover) 0.1 - 26.5kHz

L/RXVR sets the crossover point for LTRB and RTRB. When either is set to full cut, the level is -3 dB at the frequency set with TRXVR.

Lexicon Reference

L TRB+ (Left Treble Adjust), RTRB+ (Right TrebleAdjust) Cut, -18 - +6dB

These controls allow independent adjustment of left and right treble. They may be used together with the stereo adjustments to create a 12 dB/octave cut or boost. Note that the 3 dB frequencies can be different from the stereo set.

Stereo Adjustments

MSTR (Master Level) Off, -72 - +12dB

MSTR is a stereo level control, with both channels equally attenuated or boosted. From -12 to +12 the fader moves in .25 dB increments. Below -12 it moves in .50 dB increments. Below -60 dB the calibration comes in larger steps, finally dropping to zero output at -72 dB.

11µs (1/2 Sample)On/Off

When this control is on, the left channel is delayed relative to the right by 11μ sec (1/2 sample). This control specifically corrects for the timing error between channels caused by consumer digital systems (e.g. the Sony PCM-F1 and its progeny) that time-share single analog converters. Turning on this delay time aligns the left channel audio data for compatibility with professional systems.

R F'n'S (Right Channel Flip 'n' Swap) +L-R, +L-R+R+L, -R+L

RFnS is used for digitally correcting problems you used to be able to fix (or create) by switching analog cables around. The normal setting is +L to the left output and +R to the right output. Other settings should only be used when correcting some problem created previously in the recording process.

- +L+R = Normal Routing
- +L-R = Right Channel polarity inverted (flipped)
- +R+L = Left and Right Channels swapped
- -R+L = Right flipped and swapped with Left

BAL (Balance) L+2.9dB- R+2.9dB

BAL implements a sine/cosine balance adjustment. Balance is smoothly adjusted over a wide range, with excellent resolution in the critical area around zero. The display indicates the actual channel gains as the control is varied.

ROT (Rotate) L+2.9dB- R+2.9dB

ROT is similar to BAL, but it treats stereo information somewhat differently. Any signal panned to the center (mono) will be treated by ROT exactly as it would be treated by BAL. However, if a signal is panned full right and the control is moved toward the left, instead of simply being attenuated (as BAL would do) the right channel is inverted in phase and added to the left channel. A stereo image appears to rotate when this control is used. Ambient information is preserved, and both channels appear to retain equal loudness.

If stereo material is recorded with a coincident pair of figure-of-eight microphones, moving the ROT slider is exactly equivalent to rotating the microphone pair. Other microphone arrays and multimicrophone setups do not rotate perfectly, but using this control is frequently preferable to simply adjusting balance. The display shows the actual channel gains for a continually panned source.

L/R DLY (Stereo Delay) 0 - 5000ms

L/R DLY controls a 5-second stereo delay line, with a resolution of 10 milliseconds. Separate mono and fine controls are provided. This is a post-processing full-level delay, and is always in the circuit.

Delays and Feedback Controls

These controls give individual channel control over the 5-second post-equalization delay line.

LDLY (L Delay) 0 - 5000ms

L/R DLY and LDLY provide 5-second, 10 milliseconds per step, mono control for the left channel. Together, these two controls must not total more than 5,000 milliseconds.

RDLY (R Delay) 0 - 5000ms

L/R DLY and RDLY provide 5-second, 10 milliseconds per step, mono control for the right channel. Together, these two controls must not total more than 5,000 milliseconds.

Fine Sample Accurate Delays can be used for subtle time alignment adjustments. NuVerb will correctly display the resulting time shift as a function of the sampling rate. As many as 500 samples can be added to any stereo/coarse delay setting for a maximum possible delay per channel of 5 seconds + 500 samples.

48 kHz = 20.833 microseconds per sample

44.1 kHz = 22.676 microseconds per sample

32 kHz = 31.25 microseconds per sample

LFIN (Left Channel Fine)0 - 500 Samples

LFIN provides 500-sample, 1 sample per step, mono fine adjust for the left channel.

RFIN (Right Channel Fine) 0 - 500 Samples

RFIN provides 500-sample, 1 sample per step, mono fine adjust for the right channel.

Two feedback paths are available per channel: overall and fine. Overall feedback is the total delay of DLAY + L(R)DLY + L(R)FIN, and is useful for long echo effects.

Fine Feedback is only around the Fine Delay and can be used for very short delay effects and coloration.

All feedback gains are adjustable in 1% increments from -99% to +99%. If the magnitudes of both feedback gains for a channel sum to more than 100%, that channel will take off and overload.

Overall and fine are distinguished by upper and lower case lettering:

LFBK = Overall Left Channel Feedback

Lfbk = Fine Delay Adjustment of Left Channel Feedback

RFBK = Overall Right Channel Feedback

Rfbk = Fine Delay Adjustment of Right Channel Feedback

DC Offsets

DCSW (DC Offset Nulling) Reset, Manual, Auto

DCSW provides three choices: RESET, MANUAL ADJUST, and AUTO ADJUST. RESET disables all DC adjustment. AUTO ADJUST enables routines for correcting DC offset from material recorded through analog-to-digital converters that are not properly trimmed for DC. MANUAL ADJUST allows selection of specific offset values.

L-DC, R-DC (Left and Right Channel Offset)

These controls allow replacement of any previously obtained value with the value selected here. The percent of the correction will be displayed.

SHUF (Shuffler — Binaural)

SHUF controls a spatial equalizer designed for recording made with a dummy head or closely spaced omni microphones.

Programs Available in the Dual Mono and Cascade Modes: Dual Delay

General Description

The Dual Delay effect consists of 2 types of delay lines: Gliding Flange delays and Fixed delays. This is a true stereo effect. (If run in Dual Mono mode, however, it will be mono.)

Two independent gliding flange predelays are available, each with a 10ms range in single sample steps. There is also a ganged stereo gliding flange delay. There are two flange gain controls which vary the overall amount of flange effect.

Setting the flange gains very high will cause an "over the top" type of flange to occur as the flange glide delays cross over the predelay pointers. The outputs of the flange delays are fed to the delay left and delay right lines which are 2.5 seconds long. Once into these delay lines, you can create many different delay effects. There are two programmable taps on each delay line. Delays 1 (left) and 2 (right) can be programmed anywhere along this 2.5 second path. There will, however, be no apparant delay unless a feedback value is assigned to the delay values via feedback parameters 1 and 2. All Pass filters, or diffusors, in line with the feedback paths are labeled APD (All Pass Delay) and APG (All Pass Gain). The actual "tuning" of the All Pass Delay is accomplished with the APD control. The amount of diffusion is set by APG. When APG is turned high and FBK 1 is adjusted away from the 0% value, each feedback loop will be rediffused.

Delays 3 and 4 are cross feedback delay lines. They are also adjustable anywhere along the 2.5 second delay line. Delay 3 feeds from the left delay position to the input of the right delay line. The same is true with Delay 4 feeding into the left delay line. The feedback parameters adjust the amount (level) passed into the destination delay lines.

The last pair of delay pointers (LDLY and RDLY) can be thought of as independently adjustable post delays. These can be adjusted anywhere along the 2.5 second delay line.

The output of each delay line can be positioned anywhere in the stereo pan field. LPAN adjusts the position of the left delay loop; RPAN positions the output of the right delay loop.

Dual Delay Parameters

The Flanger

FLNGDLY (Flange Delay) 0-479 samples = 0-20ms

FLNGDLY is a separate 20 ms ganged stereo delay line which is controllable in single sample steps.

LPDLY, RPDLY (Left, Right Flange Base Delays 0-479 samples = 0-20ms

LPDLY and RPDLY are base delays which get summed with the stereo ganged flange delay. These base delays are adjustable in single sample steps throughout a 20 millisecond range.

LFLG, RFLG (Left, Right Flange Gain) -99% to +99%

LFLG and RFLG are flange gains which are adjustabe as a feed forward amplifier loop (+99% positive value) or feedback amplifier loop (-99% negative value).

Delay and Feedback Controls

DLY1, DLY2 (Delay 1, Delay 2) 0-19996 samples = 0-2498.9ms

DLY1 and DLY2 set the delay values for the respective left to left and right to right feedback loops

FBK1, FBK2 (Feedback 1, Feedback 2) -99% to +99%

FBK1 and FBK2 set the gain of feedback for each of the delay lines. Available values range from -99% to +99% gain.

APD1, APD2 (All-pass L and R Delays) 0-19996 samples = 0-2498.9ms

APD1 and APD2 are diffusors in series with the feedback loops associated with DLY1 and DLY2. Their controls range from 0 to 10 ms. These controls essentially "tune" the diffusor delay line.

APG1, APG2 (All-pass L and R Gain) 0 - 191

APG1 and APG2 are gains associated with the diffusors. You can think of them as controlling the amount of diffusion for delay lines 1 and 2.

DLY3, DLY4 (Delay 3, Delay 4) 0-19996 samples = 0-2498.9ms

DLY3 controls the delay time which cross-feedbacks to the input of DLY2. DLY4 controls the delay time which cross-feedbacks to the input of DLY1.

FBK3, FBK4 (Feedback 3, Feedback 4) 0 - 99%

FBK3 and FBK4 control the gain of the cross feedbacks going with each of their respective delay lines.

LDLY, RDLY (L and R Delays) 0-19996 samples = 0-2498.9ms

LDLY sets the left channel delay line's time. RDLY sets the right channel delay line's time.

LPAN, RPAN (Left and Right Pan Placement) L, 0-98%R/L, R

LPAN adjusts the left delay channel pan placement. RPAN adjusts the right delay channel pan placement

Split Chamber

General Description

The Split Chamber effect can simulate many different types of acoustic spaces or mechanical devices. This effect is great on anything. Sizes of 25 and larger set a lower acoustic density. Shape and Spread help create the illusion of larger spaces while using short reverb times. As in the Random Hall effect, the Link parameter couples the Size parameter to the reverb time and Spread. Unlink provides a method of setting stable reverb time and Spread values, then adjusting size to set the right density and "tuning". Split Chamber is bright by design, so you may want to use lower values of treble decay — maybe even as low as 1.0kHz or 500Hz.

The randomization circuit in Split Chamber is designed to reduce coloration and/or frequency nodes caused by low frequency input. If you want to create your own special Chambers or Halls, you should keep RAND set to 90 or 95.

Typically, sizes of 14-24 meters with treble decays higher than 3.4kHz will emulate bright sounding metal plates. Remember to set the shape and spread parameters to extremely low values to maintain the explosivness of the reverb decay. Because plates are very diffuse, any preset mimicking a plate should have diffusion set relatively high (70-80), while the bass multiplier is kept to some value less than 1.2kHz.

The diffusion and predelay parameters precede the reverberator. When Chamber effects are loaded into Dual Mono mode, the audio will be Mono In-Mono Out. When loaded into Cascade mode, audio is routed summed Mono In-Stereo Out.

Split Chamber Parameters

Split Chamber (the reverberator)

RTIM (Mid-Frequency Reverb Time) .09 - 24.11s

RTIM sets the reverb time for mid-frequency signals. Because low-frequency reverb time (BASS) is a multiplier of RTIM, RTIM acts as a master control for the reverb time.

SIZE 4.0 - 66.4M

SIZE sets the rate of buildup of diffusion after the initial period (which is controlled by DIFF). It also acts as a master control for RTIM and SPRD. The SIZE control changes a reverb sound from very large to very small. Generally, you should set the SIZE control to approximate the size of the acoustic space you are trying to create, before adjusting anything else. The size in meters is roughly equal to the longest dimension of the space. Moving SIZE while a signal is present may cause audible transients on critical material.

The apparent size of the space created is actually a combination of the settings of the SIZE, SHAP, and SPRD controls. Small acoustic spaces are characterized by a rapid buildup of diffusion. However, both small and large spaces frequently have an uneven buildup of initial reverberation. This uneven buildup is controlled by the SPRD and SHAP controls.

SHAPE 0 - 255 SPREAD 0 - 202

SHAP and SPRD work together to control the overall ambience of the reverberation created by NuVerb. SHAP determines the contour of the reverberation envelope. With SHAP all the way down, reverberation builds explosively, and decays quickly.

As SHAP is advanced, reverberation builds up more slowly and sustains for the time set by SPRD. With SHAP in the middle, the buildup and sustain of the reverberation envelope emulates a large concert hall (assuming that SPRD is at least halfway up, and that SIZE is suitably large—30 meters or larger.)

SPRD works together with SHAP to control the duration of the initial ambience created by NuVerb. Low SPRD settings result in a rapid onset of reverberation at the beginning of the envelope, with little or no sustain. Higher settings spread out both the buildup and sustain.

XOVR (Bass Crossover) 0.1 - 26.5kHz

XOVR sets the frequency at which the transition from RTIM to BASS takes place. XOVR should be set at least two octaves higher than the low frequency you want to boost. For example, to boost a signal at 100 Hz, set XOVR to 400 Hz (This setting works well for classical music). XOVR works best around 400 for boosting low frequencies, and around 1.5 kHz for cutting low frequencies.

BASS (Bass Multiply) 0.2x - 4.0x

BASS sets the reverb time for low-frequency signals, as a multiplier of the RTIM parameter. For example, if BASS is set to 2X, and RTIM is set to two seconds, the low frequency reverb time will be four seconds. For a natural-sounding hall ambience, we recommend values of 1.5X or less.

TDCY (Treble Decay) 0.5 - 21.2kHz

TDCY sets the frequency above which sounds decay at a progressively faster rate. It filters all the sound except the pre-echoes. When set relatively low, it gives a darker tone to the reverberation, simulating the effect of air absorption in a real hall. TDCY also helps keep the ambience generated by the effect from muddying the direct sound.

LINK Link/Unlink

When LINK is set, the reverb time and spread values scale linearly as the SIZE control is varied. For some special effects, RTIM and SPRD can be unlinked.

RAND (Randomization) Off, 0 - 98%, Up Full

RAND sets the rate of randomization of the reverb tail.

Diffusion and Predelay

DIFF (Diffusion) 0 - 99

DIFF controls the degree to which initial echo density increases over time. High settings of DIFF result in high initial buildup of echo density; low settings cause low initial buildup. Echo density is also affected by SIZE; smaller spaces will sound denser. To enhance percussion, use high settings of DIFF. For clearer, more natural vocals, mixes, and music, use low or moderate settings.

PDLY (Predelay) 0 - 1000ms

PDLY adjusts an additional time delay between the input of signal and the onset of reverberation. The control is not intended to mimic the time delays in natural spaces. In real rooms the build-up of reverberation is gradual, and the initial time gap is usually relatively short. Natural spaces are best emulated by setting SHAP at a middle value and adjusting SPRD for the desired effective pre-delay.

Additional delay added with the PDLY control can increase the initial time gap slightly, emulating a situation where reverberant pick-up microphones are located much further from the source than the main microphones. If less than about 30ms of pre-delay is added, this additional delay can add clarity with some music, but it can also sound unnatural. Large pre-delays can be useful for slap-echo effects.

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Compressor

General Description

The Compressor effect is a true digital compressor which will run in either Dual Mono or Cascade mode. In Dual Mono mode, it configures to Mono in Mono out; in Cascade mode, it configures as a true stereo effect. The compressor can be described as an upwards averaging compressor. Digital compressors, like analog compressors, decrease audio above a given threshold. Unlike analog compressors, they increase gain below the threshold. The result from either analog or digital compression is exactly the same — less dynamic range.

The audio path takes two routes. One path goes through a predelay mechanism which delays the audio a maximum of 48 ms. The other path sends control information (dependent on the CmpGain and ExpGain. As the signal crosses the threshold point, both Compressor Gain and Expansion Gain vary constantly. Compressor Gain determines the maximum amount of gain increase below the threshold; Expansion Gain determines the maximum amount of gain attenuation below the threshold.

Generally, digital compression requires lower threshold settings than analog compression. The reason for this is that there is no such thing as headroom in a digital system — dBfs (Digital Full scale [0VU]) is the maximum level audio. Audio dynamics below full scale, however, can be manipulated and modified.

The whole purpose of a digital compressor is to maintain peaks while compressing lower level audio signals upwards. If you think about it in terms of the most significant and least significant bits, you would never want to reduce the most significant bits — you want to increase the least significant bits.

Adding some predelay gives the control mechanism time to react before the audio reaches the digital VCA. Of course, the more predelay you add, the more "out of sync" the audio will become. Attack constants should be kept to short values (7,15, or 30ms). A good starting point for release time is 91 or 114 ms.

Compressor Parameters

PDLY (Predelay) 0 - 48ms

PDLY sets the predelay of the audio before the digital VCA.

The Compressor

SLOPE 1.0 - 99.99:1

SLOPE controls the slope of the gain reduction curve or the ratio of input level versus output level.

THRS (Threshold) 0 to -40dB

THRS sets the level at which compression starts.

ATTACKO - 960ms

ATTACK adjusts the attack time constant.

RELEASE(Release Time Constant) 0 - 4000ms

RELEASE allows adjustment of the release time constant.

CmpGain (Compressor Gain) 0 - 24dB

CmpGain adjusts the gain of low level signals (below the compression threshold).

TheExpander

X SLOPE (Expander Slope) 1.0 - 8.93 : 1

X SLOPE controls the slope of the expander circuit.

X THRS (Expander Threshold) 0 to -70dB

X THRS sets the threshold at which the expander starts to work.

ExpGain (Expander Gain) 0 - 24dB

ExpGain sets the amount of negative gain below threshold.

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PONS

GeneralDescription

Dither is a low-level pseudo-random signal which is added to digital audio to reduce quantization noise, in effect, by replacing it with a "nicer sounding" noise. It is possible to filter the quantization noise in such a way that almost all of the noise within the frequency range where human hearing is most acute is shifted to higher frequencies. This is called psychoacoustically optimized noise shaping (PONS) because it takes advantage of the variations in the ear's sensitivity to noise within the 20 Hz - 20 kHz range.

PONS Parameters

DITH (Dither Gain) 0 - 254

DITH allows you to vary the amount of dither gain added to the signal.

PONS On/Off

The PONS control allows you to turn the dither function on or off.

MIDI Implementation

Lexicon NuVerb

Function	Function		Recognized	Remarks	
Basic Channel	Default Channel	X X	Off 1-16, OMNI	Any combination	
Mode	Defaullt Messages Altered	X X X	X X X		
Note Number	True Voice	X X	X X		
Velocity	Note ON Note OFF	X X	X X		
After Touch	Keys Channels	X X	X X		
Pitch Bender		Х	0		
Control Change	0-95	X	0		
Program Change	True #	X X	X O		
System Exclusi	System Exclusive		Х		
System Common	:Song Pos :Song Sel :Tune	X X X	X X X		
System Real Time	:Clock :Commands	X X	X O		
Aux Messages	:Local ON/OFF :All Notes OFF :Active Sense :Reset	X X X	X X X		
Notes:					

Mode 1: OMNI ON, POLY Mode 3: OMNI OFF, POLY Mode 2: OMNI ON, MONO Mode 4: OMNI OFF, MONO O : Yes X : No Nu Verb User Guide Reference

Time Code Applications

About time Code

Time Code is an electronic signal applied to tape or film which identifies each individual video frame. The ability to uniquely identify any frame provides a reference system for fast and accurate location of any point on the tape. This referencing system maintains its accuracy regardless of changes in playback or editing equipment, allowing precise synchronization of an entire editing system.

Time Code identifies each video frame by assigning it a unique "address". Frames are sequentially identified by hour, minute, second, and frame. For example, a typical Time Code address appears as:

09 : 42 : 31 : 07 hours minutes seconds frames

As each frame is advanced, the Time Code address is increased by one frame "count". Because the Time Code signal is locked to advancing video frames, both advance at exactly the same rate.

In the USA, there are two standard frame rates, one for black and white (monochrome), and one for color.

Monochromatic video runs at a rate of 30 frames per second. If a black and white TV program is measured by Time Code, the program length, the Time Code display, and clock time, will all be in sync.

Color video signals run at a rate of 29.97 frames per second, and clocking a one-hour color program at 30 frames per second will result in a time discrepancy of 3.6 seconds (or 108 frames). In order to correct this discrepancy, a version of Time Code called SMPTE Drop Frame was developed.

SMPTE Drop Frame Time Code, as its name implies, eliminates frame addresses from the Time Code each hour to allow matching of Time Code and clock time. Specifically, frame addresses 00 and 01 are eliminated at the end of every minute in an hour, except for minutes 00, 10, 20, 30, 40, and 50. For example, 00:00:59:29 advances to the number 00:01:00:02. In Drop Frame mode, the frame numbers 00 and 01 do not exist, except for minutes 00, 10, 20, 30, 40, and 50. Since Drop Frame Time Code eliminates only frame addresses, the actual video is unaffected. Color videoframes continue to progress at the rate of 29.97 per second. Any calculations of program length based on Drop Frame Time Code will, therefore, agree with standard clock time.

Time Code Formats

SMPTE Non-Drop SMPTE Standard Time Code, compatible with a monochromatic

frame rate of 30 frames per second

SMPTE Drop Frame SMPTE Standard Drop Frame Time Code, compatible with a color

frame rate of 29.97 frames per second

EBU Compatible with the European broadcast standard frame rate of 25

frames per second

Film Compatible with frame rates of 24 frames per second

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Synchronizing MIDI

For synchronization the MIDI specification provides for MIDI Clock, MIDI Clock with song pointer information, and MIDI Time Code. Other manufactures have provided their own proprietary methods of MIDI synchronization, the most common being OMS by Opcode, and DTL by Mark of the Unicorn.

To Synchronize NuVerb Automation you need:

- A source of MIDI Time Code. Regular Time Code must be converted to MIDI Time Code, (Seebelow.)
- A Midi Interface for your computer
 (For information on using MIDI Manager to connect the MIDI Time Code source to NuVerb see: About MIDI Manager)

NuVerb Uses MIDI Time Code for synchronization. It must be connected to the program using the MIDI Manager[™] from an external source. A MIDI interface is required to get your source of MIDI Time Code into the computer. Many of the more sophisticated MIDI interfaces also provide synchronization capabilities, often with MIDI Time Code as one of the options.

Sources of Time Code for synchronizing NuVerb

Many sources of Time Code exist. A sampling is presented below. Most of these sources, however, do not provide *MIDI* Time Code, and their time code will, therefore, require conversion for NuVerb.

Possible sources of Time Code for NuVerb:

- A multitrack tape analog or digital with Time Code recorded on one of the tracks
- A Digital tape deck (ADAT, DA88 etc) that outputs Time Code
- A Hard Disk Recorder/Digital Audio Workstation(DAW) that outputs Time Code
- Time Code that your tape deck or (DAW) is synchronizing to, often from a video source or from another audio source.

Converting Time Code To MIDI Time Code

There are a number of products that convert Time Code To MIDI Time Code, such as:

- MIDI Interfaces -Many of the more sophisticated MIDI interfaces also provide conversion capabilities
- Stand alone converters that work with existing MIDI interfaces
- Time Code synchronizer these mechanically synchronize tape decks to Time Code. Some also output MIDI Time Code.

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MIDI Interface Sources

Manufacturer	Model	Comments
Adams-Smith, 34 Tower St., Hudson MA 02179	Zeta 3	o/p MTC
	Electric Willy	MTC-LTC converter
Alesis, 3630 Holdridge Ave., Los Angeles CA 90016	BRC	ADAT controller o/p MTC
Atari, P.O. Box 61657, Sunnyvale CA 94088	SMPII	o/p MTC
Fostex, 15431 Blackburn Ave., Norwalk CA 90650	4050	o/p MTC
	MR-8	o/p MTC
J. L. Cooper, 12500 Beatrice St., Los Angeles CA 90066	PPS-2	o/p MTC
	PPS-100	o/p MTC
	SyncLink	o/p MTC
	Data Sync	MTC output for ADAT
	Data Master	Pro sync for Atari
Mark of the Unicorn, 1280 Mass.Ave., Cambridge, MA 02138	MTP	Mac Interface: o/p MTC
	MTPII	Mac Interface: o/p MTC
	Video Time Piece	Mac Interface: o/p MTC
	Express	Mac Interface: o/p MTC
MIDIMAN, Suite 108, 236 W. Mountain, Pasadena CA 91103	Syncman	Mac Interface: o/p MTC
	Syncman Plus	Mac Interface: o/p MTC
	Syncman Pro	Mac Interface: o/p MTC
Opcode Systems, 3641 Haven St. A, Menlo Park CA 94025	Studio 3	Mac Interface: o/p MTC
	Studio 4	Mac Interface: o/p MTC
	Studio 5	Mac Interface: o/p MTC
Roland, 7200 Dominion Circle, Los Angeles CA 90040	SBX-80	MTC Converter
Steinberg Jones, Suite 1001, 17700 Raymer St., Northridge, CA 91325	Mac MIDI IIS	specifically for Atari
Tascam (TEAC), 773 Telegraph Rd., Montbello CA 90640	SY-88 Sync Card	Access. (RS-422),TC,Video, MIDI
	MMC-100	o/p MTC

About MIDI Manager

MIDI Manager is an Apple System Folder startup document that allows you to run several MIDI applications at once. It allows you to send MIDI data from one program to another. In NuVerb this is used for synchronization via MIDI Time Code.

MIDI Manager has three components: The Apple MIDI Driver, MIDI Manager™, and PatchBay. PatchBay™ has an optional Help application.

On Apple System 7, the Apple MIDI Driver must be in the top level of the system folder, i.e. not nested inside a folder in the system folder. MIDI Manager should be placed in the Extensions folder found inside the System folder. After installation, it is necessary to re-start your computer to enable MIDI Manager $^{\text{TM}}$.

You can have more than one MIDI driver in your system folder, and use one on the printer port and one on the modem port. This can be an area of system setup confusion, so proceed with caution if using this approach.



Appendix

Troubleshooting

Hardware Verification

Ch	eck off these items:
	Card correctly seated in NuBus socket with no bent pins
	Digidesign Expansion chassis correctly installed and functioning properly (if applicable)
	Audio source has AES output capability
	NuVerb AES I/O cable correctly connected to AES source/destination
	Audio monitoring device correctly connected to receive NuVerb output.
	NuVerb passes audio

Check to make sure the board is passing audio

The NuVerb board should pass audio as soon as the Mac is powered up. By connecting any AES signal source and monitoring the output, you can verify that the board is receiving power and that the AES I/O is OK. This can be done without installing or running the software application.

Note: To connect an analog source to NuVerb, an external A/D-D/A converter with AES I/O will be required. If you are installing NuVerb with a digital source that uses a format other than AES, a format converter will be required.

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Hardware Troubleshooting

If you do not get audio output, perform the following checkout procedure.

- 1. Recheck the cables and the audio connections of the entire signal chain. Verifying that the individual parts of the chain work independently is often helpful.
- 2. Remove the board, observing all installation precautions in regard to static, power down etc. Check for bent pins on the edge connector. If the pins are bent, contact Lexicon Customer Service at (617) 736-0300.
- 3. If the connector pins are OK, reinstall. Carefully seat the board, re-boot the Mac and retry the audio pass-through test.
- 4. If you are using the Digidesign Expansion chassis, use the "Expansion ViewTM" application to verify that the card is being recognized by the Expansion chassis as well as the Mac.
- 5. Proceed to software installation to enable futher testing.

Software Verification

Ch	neck off these items:
	Compressed application file copied to hard drive and decompressed
	MIDI Manager placed in System Extensions folder
	MIDI Manager Patchbay placed in the Apple Menu Items folder
	Apple MIDI Driver placed in the System folder (not "nested" in another folder within the System folder)
	Double click on the NuVerb application icon to open; select Create Default Library from the Options menu
	Start your audio source and verify NuVerb is producing reverb

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In general, all you need to run NuVerb is the NuVerb application and MIDI Manager (supplied with NuVerb). Watch out for System folder conflicts. If there is an installation problem, it is probably here.

The application itself is supplied in a compressed form on a floppy disk and must be copied to the Mac hard drive and decompressed to run. The NuVerb icon verifies that the application is present in its decompressed form.

Open NuVerb by double clicking on the application icon. When the application opens, select **Create Default Library** from the **Options** menu. Single click on *Large Hall*, to load the program. If your source of audio is correctly connected and playing, you should hear the *Large Hall* reverb sound. This completes the verification procedure for NuVerb. If you encounter difficulties, check through the items below.

Software Troubleshooting

If the application opens, but you do not hear audio, re-check cables, audio source connections, and the entire signal chain.

If the application does not open, or immediately quits or locks up, refer to the items below. — a System folder conflict is likely.

The System folder must contain certain items for NuVerb to run. Check for the following:

- 1. Verify that the Apple MIDI Driver is present in the top level of the System folder, i.e. not inside another folder inside the System folder.
 - In theory, MIDI Manager will allow the use of multiple MIDI Drivers. However, if there are any other MIDI drivers (Mark of the Unicorn, and Opcode among others provide their own MIDI Manager Drivers), remove them and try running NuVerb with the Apple MIDI Driver provided.
- Verify that MIDI Manager is in the Extensions folder located in the System folder.
 MIDI Manager allows NuVerb to receive MTC (MIDI Time Code). Other applications (such as OMS) use MIDI Manager to send timing information between applications.

Appendix Lexicon

3. Verify that PatchBayTM is placed inside the Apple Menu folder and that it is present in the Apple menu. If you are unfamiliar with MIDI Manager patching, you also place Patchbay $Help^{TM}$ in the Apple menu.

4. Remove all System Extensions, except MIDI Manager, and re-boot. If NuVerb works properly, begin replacing the extensions one at a time, re-booting each time to determine which extensions are in conflict.

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Specifications

AES/EBU Interface

Sample Rates: 44.1 kHz or 48 kHz ±5%
Slave only — All Channel Status and User bits are
passed through; they are neither observed nor modified.
Conforms to both the AES ANSI S 4.40-1985 specification,
and the EBU doc. tech. 3250. Both input and output are
transformer-coupled. Input and output levels and impedance
comply with CCITT V.11 EIA-422A specifications.

Digital Audio Connections

XLR - DB-9, cable provided

Data Resolution

20-bit wide internal data path

Control Interfaces

MIDI

MIDI Manager

Mac NuBus OMS

MIDI Time Code

Power Requirements

+5v @ 1.5A and +12v @ 50mA

+5v+3% (4.90-5.20v) DC

+12v<u>+</u>3% (11.50-12.80v) DC

Line Voltage: 90-140 and 170-270 volts (RMS)

Line Frequency: 47-60 Hz

FCC Rating

Class A

Physical Dimensions

4.0"W x 12.875"L x 0.6"H (Mac NuBus)

Operating Temperature Range

50-95°F (10-35°C)

Specifications subject to change without notice.

Appendix Lexicon

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