Getting Started
With Logic

Contents

An Introduction to Logic

Recent years have seen a revolution in the use of personal computers for creating music.

Music projects that until recently would have required an array of professional studio equipment can now be completed in a home or project studio, using a personal computer and readily available resources. A personal computer with a fast processor and enough RAM can now serve as a workstation for recording, arranging, mixing, and producing complete music projects, which can be played back on the computer, burned on a CD or DVD, or distributed over the Internet.

What Is Logic?

Logic is an integrated system for composing, producing, and scoring music, built specifically for Mac OS X. Musicians can create professional sounding original music compositions, royalty-free soundtracks for Final Cut Pro video projects, and more. Logic allows you to build musical arrangements using MIDI and software instruments alongside audio recordings of acoustic instruments, vocal performances and prerecorded audio files.

You can freely combine and arrange audio and MIDI data in Logic's Arrange window, add professional-quality effects, mix your music in stereo or Surround (Logic Pro), and export the final mix to one or more standard audio file(s) or an audio CD that can be played on any multimedia-equipped computer, home stereo or imported into Final Cut Pro or other applications.

Logic includes the following features, amongst many others:
- Record MIDI information via connected MIDI input devices, such as keyboards, and play back this information via any connected MIDI device or Logic's integrated software instruments.
- Create, arrange, and edit MIDI projects, and print out musical notation via a printer connected to your computer.
- Digitally record acoustic and electric instruments or vocal performances into your projects, and process these audio recordings with Logic's in-built real-time effects.

- Make use of the integrated software instruments, or third-party Audio Unit instruments.
- Load songs or channel strips from Apple's *GarageBand* application, and edit them, making use of the additional processing and editing possibilities afforded by Logic.
- Mix your MIDI and audio tracks, including effects and software-based instrument settings, via a sophisticated total recall mix automation system. Logic includes high-quality effects plug-ins that you can use in your projects. You can also install third-party effects in the Audio Units plug-in format.
- Bounce all audio data, including effects and mix automation settings, to a stereo (or multiple Surround format, in Logic Pro) file(s) for mastering or further processing.
- Work in real time: You can work on Logic songs in real time, adding and editing audio and MIDI parts while the project is playing, and hear the results of your changes immediately.
- Use existing loop libraries: Logic directly supports Apple Loop files, and is compatible with a wide variety of existing audio file types, including those created in ReCycle.
- Locate and preview files easily: The Project Manager (only Logic Pro) and Apple Loop Browser, parts of the Logic interface, provide powerful file browsing and search features, making it easy to locate loops by instrument, genre, mood, or other search criteria.
- Mix Apple Loops recorded at different tempos and keys: Logic automatically matches loops to the project tempo and key, allowing you to freely combine loops from different sources in a single project.

About This Guide

This book is designed to get you up and running with Logic quickly. It is not the final arbiter on all things in Logic, and does not cover all areas of the program in detail.

You will find descriptions of the most essential aspects of Logic's interface, commands, and menus. These descriptions are generally paired with step-by-step instructions for accomplishing specific tasks. We suggest that you follow these instructions, making use of the included Tutorial song. The Tutorial song and this guide will assist you in quickly learning how to handle MIDI and audio information via a series of exercises and examples.

Chapter 1 covers the set-up of Logic. If you are ready to jump right in and start using the application, skip ahead to Chapter 2, "Getting Started With Logic". The following chapters will provide you with a brief introduction to many Logic concepts and facilities.

This guide is not designed to be a complete guide to creating music with your computer. Commonly used technical terms are covered in the Appendixes, as appropriate to their use with the application.

If you wish to learn more about digital audio and the elements of a music project, read Appendix A , "Audio and MIDI Basics,". Appendix B provides information about Audio and MIDI in Mac OS X. Appendix C will guide you through the connection of Logic to a mixer and using Logic as a mixer. Appendix D will help you to optimize your computer for music production.

Additional, more comprehensive information can be found in the reference manuals and in Logic's Online Help system. We recommend that you read the relevant portions of the reference manuals that interest you, in addition to this guide.

The Onscreen Help system—accessible from Logic's Help menu—is fundamentally the reference manuals in electronic form. It has the advantage of being at your fingertips when you need it, and is also searchable.

Even if you're the type who just doesn't like reading manuals, we ask that you read the next section. It will provide you with essential information on the copy protection hardware used by Logic, the XSKey.

Please note that all topics described herein were accurate at the date of printing. For up to date information on changes or additions made after printing, please refer to the *Late Breaking News* on the Logic DVD, and/or to the *Update Info,* included with each Logic update.

Conventions of This Guide…

Before we ask you to load the Tutorial song from the DVD, we'd like to cover the following conventions used in this Guide.

Menu Functions

For functions that can be reached via hierarchical menus, the different menu levels are described as follows: *Menu > Menu entry > Function*.

Important Entries

Some text will be shown as follows:

Important: Information on function or parameter.

These entries discuss a key concept or technical information that should, or must, be followed or taken into account. Please pay special attention to these entries.

Notes

Some sections provide additional information or tips that will assist your use of Logic. These are displayed as shown below:

Note: Information on function or parameter.

Key Commands

Many Logic functions can be activated or accessed with key commands—computer keyboard shortcuts. The key commands mentioned in this guide are based on the standard Key Command Set, assigned by the Logic Setup Assistant. Where possible, we have also included the standard key commands for PowerBook users. These are based on the PowerBook Key Command Set, assigned in the Logic Setup Assistant.

Setting Up Logic

<div style="text-align:right;font-size:3em;font-weight:bold">1</div>

Setting up Logic is easy: When you launch Logic for the first time, the Logic Setup Assistant automatically starts.

The Logic Setup Assistant will guide you through the process of setting up Logic for use with your *installed* audio and MIDI hardware. The following section provides information on MIDI and audio hardware setup. Further to this, the initial settings that can be specified—with the aid of the Logic Setup Assistant—are explained.

MIDI and Audio Connections

Prior to launching Logic for the first time, you will need to set up your MIDI and audio hardware. You should install the drivers of any optional audio interface(s) and your MIDI interface(s) before starting Logic. This will allow Logic to find and use these devices at startup. In order to be usable in Mac OS X, audio interfaces should support the Core Audio API and MIDI interfaces should support the Core MIDI API.

Connecting a MIDI Keyboard

If using a simple MIDI master keyboard, without internal tone generation facilities, you only need to connect the MIDI Out port of the keyboard to a MIDI In port on your MIDI interface—using a MIDI cable.

If using a MIDI keyboard fitted with a USB connector, you don't require a separate MIDI interface as it is already built into the keyboard. Just be sure to install the driver, if needed, and connect the keyboard to your computer with a USB cable.

Note: More detailed information and tips on MIDI can be found in the Appendices of this guide and in the Logic reference.

If you don't have a MIDI keyboard handy, Logic allows you to use the computer keyboard for MIDI note entry. Just press the Caps Lock key to activate this mode, and to display this onscreen keyboard.

Connecting Audio

There are countless optional audio interfaces available, and at least as many ways that they can be set up and used with Logic and external audio gear. Given the differing requirements and working methods of people across the world, there is no one size fits all solution for connecting an audio interface.

Note: Tips on setting up Logic with an audio interface and external mixer can be found in the Appendices of this guide, and in the Logic reference.

In the simplest scenario, you would use the internal audio interface of your computer for monitoring and recording audio. In order to avoid sending audio to the built-in speaker, you should connect the audio out of the computer to a hi-fi system, external amplifier or a mixer. You will require an appropriate cable to do so. Such cables can be obtained from your local music or electronics shop.

The computer is equipped with a 3.5 mm stereo jack connector for audio output, so you'll need a cable with a 3.5 mm stereo jack plug at one end and plugs that fit your hi-fi system, your amp or your mixer inputs at the other end. Connections on most hi-fi systems are Cinch (RCA) plugs. Most mixers are equipped with either Cinch or 6.3 mm Jack (phono or 1/4 inch) plugs.

Note: The Appendices contain further information on Mac OS X audio options, driver-specific options and related Logic parameters.

The Logic Setup Assistant

Note: As a tip, we recommend that you write down the MIDI input and output connections of all of your MIDI devices before launching Logic/the Logic Setup Assistant for the first time.

You can start Logic by double-clicking on the Logic icon in the *Applications* folder.

The first time Logic is launched, the Logic Setup Assistant will run. It will guide you through the process of setting up Logic for use with your *installed* audio and MIDI hardware.

There is little point in describing each page, as the Logic Setup Assistant is extremely easy to use. Simply follow the onscreen prompts, and select the desired options via the sliders, checkboxes, and pull-down menus.

You will be asked to…

- select the audio interface that you would like to use with Logic,
- determine the number of channels (tracks, busses, instruments, inputs, and outputs) you'd like to have in your mixer,
- define the inputs that you will usually use for recording your audio tracks,
- choose the initial Key Command Set for your keyboard (you can also import your key commands from the Logic 6 preferences file),
- select the monitors you wish to use with Logic,
- add all connected MIDI devices.

Once you have completed the Logic Setup Assistant steps, relaunch Logic. The default song features nine useful Screensets and also contains the MIDI devices that you set up in the Logic Setup Assistant, allowing you to begin using the software immediately!

Note: Don't worry if you're not sure about some of these options (we'll discuss many of these terms shortly). Your decisions aren't forever here, and you can change all settings later, if you wish. You may start the Logic Setup Assistant several times via *Logic > Preferences > Start Logic Setup Assistant* to create differently configured songs as starting points for your work with Logic.

Templates

Logic offers a number of song templates. These templates serve as a starting point in different recording situations, each of which has special requirements. As an example, if you want to use Logic to record real instruments, you can open a recording template, that is customized to meet the needs of a recording project. Use of templates can save a great deal of time.

To open a template:
1 Choose *File > New* in Logic's main menu bar.

2   Check the *Use song template* option in the dialog that appears.

3   Select the desired template from the Template pull-down menu.

Logic also allows you to save your own songs as templates:

▪ Simply choose *File > Save as Template* and type the desired song name in the Name field.

Note: Please take a look at the supplied templates. They might provide you with some ideas on possible Logic song customizations that will best meet your needs for future projects.

Autoload Song

Logic allows you to define one template that is automatically loaded each time Logic is booted. This template is called the Autoload Song.

To create your personal Autoload Song:

1   Customize a song to meet your requirements (more on this is discussed in the following chapters).

2   Choose *File > Save As Template* in Logic's main menu bar.

3   Ensure that the Song Templates folder is selected in the dialog box that launches.

4   Type "Autoload" into the Name field.

Your Autoload Song will be opened automatically the next time you launch Logic.

Getting Started With Logic 2

This chapter provides a basic overview of Logic's main working window and the tools that are used for data interaction and editing.

Before beginning, we'd like to briefly cover what Logic will bring to your computer.

What Is Logic?

Logic incorporates the functionality normally found in an entire professional audio production studio. All within an intuitive user interface, and all within your computer. It is an integrated system for composing and producing music. With Logic, you can:

- Record MIDI information via connected MIDI input devices, such as keyboards, and play back this information via any connected MIDI device or Logic's integrated software instruments.
- Create, arrange, and edit MIDI songs, and print out musical notation via a printer connected to your computer.
- Digitally record acoustic and electric instruments or vocal performances into your songs, and process these audio recordings with Logic's in-built real-time effects.
- Make use of the integrated software instruments, including; Sculpture, Ultrabeat, ES1, ES2, EVP88, EVB3, EVD6, and EXS24, or add third-party Audio Unit instruments to Logic.
- Load songs or Channel Strip settings from Apple's *GarageBand* application, and edit them, making use of the additional processing and editing possibilities afforded by Logic.
- Mix your MIDI and audio tracks, including effects and software-based instrument settings, via a sophisticated total recall mix automation system.
- Bounce all audio data, including effects and mix automation settings, to a stereo (or multiple Surround format) file(s) for mastering or further processing.

Loading and Starting the Tutorial Song

Copy the "Tutorial" song file and "Tutorial ƒ" folder from the Logic DVD to your hard disk, if you haven't already done so.

To open the Tutorial song:

1 Launch Logic.

2 Choose *File > Open*. The Open dialog appears.

3 Choose the *Logic Songs* item in the *Open File Type* pop-up menu, to ensure that only Logic Songs appear in the file selector.

4 Browse to the location of the Tutorial song, select it, and press the Open button. Alternately, you double-click on the Tutorial song icon (in the file selector of the Open dialog, or in the Finder).

To navigate through the Tutorial song:

1 Simply press Return or Enter on the numeric keypad of your computer keyboard, to play the song.

2 To stop the song, press 0 on the numeric keypad; on PowerBooks, use the Return key.

3 To return to the beginning of the song, push the 0 key again.

Note: Alternatively, you can use the Space bar to toggle Start and Stop operations.

Getting to Know Logic's Arrange Window

The Tutorial song is compact and only contains a small arrangement fragment. It is principally intended to introduce you to some important elements of Logic. After loading the Tutorial song, you will see the following onscreen:
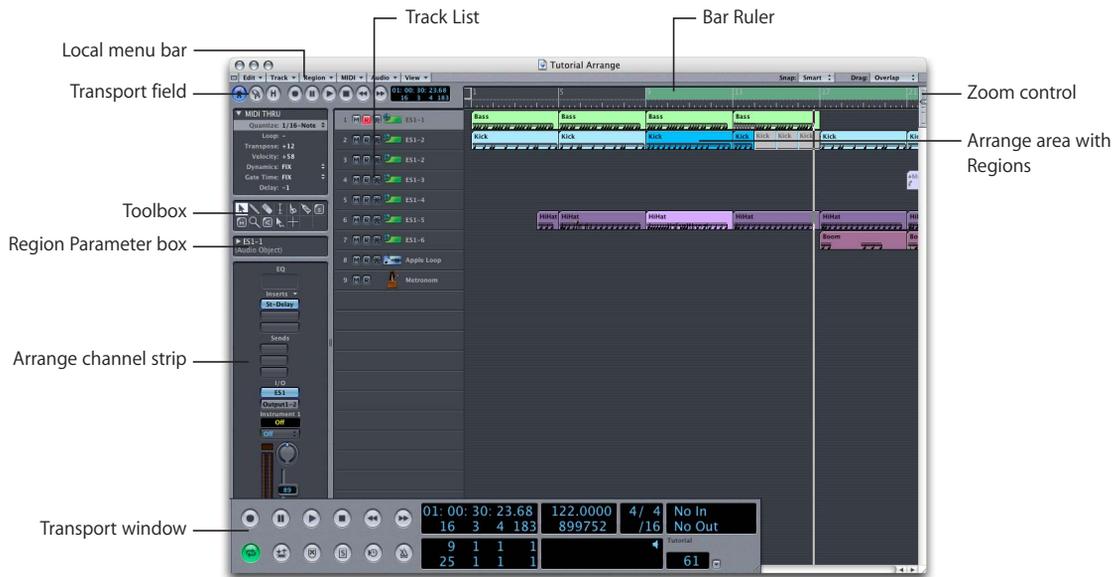
Transport Field

This is where you control the operation of Logic. You can start and stop playback, turn on Cycle (a cycle is a looped portion of the song), set drop in/out points for recording, adjust synchronization settings, and adjust several other options. This field can be shown/hidden via the *View > Transport* menu option.

Local Menu Bar

Given Logic's extensive range of functions, it would be impractical to display all of them in the main menu bar. Therefore all many Logic windows provide a local menu bar, ensuring that only relevant functions are available in each window.

Bar Ruler

The *Bar Ruler* displays Logic's time axis. Here, you can set the Cycle area graphically with the mouse (in our Tutorial song the Cycle area runs from bar 9 to bar 25), set markers, or jump to any desired song position by clicking in the lower part of the ruler.

Arrange Area with Regions
This is the workspace when arranging with Logic. It may contain MIDI and/or audio tracks with any number of MIDI or Audio Regions, respectively. MIDI Regions contain notes and controllers, used for playing MIDI and software-based instruments. Audio Regions are pointers to underlying audio files that are played back from the hard disk of your computer.

Zoom Control
Dragging the *Zoom control's sliders* allows you to alter the horizontal and vertical magnification factor of the active window's contents, and adapt them to your screen resolution.

Transport Window
The *Transport window* performs the same functions as the Transport Field, but can be located anywhere onscreen, and is variable in size and content. The slider enables quick jumps to any song position.

Track List
Is where you determine the destination for each track, swap, insert, or delete tracks.

Toolbox
The tools contained in this box enable you to edit Regions, notes or other data in a variety of ways.

Region Parameter Box
The *Region Parameter box* is where various aspects of MIDI Region or Audio Region playback can be adjusted. The parameters available in the box will change, dependent on the current selection. As an example, where one or more MIDI Region(s) or Audio Region(s) have been selected.

Arrange Channel Strip
The channel strip of the selected track is displayed, and can be adjusted.

As you can see, the Arrange window is divided into three basic areas—from left to right. These are: the Parameters area, the Track List and the Arrange area. Above the Arrange area, you'll find the Bar Ruler.

While reading the information in this section, you'll learn how these various areas interact with each other, and will also discover how similar the handling of both MIDI Regions and Audio Regions is in Logic.

Tracks and Regions

Logic works on the basis of tracks, much like a multitrack tape machine. You can see and access these tracks in the Arrange window's Track List—shown below.
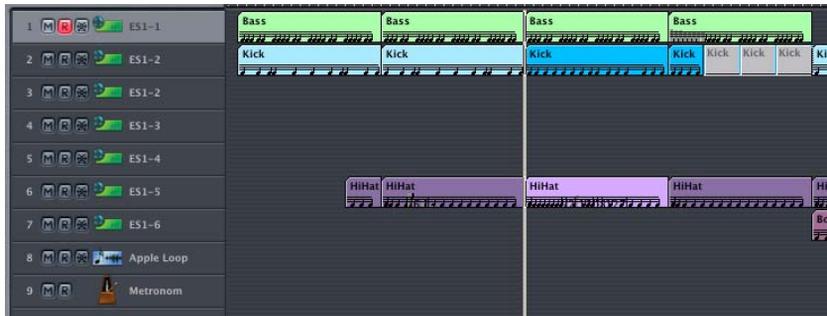
Narrow rectangles known as MIDI Regions or Audio Regions appear in the *Arrange area*—horizontally aligned with the tracks listed in the Track List. An Audio Region represents an underlying audio *file*. A MIDI Region represents an individual recording, or *take* of MIDI data. Each time you record, a MIDI Region or Audio Region will be created on the selected track.

You can consider the MIDI Region a container for the actual MIDI data. This data can include—either individually or in combination—note events, control data, program changes, or even SysEx data for your MIDI tone generators or the integrated tone generators in Logic. To explain:

• Note data is derived from the notes played on your MIDI keyboard. It includes information about the time (bar/beat position) the note was played, how long the note was held and the velocity at which (how fast) the key was struck.
• Controller data (continuous controllers) includes volume and pan position settings and changes, plus any other controllers that you may use, and that your synthesizer responds to.
• Program changes allow you to select different sounds (or patches) from your MIDI synthesizer or module.
• SysEx (short for System Exclusive) is a part of the MIDI language that can be used to store the entire memory of your MIDI devices, amongst other things.

Note that one of the tracks in the list is always highlighted. A *selected* MIDI track is automatically *armed* for recording—indicated by the red *Record Enable* button.

Any MIDI input received by Logic, when in record mode, will be recorded to this track. This recording will then appear as a MIDI Region in the Arrange area.

The illuminated *M* on a track indicates that all Regions on the track are muted—all Regions aligned horizontally on this track are silent. Muting/unmuting of MIDI or audio tracks is achieved by clicking the Mute button on each track in the Track List, or by use of the *Mute Track* key command (Control-M) on a *selected* track. Give both a try.

The orange indicator you see to the left of a track is a level/activity meter. Such meters appear on all active tracks, and are useful aids for keeping an eye on what tracks contain Regions that are *currently playing,* and their relative levels.

Recording on *audio* tracks is a little different to that of MIDI tracks. Audio tracks must first be armed, which is achieved by clicking on the *Record Enable* button on the desired track. Once armed, pressing the *Record* button on the Transport Bar (or the *Record* key command, default *, on PowerBooks #) will start recording audio data to the selected track.

Before any audio can be recorded, you must first set a recording path and file name—a location on your computer's hard disk, and a name for your recorded audio files. We'll take a closer look at this in the "Making Your Own Audio Recordings" section on page 62.

Reorganizing Your Tracks

You may want to reorganize your tracks to keep things neat onscreen, or to group audio tracks or particular instruments together.

To reorganize your tracks:
1 Move your mouse pointer over the *number* of the track you wish to move.

2 When the appearance of the mouse pointer changes to a hand icon, click-hold the track.

3 With the mouse button held down, drag the track up or down the Track List to the desired location, then release the mouse button. This will change your track order, and will also move all of the Regions associated (aligned) with the track in the Arrange area.

The Arrange Area
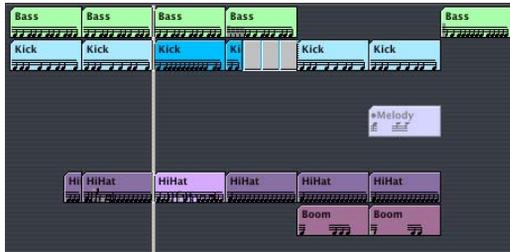
The large gray area next to the Track List is the *Arrange area*. This is where your Regions are arranged into a song. You can freely drag and drop your Regions from position to position, make loops, copies, and more.

Audio and MIDI data can be recorded directly into the Arrange area, as mentioned earlier. You can add Audio Regions—in AIFF, WAV, SDII, MP3, ReCycle, or Apple Loops formats—directly to the Arrange area by dragging and dropping audio *files* from any folder on your hard disk.

Above the Arrange area, you'll see the *Bar Ruler*. This is used for a number of functions performed in the Arrange area, including song navigation. Much of the Bar Ruler's functionality is tied to the Transport window, which we will discuss in the next chapter.

Just above the Bar Ruler—to the top right of the window—you'll see the *Drag* and *Snap* (only Logic Pro) pull-down menus. These affect how Regions behave when edited or moved. More information can be found in the Logic reference and Onscreen Help.

Parameters Area

There are three boxes in the Parameters area to the left of the Arrange area. They are, from top to bottom, the Region parameters, the Toolbox and the Track/Instrument parameters. You'll also see the Arrange window's channel strip—a mixer fader for the selected track.

Region Parameters

This Parameter box is directly related to the Regions which appear as rectangles in the *Arrange area* to the right of the *Track List*. When either a MIDI or Audio Region is selected—by clicking *once* on it with the mouse—this Parameter box will update to reflect the parameters assigned to that particular Region. Give it a try on several Regions, and pay attention to the changes that occur in the *Region Parameter box*.

Each Region in the *Arrange area* may have its own parameter settings, allowing independent transposition, quantization, and more. The parameters available for MIDI and Audio Regions are different. The reasons for these parameter differences are due to the very nature of MIDI and audio. Audio Regions don't offer a transposition parameter, for example.

Note: An exception to this rule are Apple Loops, used in Apple's *GarageBand* application. These special audio files can be transposed, and also allow for tempo changes without alteration of their pitch.

To change a parameter value, simply click-hold to the extreme right of the Region Parameter box—alongside the desired entry. This will open a pull-down menu for some parameters, and for others will change the cursor to act as a slider. Drag the mouse on the vertical axis (up and down) to change the value of these parameters. Please select a Region, and give this a try for each parameter—to familiarize yourself with the methods used to interact with each of them.

Some Extra Tips

- In the Region Parameter box of a MIDI Region, the *Transpose, Dynamics, Gate Time,* and *Delay* functions have a couple of *click zones* to the right of the text. If you click to the extreme right of the box, you will be able to increment/decrement values in individual steps. If you click about a half centimeter in from the right hand edge of the box beside the *Delay* parameter, a pull-down menu of mathematical variables will be displayed—1/8th, 1/16th and so on—allowing you to select one, if appropriate to the task at hand. Why not give it a try?
- On a program-wide level. Double-clicking on numerical values in almost all Parameter boxes, editors, on the Transport Bar and so on will allow you to directly type in a value. This method of direct numerical entry can be used for quantizing, program changes, many effects parameters, and more, thereby accelerating your workflow. To make use of this facility, double-click on the numerical values within the various parameter fields, and use your computer keyboard to type in a new value, followed by the Return key. Once again, give it a try.

Important: It should be noted that the Region parameters are available as real-time processes, meaning that changing these parameter values—*Quantize, Transpose,* and so on—can occur while Logic is running. These processes occur on *playback* and do not actually alter the underlying MIDI or audio data. To undo any changes, simply select the target MIDI or Audio Region, and change the parameters back to their former settings using the techniques described above.

The Toolbox

Key to selecting, and altering, MIDI and audio information in the Arrange window and Logic's other editing windows is the *Toolbox.* This contains a *Pointer (Arrow), Pencil, Eraser, Scissor,* and *Glue* tools (plus others) that allow you to select, draw, delete, cut, merge, copy, paste, and crossfade (Audio Regions only) Regions. There is also an *Automation* tool.

The Toolbox is context-sensitive. This means that different tools will appear for particular tasks in the various individual edit windows. As an example, there is no *Crossfade* tool in the Score window as audio is not handled in this editor. There is, however, a *Voice Separation* tool in the Score window, which would be of no use in the Arrange window, for example.

You can change the currently active tool by clicking on the appropriate tool in the Toolbox. The mouse pointer will adopt the shape of the selected tool, making it simple to know what function is currently assigned to the mouse by looking at the cursor. The *Eraser* is used for deleting, the *Scissors* for cutting and the *Glue* tool for merging Regions.

You can also select a second tool for use via a Command-mouse click. This second tool is available when the Command key is pressed while editing Regions. You can assign the right mouse button (if using a three-button mouse) to a third tool, allowing the use of three assignable tools:

- left-click
- Command-click
- right-click

When you want to select any of the tools, you can also press the Esc key on your computer keyboard. The Toolbox will float at the location your mouse pointer currently occupies onscreen. When the floating Toolbox appears, simply select the appropriate tool with your mouse cursor. As usual, try it out.

If a Toolbox is opened at the mouse position (Key Command: *Show Tools*, Default: Esc) you can also use a numerical key to choose a tool. Tools are numbered from the top left to the bottom right.

To select a tool numerically:

1 Press the Esc key.

2 Press any of the 1 to 9 keys to assign a tool to the (left) mouse button—the number 2 will select the *Pencil* tool, the number 3 will select the *Eraser* tool, the number 5 will select the *Scissors* tool and so on. Note that this functionality is limited to the first nine tools available in any Toolbox.

3 To undo your tool selection, press the Esc key again, switch to the *Pointer* tool, and close the Toolbox.

Effective Range of the Tools

- Tools are only effective in the working area of the editing window in which they were selected. Individual tools can be defined for each open window.
- A tool basically affects the Region you click on. If multiple Regions are selected, the tool will operate on all of them.

About the Tools

There are additional tools to those outlined below, found in specific editing windows. The following are the primary tools used in song construction and editing. The window-specific tools are discussed in the Logic reference, in conjunction with topics and examples covering their use.

Pointer

The *Pointer* is the default tool. The mouse cursor also takes on this shape outside the working area when you are selecting from a menu or entering a value. Within the working (active) area, the Pointer is used for:
• selecting (by clicking on Regions).
• moving (by click-holding and dragging).
• copying (by holding down the Option key and dragging).
• editing lengths (by click-holding the bottom right or left corner, and dragging).
• click-holding and dragging anywhere on the window's background allows you to "rubber-band select" multiple Regions.

Pencil

The *Pencil* is used to add new Regions. You can also select, drag, and alter the length of Regions with this tool.

Eraser

The *Eraser* deletes Regions. This is done by clicking on them once. When you click on a selected Region, all other currently selected Regions are also deleted (as if you had used the Backspace/Delete key).

Text Tool

The *Text* tool is used to name Regions and Environment Objects or to add text to a musical score.

Scissors

The *Scissors* are used to split Regions—before copying or moving individual sections, for example.

Glue Tool

The *Glue* tool performs the reverse action of the Scissors tool: all selected Regions are merged into a single Region, which is given the name and track position of the first Region on the time axis.

Solo Tool

Click-holding with the *Solo* tool allows you to isolate and listen to selected Regions. This function works during playback or when the sequencer is stopped. Soloed Regions are outlined in yellow.

Mute Tool

Clicking on a Region with the *Mute* tool prevents it from playing. A bullet is placed in front of the Region's name, to indicate that it is muted. The background of the Region will also change to a more subtle shading of the Region color, and will display a number of diagonal lines (if the *Muted Regions are textured* parameter is active—see below), making it easier to recognize in an arrangement. You can unmute the Region by clicking on it again with the tool. If multiple Regions are selected, the mute tool will affect them all.

Note: The "Melody" MIDI Region on the *ES1-3* track of the Tutorial song is muted. If you click on this MIDI Region with the Mute tool, the bullet and the background shading will disappear, and the melody can be heard.

Note: You may also wish to activate the *Muted Regions are textured* parameter in the *Logic > Preferences > Display > Arrange* preferences, to further highlight muted Regions. This is particularly useful on gray (non-colored) Regions.

Magnifying Glass

The *Magnifying Glass* allows you to zoom in on a section by rubber-band selecting it, right up to the maximum possible window size. To revert to a non-zoomed view, click on the background of the active window with the *Magnifying Glass* tool.

Crossfade Tool

In the Arrange window, the *Crossfade* tool allows you to simply click-hold and drag across the section where two Audio Regions meet. A crossfade will automatically be created between the Audio Regions.

Velocity Tool

In the Matrix and Score editors, you can use the *Velocity* tool to change the velocity of notes. To do so, click-hold on the desired notes and move your mouse vertically. Moving up increases velocity, and down, decreases velocity.

Automation Tool

When editing mixer automation data, this tool has various functions which are dependent on the setting shown in the pull-down menu just below the Toolbox.

Note: *View > Track Automation* must be active for this pull-down menu to be visible.

The two pull-down menu options are *Curve* and *Select*.

- Curve—You can bend the line between two nodes or any selection. There are four different curve types available: convex, concave, and two different types of S-curves.
- Select—You can rubber band select any lines and/or nodes in the Automation track. If *the Region* is clicked once, all currently visible automation events that fall within the Region borders will be selected. Once a selection has been made, you can freely adjust the Automation data levels, copy, move them, and so on.

Note: The Automation Tool is only available in Logic Pro, not in Logic Express.

Marquee Tool

In the Arrange window, you can use the *Marquee* tool (looks like a crosshair, or plus sign) to select a portion of an individual Region, or a horizontal selection of multiple Regions. To use the Marquee tool, select it from the Toolbox and drag from left to right across the desired Regions. As you do so, you will see a Marquee box (shaded area) appear onscreen, indicating the range of the Marquee selection. All data that falls within the Marquee area will be affected by parameter changes or functions.

Note: Obviously, some parameters are only relevant to either Audio Regions or MIDI Regions. If such parameter changes are applied when both Audio Regions and MIDI Regions are selected, there will be no change with one type of data, while the desired change is made to the selection. As an example, if a portion of an Audio Region and MIDI Region are selected, and the *Transpose* parameter is used, only the MIDI Region will be affected.

The Track/Instrument Parameters

The parameters in this area are linked to the Track List. They vary in accordance with the type of track selected (audio, Audio Instrument, MIDI, and so on) and affect all Regions on this track.

Note: Track type is determined by the Audio Object it is assigned to. The parameters of a track or instrument simply mirror the parameters of the corresponding Audio Object. Given this relationship, the Parameter box below the Toolbox to the left of the Arrange window, is known as the Object Parameter box.

The Object Parameter box (Instrument Parameter box) will update each time a new track is selected in the Track List. Please select a few tracks in the Track List with the mouse, or by using the up/down arrow keys on your computer keyboard. While doing so, watch the changes in the Object Parameter box.

The Channel Strip of the Selected Track

At the lower left border of the Arrange window, a mixer channel strip is displayed. This channel strip corresponds to the selected track in the Arrange window's Track List.

If the lower portion of the channel is obscured, you can click on the small arrowheads at the top left of the Region and Object Parameter boxes to collapse one, or both, of these panels. This will allow you view the entire channel strip.

The *Arrange channel strip* is identical to the channel strips found in the Track Mixer and Environment windows. Changes made in any of these windows/mixers will instantly be reflected on their counterparts in other windows.

Note: The advantage of having the channel strip accessible from the Arrange window is that it saves a visit to another window in order to make a quick adjustment to a sound. It also allows you to insert plug-ins and instruments and change routings directly from the Arrange window, thus saving you time.

Key Commands

You can activate most of Logic's functions via key commands. A key command is a computer keyboard shortcut for a function or task in Logic. A number of functions are *only* available as key commands. The Key Commands window is used for the assignment of key commands to your computer's keyboard. The use of key commands allows you to customize Logic to suit your own working style, and will speed up your use of the program.

Your personal key commands are stored (along with settings made in the Preferences window) in ~/Library/Preferences/com.apple.Logic ("~" denotes the path to your user folder: hard disk/users/username/, for example).

Key Commands Window

The Key Commands window can be opened via the *Logic > Preferences > Key Commands* menu option or with the Option-K key command—give it a try!
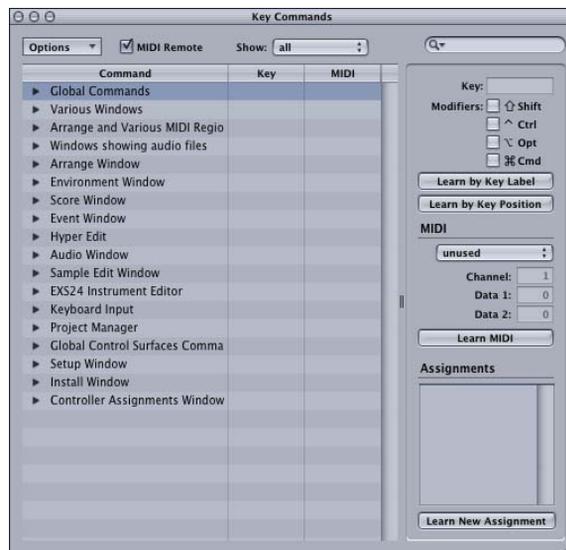
The *list* of key commands (arranged in groups) appears to the left of the window, and the *Properties Box* is to the right.

In the List shown to the left of the Key Command window, the following applies:
- Groups can be extended or collapsed by clicking on the arrow to the left.
- When the list has keyboard focus, physically pressing a key command (or key command combination) selects the appropriate key command.
- If the triggered key command is located in a collapsed group, the group will automatically be expanded.

To assign a function to a key:

1 Click on the *Learn by Key Label* button.

2 Select the desired function in the list by clicking once on it with the mouse.

3 Press the desired key on your computer keyboard, plus any modifier key(s)—Command, Shift, Control, and Option—that you wish to use as part of the key command.

4 To create further key commands, repeat steps 2 and 3.

5 Deactivate the *Learn by Key Label* button!

To delete key command assignments:

1 Click on the *Learn by Key Label* button.

2 Use the mouse to select the function with a key assignment that you wish to delete.

3 Press Backspace.

4 To erase more assignments, repeat the second and third steps.

5 Deactivate the *Learn by Key Label* button.

To check the function of a key:

1 Deactivate the *Learn by Key Label* button.

2 Press the key command (or combination of keys) that you want to check. The associated function will be highlighted, and displayed in the middle of the window.

Special Keys

Some keys have special functions:

• The Control, Command, Shift, and Option modifier keys can only be used in conjunction with other keys.
• The Backspace key has the fixed *Delete selected Objects* function. It can only be assigned to another function in conjunction with the modifier keys.

The Plus and Minus keys increase or decrease any selected parameter value in single units. They can, however, be assigned different functions which override this default behavior.

Controlling Windows — Screensets

Every song created in Logic can have up to 90 Screensets. Screensets are window combinations that can be customized by you, and stored to a specific numeric key/combination of keys on your computer keyboard. To recall a Screenset, you simply need to press the appropriate key or key combination. Each Screenset remembers the type of edit or Arrange window(s) opened plus their individual size, position, and zoom settings. This facility accelerates your workflow massively, and allows you to tailor Logic to fit your needs and tastes.

To set up a Screenset:

1 Press any of the numeric keys above your computer keyboard (you can also use a numeric keypad, if using a PowerBook or iBook).

2 Open the desired windows by selecting them from the Windows menu, or by using the appropriate Key Commands.

3 Resize, zoom, and reposition your selected windows to meet your needs. Resizing and repositioning of windows is as per any Macintosh application. Zooming of individual windows is achieved with the Zoom sliders.

4 Press the numeric key again.

Note: This will only work for keys/Screensets 1 to 9.

To set up more than nine Screensets:

▪ Press Control while typing in the desired numeric key combination.

Important: You can *not* use the number *0* for any of your Screenset combinations. The reason is that number 0 is assigned for the Transport Bar *Play* function, using the computer's keyboard.

To lock Screensets:

▪ If you want to ensure that your Screensets remain as you intended, you should always lock your Screensets by pressing Shift-L. The lock also includes zoom settings, catch mode and the visible area.

Navigating the Song

In this chapter, you will learn how to move to different parts of the song, start and limit passages, and to isolate and audition specific portions and components within the song.

In short, you'll learn how to navigate through the song. As you're reading, follow the steps and try out the functions. You can't break anything.

Please load the Tutorial song, if you haven't already done so.

The Transport Window

The second, smaller window—displayed after loading the song—is the floating Transport window. It is laid out like the control surface of a tape machine, with the top row of buttons used for operating the *Record, Pause, Play, Stop, Rewind,* and *Forward* functions. In addition, you can use the Transport window for operations such as *Solo*, *Synchronization* or *Cycle,* which we'll cover shortly.
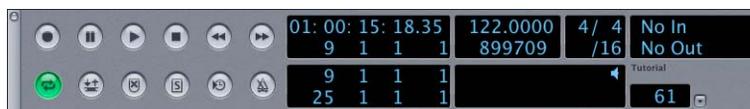
You can start the song by clicking on the *Play* button (see picture below) on the Transport bar, or by pressing Enter on your numeric keypad.

Try out the buttons in the upper row of the Transport bar. You should be pretty familiar with them as they are identical to the functions found on tape machines and cassette recorders.

Here's an overview of the Transport window elements:

Note: Clicking on the downwards pointing arrow beside the *Song End* box will open a menu of Transport bar display options, which allow you to customize the appearance of the Transport bar to meet your requirements. We suggest that you select the *Legend* menu option, which will turn on the function titles, as shown in the image above, while learning Logic.

- The *SMPTE/Bar Position* area indicates the current bar number occupied by the Song Position Line (more on this in the next section). In the figure above, the display shows 1 3 2 181, which means: first bar, third beat, second 16th, and 181st clock pulse. The time position, 01:00:01:05:38 means—1 hours, 0 minutes, 1 seconds, 5 milliseconds/38 frames.
- The lower two sets of numbers, from top to bottom, are the left and right *Locators*, used for setting cycle area points, which will be discussed shortly.
- The *Tempo* display indicates the tempo accurate to 1/10,000th of a Beat Per Minute.
- Beneath the Tempo, the maximum number of MIDI events that it would be possible to record on this particular computer is indicated.
- The /16 below the *Time Signature* of 4/4 indicates the *Format* of the note and bar display, so that any edits performed on your MIDI or audio data can be carried out with more precision. The /16 refers to the number of divisions in the bar.
- The *MIDI Activity* display shows all MIDI input and output and also serves as a *Panic* button. If you have hung notes, you can click once in the MIDI Activity Window to send a MIDI reset message, or double-click to send a Full Panic Reset which systematically works through all MIDI channels and ports and resets all connected MIDI devices. This guarantees absolute silence.
- The *Song End* box displays the bar number that the song will end at, and sets a maximum song length. By default this is set to 201 bars.

Note: You can resize the Transport window by dragging the lower right corner to the left or right.

Transport Key Commands
By default, there are several key commands assigned to the transport functions. They are assigned to the numeric keypad of your computer keyboard. See the following chart for these commands, and try to remember and use them while working through the guide.

Key	Command	PowerBook Key
0	Stop (if stopped: Return to Zero)	Return
Enter	Play (if playing: play again)	Enter
*	Record (if recording: record again)	Backslash
,	Pause (toggle)	Shift-Return
Space bar	Play/Stop (toggle)	Space bar
/	Cycle (toggle)	/

Moving to Different Song Positions

There are several ways to "jump" to specific song positions. At the top of the Arrange window, you can see the Bar Ruler.

- Click at various spots in the lower half of this ruler and you'll immediately jump to that position. As you click, a vertical light gray line will appear in the Arrange area aligned with the point selected on the Bar/Beat Ruler. This is the *Song Position Line* (SPL).
- Engage *Play* via the Transport bar or by pressing Enter.
- Now click on the Bar/Beat Ruler, and hold down the mouse button. Take note of the SPL, which moves to align itself with the mouse position in the Bar/Beat Ruler. You can move to any position in the Bar/Beat Ruler, and hear different sections of your song instantly, by moving the SPL in this way. *Play must* be engaged for this live auditioning (hearing the music or audio) to occur.

If you would like to jump directly to a specific position when the sequencer is not in Play mode (press the *Stop* button now, if Logic is presently running), you can also take advantage of Logic's *Locators*. To the right of the Transport buttons, the current song position—in both absolute time (that's hours, minutes, seconds, in plain language) and as musical measures (bars/beats/sub-beats)—is displayed.
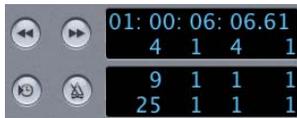
- Click-hold on the *Song Position* indicator, and drag the mouse on the vertical axis (up and down) until the song position displays 17 1 1 1, and start playback—you know the key command. Logic will begin playing at measure 17. Take note of the SPL as you're doing so.
- Another way of doing the same thing is to double-click on the current *Song Position* locator on the Transport Bar. This will open a numeric entry dialog box, where you can directly type in *17.* Give it a try.

If you need to enter sub-divisions of the bar, seperate each number with a space or colon. As an example, 17 3 2 1 (don't forget the Space between each numeric entry), which translates to bar 17, beat 3, sub-beat 2, clock tick 1.

Note: The resolution of the sub-beat is determined by the *Format* value, set in the Transport window (see page 31).

Display Current Song Position

If you manually enter and jump to positions, the song overview displayed can, on occasion, not correspond to what you hear.

To ensure that the current song position is always displayed:

▪ Activate the *Catch* button (see picture below) found to the upper left of the Arrange window. The song overview will update to follow the SPL.

This facility ensures that when the SPL exits the visible portion of the song overview, the display will update to follow it. In general, Catch mode should be activated while using the program.

Note: Please remember that you can always use the two *Zoom controls* to change the horizontal and the vertical zoom ratios as you like, allowing you to see more of your arrangement.

Cycle Mode

In Cycle mode, you can endlessly repeat a section of the song as long as *Play* is engaged. This is useful for editing Regions "live"—as the song is playing—or for recording new tracks to a specific section of the song. Two *Locators* can be used for setting *cycles*. These are position markers that define the left and right boundaries of a song segment. They are found directly to the right of the *bottom row* of the Transport window's control buttons.

To activate Logic's Cycle functions:

▪ Turn on Cycle mode by clicking on the *Cycle* button in the Transport window or by pressing the Cycle key command. When active, the *Cycle* button will turn green.

This visual representation of the cycle (the highlighted section) can be interacted with directly in the Bar/Beat Ruler.

You can adjust it in the following ways:

- Move it by grabbing it in the middle, and dragging your mouse to the left or right.
- You can also change the area borders by grabbing either the bottom left or right corners of the highlighted section on the Bar/Beat Ruler, and moving the mouse left or right.
- By clicking anywhere in the upper part of the Bar/Beat Ruler, the cycle can be deactivated. Another click reactivates it.

Press *Play* and allow the area to cycle over the selected song section. You can even resize the cycle while it is playing, using the technique mentioned above. When Cycle mode is engaged, pressing *Stop* twice will move the SPL to the beginning of the cycle, rather than the beginning of the song, which is its default behavior. Give it a try.

Selecting and Soloing

In order to edit *any* data type in Logic—be it notes, MIDI or Audio Regions—you first need to select them. All functions and operations will only affect items that are *selected*. We will demonstrate this with the *Solo* function:

To solo a Region:

1 Turn on the Solo function by clicking on the *Solo* button in the Transport Bar, or by pressing the *S* key. The *Solo* button and the Bar/Beat Ruler at the top of the Arrange window will turn yellow.

2 Extend the cycle boundaries from bar 9 through 13, and enable Cycle mode. We will be working with the MIDI Regions between these bars.

3 Start playback, and click once on the "Kick" MIDI Region to highlight it. A black bar at the top of the MIDI Region indicates that it is selected. You will hear the kick drum part in isolation, because when *Solo* is active, only selected MIDI Regions will play.

4 Click on the other MIDI Regions in the cycled section, one at a time, to solo them.

You can also solo several *selected* MIDI Regions:

1 Select the "Kick" MIDI Region again.

2 Hold the Shift key down, and click on the "Bass" MIDI Region. This will also be selected and played.

3 While still pressing the Shift button, click just below the "HiHat" MIDI Region, and keep the mouse button depressed. Now, drag a lasso over *all* of the MIDI Regions in the cycled section. Your previous selection will now be reversed, and you will hear the remaining HiHat MIDI Region.

Try out the selection functions with other MIDI Regions, individually and grouped (using the Shift key), if you'd like more practice.

Oh … and congratulations are in order!

You've just mastered the most essential of Logic's techniques—the selection of MIDI Regions, notes, Audio Regions … you name it!

Editing Regions

<div style="text-align: right; font-size: xx-large;">4</div>

In this chapter, you will learn how to edit Regions with Logic's tools. We will also introduce you to Logic's Loop function and the Loop Browser.

Try everything described below with the Tutorial song Regions. Should something unexpected happen while you're experimenting, you can easily restore the song to it's original state by reloading it. Simply select *File > Revert to Saved* from the main menu bar to do so.

Resizing Regions

In the Arrange window, the *Pointer* tool can be used to resize each Region.

To change the length of a MIDI Region in the Tutorial song:

1   Choose the *Pointer* in the Toolbox.

2   Move the Pointer over the bottom left or right hand corner of a MIDI Region.

3   When the cursor turns into two small arrows/a hand with an upwards pointing finger (left/right corner of the MIDI Region) you can resize the MIDI Region, thereby changing its length. You can do this while Logic is in Play (or Record) mode, or stopped.

Note: When adjusting the length of Audio Regions, dragging (to the right) from the bottom left hand corner will also move the *Anchor* point. The *Anchor* is the start point of the audio file that the Region is based on. Dragging from the right hand corner to the left will simply shorten the Audio Region. No Audio Region can be longer than the underlying audio file that it is based on.

Moving Regions

In the Arrange window, the *Pointer* tool can be used to move Regions onto other tracks, or to other positions.

To move a Region in the Tutorial song:

1 Choose the *Pointer* in the Toolbox.

2 Position the cursor over the middle area of a Region. When it changes to a hand with five outstretched fingers (see figure below), click once, hold the mouse button, and drag the Region to the desired position.

To move multiple Regions simultaneously:

1 Click-hold the mouse button, and rubber-band select the "HiHat" and "Boom" MIDI Regions: (near the end of the arrangement).

2 Once all are highlighted, grab and drag them four measures (bars) to the right. Make use of the position display on the help tag (shown during this operation) as your reference. It should read 25 1 1 1 when you release the mouse button.

Important: You should *always* refer to the help tags appearing when carrying out any of the following operations in Logic: move, copy or cut/divide. This will help you when editing and arranging, and can aid in avoiding disastrous mistakes (also see the Undo section below*).*

The help tags automatically appear whenever you are performing an edit.

Undo/Redo

Did you make a mistake, such as not selecting all of the MIDI Regions, or perhaps you moved them to the wrong place?

If so, this would be a good time to become acquainted with one of the most important functions in Logic—the Undo. The *Undo* function allows you to undo the previous *editing* step, should things go wrong.

To use the *Undo* function,
- Select *Edit > Undo "edit function name".* If we were to undo the example above, the MIDI Regions would be reset to their original positions, and you could re-attempt your edit. Give it a try, even if you got the edit right!

To reverse the *Undo*:
- Select *Edit > Redo.*

To undo more than one editing action:
1 Select *Edit > Undo History.*
2 A listing of all previous editing actions will open. You can go "back in time" to any of these edit operations. Click on one to see what happens.
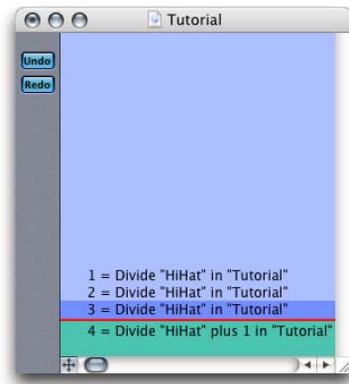
3 To return to the most recent editing step, click on the most recent entry—namely, the one at the bottom of the list. Cool huh?

Important: It is vital that you make the distinction between what can be undone and what can't. As an example of this—the *Quantize* or *Transpose* playback parameters do not actually alter data. They simply change the way it is *played back*.
Realtime playback parameters such as these do not involve an *edit* operation (such as a cut, copy or paste), and therefore the *Undo* function (and thus the Undo History) has no effect on them. To undo a playback parameter, simply select the affected MIDI Region, and adjust/reset the appropriate parameter to its former (or default) value.

Copying Regions

In the Arrange window, you can use the *Pointer* tool to copy MIDI and Audio Regions. The procedure is quite similar to moving Regions.

To copy one or more Regions:

1 Select one or more Tutorial song Regions (using the rubber-band or shift-click methods discussed earlier).

2 Press and hold the Option key while moving these Regions to a new position, and release the mouse button. A copy of the Regions is placed at the target position. These newly-created Regions retain the names of the originals, with the text "*copied" added to the end of the name.

Note: You can decide whether or not this extension should appear in the Region's name by opening the *Logic > Preferences > Global > Editing* preferences dialog. Click in the checkbox to the left of the *Add Last Edit Function to Region Name* option if you want a description of any edit operations to appear on edited Regions. If not, uncheck the box.

Note: Remember to keep an eye on the displayed help tag while copying Regions! If something goes wrong, or you decide to reverse the copy operation, you can use the Undo function (or Undo History) to do so.

Cutting Regions

You can use the *Scissors* tool to cut a Region.

To do so:

1 Select the *Scissors* tool from the Toolbox. This will change the appearance of the mouse cursor to a pair of scissors.

2 Click-hold on the last "Kick" MIDI Region in the *ES1 2* track, and move the mouse left or right. While doing so, constantly refer to the displayed help tag.

3 When position 24 1 1 1 is reached, release the mouse button. This will cut the selected Region(s) at the beginning of bar 24.

4 Following the cut, you could delete the last bar with the *Eraser* tool, or by pressing the Backspace key. This will wipe out the kick drum upbeat in the last measure.

You can also divide multiple selected Regions simultaneously this way. Give it a try, and reverse the results with the Undo function.

Loops

The Loop function enables you to repeat a Region automatically, without needing to copy it. The *Loop* switch can be found in the *Region Parameter box*.

In the Tutorial song, you can see a looped MIDI Region on the *ES1-2* track, between measures 13 and 17. The loops are displayed as gray segments, following the original MIDI Region. These loop repetitions are always the same length as the original MIDI Region.

To switch off looping:

1   Select the original MIDI Region.

2   Click the *On* option, found beside the *Loop* entry in the *Region Parameter box*. The gray loop repetitions disappear.

3   Reactivate the loop by clicking beside the *Loop* entry again.

4   Click on the bright blue "Kick" MIDI Region that follows the loop repetitions, and press the Backspace key. The gap is immediately filled with further repetitions of the original MIDI Region.

Note: A looped Region is repeated until it encounters another Region on the same track (or the song ends). To turn off the repetitions at a desired position, simply insert an empty Region onto the track with the *Pencil* tool (or by copy/pasting another blank Region). In the following, we will use the term *Stop Region* to refer to this kind of Region.

To increase the length of a loop:

▪ Grab the lower right corner of the original MIDI Region, and drag to the right to increase its length by one bar. As you can see, the loop repetitions change their length accordingly. This can be done while Logic is running, allowing you to immediately listen to the results in the context of the arrangement.

To copy a looped Region:

1   While pressing Shift, click on the original MIDI Region, and—if used and desired—the Stop Region for the repetitions.

2   When both have been selected, release the Shift key.

3   Press and hold the Option key, click on the original Region, and drag the entire section to the desired position. Release the mouse button and Option key. The entire passage, including the Stop Region, will be copied, and you're done!

Note: If the Stop Region is not copied, the original MIDI Region—with the *Loop* playback parameter active—will be copied to the desired location. This will create a MIDI Region copy with loop repetitions that continue to the song end point, or to the next Region on the destination track.

Important: Loop repetitions are merely pointers to the original Region. They can not be transposed and don't have any playback parameters in the *Region Parameter box*. Only a "real" Region (or a copy) may be transposed and offers playback parameters. If you'd like to use different playback settings for each of the loop repetitions, you'll need to turn them into real copies first.

To turn a loop into a real copy:

1   Select the original Region.

2   Choose *MIDI > Alias > Turn Loops to Real Copy*. New Regions will now replace the gray loop repetitions.

The Loop Browser

Logic ships with a number of Apple Loops. These are musical phrases that can be repeated seamlessly. In comparison to standard audio loops, Apple Loops have a significant advantage: they can be transposed and (automatically) time stretched. When you add an Apple Loop to a song in Logic, it will automatically be matched to the tempo and key of the song. This function allows you to use several loops together, even if they are of different speeds and keys.

Note: You can use Logic's Loop function (in the Region Parameter box), to repeat an Apple Loop for any desired period of time in a song.

So let's add an Apple Loop to our Tutorial song:

1 Choose *Audio > Loop Browser* to launch the Loop Browser.

In the Loop Browser, you can use the buttons in the upper half of the window to show your loops by category, by instrument, genre, or mood.

2 As an example: to add an electronic drum loop to our Tutorial song, simply click on the Drums button and then on the Electronic button. All Apple Loops that match these criteria are shown in the lower half of the Loop Browser.

As you scroll down the list, you'll see that there are two types of Apple Loops: those featuring a blue soundwave icon and others with a green note icon. The Apple Loops that feature the blue icon can be added to audio tracks, and can be edited like other Audio Regions. As mentioned earlier, they have the major advantage of automatic tempo and key matching to that of the song tempo and key.

The Apple Loops that feature the green icon can also be added to audio tracks, where they behave exactly like their blue icon counterparts. They can also be added to all Audio Instrument and MIDI tracks. On such tracks, these files can be edited like other MIDI Regions, including individual note editing.

Another interesting thing about the green Apple Loops is that if dragged onto a "blank" Audio Instrument track (one with an empty channel strip), the corresponding instrument and effect setting are automatically inserted. Try this:

3 Drag a green Apple Loop to the *Apple Loop* track. Place the left edge of the loop at the point in the timeline where you want the loop to start playing. The appropriate instrument, effect, and input settings are automatically loaded into the empty channel strip. You can check this out further by pressing Control-2. The Track Mixer will open, with one channel strip selected (highlighted), and configured to match the original Apple Loop settings.

Note: You can also perform text searches, and further refine your searches in several other ways in the Loop Browser.

MIDI Regions

<div style="text-align: right">5</div>

MIDI Regions are containers for MIDI events. They offer a number of additional editing possibilities over Audio Regions.

In the following chapter we will look at these more flexible aspects of MIDI Regions. We will also explore Logic's event editors.

Transposing MIDI Regions

Transposition is a pitch change of either a MIDI event or Region by a number of semitones. The *Transpose* parameter is found in the Region Parameter box. It can be used to change the transposition of the selected Regions.

Note: Audio Regions can not be transposed with the Transpose function. This isn't true of A*pple Loops*, however. These loops may be transposed, and can also be played back at varying speeds.

To transpose a MIDI Region:

1 Select the last of the four "Bass" MIDI Regions in the first track.

2 Click-hold to the right of the *Transpose* parameter in the Region Parameter box.
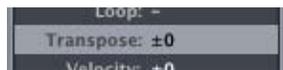
3 In the menu that is displayed, select a value of +12 by carefully dragging your mouse upwards.

4 Release the mouse button. The selected Bass MIDI Region will be transposed up 12 semitones (an octave). Listen to the result.

When multiple MIDI Regions are selected, an asterisk (∗) may be shown instead of a value for the *Transpose* parameter in the Region Parameter box. This indicates that the selected MIDI Regions each have different transposition values.

A nice feature of Logic is that global adjustments made to multiple MIDI Regions work relatively. In other words, this means that individual transposition differences (the relative pitches) between MIDI Regions are maintained, even if all MIDI Regions are transposed. As an example, if you were to rubber-band select the transposed "Bass" MIDI Region and the preceding "Bass" MIDI Region, and transpose both of them up five semitones, the originally transposed MIDI Region would be playing back eight semitones higher (three semitones plus five semitones), and the other MIDI Region would be playing back five semitones higher than their original pitches. Try it out.

Quantize

Quantizing is the rhythmic correction of notes, aligned to positions on a grid. When quantization is applied to any selected event or MIDI Region, Logic will move all note events to align perfectly with the nearest grid positions.

In the image above, the first four beats show unquantized note events. In the second four beats, the notes have been quantized, and now align to the nearest beat positions on the grid.

In the Tutorial song, Logic's *Quantize* function is used on the brighter colored "HiHat" MIDI Region between measures 9 and 13. The timing of note data in this MIDI Region was intentionally left slightly off the beat. As *Quantize* is activated and set to *16th Note*, you cannot hear these timing errors.

To deactivate the Quantize function:

1   To best illustrate how quantization affects MIDI note timing, you should activate the metronome. To do so, click on the *Metronome* button found toward the lower right end of the Transport Bar.

2   Select the bright "HiHat" MIDI Region.

3   Set a cycle from measure 9 to measure 13 by choosing the *Region > Set Locators by Regions* menu entry (this function is also available as a key command), and activating the *Cycle* button in the Transport Bar.

4   In the *Region Parameter box*, click on the *16th note* text alongside the *Quantize* entry. In the pull-down menu which opens, select the *Off* setting. This quantize value will then be displayed as the *Quantize* value. As the MIDI Region continues to play, you'll discover that it now sounds out of time, rhythmically, as this is a less than perfect recording.

5   Try out other quantization values such as 1/*8 Note* and *1/4 Note* on this MIDI Region, and listen to the results of the hihat notes being forced to different grid values.

Quantize parameter values followed by an alphabetic character will introduce a "swing" feel to the quantization. On the HiHat MIDI Region, this is most obvious with *1/8th note* quantize values. The letter *A* represents the lightest swing effect, the letter *F* the strongest. Judicious use of these different groove factors can make your choruses sound like they swing more than verses do, for example.

Note: Another thing to consider, while experimenting with different Quantize settings, is that this operation happens in real-time, while the sequencer is playing. As you've also discovered, you can jump to different song positions, solo tracks and change cycle areas while Logic is playing. This real-time functionality is available for most Logic operations.

MIDI Recording

If you have a MIDI keyboard connected to your computer, you can now try the MIDI recording function of Logic. We suggest that you play a little solo over the last eight bars of the arrangement. We have already prepared a suitable sound on the *ES1-4* track.

As you may not play the solo perfectly on your first attempt, and to introduce you to a nice Logic feature, we'll set things up so that you can record several takes automatically in Cycle mode. Once you've finished recording, you can then select your favorite version of the solo.

To prepare the song for recording:

1   Open the *File > Song Settings > Recording* window.

2 Check the *Auto Mute in Cycle Record* box.

Selecting this setting causes each previous take to be automatically muted when the cycle repeats. This way, you can record one passage after another, without being distracted by (that is hearing) your previous takes.

3 If you would like to hear the metronome while recording, you should enable it now in the Transport window.

To start recording:

1 Select the *ES1-4* Track List entry by clicking on it. Simply selecting the track will arm it for recording.

2 Play your MIDI keyboard; you should hear the lead sound. You can start playing the cycle, and do a little experimenting on the keyboard while listening.

3 If you don't like the current key, you can transpose it in the *Region Parameter box* as desired.

Note: *MIDI THRU* always appears in place of a Region name in the *Region Parameter box*, when no Region is selected in the Arrange window. Any changes made to the *MIDI THRU* settings, in the *Region Parameter box*, affect the notes received at Logic's MIDI Input, and will be applied to any subsequently recorded MIDI Regions.

4 When you're confident enough to record the solo, begin recording by clicking * on the numeric keypad, or by pressing the *Record* button on the Transport window.

5 Anything you play will now be recorded, and a MIDI Region will be created on the selected track.

6 Allow Logic to continue running. After reaching the right cycle boundary, the SPL will jump back to the left cycle boundary.

Allow the section to repeat, recording on each pass, until you feel that you have one or two good takes. Logic will create a new track automatically, for every cycle repetition, and will move previously recorded tracks down the Track List.

7 Press Stop when you're done.

To select the best take:

1 Press Play, and use the *Mute* tool, to audition the individual takes, one by one.
Once you've decided on a favorite take, simply delete the unwanted takes by clicking
on the corresponding tracks in the Track List. Once selected, use the *Track > Delete*
menu option repeatedly, until all unwanted tracks are removed.

2 If you accidentally delete the good take, don't forget the Undo function.

Saving the Song

To save the Tutorial song, featuring your new solo:

1 Choose *File > Save As*.

2 Enter a new name—*not* "Tutorial"—for the song to be saved as in the ensuing file
dialog. This way, you will save a copy and retain the original version for further
experimentation.

Note: The *File > Save as Project* menu option allows you to also save songs as Projects in
Logic. Projects provide intelligent management of all additional files that are associated
with a song. More information regarding Projects can be found in the Onscreen Help
system and/or the Logic reference.

MIDI Event Editing

This section briefly discusses the use of Logic's various MIDI editing windows.

The Score Editor

The Score Editor offers extensive score layout and printing facilities, allowing
everything from simple melody lines to full symphonic scores to be transcribed. A
detailed description of the Score Editor can be found in the Logic reference.
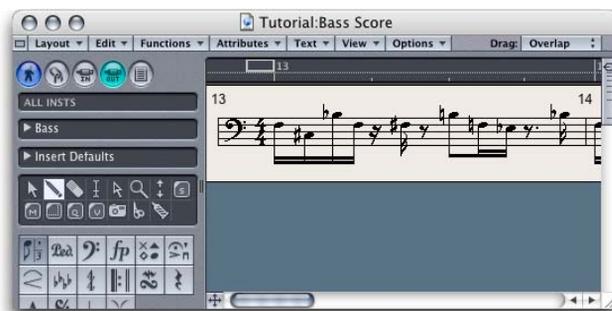
The Matrix Editor

Although it looks very different, the Matrix Editor is quite similar to the Arrange window. Unlike the Arrange window—MIDI note events, rather than MIDI Regions—are displayed as horizontal bars in the Matrix editor. Editing, you'll discover, is quite similar.
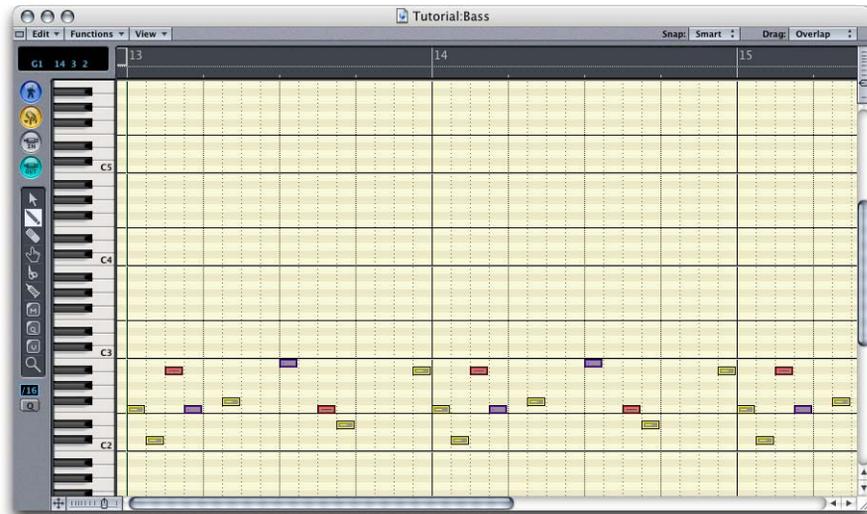
The illustration above shows a MIDI Region with chords displayed in the Matrix Editor.

The keyboard along the left edge of the Matrix Editor indicates the pitch of the notes/keys played in the display. A chord is represented by a group of overlapping bars.

As you can see, the position and length of notes are clearly visible in the Matrix Editor. The display can be zoomed horizontally and vertically with the two *Zoom controls*, just as in the Arrange window.

Note: When making changes in the Matrix—or any other Logic editor—you can hear the changes in real-time. This is achieved by activating the *MIDI Out* button found towards the top left of each editor window (see picture below). We suggest that you activate this button by clicking on it. It is illuminated when active.

To change note lengths in the Matrix Editor:
1 In the Matrix Editor, you can change the length of single notes or multiple notes. Highlight the desired note(s) by clicking on it/them (with Shift held) or by rubber-band selecting it/them.
2 Grab the lower right corner of one of the selected notes, and drag it to the desired length. Release the mouse button.

If you change the length of multiple notes simultaneously, they will retain their relative length differences. It is possible to override this behavior, and force all notes to have the same *end* point by pressing Shift, while dragging the right corner. This method will even work on note events selected across multiple bars.

You can also adjust the *start* point of any selected notes by click-holding and dragging the bottom left corner. Note that the Shift function used to align note endpoints does not work on the beginning of notes.

To change note pitches in the Matrix Editor:
1 Select the *Pointer* tool from the Toolbox.
2 Choose any note event, or group of notes, by rubber-band (or Shift) selecting them.
3 Grab the center of the note(s) and drag it/them up or down. As you do so, you will hear the pitch(es) change.
4 When the desired pitch(es) is/are reached, release the mouse button.

To delete note events in the Matrix Editor:
1 Select the *Eraser* from the Toolbox.
2 Click on the note you want to delete. The note will disappear. As an alternative method for deletion of the note—or any other selected event—simply press the Backspace key.

Velocities (how fast the note was struck—and usually how loud it is) of notes are indicated by color—with "hot" colors, such as reds, used for higher values and "cool" colors, such as blues, used for lower velocities. A further indicator of velocities is the line within the note event bar, with higher velocities indicated by a longer line. Velocities of selected note events can be adjusted with the *Velocity* tool.

To change the velocity of notes in the Matrix Editor:
1 Select the *Velocity* tool from the Toolbox, as shown.

2 Click-hold on a note, and drag the mouse up and down. As you do so, you'll note that the color of the selected note event changes, and the line within the note changes length.

You can also change the velocity of multiple selected notes simultaneously. You'll see that the velocity of the note that you edited individually retains its relative distance (level) from the other selected events. As you drag the mouse up and down, you'll discover that when maximum or minimum values are reached for *any* of the selected events, no further increase or decrease in *any* of the other events' values is possible.

In all versions of Logic, you can make volume and panning changes using the Hyper Draw function, within the Matrix and Score Editors. Logic Pro also allows the drawing of controller curves for other types of continuous controllers.
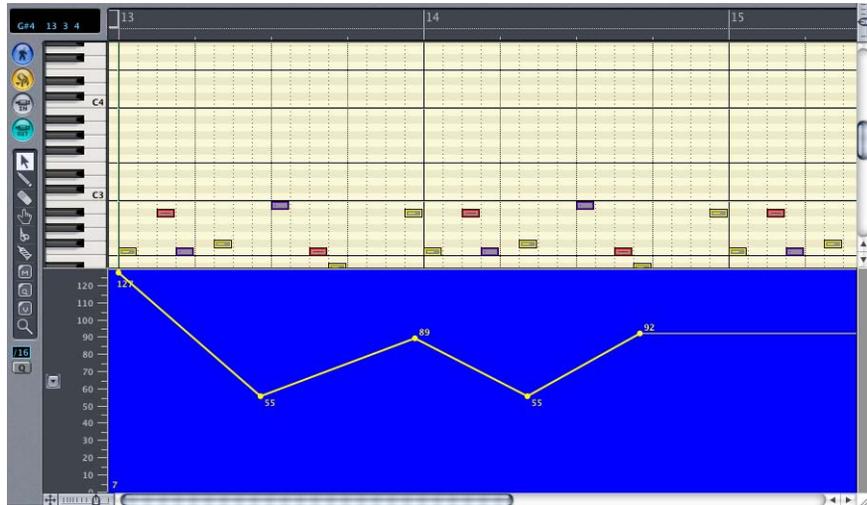
In the illustration above, you see the Matrix Editor with Hyper Draw volume curve.

Using Hyper Draw in the Matrix Editor
1 To access the Hyper Draw function within the Matrix Editor, select *View > Hyper Draw > Volume* (or *Pan*, or another controller type in Logic Pro). As an alternative method, you can press F8 to activate Hyper Draw. F9 will switch back to the standard Matrix Editor view, without the Hyper Draw display being visible.

More information about the Matrix Editor can be found in the Logic reference and Onscreen Help system.

The Event List

The Event List shows all data contained within a selected MIDI Region as an alphanumerical (a collection of numbers and letters) listing.

To open the Event List:

1 Select the last "Bass" MIDI Region—between bars 25 and 29, on track 1.

2 Select *Windows > Event List* or press the *E* key.

Note: You can close the Event List by pressing the *E* key again (*Toggle Event Editor key command*). The *Windows > Event List* menu command (or the separate *Open Event Editor* key command) allows you to open multiple Event Lists, if desired. You may also open the Event List by double-clicking on a note in the Matrix Editor.

The *Status* column displays the event type. You can hide/show specific event types by using the *Filter buttons* to the left of the list, which may help you to get a better view of the data that you're looking for. A click on the button featuring the note icon, for example, will hide all note events, with the Event List display restricted to other event types. A second click on the note button will re-display the note events.

The left-most column of the Event List indicates the position of each event. To the right of the event type, the MIDI channel number is displayed, followed by (depending on the event type) the note/controller number, the (event) value and length. All data—with the exception of the event *type*—can be edited using the usual methods.

More information about the Event List can be found in the Logic reference and Onscreen Help system.

The Hyper Editor

The Hyper Editor is useful as a graphically-based drum grid editor, and also for the graphic input, and editing, of MIDI controller data.
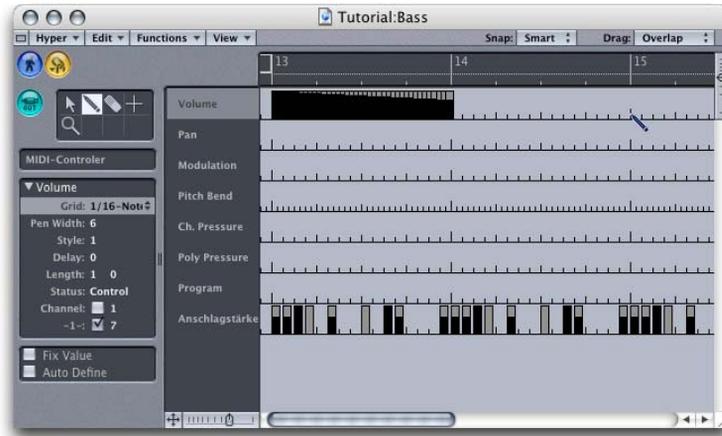
There are two predefined *Hypersets* that can be selected from the pull-down menu below the Toolbox (*GM Drum Kit* and *MIDI Controller*). You can freely alter these Hypersets, and can also define completely new ones. Here's a brief explanation on the use of the Hyper Editor.

To insert note or controller information:

1 Select the *Pencil* tool.

2 Click, or click and drag horizontally on a row with your mouse. Higher note velocities/ controller values appear as taller vertical bars. Note events are only added when inserting them in the *Velocity* row.

To adjust existing note or controller information:

- Click on an individual event, and drag vertically with your mouse (this can be done with the *Pencil* or *Arrow* tools). Alternately, you can draw over the existing curve.

Note: Select the "Kick" MIDI Region, and open the Hyper Editor via the Windows menu (or by pressing Command-5) and experiment with these techniques, making use of each of the tools. While in the Hyper Editor, click-hold on the *MIDI Controls* pull-down menu and select the *GM Drum Kit* entry. You'll see a very different view of the "Kick" drum part. Once again, please experiment with the various tools on the individual parts.

More information about the Hyper Editor can be found in the Logic reference and Onscreen Help system.

The Transform Window

The Transform window is a very powerful editor that can be customized to build your own preset transform operations. It can be used for dramatic MIDI data changes, or for subtle alterations. As an example of the latter, it could be used to reduce the amount of filter modulation—with values ranging between *97* and *105*—by a fixed percentage. While this type of change could be performed in other editors, it would need to be done on each individual modulation event. The Transform window allows you to quickly achieve the same result on multiple events.
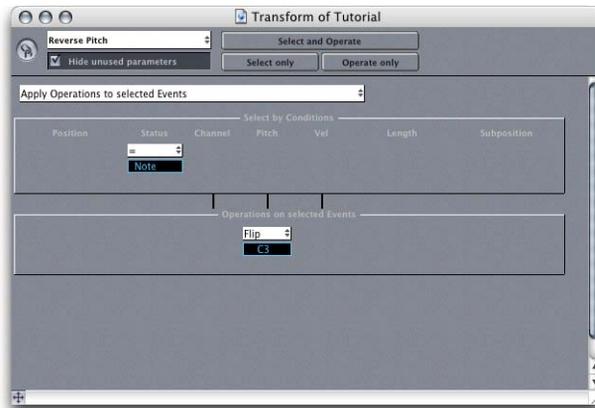
To best illustrate how the Transform window can be used:

1   Please select the "Bass" MIDI Region (between bars 25 and 29) on track 1.

2   Create a cycle from bar 25 to bar 29.

3   Open the Transform window via the Windows menu, or by pressing Command-4.

4   Select the *Reverse Pitch* preset from the pull-down menu, to the top left of the Transform window.

5   Press the *Play* button on the Transport window or use the key command, and listen to the part a couple of times.

6   While the MIDI Region is cycling, press the *Select and Operate* button in the Transform window, and listen to the results.

7   Use the *Undo* function to return the MIDI Region to its former state.

8   Please experiment with the other presets and buttons, ensuring that you *Undo* between each process.

More information about the Transform window can be found in the Logic reference and Onscreen Help system.

Audio Regions

6

Logic allows you to record not only MIDI data, but also audio parts. This enables you to integrate acoustic instrument or vocal performances into your songs. More on this can be found in the following chapter.

As with MIDI recordings, audio recordings are made and displayed in the Arrange window on tracks. These are *Audio*, rather than *MIDI* tracks. Once captured, audio recordings can be mixed and processed with realtime effects.

Important: Audio recordings are referred to as *Audio Regions* in the Arrange window, and they look very similar to *MIDI Regions*. Audio Regions are actually visible portions of audio *files*. When you cut or resize an Audio Region in the Arrange window, the audio file itself is not cut or resized. The Audio Region that you see is a visual representation of a part (or all) of the audio file, and changes that you make to it in the Arrange window simply instruct Logic on *how* to play the audio file. In other words, the Audio Regions are simply "pointers" to the underlying audio file.

Although the handling of Audio Regions and MIDI Regions is *similar* in Logic, it is not exactly the same. As a result, the editing and parameter options available for MIDI and Audio Regions are slightly different.

Note: Audio Regions are, in general, less flexible than MIDI Regions. As examples, they can not be transposed, and have a fixed playback speed. This isn't true for A*pple Loops* files, however. These types of audio files may be transposed and played back at varying speeds, without pitch alterations.

Please reload the Tutorial song for more exercises.

Creating Audio Tracks in the Arrangement

In the following section, you will learn how you create a new audio track in the Arrange window, and how to import an audio file into audio tracks.

To create an audio track in the Arrange window:

1 In the Arrange window, select the *ES1-6* track in the Track List, and create a new track via the *Track > Create* menu option, or by pressing Shift-Enter. A new track will appear below the previously selected track in the Track List.

2 Click-hold on the *ES1-6* entry of the newly-created track in the Track List, and a hierarchical menu will open.

3 Browse to *Audio > Audio Track > Audio 1*, and release the mouse button. This will assign the track to the first Audio channel.

Important: It should be noted that a Track Audio Object must exist within the Environment to allow its selection as an audio track from the Track List hierarchical pull-down menu. We have set up only two Track Audio Objects in the Tutorial song. You may use many more, however. Information on setting up Audio Objects for use as extra audio tracks can be found in the "Creating Audio Objects" section on page 68.

You can rename this audio track by clicking on *Audio 1* in the *Object Parameter box*. It may make more sense to you if you were to name it "Drums", for example.

To import an audio file:

1 Select the *Pencil* tool, and Shift-click at measure 17 of the audio track. Logic will now ask for the file location via the standard operating system file dialog.

2 Browse to the drive and folder that contains the "Drumloop.aif" tutorial audio file.

3 Double-click on this file, and it will appear at the beginning of bar 5 in the Arrange window.

4 As an alternative method, you can simply drag'n drop the file from the desktop to the desired location in the Arrange window.

If you enlarge the display through use of the *Zoom controls*, you will see a waveform display in the Audio Region that was just imported. The audio file name is displayed above this waveform overview. A symbol indicating whether the file is mono or stereo will be shown at the end of the file name. Stereo files are indicated by two interlocked rings and Mono files, by a single ring.

Start playback from measure 17. At this point, you should be hearing the audio file, and will notice that the speed of the MIDI tracks and the drum loop are out of time with each other. You can fix this by adjusting the speed of the song: The drum loop has a tempo of 120 bpm, the song a tempo of 122 bpm. Reduce the song tempo in the Transport window to 120 bpm, and the drum loop and MIDI arrangement will play in sync.

You can move, cut, and copy the Audio Region in the Arrange window, just as with MIDI Regions. Please experiment with this, making use of the *Undo* function as you go.

Note: The Matrix and Score Editors, plus a number of MIDI-specific functions are not applicable to Audio Regions.

Sample Editor

Double-clicking on the "Drumloop" Audio Region in the Arrange window (or using the *Toggle Sample Editor* key command—default key command is *W*—on a selected Audio Region) opens the Sample Editor. If you want to precisely edit audio *files*, this is the window to use!

To listen to the audio file in the Sample Editor:
▪ Press the button featuring the loudspeaker symbol. Pressing the button that features the Loop symbol will repeatedly play the selected portion of the file.

Below the waveform display, you can see three markers that can be dragged with the mouse.
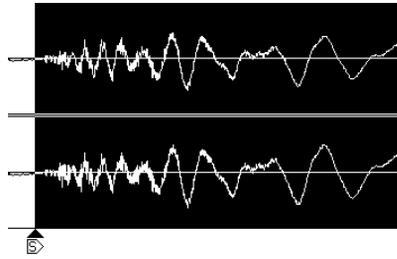
These are:

The *S* arrow pointing to the right indicates the start point of the Audio Region. If you move it from, say, the kick drum at the beginning of the drum loop to a snare beat, the loop will start with the snare when the arrangement is played back. When you move the *S* marker, you will also move the upwards-pointing black triangle. You can also grab the triangle directly, and move it separately.

The black triangle represents the *Anchor point* of the Audio Region. If it isn't placed at the same position as the *S* marker, the Region will be positioned (snapped) in accordance with the triangle when moved in the Arrange window—rather than the position of the *S* marker.

You can, for example, place the triangle at the downbeat of a recording, but also include an upbeat by shifting the *S* marker to the left. If you move the Audio Region in the Arrange window, its position will snap according to the downbeat, rather than the beginning of the upbeat. This facility makes accurate Region placement much easier.

Note: The *Anchor* point can not be positioned before or after the *Sample Start* and *End* points, respectively.

The *E* to the right of the other two markers represents the end of the Audio Region. If moved, you will also alter the Region's length in the Arrange window.
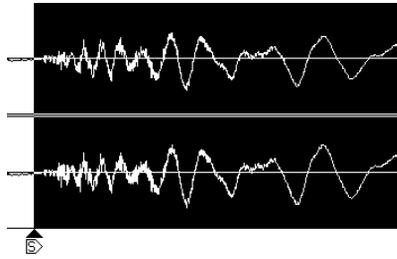
The Audio Window

Put simply, the Audio window allows to you to manage all audio files used in the open song. Press Command-9 to open this window, or browse to it via the *Audio > Audio Window* menu option. Alternately, you can switch to Screenset 7 in the default song created by the Logic Setup Assistant.
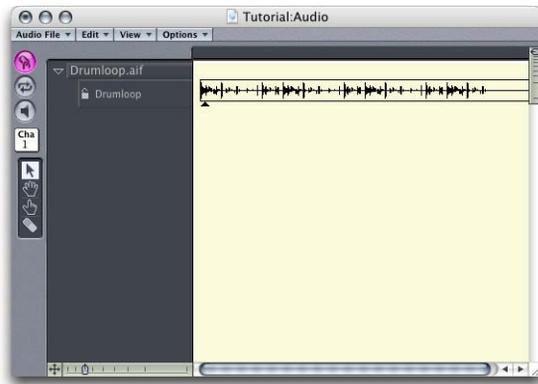
Quickly Resizing Audio Regions

You can define Audio Region start and end points in either the Audio window, or directly in the Arrange window. Either method is useful for roughly defining an Audio Region's size. If you need precise control over the Audio Region or file start and end points (for loops and so on), please make use of the Sample Editor.

Audio File Menu

This menu provides a range of file handling tools, including delete, backup, conversion, and more. These tools can aid you in housekeeping tasks for all of the audio files used in the song. Please refer to the Logic reference or Onscreen Help system for detailed information on each function.

Making Your Own Audio Recordings

First, connect the sound source—a mixer, CD player, or microphone, for example—to the audio inputs of your system. Create a new audio track, if necessary.

Arming Tracks

Unlike MIDI tracks, audio tracks must be manually armed before recording, just as the tracks on a tape recorder must first be armed. There is a small *R* (Record Enable) button to the left of each audio track in the Track List. Clicking on this button prepares the audio track for recording. The *Record Enable* button will turn red, indicating that the track is armed. You can also click on the *Record Enable* button on an audio channel in the Track Mixer (or Arrange channel strip), in order to arm the appropriate audio fader/track.

Setting a Record Path

When you press the Record Enable button for the first time, a Finder dialog will open automatically, prompting you to set a record path. You can change this record path via *Audio > Set Audio Record Path*.

Note: You can also convert your song into a new project via the *File > Save As Project* menu option. A Finder dialog will open, prompting you for a project location and name. All audio files, including existing and new recordings, will be saved into the *Audio* folder within the project folder.

Projects can also include other file types associated with a particular song. These may be: *QuickTime Video* files, EXS *Instruments* and *Samples*, plug-in *settings* and Space Designer *Impulse Responses*.

As projects have an identical internal folder structure, the transport and archiving of all files associated with your songs is both consistent and easier. Projects also make collaborations with other Logic users simpler as an entire project can be burnt to CD or DVD and sent to a colleague. If your networking or Internet access is fast enough, projects can also be shared in this way. Further information about projects can be found in the Onscreen Help or Logic reference.

Stereo Recording

To make a stereo recording, you must first configure the selected track's Arrange window channel strip as stereo. The symbol on the button indicates the current status as follows: A *single circle—mono*. A *pair of interlocked circles—stereo*.

The level meter will also divide into two discrete meters, when a channel strip is set for stereo operation.

Levels

As soon as you arm an audio track, you will hear any signal being sent to the audio inputs of your system. The audio track's channel strip in the Track Mixer controls the level of the monitored signal—what you're hearing.

Important: The fader always controls the *playback* level, *not* the recording level. Recording levels must be set externally—on your mixer, or at the original sound source.

Care must be taken when setting input levels, as digital audio will "clip" when overloaded. Clipping results in a particularly harsh, metallic distortion, so unless you have a penchant for heavier musical styles, we don't recommend overloading the inputs!

Starting to Record

Start recording by pressing the *Record* button on the Transport window, or by pressing * on the numeric keypad. You will notice that a waveform is drawn, in realtime, in the Arrange window during recording.

Keep an eye on the level meter on the audio faders. In the event that the clip indicator (top, red LED) is illuminated, you will need to make the recording again, using a lower level. To avoid constantly watching the level meter, the overload indicator remains lit until it is clicked. If your recording level was too high, ensure that you click on the overload indicator to reset it.

Once you've finished recording, press *Stop* on the Transport Bar or by pressing *0* on the numeric keypad.

Congratulations, you've recorded your first audio file.

Important: Please do not forget to disarm the track after recording has finished. Do this by clicking on the illuminated (red) *Record Enable* button which will then turn gray. If the track is not disarmed, you will not be able to listen to the Audio Region on this track.

Mixer, Instruments, and Effects   7

This chapter provides an overview of Logic's mixing facilities and the use of software-based instruments and effects.

Logic offers three ways to view and access mixer channels, where you can set volume, pan, instrument, and effect parameters. The fastest way to access the mixer channel of a track is by simply selecting the desired track in the Arrange window. This will update the mixer channel strip displayed to the lower left of the Arrange window, just below the various Parameter boxes. Only one mixer channel can be seen and used at a time here. Should you wish to view and access multiple channels, you can use the Track Mixer.

Track Mixer

More channels can be seen in the Track Mixer, which is accessible via the *Windows > Track Mixer* menu option, or Command-2. The Track Mixer horizontally reflects the track order as displayed—from top to bottom—in the Arrange window's Track List.
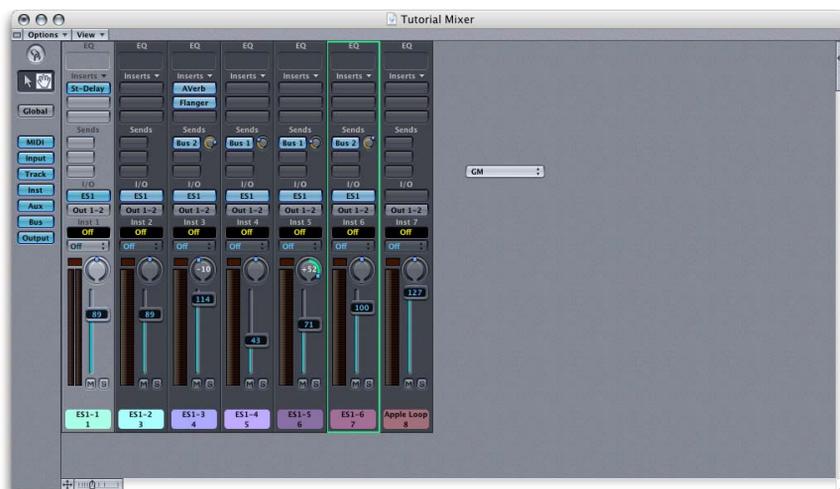
Note: The updating of Track Mixer channels is entirely automatic, so as you add or delete tracks from the Arrange window's Track List, the Track Mixer will show or hide the corresponding MIDI or audio channel faders.

To the left of the Track Mixer window, you will see a collection of buttons, as shown. These buttons will toggle (hide/show) the display of particular classes of channel strips.

The button on the top—*Global*—toggles the display between channels which correspond to those that exist in the Arrange window's Track List, and *all* defined MIDI Instrument and Audio Objects that exist in the song's *Environment* (more on this in a moment).

The other buttons can be clicked individually, in order to display all channels of the selected class. Multiple classes can be selected for display in the Track Mixer by holding Shift while clicking on the individual buttons.

Please try the various Track Mixer display modes with the Tutorial song to get a feel for how this view functionality works.

Mixer and Audio Objects in the Environment

Another mixer view is offered by Logic's Environment. You can access the Environment via the *Windows > Environment* menu option, or Command-7. If you don't see any mixer channels in the new window, please select the *Audio* option shown in the *Layer* pull-down menu to the left of the Environment window.
The Environment Mixer looks very similar to the Track Mixer. However, there are two important differences:
- This Mixer does not change its look dynamically to reflect the Arrange window's track order. Rather, it shows all Audio Objects in user-defined order.
- In the Environment Mixer, additional channels can be inserted by creating and configuring new Audio Objects.

Various Audio Objects

A number of tracks, instruments, busses, and so on were created when you ran the *Logic Setup Assistant*. These different types of Audio Objects are based around the same fundamental Environment Object—namely the Audio Object—but each was configured differently, and has distinct facilities.

The cabling between Audio Objects—which deals with the audio signal flow—is automatically and invisibly connected by Logic, as new Audio Objects are created and assigned. This invisible cabling follows a fairly standard signal path, normally found on a mixing console with audio channels, busses, master faders, and so on. As such, the Logic mixer will immediately be familiar if you've had any experience with mixing consoles.

This section describes the most important Audio Object types, and what they are used for.

Audio Track Object
The Audio Track Object is, as mentioned, the fundamental Object used for audio functionality in Logic's Environment. By default, any Audio Object created will be assigned to the first available *playback* channel, or Audio Track. An Audio Track Object is used to record and play back Audio Regions on the corresponding track in the Arrange window.

Audio Instrument
This Audio Object supports the use of software-based instrument plug-ins. These plug-ins include those that are built into Logic, plus third-party Audio Unit instruments. Although the Audio Instrument Object looks similar to Logic's other Audio Objects, it supports MIDI *note* input, which the others do not. This enables appropriate plug-ins to be played via MIDI, just like an external MIDI synthesizer, sampler or module. The corresponding Audio Instrument tracks in the Arrange window allow you to record and play back MIDI Regions.

Bus Object
Signals from various Audio Objects can be mixed to a Bus Object, which is the software equivalent of a bus/group on a hardware mixing console. One or more effects are often inserted in a bus. In this scenario, the bus acts as both an effect unit and a return channel strip simultaneously.

A Bus Object also acts as a "group" fader, where multiple audio channels can be routed to it, allowing volume or pan to be globally adjusted for all grouped channels by adjusting these parameters on the Bus channel strip. Busses can be routed to Output Objects (Master Faders) or to other Bus Objects.

Output Object
This is Logic's Master Output Object, equivalent to the master output faders on a mixing desk. If your audio interface features multiple outputs, you can set up an Output Object for each physical output—or output pair. This fader type features a *Bounce* button (labeled *Bnce*) which is used to bounce (digitally combine, or mix) any incoming audio—from the other fader types—to a mono, stereo or multiple Surround (Logic Pro only) format audio files.

Master Object

This, as the name suggests, is a Master Volume control for the entire mixer. It is Logic's equivalent to the Control Room fader on a mixing desk.

Note: The Master Object is only available in Logic Pro, not in Logic Express.

In the illustration above, you see some different Audio Objects in the Environment view.

Creating Audio Objects

If you need more Audio Objects than the Logic Setup Assistant created, you can add them manually. Each Audio Object, regardless of *type*, is created in the same way.

To create Audio Objects manually:

1 Open the Environment window by using Command-7.

2 Select the *Audio* Layer from the *Layers* menu to the left.

3 Create an Audio Object by selecting *New > Audio Object*. This will generate a small waveform icon onscreen.

4 Double-click on the icon to change its appearance to a blank audio fader.

5 Clicking on the *Channel* entry in the *Object Parameter box* will allow you to select the Audio Object *type* via a hierarchical menu, as shown in the following diagram.

Important: It is vital that no two Audio Objects are assigned to the same *Track, Instrument,* and so on. In other words, don't create two Audio Objects that are assigned to Track 1, or Instrument 3, for example.

The *MIDI Channel* entry determines the channel used by the Audio Object. By default, this will match the Audio Object's Track number—as examples, Track 1 will be set to MIDI channel 1, Track 2 to channel 2, and so on. Again, ensure that no two Objects of the same *type* are assigned to the same MIDI channel. There is no need to concern yourself too much with this parameter. It is of little consequence to Logic's Track Automation system, and is primarily of use for compatibility with songs created in older Logic versions.

You should only set up as many Audio Objects as you think you will reasonably need. In other words, don't set up 64 audio playback channels if you are only likely to use 16 tracks for audio playback in your day to day use of Logic. The reasons for this:

• Each channel (Audio Object) occupies an amount of onscreen space, and when dealing with an Environment that has, say 40 Audio Objects, you will find yourself scrolling endlessly through faders when using the Environment's Audio Mixer (*Audio > Audio Mixer*).
• Each Audio Object uses system resources, even when not in use.

You can return to the Environment (or run the *Logic Setup Assistant* again) and simply create (or delete) additional Audio Objects at any time. Note that the maximum number of each Audio Object type that can be created is primarily determined by the version of Logic you are using.

Using the Mixer and Plug-ins

Logic offers two types of plug-ins: software instruments and effects.

Software Instruments

Audio Instrument Objects are designed for use with software-based synthesizers such as those delivered with Logic and/or Audio Units instruments from other manufacturers.

Note: Coverage of all Logic instruments can be found in the *Logic Pro 7 Plug-In Reference* or *Logic Express 7 Plug-In Reference* (depending on where you are using Logic Pro or Logic Express).

If an Audio Instrument Object already exists within the Environment it can simply be selected from the hierarchical pull-down menu in the Arrange window Track List. If no such Object exists, it can easily be created as described in the "Creating Audio Objects" section on page 68.

The Tutorial song makes use of several *ES1* instances.

Please select one of the *ES1* tracks, and take a look at the Arrange channel strip to the left of the Arrange window. Below the *I/O* text on the channel, you will see a blue *ES1* label.

- Click-holding on this label will allow you to select one of the available instruments from the hierarchical menu that launches. Just browse to the desired instrument name, and release the mouse button. A Plug-in window, containing the selected instrument, will launch.

- Double-clicking on the label opens a closed Plug-in window, allowing access to the plug-in's parameters.

Recording software instruments is just like recording MIDI instruments:

1 Simply select the desired Audio Instrument track in the Arrange window, and press *Record* in the Transport Bar (or use the * key).

2 Start playing your MIDI keyboard.

3 Once you're done, press the *Stop* button in the Transport Window, or use the *0* key command.

Software instruments generally use more CPU resources than traditional effects, so you need to be judicious about their use, particularly if your computer isn't a cutting-edge machine.

Note: Logic Pro includes a *Freeze* function—accessed via the "snowflake" buttons on Audio and Audio Instrument tracks in the Arrange window's Track List—which reduces the amount of processing power required for software instrument and effect playback. This is a more advanced function that is covered in the Logic reference, but should you find that your CPU can't cope with the demands being placed on it, consider the *Freeze* or *Bounce* functions. More on Bouncing is found in the "Bounce—the Final Mix" section on page 80.

Using the Channel Equalizer

Double-clicking on the EQ button at the top of each channel will automatically insert the Channel EQ into the first available Insert slot, and will launch the Channel EQ Plug-in window. It can also be inserted by click-holding on the top Insert slot (or others, if you wish). Browse through the hierarchical menu that opens, and select the *Stereo > Logic > EQ > Channel EQ*.

Note: Equalization (EQ) is the process of boosting or cutting certain frequencies in an audio signal. EQ is used to make individual instruments or frequencies stand out (or the reverse) in an overall mix.

Each audio channel in Logic features a number of parametric (and other) EQ options. You may also insert further EQ's in other available Insert slots, if desired. All EQ parameters can be automated.
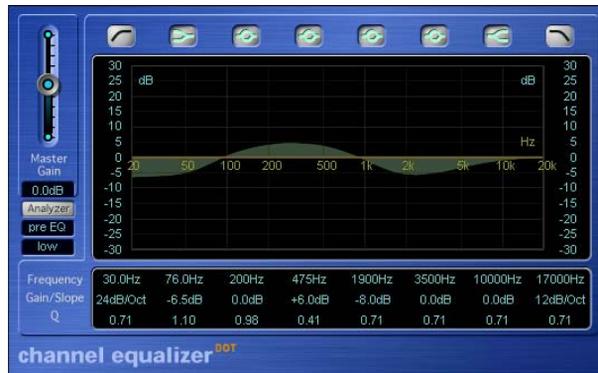
If the Track Mixer or the Arrange channel strip is visible, you'll notice a small thumbnail graphic of the Channel EQ at the top of the strip. This provides an instant overview of the Channel EQ settings.

Note: Please note that in cases where multiple instances are inserted, only the topmost Channel EQ settings are displayed by the thumbnail graphic.

Setting EQ Parameters
The *Band Type* buttons, above the Channel EQ's main display panel, turn individual EQ bands on or off.

You can set/adjust the band parameters either directly in the central EQ display, or in the parameter area below it. As you move the mouse horizontally over the display, pivot marks for individual bands appear on the frequency axis, while the parameter area of the same band is highlighted. You can change the parameters of any band by:

• Moving the mouse cursor horizontally over the display until the desired band is highlighted. Now, click-hold on the display background (not directly on a pivot point): vertical mouse movements change the *Gain*, horizontal movements change the *Frequency* of this band.

• Click-holding directly on the (illuminated) pivot point of the desired band: vertical movements (up/down) change the *Q* value. The direction required to increase or decrease the *Q* value depends on whether you are above or below the zero line (this ensures that "up" increases, and "down" decreases the volume in this band—you will find this intuitively correct). Again, horizontal movements (left/right) change the *Frequency* of the band.

- Click-holding on the desired parameter in the parameter area below the graphic display (*Frequency*, *Gain/Slope* or *Q*): Moving up increases, and down decreases, the value. In order to prevent accidental changes, this is the only way to change the *Slope* value of the high and lowpass filters.

As long as your mouse cursor is in the access area of a band, its individual curve will be graphically inserted over the resulting curve of the entire equalizer.

The *Bypass* button is used to bypass or activate the EQ.

Inserting Audio Effects

The internal audio effects of Logic can be inserted into the individual audio channelsby selecting the desired effect from the hierarchical menu, accessed via the *Insert* slot(s) found on each audio channel strip.

To insert an effect:

1 Open the Track Mixer, or launch the Audio layer of the Environment (Screenset 3 of the default Song). Alternately, use the Arrange channel strip.

2 Once a mixing surface is open, click-hold on any of the *Insert* slots on the desired audio channel.

3 A hierarchical pull-down menu will open, displaying the various effects, grouped in categories. Usually, you would insert effects from the top slot down.

4 Highlight the category, then the effect name from the menu listing, and release the mouse button. The *Insert* slot will turn blue, with the name of the selected effect displayed, and a Plug-in window will launch.

5 To remove a plug-in from an *Insert* slot, click-hold on the desired slot and select *No Effect* from the menu.

Note: Further information about Inserts and the use of plug-ins can be found in the first part of the *Logic Pro/Express 7 Plug-In Reference* .

How Effects Are Grouped

Logic hierarchically groups effects as follows:

- Audio Channel Type—either Stereo, Mono/Stereo or Mono. To explain:
  - *Stereo*: Stereo in, stereo out (True stereo). Both input signals are processed separately, so the stereo qualities of the signal remain unchanged—this is important for summed or stereo bus signals used as inserts.
  - *Mono/Stereo*: Mono in/Stereo out. For use with mono signals only, but the effect output is stereo. Commonly used on the following mono signals: Chorus for bass, Reverb for lead vocal.
  - *Mono*: Mono in, mono out. Should only be used on mono signals. Typical applications are for EQ's or dynamics processing (Kick, Snare, Bass).
- By origin (Logic or third-party): *Logic, Audio Units*. Grouping of effects in this fashion makes the selection of effects simpler.
- By effect definition—*Dynamic, Modulation, Reverb, Filter*, and so on. The effect definition groups effects of a particular type together.

Logic automatically limits the available effect types shown in the plug-in menus to match the Audio Object's signal I/O settings. In other words, if an Audio Object is mono, then *only* mono (and mono/stereo) effects will be available in the Plug-in menu. This also applies to stereo Audio Objects with *only* stereo plug-ins being available. It is possible to override these settings by pressing and holding Option before selecting the Plug-in menu on an Audio Object.

If you choose to use a plug-in that does *not* match the Audio Objects' signal I/O flow, Logic will be forced to do a data stream conversion, which places a greater strain on the CPU, resulting in fewer effects and/or tracks.

Channel Strip Setting

Logic's Mixer windows allow you to save and load multiple plug-ins (inclusive of their settings files) via the arrow pull-down menu alongside the word *Inserts* on channel strips. The entire channel strip can be stored and recalled for use on any suitable Audio Object, allowing common chains of effects such as Reverb, Chorus, and Delay to be loaded far more quickly than individually inserting each plug-in.

To load a Channel Strip setting:

- Click on the word *Insert* on any channel strip. The Channel Strip Settings menu opens, offering you a list of all available Channel Strip settingsand menu functions.

The Channel Strip Settings menu also offers you all GarageBand channel strips.

The Plug-in Windows and their Parameters

You can edit the effect's parameters by double-clicking on the (active) *Insert* slot, which will launch the Plug-in window. Many of Logic's effects feature an enhanced graphical interface—as you've already discovered with the Channel EQ.

Note: By default, the Plug-in window will automatically launch as soon as any plug-in is inserted. A double-click on the *Insert* slot will reopen the window if you have closed it.

Please refer to the Logic reference or Onscreen Help system for specific information on the parameters and use of each effect.

Plug-in Settings

Settings are used to store all parameter adjustments you make in the Plug-in window of each effect (and instrument). Every Logic and third-party plug-in allows the storage and recall of settings. settings are accessible by click-holding on the *Settings* pull-down menu (the downwards-pointing arrow) below the *Bypass* button at the top of the Plug-in window.

Settings pull-down menu

- Within the *Settings* pull-down menu you can load an effect (or instrument) preset via the *Load Setting* option.
- To save your own personalized plug-in settings, adjust the parameters of the effect (or instrument) as desired, then click hold on the *Settings* pull-down menu and select *Save Setting*. In the ensuing operating system file dialog window, type in an appropriate name for your Setting, and press the *Save* button.
- You can also use the *Settings* pull-down menu to copy and paste parameters between Settings.

Note: Logic automatically creates a folder called "Plug-In Settings" when first installed. Within this folder, a separate sub-folder is created for each effect. When you use the *Save/Load Preset* functions in the *Settings* pull-down menu, Logic will automatically save/load the Setting file to/from the corresponding effect folder. As each effect Setting is stored in its own associated folder, you should find it easy to manage hundreds of presets. This feature is applicable to all Logic and third-party effects.

Important: It is recommended that you do *not* attempt to change the folder structure within the Plug-In Settings folder.

Additional Plug-in Window Options

The gray area at the top of the Plug-in window displays a *Link* button and a *Bypass* button.

Follow these steps to see how the Link button can be used:

1 Insert a plug-in into the first *Insert* slot of the first Audio channel, if you have not already done so. This will launch the Plug-in window.

2 If the Plug-in window doesn't automatically launch, double click on the illuminated *Insert* slot.

3 Activate the *Link* button to the left of the gray Plug-in window area.

4 Now insert a different plug-in into the second *Insert* slot of the audio channel. You will notice that the open Plug-in window updates to show you the newly selected plug-in.

5 Deactivate the *Link* button to the left of the gray Plug-in window area.

6 Now insert a different plug-in into the third *Insert* slot of the audio channel. You will notice that a new Plug-in window is automatically spawned for the newly selected plug-in.

These two Plug-in window behaviors may be useful for different tasks, when assigning effects and mixing in Logic.

The *Bypass* button is used to bypass the effect. This is useful for allowing comparisons of an audio signal with, and without, the effect. Bypassing an effect is achieved by simply clicking on the *Bypass* button when in the Plug-in window.
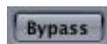
If you wish to bypass an effect when no Plug-in window is opened, press Option and click on the desired channel's *Insert* slot(s).

Channel or Bus Effect?

Certain effects are often inserted into Buses rather than individual channels, allowing multiple tracks to make use of a single effect "unit", thus saving CPU power. As the *Send Level* knobs on each audio channel can be used to control the amount of signal sent to the Busses, the amount of effect applied to each channel's signal can be varied.

To send audio from an Audio track to a Bus:

1 Click-hold on any of the *Send* slots of an Audio channel, and a menu will open, displaying all available Busses.

2 Select the desired Bus. The *Send* slot turns blue, with the name of the selected Bus displayed. A small knob appears to the right of the *Send* slot. This is the *Send Level* control. It determines the amount of signal which is sent from the Audio channel to the Bus channel.

3 To adjust the amount of send level, click-hold on the knob and drag your mouse to the right. You may also press Option and click on the knob which will automatically set it to a value of *0.0 dB*.

Insertion of an effect on a *Bus channel* works in the same way as inserting an effect in one of the other audio channel types.

Dynamics processing and equalization is generally applied on a per-channel basis. Other effect types, such as reverbs or modulation processes—chorus, flanging, and others—can be used in either the Bus or channel *Insert* slots, but are generally used on Busses. Delays are commonly used on Busses—except when special settings are required for a single channel. Filter effects are usually channel-based.

Automated Mixing

Logic's Mixer can be fully automated. This automation allows a full "flying-fader" mixdown of all audio channels, output faders, busses, software instruments, and effects.

Note: Everything that you'll learn in this section (on an individual channel basis) also applies to the channel strip you can see on the left-hand side of the Arrange window.

Here's a quick guide to using Logic's automation system:

1 Open the Track Mixer and the Arrange window. Resize both windows if necessary, so that you can see the Track List and a few of the channel strips in the Track Mixer. Although you can make use of the Arrange channel strip in isolation, having the Track Mixer open will allow you to see multiple channels—so keep an eye on both, and watch what happens when one or the other is changed.

2 Select *View > Track Automation* in the Arrange window's local menu. The Arrange window will zoom in vertically (select *Current Track* when prompted).

3 Now click on any track in the Track List—MIDI or audio—and pay attention to the Track Mixer window. You will see that as you select a track in the Track List, the corresponding fader in the Track Mixer will be outlined (and the fader to the left of the Arrange window also updates to reflect the selection).

4 Select the *Touch* option by click-holding on the panel above the *Pan* knob on the outlined fader—keep an eye on the Arrange window fader while doing so.

5 To record changes to the volume, press *Play* on the Transport Bar (or use the Key Command) and move the highlighted fader up and down in the Track Mixer. As you do so, you'll see a curved line being created on a gray bar in the Arrange window (and the miniature fader on the Track List will move).

6 Once done, press *Stop*.

7 Return to the beginning of the newly-recorded automation track, using any of the navigation methods you learned earlier, and press *Play*. Note that the fader on the Track Mixer (and the Arrange window fader—assuming the same track is still selected) is now replaying your recorded automation movements. This automatic playback of changes to the Track Mixer's channel parameters is often referred to as flying fader automation.

The same automation method can be used for controlling the volume of additional channels, automating Pan knob positions, EQ, and plug-in parameter automation.

Editing Automation Data

You'll probably want to edit your recorded automation data at some stage or another, or perhaps to create some automation more precisely. The following paragraphs offer a brief overview of automation editing techniques. More information can be found in the Onscreen Help system or Logic reference.

Before we start, we'd like to cover a couple of concepts. Namely, those of "nodes" and "lines" in the Automation data.

- *Nodes* are dots on an automation track that represent a particular value and time position for the defined automation type.
- *Lines* connect the dots, and represent a linear (straight) or curved transition of automation values over time. A ramp up in volume between two nodes, for example.

Inserting Nodes

A short click anywhere in the automation track will insert a node at that position, and value. A short click on, or just outside, a line will insert a node on the line.

Deleting Nodes

To delete a node, simply click on it *quickly* (a short click). The position of the node will determine what happens to the automation data. Try these and use the *Undo* or *Revert to Saved* functions between each.

- Click on the first node, and it will be deleted. This will, in turn, make the second node the first node. A click on this node will delete it and make the (original) third node, the first node and so on.
- The same also applies to the last node, but works backwards from the last, second to last, third to last nodes and so on.
- Clicking on a node which falls between two other nodes will delete it, and the nodes which surrounded it will be joined directly by a recalculated line.

Moving Nodes

It is possible to select one, or multiple nodes (and therefore the lines which connect them). You can move adjacent nodes—nodes that are beside each other—or you can move non-contiguous nodes—nodes that are separated by other nodes. Select non-contiguous nodes with the Shift key depressed.

Handling Lines

Lines are created automatically between nodes. The following node functions are pertinent to lines.

- a short click on, or just outside, a line (not on an existing node) will add a new node on the line.
- a long click on a line allows you to move the line, along with its two endpoints—the nodes that encompass the line.
- a long click outside a line will create and select a new node, allowing you to move this new node immediately.

Curves

There may be occasions where you wish to create non-linear automation data.

- Linear means a straight line.
- Non-linear means curved.

Click-holding on a line or a selection (of several lines and/or nodes), with Command-Control depressed, allows you to set various curves on a line or the current selection.

Various automation curves
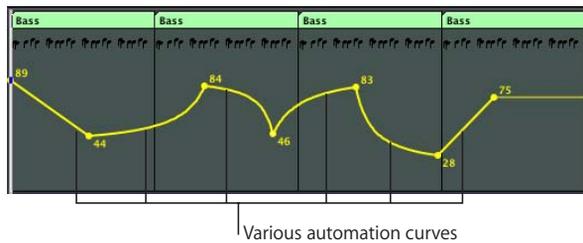
Bounce—the Final Mix

Bounce is a realtime or offline (faster than realtime) digital process. The entire song—or a section of it defined by the left and right *Locators*—is combined into a single mono or stereo file.

Note: In Logic Pro it is also possible to *Bounce* to a number of discrete files for Surround sound purposes. Please consult the Logic reference for further information.

To bounce all tracks routed to Output 1-2:

1 Choose *File > Bounce* from the main menu bar. The Bounce dialog will launch. (The screenshot below shows the Bounce dialog of Logic Pro. The Logic Express Bounce dialog looks slightly different.)
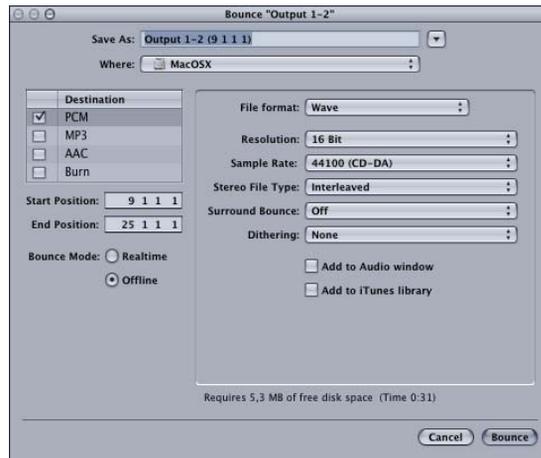
2 Check that the *Start* and *End* positions are correct. By default, they will encompass the area from the beginning of the first Audio Region to the end of the last Audio Region. You may wish to add an extra bar or so to the *End* position, to ensure that you capture any Reverb tails or Delay repeats, if applicable.

3 Select the other parameters—*File Format, Resolution, Sample Rate, Stereo File Type, Surround Bounce, Dithering,* and *Bounce Mode* (*Realtime* or *Offline*) as desired, by click-holding in each pull-down menu panel. Further information on these parameters is available in the Logic reference and Onscreen Help system.

Note: You may select between various audio file formats when bouncing (MP3, for example) and may also burn a CD directly from the Bounce dialog.

4 Press the *Bounce* button and an operating system File Save dialog window will open. Browse to the desired folder, and name the file.

5 Press *Save* and the bounce will commence.

Note: If the *Offline Bounce* mode is selected, you will not hear the audio being played during the process.

6 Once completed, the bounced file will be available for your use in CD-burning programs, Logic itself or other applications.

Note: If you have audio hardware with more than one output pair, you can also bounce the signal routed to the other Output Objects. Logic features a *Bounce* (labeled *Bnce*) button in the lower left corner of Output Objects. If you click this button of the desired Output Object, the Bounce dialog opens.

The Environment Concept

Logic's Environment window—accessible from the Windows menu—is Logic's "brain". Its primary purpose is to get MIDI and audio information into, and out of, Logic.

You were introduced to the Environment when you defined and configured new Audio Objects for use as audio tracks, busses, and instruments (see the "Mixer and Audio Objects in the Environment" section on page 66). As you know, these Objects can show up as tracks in the Arrange window. This illustrates a basic and important principle of Logic:

The Environment has a direct relationship to the Arrange window's Track List: Each track has a destination, and this destination is an Object in the Environment. The reverse is not true, however, because not every Object in the Environment *needs to* be displayed in the Arrange window.

The MIDI Artery

Although the possibilities of the Environment go far beyond what we'll be covering in this guide, there are several key concepts that are essential to know, in order to understand and operate Logic. These things are quite well illustrated in the Environment of the Tutorial song.

So, to simplify things, you should open the *Layer* **shown in the graphic.**

1 Select the *Windows > Environment* menu option, or press Command-8.

2 Choose the *Click & Ports* layer from the pull-down menu to the left, and take a close look at the Objects shown.
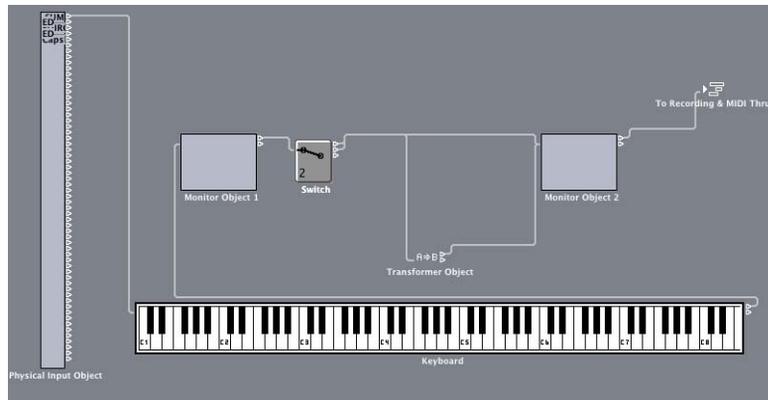
On the left-hand side you can see an Object named *Physical Input*. Only one of these Objects exists in the Environment. It represents the inputs of your MIDI interface, and is where the MIDI data from your keyboard is received and fed into Logic's Environment.

If you play a few notes on your MIDI keyboard: the onscreen *Keyboard* should reflect the notes being entered. Take a closer look, and you'll see that there is a connection between the *Physical Input* Object and the onscreen *Keyboard*. The data is fed from the onscreen *Keyboard* into a *Monitor* Object, where the incoming note names are displayed. The *Monitor* Object is followed by a *Switch* that feeds the data—either unaltered or altered by a *Transformer Object*—to a second *Monitor* Object.

Play some notes, click on the *Switch* and listen to the results. The second *Monitor* shows what's happening to the notes: They are transposed, made louder or left unchanged. This is a very simple example of what can be done with the Environment.

The last Object in this chain, named "*To Recording & MIDI Thru*", is very important. It represents Logic's actual MIDI input. The *Physical Input* Object and dataflow example that we looked at in the preceding paragraphs is "in front of the door", so to speak. Only MIDI data that is fed into the *Sequencer Input* Object can be recorded by Logic.

Note: Like the *Physical Input* Object, there is only one *Sequencer Input* Object in the Environment.

So, what does this all mean to me?

Well, basically three things:

• It is possible to intercept the data coming into the MIDI interface, and to manipulate and route it to specific MIDI instruments or outputs, while bypassing the actual sequencing part of Logic completely.

- You can insert Objects between the *Physical Input* Object and the *Sequencer Input* Object, alter the MIDI data and record the results (as shown by the note transposition and velocity increase in the example above).
- You can also deactivate Logic's MIDI input completely (although you'll want to avoid this): If you cut the connection between the *Physical Input* and the *Sequencer Input* Object (by clicking on a cable and pressing Backspace, for example) you will not be able to receive and record MIDI data with the sequencer.

Note: You can quickly check if Logic is receiving data by playing a few notes on your MIDI keyboard while looking at the small *MIDI Activity* display in the Transport Bar.

Cutting the Sequencer Input connection:
1 Select the cable running from the second *Monitor* Object into the *Sequencer Input* (named *to recording & MIDI Thru*) by clicking on it, and pressing Backspace. Ensure that no other Object is selected/highlighted.

2 Play your MIDI keyboard, and you'll see that the onscreen *Keyboard* and *Monitor* Objects continue to display the incoming data, but the *MIDI Activity* display in the Transport Bar will indicate no data reception.

To make the shortest possible connection between the *Physical Input* Object and the *Sequencer Input* Object:
1 Click-hold on the small triangle at the top right of the *Physical Input* Object. As you move the mouse cursor, you'll note an onscreen cable.

2 Move the cable's "plug" (at the mouse cursor position) over the *Sequencer Input* Object until it is highlighted/selected, and release the mouse button. This replaces the old connection (broken in the previous exercise) with a new one.

3 Play a few notes on your MIDI keyboard. You'll note that the onscreen *Keyboard* and *Monitor* Objects do not display the incoming data, but the *MIDI Activity* display in the Transport Bar does indicate data reception.

External Control
If you have connected a MIDI device such as a MIDI keyboard or sound module to your computer, you can use the Environment to control this MIDI instrument from Logic.

The following example shows you how to control an external, mono timbral MIDI instrument from Logic:
1 Select a new, blank layer from the Layers menu by selecting the ***Create*** entry.

2 Select *New > Instrument* from the Environment's local menu. A new Instrument Object is created. The Instrument Object transmits data on a single MIDI channel, making it perfect for connecting an external mono-timbral instrument.

3 Click the Instrument's *Name* field in the Object Parameters box. Type the name of the MIDI device that this Instrument Object represents.

4　To connect the Instrument directly to one of your computer's MIDI ports, you need to define the Instrument Object's *Port* setting. To do so, click on the *All* menu option in the Object Parameter box *Port* setting, and select the MIDI port that connects this Instrument Object to the actual hardware MIDI device. As mono-timbral MIDI devices can only receive data on one MIDI channel at a time, you must set the Instrument Object's MIDI channel to match the MIDI channel of the device it represents.

5　Double-click on the number *1* beside the Object Parameter box MIDI Channel setting (Cha), and enter the MIDI channel that your mono-timbral MIDI device is set to receive on.

6　Create a new track in the Arrange window (or click-hold on the name of one of the existing tracks), and select the newly-created MIDI Instrument Object as the "target", from the hierarchical track menu. If you can't see the new Object, click the *show in menu* checkbox beside the icon in the Object Parameter Box.

7　If you select this track, and play, or perhaps record, some notes, the MIDI data is sent from the Arrange window track to the MIDI Instrument Object (the target), and from there to the MIDI output that the external instrument is connected to.

Note: Logic sees all data received at the *Sequencer Input* and this data—recorded as a *MIDI Region* in the Arrange window—can be routed to any target Object that exists in the Environment. While it is possible to create several *MIDI Out* Objects that represent your physical MIDI Out ports, and cable *Instrument* Objects into them, this step is unnecessary as the *MIDI Out* port and *MIDI Channel* (or channels, in the case of Multi Instrument Objects) can be addressed directly from the Instrument (or Multi Instrument) Object.

From Arpeggiators to Step Sequencers

Beyond the audio and MIDI Objects that you've been introduced to, the Environment offers a large number of other Objects that can be used for MIDI data manipulation. These include: arpeggiators, MIDI delays, transformers, chord memorizers, and more. These Objects can be connected freely with virtual cables, enabling the creation of various (from the simple to the very complex) MIDI processors.

There are, in fact, so many creative possibilities waiting for you here that you can even build step sequencers, drum computers and random pattern generators in the Environment. This tutorial, however, is not the place to discuss all of the possibilities afforded by the Environment—extensive information can be found in Logic's Onscreen Help system and the Logic reference.

Audio and MIDI Basics

A

This appendix offers a brief overview of MIDI and digital audio basics.

If you want to know what an audio file is, how audio is converted into and from computer information and what this MIDI thing is all about, you'll find it here.

MIDI

MIDI is an acronym for Musical Instrument Digital Interface. To break this down further—the "Musical Instrument" part of MIDI refers to electronic musical instruments such as synthesizers, samplers, and even MIDI guitars. The "Digital Interface" part sounds technical, but really isn't.

Basically, MIDI's "Digital Interface" is broken down into two components.

- MIDI is a computer-based language—and as you probably know, computers talk digitally. MIDI keyboards, modules, and cards are actually computers in disguise.
- MIDI's "Interface" is just that. MIDI is a hardware standard which consists of a set of physical connectors labeled IN, OUT, and THRU. You will find one or more of these connectors on all MIDI devices, such as keyboards or modules.

The MIDI Language

The "language" of MIDI is understood by all MIDI devices. The purpose of the language is to translate your musical performance into information that can be understood by a computer. (Don't forget that MIDI keyboards and modules are actually computers in disguise).

When you play your keyboard, or Logic is playing a MIDI song file, MIDI information which *describes* your performance is transmitted as a string of MIDI messages. These instructions tell any connected synthesizer or sound module *how* to play a piece of music. The synthesizer or module receiving the MIDI data actually generates the sounds that you hear.

Important: MIDI does not send sounds. It only sends instructions.

The MIDI Connection

MIDI, as mentioned, is also a hardware "interface" which consists of a standardized set of connectors labeled IN, OUT, and THRU.

MIDI connectors consist of a round socket with 5 holes arranged in a semicircle. MIDI cables, used for connecting MIDI devices, have a matching plug that features 5 pins. Only three of the pins actually carry information.

MIDI only works in one direction on each connector. If you want your MIDI keyboard to send messages *to*, and receive messages *from* Logic, you must connect *two* cables.

Here's the way your MIDI connections must be made, in order to work:

• MIDI OUT sockets must be connected to MIDI IN sockets on the receiving device.
• MIDI IN sockets must be connected to MIDI OUT sockets.

Important: If you connect a MIDI OUT to another MIDI OUT or a MIDI IN to another MIDI IN, no communication will happen, and your MIDI system won't work.

The MIDI THRU connector is not found on all MIDI devices. It simply mirrors the MIDI messages arriving at the MIDI IN socket, and allows you to "daisy-chain" more MIDI devices. Before doing this, read the section on MIDI channels, which is very important when chaining MIDI keyboards or modules.

MIDI messages are sent from a MIDI controller such as a keyboard or sequencer—such as Logic—via the MIDI OUT connector. The device (MIDI synthesizer or sound module) receiving the MIDI messages at its MIDI IN socket, responds to these messages by playing sounds.

Important: Remember, MIDI does not send sounds. It sends instructions on how, what and when to play.

Note: Many MIDI keyboards include both the keyboard controller and MIDI sound module functions within the same unit. In such devices, there's an internal MIDI link between the keyboard and sound module. This internal link can be enabled or disabled by setting LOCAL ON or OFF—on the keyboard itself.

When using your MIDI keyboard with Logic, and the keyboard is acting as both controller and sound module, you should set LOCAL to OFF. Doing so avoids "it sounds like my notes are doubled or flanging" types of problems.

If your keyboard is simply acting as an input device, and you don't want to use its sounds (or it doesn't have any, as is the case with controller keyboards), you simply need to connect its MIDI OUT to the MIDI IN on your computer. Logic will take care of the "channels", which we're just about to take a look at.

MIDI Channels

MIDI is divided into 16 logical "channels". Each channel is identified by a special channel number message that is sent with the other MIDI messages. Most keyboards can generally be set to transmit on any one of the 16 MIDI channels. A MIDI sound source—such as your synthesizer or sound module—can be set to receive on a specific, or multiple, MIDI Channel(s).

Devices capable of receiving on multiple MIDI channels simultaneously are said to be "multi-timbral". The term literally means "many sounds", which can be a little confusing, as most synthesizers are obviously capable of producing many sounds. Not all synthesizers, however, are capable of producing many sounds at the one time. This capability means that a suitably-equipped MIDI keyboard or module could be used to produce all of the drum, bass, piano, string, and brass sounds in a performance.

In this scenario, each part, or instrument—drums, piano, strings, and so on—will be assigned to a specific MIDI channel. Given the 16 logical MIDI channels available to each MIDI port and a multi-timbral synthesizer, up to 16 different "instruments" can be played simultaneously. Most modern MIDI keyboards and sound modules are multi-timbral.

Important: In *all* MIDI systems, the sound module must be set to receive on the channel (or channels in multi-timbral devices) which match the channel(s) that the keyboard controller (or Logic) is transmitting on, in order to play sounds. If the channels do not match, the receiving device will not play.

As an example: Imagine a 4-way multi-timbral device (a device capable of receiving on 4 MIDI channels simultaneously) is receiving song data from Logic—with tracks assigned to channels 1, 2, 4, and 5.

The device itself is set to receive on channels 4 to 8. In this case, only the song's MIDI data sent on channels 4 and 5 would be "seen" by the device, and subsequently played. The MIDI data sent on channels 1 and 2 would be ignored.

As you can see from the above example, each channel needs to be "tuned in" to a corresponding channel sent from Logic. This, if you use a little imagination, is not unlike tuning in a TV or radio channel. If the channel isn't tuned properly, you won't see or hear anything … and neither will your sound module!

Audio

Audio, as a term, basically refers to any sound that you can hear. In the physical, as opposed to computer world, this is known as *Analog Audio*. When Logic records analog audio signals via an audio interface connected to, or installed in, your computer, the audio is converted into digital information. This information is stored as a *Digital Audio* file on your computer's hard disk.

As with MIDI, the *Digital Audio* part sounds technical, but really isn't. As discussed earlier, computers talk "digitally", and need to deal with analog audio signals as digital information.

Important: Unlike MIDI, digital audio files are actually recordings of sounds, *not* an instruction language.

Digital and Analog Recording

While digital audio recording is similar in concept to analog recordings made on tape, the technical differences are significant. For much of the 20th century and into the 21st, analog tape recordings have been used for the storage of audio performances—spoken, sung, and played.

The analog tape medium is a thin plastic strip coated in tiny metal particles. It is usually stored on a roll or spool, or as a cassette tape, which you're probably familiar with.

The process of analog tape recording involves the transmission of small electrical charges, sent to the magnetic "heads" of a tape recorder. Changes to the strength of these charges alter the magnetic fields generated by the heads, and rearrange the positions of the metal particles on the tape. Needless to say, this is a less than precise science. Due to the randomness involved in the rearrangement of magnetic particles on tape (and other technical reasons), the recordings are said to be "analogous"—similar to the actual performance.

Digital recording, on the other hand, is much less random. Analog signals are converted into digital audio signals via the ADC (Analog to Digital Converter) of the audio interface. The digital audio signal, can be are stored "digitally" on your computer's disk—as a series of ones and zeroes. Provided this file remains consistent, digital recordings will be virtually identical each time they are played back.

In a copying situation—tape to tape—there is no comparison between analog and digital recordings. Each subsequent copy of an analog recording becomes noisier and less like the source material. This is the "random" factor of the magnetic particles becoming less like the original each time a copy is made.

Digital audio files, on the other hand, can be copied any number of times, with each subsequent copy adding no noise.

On a more practical level, digital audio files stored on hard disk have the following advantages over analog audio stored on tape.

- Digital audio can be cut, copied, and pasted freely from location to location. Could you imagine physically cutting a stereo analog recording stored on tape into even four or five segments and splicing them back together? Not much fun!
- You can move to any spot in a digital audio file almost instantly rather than waiting for the tedious mechanical rewinding and fast forwarding of an analog tape machine.
- You can process digital audio in ways that are simply impossible with analog audio. As one example, it is possible to adjust the pitch of a digital audio file without changing its speed.

Digital Conversions

When an analog audio signal arrives at the inputs of your computer's audio interface, it must be converted into digital information before the computer can deal with it. This process is called *analog to digital conversion* and is handled by the Analog to Digital Converter (ADC) of your audio interface.

At the other end of the signal path, the digital signal needs to be reconverted into an analog signal, so that it can be listened to through analog audio playback systems—an amplifier and speakers. This process is called *digital to analog conversion* and is dealt with by the Digital to Analog Converter (DAC) of your audio interface.

About Bits and Sampling Rates

When recording a sound into your computer, the ADC of your audio interface takes a "sample" of the sound source, a specific number of times per second. This is known as the "sample rate", which is measured in kHz (kilohertz—kilo means thousand) or "x" thousand samples per second. The higher the rate, the more samples the AD converter takes, and the more accurate the digital representation of the sound will be.

Put another way, imagine each sample to be a photograph of a concert that you were trying to describe to a friend. If you had taken one photo every 10 minutes, you'd find it hard to describe the great light show. If you took a thousand photos during that 10 minutes, your friend could easily see what happened. This increased "rate", or number of photos (samples), delivers a far more accurate overall picture of what happened. This is how sampling works. The more "sonic photos" taken, the more accurately the sound is represented over time. A videotape recording of the concert—running at 25 frames (samples) a second, would give an even more accurate idea of the light show.

Common sample rates used in audio production include: 44.1 kHz or 48 kHz, and high-end systems may use rates from 96 kHz up to 192 kHz.

The sampling resolution—expressed as *bit* values—determines the precision of the measuring scale used to store (the numbers of) each sample. Remember that computers store audio files as digital information—a series of ones and zeroes. There are three audio file resolutions commonly in use: 8, 16, and 24 bits. 24 bit systems are more expensive and are used extensively in DVD audio and film production.

To give you an idea of the relevance of the sampling resolution, imagine two people are building a house. One is using a tape measure marked to the nearest foot. The other has a tape measure marked to the nearest inch. Although the house built with the tape measure accurate to the nearest foot may not fall down, the one using the finer scale will build a more accurate house.

About File Formats

Continuing on from the 24 bit and 16 bit resolution discussed above, Logic can record and play back 16 and 24 bit audio files. You can even use both 16 and 24 bit files in the same song. The advantage of the higher resolution 24 bit files in Logic is most apparent when mixing.

Every mixing operation in Logic—a volume change, panning, effects processing, and so on involves some sort of mathematical calculation. In digital systems, where everything is represented by ones and zeroes, there are (often) occasions where the calculations don't result in a nice, round number. To handle this, Logic will "round off" the value resulting from the calculation to the nearest suitable value. This is known as a *roundoff correction* in digital audio terminology.

If you begin with a 24 bit file, the sample is represented by around 16 million little *slices*, whereas the 16 bit file of the same audio is represented by 64 thousand slices—note that *slices* is not a technical term, in any way!

As you can see, the higher resolution 24 bit file has far more *slices* that could be used as possible values during a *roundoff correction*. The end result of all of this?

24 bit files retain more of the original character of the sound after processing/mixing, making your mixes more precise, and largely avoiding coloration of the sound.

About MIDI and Audio File Sizes

Digital audio files consume a great deal of hard disk space. "CD quality" audio with 16-bit dynamic resolution and 44.1 kHz frequency resolution requires 5 megabytes (MB) of hard disk space for 1 minute of *monophonic* audio. For a *stereo* recording, this requirement is doubled, with a one minute audio file using 10 MB of storage space.

MIDI file data, on the other hand, is tiny. An average MIDI song file, three minutes in length and containing a dozen or more tracks will be about 20 kB in size.

The reason for this huge difference in size is that MIDI is, as discussed earlier, a language that *describes* what notes to play. The actual sounds themselves are generated by a connected MIDI device.

Audio and MIDI in Mac OS X   B

This chapter covers the audio and MIDI facilities of Mac OS X.

You will learn how to set up, and optimize, your audio and MIDI hardware for use in Mac OS X.

Core Audio

All audio devices are accessed via Core Audio in Mac OS X. Core Audio is a flexible, high-performance, low-latency audio system. Logic is compatible with any audio hardware that is supported by a Core Audio driver.

Sound Preference Pane

From Mac OS X 10.2 onwards, the *Sound* preference pane is only required for switching the system's Sound Effects ("Sosumi", "Ping" and others…).

If you are on the road with your PowerBook, and want to fix a musical idea quickly, you might want to use the PowerBook's internal microphone for recording with Logic. Select > System Preferences > Sound, and then *Input*. Switch between *Line In* and the *Internal microphone* in this pane.

Select > System Preferences > Sound, and then *Output*. This preference pane determines the default output device. This output device is used for system alert beeps, and for some audio applications, such as iTunes and iMovie. If you would prefer your system beeps and playback of iTunes and iMovie audio to be output via your external Core Audio hardware, select your device here.

You should always select the maximum possible volume level in order to make full use of the entire dynamic range, when working with applications that use the default output.

Note: Reduce the level setting of your amplification system when adjusting the *Volume* setting to avoid any speaker damage.

Please note that you can set an independent level for the alert beep. It is recommended that you reduce this to the minimum level, or even deactivate alert beeps entirely, when working on compositions.

Audio MIDI Setup (AMS)

Apple's *Audio MIDI Setup* application is integrated into the operating system. It was introduced in Mac OS X, version 10.2. The AMS application is found in the Applications > Utilities menu.

Note: You may find it useful to move the AMS application into the *Dock*.

As AMS mirrors the parameters of the *Sound* preference pane (except for *Sound Effects*), it should be used for almost all adjustments that you wish to make to your audio interface settings.

The AMS application is useful for selecting a default setting for your *Core Audio* hardware. You will require this "default" setting for all audio applications (iTunes, for example) that are incapable of directly selecting a setting. For more capable audio applications, such as Logic, it is possible to set all parameters from within the host itself.

Note: The appearance of the AMS application may vary, dependent on the version of Mac OS X in use.

Core MIDI

MIDI data is handled by the Core MIDI system of Mac OS X. Compatible MIDI interfaces for connecting a keyboard, MIDI fader unit or external sound generators are recognized and activated automatically.

The MIDI Page of AMS

The AMS application offers a MIDI page that allows you to see all installed MIDI interfaces, and make connections between them, if necessary.

Please note, however, that you don't need to change any settings in this page if you want to use the MIDI interface(s) with Logic. All MIDI parameters and connection options can be accessed directly in Logic's Environment.

A Brief Guide to Connecting MIDI Hardware

If you use a simple master keyboard—without an integrated sound generator or fancy master keyboard functions—you'll only need one cable to connect the master keyboard's MIDI Out with the MIDI In of the MIDI interface.

If the keyboard can generate its own sounds, connect the computer's MIDI Out to the keyboard's MIDI In. If your computer (or the MIDI device) offers more than one MIDI output, connect any other tone generators to these.

If the computer only has one MIDI output, you need to connect the second tone generator's MIDI In to the keyboard's MIDI Thru port. A third device can be connected to the second's MIDI Thru, and so on. The MIDI Thru port always delivers a copy of the signals coming into the device's MIDI In. It is preferable, however, to use a direct connection from a computer's MIDI Out to a device, rather than chaining too many devices, one after the other. This is because timing problems may occur in the chain, if numerous MIDI commands are sent in a short time period. This is due to the slight delays introduced by each MIDI In to MIDI Thru transaction.

If your computer offers several MIDI inputs, you can connect the MIDI outputs of other MIDI expanders to it.

MIDI Local Off

If your keyboard has an internal sound source, it is important that you stop the keyboard from generating sounds directly from its own keyboard. If you buy a new keyboard that is to be used without a sequencer, and connect it to an amplifier, you would expect the device to make a sound when you press its keys—in other words, the keyboard is directly connected to the sound generator.

When using the keyboard with a sequencer, however, this is not desirable. In this scenario, the keyboard is used as the computer's input device, and the computer will play the various connected tone generators, be they the keyboard's own sound generator or any other connected sound modules. If you wanted to control and record another sound module with your keyboard, its own sounds would get in the way— which is why the keyboard must be separated from its own internal sound generator.

This function is known as "Local Off", and can be set directly on your keyboard. The sequencer will speak to your keyboard's tone generator just like any other connected, keyboardless sound module.

Note: If you cannot find the "Local" function in your keyboard's MIDI menu, consult its manual as to how best to proceed for sequencer use. Some keyboards allow you to select from: "Local", "MIDI" or "Both" for each of their "Parts". The "MIDI" setting, if applicable, is the equivalent of "Local Off".

Tape Synchronization
Details on synchronizing Logic with digital or analog tape machines, multi-trackers or video editing systems, and their cabling requirements, can be found in the Logic reference.

Connecting Logic to a Mixer

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Dependent on your audio hardware and working routines, there are a number of possibilities available for the use of Logic in conjunction with a mixing board or on its own.

The following section introduces three approaches to setting up your Logic system. The first, using Logic as a mixer and the others discussing the use of an analog mixing console with Logic.

Using Logic as a Mixer

It is possible to completely bypass the use of a Mixing console with Logic. Key to this is a suitable audio interface, equipped with as many audio inputs and outputs as your recording situation demands.

If you are primarily a keyboard player, who uses Logic's internal instruments, and occasionally records some vocal parts, you may not need any external hardware—making do with the audio ins and outs of your Macintosh. Most users will require an audio interface that is better equipped, however.

Audio interfaces come in a huge variety of shapes and sizes, with an equally diverse range of facilities and potential interfacing possibilities. All interfaces that offer a Core Audio driver, regardless of features, can be controlled with Logic—effectively making Logic your system's mixer.

Here's an example recording scenario:

- a FireWire audio interface, equipped with: two mic/line inputs (phantom powered), six line inputs, a digital input, two master outputs, a digital output and a headphone output.
- two stereo MIDI synthesizers
- a guitar
- a condenser microphone
- a DAT machine

Given that the audio interface has sufficient inputs to handle all of the studio's equipment, you would connect your devices as follows:

- input 1—microphone (phantom power active)
- input 2—guitar (phantom power active)
- input 3—synthesizer 1 left output
- input 4—synthesizer 1 right output
- input 5—synthesizer 2 left output
- input 6—synthesizer 2 right output
- input 7—unused
- input 8—unused
- digital input—DAT digital output
- digital output—DAT digital input
- master output—into your amplifier and speakers
- headphone output—headphones

In Logic, you would set up six discrete *Audio Input* Objects on the Audio layer of your Environment, as follows:

- Audio Input 1—mono
- Audio Input 2—mono
- Audio Input 3—stereo (for control of synthesizer 1's left and right channels, connected to inputs 3 and 4 of the audio interface)
- Audio Input 4—stereo (for control of synthesizer 2's left and right channels, connected to inputs 5 and 6 of the audio interface)
- Audio Input 5—stereo (for control of the left and right channels, connected to inputs 7 and 8 of the audio interface)
- Audio Input 6—stereo (for control of the left and right channels of the audio interface's digital input)

The outputs of the audio interface are addressed by the *Output* faders in the Audio layer of the Environment.

To adjust the incoming levels of the external synthesizers, the microphone, guitar, and DAT machine, you can simply change the level of the corresponding *Audio Input* Object.

Important: The *Audio > Audio Hardware & Drivers > Software Monitoring* preference must be active in order to hear incoming audio via the *Audio Input* Objects.

Note: Adjustment of the *Audio Input* Object levels only affects the incoming audio stream when Logic is monitoring audio. When *recording* you need to adjust the input levels at the source. In other words, you need to increase or decrease the level of the synthesizers connected to inputs 3/4 and 5/6 if you wish to record their output as audio into Logic. This type of level adjustment doesn't need to take place on the DAT machine connected to the digital input. In the case of microphone and guitar, you may need to insert a compressor into the signal path—either externally, or into the top Insert slot of *Audio Input* Objects 1 and 2, to ensure that an appropriate audio level is captured.

Mixing Desk Without Sub Groups

If your analog mixing desk does not offer sub groups, proceed as follows:

Connect the audio hardware outputs to the first of your desk's Line or Tape inputs. Use as many channels as your audio hardware requires. Use the remaining channels for your other sound sources, effect processors, and microphones.

Note: If you find yourself short on channels, you can connect Logic's outputs to your desk's Aux Returns (or "Effect Returns"). This really cannot be avoided with smaller mixers, but it is not much of a penalty, as Logic offers extensive EQ and processing power, anyway.

Your mixing desk is likely to offer at least two Aux Sends (not to be confused with Aux Returns)—they should be wired "pre-fader", or should be switched to this mode, via a dedicated button. "Pre-fader" means that the signal is accessible *before* it enters the channel fader (volume slider). This means that the pre-fader Aux Send will output the channel's signal, even if its fader is pulled all the way down. This kind of output is usually referred to as a monitor output, and may actually be labeled as such.

Each channel has two knobs that are used to create a mix, which is sent to the desk's corresponding auxiliary (or monitor) output. Connect these two outputs to the two inputs of the audio hardware. As an example, if the two pre-fader Aux Sends are labelled "Aux 3" and "Aux 4", you would connect a cable from the desk's "Aux 3 Output" to the first audio hardware input, and another from Aux 4, to the second input.

Once set up in this way, you can control Logic's inputs with the Aux Send controls (and their master sends). Slide the master fader all the way down for each channel that you wish to record—this will allow you to hear the recording after the "tape head". To provide you with a "real-world" example, if the tracks that are to be recorded are routed to Logic's 1 & 2 outputs, you would listen to channels 1 & 2 on your desk instead. This allows you to instantly spot any distortion introduced by an overload of Logic's inputs.

Mixing Desk With Sub Groups

If your mixing desk has sub groups, use them for recording. Connect the first sub group output to Logic input 1, and the second sub group output to Logic input 2. The recording level is controlled with the sub group faders. If your audio hardware supports more audio inputs, connect more sub group outputs to them as needed.

Connect the Logic outputs to the first few channels' Line or Tape inputs. Connect the rest of your sound sources (effect processors, microphones etc.) to the remaining channel inputs.

During recording, route the channels that are to be recorded, or even better: the sub groups to your desk's stereo (master) outputs. It is preferable to use Logic's Monitoring Function, rather than listening to the signal after conversion by your audio hardware's A/D and D/A converters (see below for more details).

Note: Avoid connecting Logic's recording inputs to your desk's main output (Main Out)—these (and the Control Room output that usually carries the same signal), are meant for your monitoring equipment and your stereo or two track tape machine. These outputs include a mix of Logic's output signal, which you do not want to re-record.

Note: As Logic can generate files destined for master CD-Rs, or burn them directly, the following information may not apply to your situation. If you choose to use a conventional mastering machine, a DAT or MiniDisc recorder or an analog tape deck, connect it directly to the mixing desk's "Control Room" output, or to the "Tape Output" of the HiFi amplifier used to monitor your mix.

Software Monitoring Function

Dependent on the latency of your audio hardware, Logic's Software Monitoring facility may be a good choice, or you may be better served by monitoring the signal directly with your external mixer.

If you find that latency is unacceptable, we recommend that you disable *Software Monitoring* in the *Audio > Audio Hardware & Drivers* panel. Monitoring should be done at the input channel of your mixer, as it avoids latency completely. To monitor the signal you are recording, simply assign the input channel of the mixer (receiving the source signal) to the main L/R outputs *and* the subgroup or aux that feeds Logic's input.

Activation of Logic's *Software Monitoring* facility is desirable as it offers great routing and processing flexibility of the monitor signal, from within Logic. Using today's state-of-the-art computers, latency is less of a problem. When *Software Monitoring* is enabled, route the recording signal solely to Logic, or alternatively, turn down the monitor signal on your mixing board.

Optimizing Your Audio Computer System

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Logic is known for its stable and reliable operation. You can further enhance your system performance by optimizing your computer configuration for music applications.

Outside of music, a well-configured and well-maintained computer performs more reliably, with fewer crashes, and that's got to be a good thing! On the following pages you will find tips and tricks, which help you optimizing your computer configuration. Finally you will be provided with a first-aid kit for computer emergencies.

Hardware
Obviously, the fastest Mac you can afford will be the most appropriate computer for use with Logic. If you can stretch to a dual-processor G5 Macintosh, do so. Logic, and Mac OS X itself, is built to make use of multi-processor Macs.

In general, you should avoid "weighing down" your computer system with unnecessary components, so don't add a SCSI card if you can make do with FireWire or internal drives.

You should concentrate much of your effort on the selection of the "right" audio hardware, to ensure that it is compatible with your software and other computer hardware components.

Memory
An adequate amount of RAM is important for the overall stability of your computer music system. 512 MB (or more!) of RAM is recommended, particularly when working with numerous audio tracks or software samplers. We recommend the use of high quality RAM.

Hard Drive
Should you work with a large number of audio tracks, consider using a separate, fast hard drive with enough storage capacity for your audio files. FireWire is a good choice for these sorts of duties. FireWire is built into all Macintoshs from the Blue and White G3 onwards.

Audio applications place high demands on the disks and mechanical parts of a hard drive. Regular hard drive maintenance is particularly important for ensuring stable, and consistent, drive operation. This includes de-fragmentation and performance checks. Frequent de-fragmentation has a positive effect on the life of a hard drive. The hard drive tools that ship with the operating system are a safe choice but these may not detect, or repair, all problems.

Note: As a general rule, the larger the hard drive, the less frequently it will need to be defragmented.

Hard drives are subject to wear-and-tear. Should your hard drive utility detect problems more and more frequently, it might be a precursor to the failure of the drive. Back up your data and consider replacing the drive before a total failure occurs.

Note: The *Audio > System Performance* window provides information on how your CPU and hard drive is performing.

Software
When deciding on the software to install on your computer music system, the general rule is: "less is more". Ideally, only the standard operating system plus Logic, and maybe the components required for accessing the Internet, would be installed on your system. In the real world, however, this isn't always practical…

You should avoid running other applications—unless absolutely necessary—while using Logic. Mac OS X is very good at multi-tasking, but why take away any potential power from Logic? Running that word processor in the background, or leaving your Internet connection "live" could cost you that "one last" reverb you need to finish a track.

Backup
The most important rule when using computers: *Always back up your data*. This is particularly true for a computer music system as it generates large amounts of data, in a short amount of time, under often demanding conditions.

For this reason, it's a good idea to back up your most important data on several external storage mediums—on a daily basis! If this seems a little paranoid, just consider the price of storage media compared to the value of your music. If your computer (or hard-disk) decides to self-destruct, the result is often the unrecoverable loss of important data, and with it, hours of work and inspiration.

If you make your living with a computer music system, you might want to invest in a professional backup solution—see your music/computer dealer for further information and assistance.

Troubleshooting

They may be rare, but every computer user inevitably experiences seemingly severe computer problems at some point. These may be crashes where the mouse freezes, the screen locks up, or the display is plastered with error messages. Even mature, well-written operating systems cannot protect you completely from hardware conflicts, bugs, or other problems.

Experience has shown that such system problems are rarely caused by a defect in our programs or hardware products. All Apple hardware and software is rigorously tested by a diverse range of musicians and studio users, from a variety of fields and uses, who look for any faults or problems.

This doesn't mean that the possibility of errors can be completely ruled out; problems can crop up periodically. This is not unexpected as the various applications, operating system versions, and drivers, are all developed, and improved in parallel by unrelated programming teams, which leads to occasional compatibility problems. We do, however, provide fixes in the form of software updates, as soon as we become aware of such problems, and are grateful to any users who make us aware of them.

If you suffer from system crashes or errors, you may well find the tips in this chapter helpful, even if the problems are ultimately unrelated to Apple products. In most cases, these problems, once identified, can be rectified with a minimum of effort, although tracing the cause of such problems can be time consuming. You will be able to overcome most of these problems without needing to consult an expert—this chapter will guide you on how to proceed. It is best to eliminate the classic causes of problems *before* you suspect a hardware defect, or another fault—especially before sending your machine in for repair, or your software for a refund. Take care, though: some of these suggestions may only cure the symptoms, and could therefore complicate the identification of the actual cause of the problem. Persistent problems *will* require the advice of an expert.

If you bought your computer and audio hardware at the same time, it is a good idea to test that the computer is functioning as expected, with just a mouse, keyboard, and display attached, before installing the audio interface and additional hardware (external hard disks, printers etc.). All new Macintoshes ship with pre-installed software, which should allow you to test that everything is working correctly. Once you have switched everything off, you can proceed with the installation of any additional hard disks, modems, scanners etc., if applicable. Once done, check that everything is working as it should be. If so, you can unplug all cables from the back of the computer and begin the installation of your audio hardware.

If Disaster Strikes…

… your first priority should be to make a backup of your most important documents. Attempt to copy your files (lyrics, songs, tax records) to other hard, or removable drives, without launching their associated applications. You can skip this step for CD-ROMs, but be aware that even CDs require a little care when handling: neither of its two sides should be scratched. Once you have made backups of your files and programs, the chances of a true disaster are all but eliminated. Never skip making regular backups, even if everything is working perfectly—eventually, any hard disk may crash. A system crash can be caused by:

• Operator error,
• A software conflict (for example incompatibility between two programs, sometimes even a virus),
• A hardware configuration error,
• Overloading of the system's resources,
• Faulty cable connections (or missing termination), or
• A hardware defect.

Eliminate the first five causes before deciding to have your hardware repaired.

If the problem persists, make precise notes of the following:

• What you were doing at the time of the error (which program, which function, which applications were open).
• The *exact* text of any error messages and/or error numbers (if applicable).
• The version of the operating system, as well as that of the program in which the error occurred.
• The Apple System Profiler, installed with Mac OS X, offers an in-depth component overview, which can be printed.
• Which System Preferences (found in the Apple menu) are active.

Note: The Apple System Profiler can be used to print details of your entire system configuration, including the properties of all hardware.

Preferences and Parameter-RAM

Many crashes can be avoided by taking one of the following measures (please exit the program first):

• Move or delete the crashing program's preferences. The preferences files are found in your users folder ~/library/preferences. Drag the preference file to the desktop. Doing so will often require you to reset some of your program's preferences.
• "Zap" the Parameter-RAM (P-RAM). This contains clock time, date, and many system settings which need to be preserved when the computer is turned off, but these can easily be set again. Hold the Command-Option P and R keys during a restart (immediately after hearing the start sound). Keep the keys held until you hear the Macintosh start sound three times.

Does the problem persist?

Hard Disk Checking and File Structure Repair
Logical file structure errors can be diagnosed and repaired with suitable software; hard disk hardware defects can also be diagnosed. The boot drive (Start Volume) cannot generally be repaired if a critical error occurs. If you usually start your computer from the internal hard drive, you will need to choose another Start Volume, which will boot the computer from another drive. This is best accomplished with the emergency CD-ROM which ships with most computers, but you may also need a second hard or removable disk drive with a system folder on it.

Choose the CD-ROM, or other drive containing the operating system, in the "Start Volume" control panel. Restart the computer. Many Macintosh computers also allow you to force a start from the CD-ROM by holding down the c key during a new start.

Launch the "Hard Disk Utility" program, and use it to repair your volumes and the privileges.

Does the problem still persist?

PCI Errors
PCI technology relies on highly-accurate timing synchronization in your computer's data stream. Unfortunately, there are certain PCI card combinations that will cause conflicts with each other, despite the fact that each works perfectly in isolation, and all meet the PCI specifications. PCI problems of this type can cause seemingly random system crashes.
• Check if the problem persists after removing the PCI card. Try to work on the machine, using the built-in AV audio hardware, for several hours without the PCI card—if the problems disappear, you've found the culprit. If the problems persist, however, you can safely rule out PCI issues as the cause.
• Try to use the PCI card in another slot. It is often possible to resolve conflicts by simply swapping slots.

Faulty Cables
Cable faults are a common problem, which can cause all manner of problems.

If the computer does not respond to certain commands, the reason may be an intermittent USB cable fault between the keyboard and the computer. Try connecting the mouse directly to the USB input of your Mac. If the computer behaves normally, you will need to purchase a new USB cable. In some situations, you may need to replace your Macintosh keyboard.

The use of the right monitor cable is important—simply having the correct connector at either end is not sufficient. Before assuming that this is an unrelated hardware fault, please test the cable by swapping it for a new one.

Another common problem is loose internal computer connections, which commonly occur after transporting the computer. Keeping the possible consequences to your warranty in mind, as well as all safety precautions, you may wish to refasten the internal connectors, with care. Be careful though: disconnect the power cable first, and wait for the high voltage to drop. Ground yourself to the computer with an anti-static strap, or by touching the metal components of the case. This can prevent visits to the repair man (or the hospital).

Viruses
Regrettably, there are some malicious people who program and distribute viruses, solely to cause damage. Check your drives regularly for viruses, especially if you are in regular contact with other people's data carriers, or download data from the Internet. Not all virus programs are able to detect macro viruses, and others which are, as yet unknown, to virus protection software developers.

Re-installing or Updating the Operating System
It is possible that as a result of a crash, or installation error, the operating system will become unusable. If this happens, re-install the operating system from your system CD-ROM.

To do so, restart your computer using the Mac OS X Installation CD (insert the CD and select it as the "Start volume" in the corresponding control panel; or on newer Macs, simply press Command during the restart) and re-install the operating system.

Sometimes, the problems simply come down to the operating system. You can usually find updates for your operating system online, where they can be downloaded free of charge.

Formatting the Hard Disk
Formatting the hard disk is the absolute last resort you should attempt, before sending the computer for repair. This will erase all files on your hard disk, and any "garbage" data that may be causing your problems.

The formatting process will erase all files, so *make backups of all files and programs first*, and *verify* these backups to ensure that they have been successful. Be sure to run virus checking software on all backups, to avoid re-infecting your newly formatted drive with any viruses that your system may be carrying.

To format the internal hard drive, you will need to start your computer from another drive, either from the CD-ROM, a boot floppy, or an external hard disk. To rule out a virus problem however, it is advised that you reformat all hard drives in the same session—a CD-ROM cannot be infected with a virus (unless it was infected to begin with).

Important: Please keep in mind that invisible software authorizations cannot be copied—please de-authorize such applications from your hard drive before erasing it!

Reinstall Logic after installing the operating system. If the problem *still* persists, a hardware conflict, or conflict between the program and the operating system is the most likely situation. If the problem only occurs with a specific program, you will need to get in touch with the software manufacturer, so if the problem lies with Logic, please contact AppleCare. AppleCare Support can be reached online at http://www.apple.com/support/logic. If the problem occurs with several applications, you will need to get in touch with your computer dealer.

Glossary

AD converter or ADC Short for analog/digital converter; a device that converts an analog signal to a digital signal.

AIFF Abbreviation for Audio Interchange File Format. A cross-platform file format supported by a large number of digital video and audio editing applications. AIFF audio can use a variety of bit depths, but the two most commonly used are 16 bit and 24 bit.

alias A pointer to a MIDI Region in the Arrange window. An alias does not contain any data. It simply points to the data of the original MIDI Region. You can create an alias by Shift-Option-dragging the original MIDI Region to a new location. An alias can not be edited directly. Any change to the original Region will be reflected in the alias.

amplifier Device which controls the level of a signal.

amplitude This term is used to describe the amount of a signal. If you have an audio signal, amplitude refers to the sound's volume, measured in decibels (dB).

analog signal A description of data that consists of a constantly varying voltage level, that represents audio information. Analog signals must be digitized, or captured, for use in Logic. Compare with digital.

Anchor point The start point of the audio file that an Audio Region is based on. Also see Sample Editor

Apple Loops An audio file in which recurring rhythmic musical elements or elements suitable for repetition are recorded. Apple Loops have tags and transients which allow Logic to perform time stretching and pitch shifting. Theses tags also allow you to quickly locate files by instrument, genre or mood in the Loop Browser that is used to import of Apple Loops in Logic. To open the Loop Browser, choose Audio > Loop Browser.

Arrange window The heart of Logic. The primary working window of the program where Audio and MIDI Regions are edited and moved to create a song arrangement.

attenuate To lower an audio signal's level.

audio file Any digital recording of sound, stored on your hard drive. You can store audio files in the AIFF, WAV and Sound Designer II formats. All recorded and bounced WAV files are in Broadcast Wave format.

Audio Instrument Logic supports the use of software based instruments. Software instrument plug-ins are inserted into Audio Instrument Objects. Software instrument recording takes place on Audio Instrument tracks in the Arrange window. Playback of these tracks is routed via the Audio Instrument Object.

audio interface Device needed to get sound into and out of your computer. An audio interface converts digital audio from your computer to analog waves that speakers can broadcast, or, in the other direction, an audio interface converts analog waves into digital audio your computer can work with.

Audio MIDI Setup (AMS) in Mac OS X the Audio MIDI Setup (AMS) utility lets you configure audio input and output devices connected to your computer. Logic uses the settings defined in the Audio MIDI Setup utility, which can be found in the Applications > Utilities folder.

Audio Mixer An Environment layer that shows all Audio Objects of a song. The Audio Mixer is used for mixing multiple audio channels in real time. The Audio Mixer is also known as Environment Mixer.

Audio Object Audio Objects are found in Logic's Environment. They are the "building blocks" of the Audio Mixer. When expanded, Audio Objects look just like channel strips. Audio Objects tell Logic where to send audio signals. The following Audio Object types are available: Audio Track Object, Input Object, Audio Instrument Object, Bus Object, Output Object, Master Object, Aux Object.

Audio Region Chosen area of an audio file which is registered in the Audio window for use in the song and, can be placed on audio tracks in the Arrange window, just like a MIDI Region can be placed on MIDI tracks. Audio Regions are aliases (or pointers) to portions of audio files. They can be as short as a single sample, or as long as the audio file itself. You can use all of Logic's tools to edit Audio Regions. Editing is non destructive on the original audio file, as the Region is only an alias of the audio file. See also Region and MIDI Region.

audio track A track in Logic's Arrange window that is used for playback, recording and editing of Audio Regions.

Audio Track Object Audio Object in the Environment's Audio layer. Used to playback audio tracks in Logic's Arrange window. All data on the audio track is routed to the Audio Object, that was assigned in the Arrange window's Track List menu.

Audio Units (AU) Audio Units is the standard format for real-time plug-ins running on Mac OS X. It can be used for audio effects and software instruments. The Audio Unit format is part of the Mac OS X operating system. Once installed, Audio Unit plug-ins can be accessed by all programs simultaneously. Logic supports all Audio Unit format plug-ins.

Audio window Logic window used for a number of audio file handling and conversion tasks.

Autoload Song Song with your favorite settings and preferences. It loads automatically when you launch Logic, and serves as a starting point for your songs and projects.

automation Automation is the ability to record, edit, and play back the movements of all knobs, controls and buttons, including volume faders and pan, EQ, and Aux send controls plus almost all effect and instrument plug-in parameters.

Aux Object Audio Object in the Environment's Audio layer. Aux Objects are similar to the Bus Objects, but are more flexible. Unlike Bus Objects Aux Objects also have Sends of their own, allowing you to form complex signal paths

bar In musical notation, a bar is a measure that contains a specified number of beats, and establishes the rhythmic structure of a musical piece.

Bar Ruler Ruler found at the top of the Arrange, Matrix, Hyper and Score windows. It displays musical time units including bars, measures, beats and beat divisions. It is used to set and display the song position, the cycle and autodrop locators, as well as markers.

beat A musical time interval: "the beat is the regular rhythmic pulse in a composition that people tap their feet to". Usually a quarter note.

beats per minute See bpm.

bit depth The number of bits a digital recording or digital device uses. The number of bits in each sample determines the theoretical maximum dynamic range of the audio data, regardless of sample rate. Also known as bit resolution, word length or bit rate.

bit rate See bit depth

bit resolution See bit depth

bounce To process recorded or streamed MIDI and/or Audio Regions with any applied effects, such as delay or compression, combining them into one audio file. In Logic, you can choose between Realtime and Offline bouncing. Offline bouncing is faster, but doesn't allow you to apply live automation or record real time audio input.

Bounce button You can bounce the output of any Output Object to an audio file by clicking the Object's Bounce button. See also bounce.

bpm Abbreviation for beats per minute, a measure of the tempo of musical piece. As an example: 120 bpm means that in one minute, there will be 120 musical beats (quarter notes).

bus The term bus is used to describe a send/return routing scheme for audio channels. In Logic, effects can be sent to/from Bus Objects for processing or submixing tasks.

Bus Object Audio Object in the Environment's Audio layer. Usually used to route the signal of an individual send bus to Output Objects. See also bus.

bypass To deactivate a plug-in. Bypassed plug-ins do not drain system resources. In Logic you can bypass a plug-in by either clicking its Bypass button in the plug-In window or by Option-clicking on the appropriate plug-in slot.

cable In Logic the term cable is used to describe the virtual cables that represents the MIDI connection between two Environment Objects.

Catch button The button in the Transport bar featuring the running man icon. Activate this button (blue) to turn on automatic horizontal scrolling during playback. This ensures that the current playback position is always visible.

Catch function A window function that makes the currently displayed song section reflect the current song position. Also see Catch button.

CD Audio Short for Compact Disc—Audio; current standard for stereo music CDs: 44.1 kHz sampling rate and 16 bit depth.

cent A tuning subdivision of a semitone. There are one hundred cents in a semitone. Many of Logic's software instruments contain a Fine parameter that allows sounds to be tuned in cent steps.

channel strip A channel strip is a virtual representation of a channel strip on a mixing console. Each channel strip contains a number of similar controls, such as a Mute button, Volume fader, Pan/Balance knob, Output selector and Bus and/or Insert slots.

Channel Strip setting Logic allows the routing of a channel strip, including all inserted effects or instruments (plus their settings) to be saved and recalled. This simplifies the task of recreating complex serial effect routings between channels or songs.

checkbox A small box. You click a checkbox to select or deselect an option.

click Metronome, or metronome sound.

Clipboard The Clipboard is an invisible area of memory, into which you cut or copy selected objects, using the Edit menu. From there, you can paste these objects to different positions. Logic's Clipboard spans all songs, allowing it to be used to exchange objects between songs.

clipping (in digital recording) Feeding too much signal through a channel strip, thereby exceeding the limit of what can be accurately reproduced results in a distorted sound known as clipping. Logic's Audio Objects feature a clip detector, which indicates signal level peaks above 0 dB.

controller MIDI data type. As examples; sliders, pedals or standard parameters like volume and panning. The type of command is encoded in the first data byte, the value in the second data byte.

Core Audio Standardized audio driver system for all Macintosh computers running version 10.2 or higher. Core Audio is an integral part of Mac OS X, allowing access to all audio interfaces that are Core Audio compatible. Logic is compatible with any audio hardware that offers Core Audio drivers.

Core MIDI Standardized MIDI driver system for all Macintosh computers running Mac OS X version 10.2 or higher. Core MIDI is an integral part of Mac OS X, allowing the connection of all MIDI devices that are Core MIDI compatible.

Cycle function A function in Logic which constantly repeats the area between the Locator positions. To turn on Cycle mode, click the Cycle button in the Transport window. The cycle function is useful for composing a part of a song or editing events, as examples. The Cycle area is shown as a green stripe in the top part of the Bar Ruler.

DA converter or DAC Short for digital/analog converter; a device that changes an analog signal into a digital signal.

DAW Acronym for Digital Audio Workstation. A computer used for recording, mixing and producing audio files.

dB Abbreviation for decibels, a unit of measurement that describes the relationships of voltage levels, intensity or power, particularly in audio systems.

default The preset parameter value.

destructive Destructive audio processing means that the actual data of an audio file is changed, as opposed to just editing peripheral or playback parameters.

dialog A window containing a query or message. It must be cancelled or replied to before it will disappear and allow you to continue.

digital A description of data that is stored or transmitted as a sequence of ones and zeros. Most commonly, refers to binary data represented using electronic or electromagnetic signals. All files used in Logic are digital. Also see analog for comparison.

disclosure triangle A small triangle you click to show or hide details in the user interface.

distortion The effect produced when the limit of what can be accurately reproduced in a digital signal is surpassed, resulting in a sharp, crackling sound.

drag & drop Grabbing objects with the mouse, moving them, and releasing the mouse button.

driver Drivers are software programs that enable various pieces of hardware and software to be recognized by other programs in a computer, and also to have the appropriate data routed to them in a format they can understand. In Logic, you can use the Preferences > Audio > Drivers panel to select and configure your audio hardware drivers. If you do not have the proper driver installed, your computer may not recognize or work properly with a given piece of hardware.

DSP (digital signal processing) In Logic, the mathematical processing of digital information to modify a signal. An example is the Insert slot of channel strips, which assigns DSP effects such as dynamic compression and delay to a channel's signal.

DTDM Mixer Logic Pro supports a number of Digidesign hardware devices via Direct TDM. The DTDM mixer is created in Logic's Environment window, and allows the use of Logic "native" effects and instruments with suitable Digidesign hardware.

dynamics Refers to changes in volume or other aspects of a piece of music over time.

dynamic range The dynamic range of a sound system is the difference in level between the highest signal peak that can be reproduced by the system (or device in the system) and the amplitude of the highest spectral component of the noise floor. The dynamic range is the difference between the loudest and softest signals that the system can reproduce. It is measured in decibels (dB). See decibels.

editor Window for editing MIDI or audio data. Logic offers the Hyper, Matrix and Score editors for MIDI event data, and the Sample Editor for audio data.

effect A type of software algorithm that lets you alter the sound of a track in a variety of ways. Logic includes a set of EQ, dynamics, time-based, modulation and distortion effects in Logic's native and Audio Unit plug-in formats.

Environment The Environment is Logic's brain: it graphically reflects the relationships between hardware devices outside your computer and virtual devices within your computer. Beyond basic input and output handling, the Environment can be used to process MIDI data in real-time, and can even be used to create processing "machines", such as virtual rhythm generators and step sequencers or complex synthesizer editors.

Environment layer A place in the Environment, used to organize Objects and making usage easier. Objects of the same type (Audio Objects, for example) are generally placed on the same layer.

Environment Mixer See Audio Mixer

EQ Shortened form of equalizer. Equalizers are used to boost or cut frequencies in an audio signal. There are several types available in Logic.

equalization See EQ

Eraser A tool used for deleting items. Click a selected item to delete it. All other currently selected items are also deleted.

event Individual MIDI command, such as a note on command. Continuous controller movements (modulation wheel, for example) produce a quick succession of individual events with absolute values.

Event List A list that shows all events and Regions of a song. It allows you to directly manipulate events and Regions in a precise, numerical way. It also allows you to add different types of Events.

export To create a version of a file, such as a Logic song, in a different format that can be distributed and used by other applications.

Fade tool Tool in the Arrange Toolbox, used to create a cross-fade. To do so, click and hold the mouse button and drag across a section where two Audio Regions meet. You can also drag the Fade tool over the start or end points of a Region to create a fade-in or fade-out, respectively.

filter effect Filters are effects you can apply to Audio or MIDI Regions (when streamed or recorded as audio). They are designed to reduce a signal's energy at a specific frequency. A true filter always acts as a subtractive device, and doesn't add anything to the signal. The names of the individual filters illustrate their function. As an example: A Low Pass filter allows frequencies that are lower than the cutoff frequency to pass.

float window Window with special status which always "floats" on the surface above all other windows, but can only be operated with the mouse. Any Logic window can be opened as a float window by holding down Option while opening it.

frame Unit of time. A second in the SMPTE standard is divided into frames that correspond to a single still image in a file or video.

Freeze function The Freeze function performs individual offline bounce processes for each "frozen" track, saving almost 100% of the CPU power used for software instruments and effect plug-ins. All plug-ins of a track (including software instrument plug-ins, if applicable, along with all related automation data) are rendered into a "Freeze file". You can use the Freeze function on individual Audio or Audio Instrument tracks.

frequency The number of times a sound signal vibrates each second, measured in cycles per second, or hertz (Hz).

Glue tool This tool can be used to merge Regions or events by simply clicking on two (or more) of them.

grab (an object) Positioning the mouse cursor over an object, then pressing and holding the mouse button down.

grid Logic's grid is represented by vertical lines that are used to map the positions of measures, beats, and sub-beats in various editors.

Hand tool A tool used to move Regions in the Arrange window or events in the editors. It automatically appears when moving the mouse cursor over an object when the Pointer tool is selected.

help tag A small text window that appears when the mouse cursor is placed over an interface element that indicates the name or value. When editing operations such as moving or cutting a Region are performed, a larger help tag will display the current position of the Region or function—in realtime.

hierarchical menu Structured menus where choosing an individual entry opens a submenu.

highpass filter A highpass filter allows frequencies above the cutoff frequency to pass. A highpass filter that offers no slope or resonance controls is generally knows as low cut filter.

History window The (Undo) History window provides a list of previous editing steps. You can click on any entry in the list to undo or redo these steps. The number of steps is defined in the Global > Editing > Limit Multiple Undo Steps preference.

Hyper Editor Graphical editor that can be used to create or edit MIDI note and controller data. The Hyper Editor is ideal for "drawing" in drum and other parts.

icon Small graphic symbol. In Logic, an icon may be assigned to each track.

importing The process of bringing files of various types into a Logic project or song. Imported files can be created in another application, captured from another device, or brought in from another Logic project.

Input Object Audio Object in the Environment's Audio Layer. The Input Object represents the physical inputs of your audio interface and helps managing audio from your audio interface into Logic.

Insert slot A point on Logic's Mixers where you can patch in (insert) an effect plug-in. All audio channel types in Logic's Track and Audio Mixers offer effect insert slots.

interface 1) A hardware component such as a MIDI or audio device that allows Logic to "interface" (connect) with the outside world. You need an audio or MIDI interface to get sound/MIDI into and out of your computer. Also see audio interface. 2) A term that is used to describe Logic's graphical elements that can be interacted with. An example would be the Arrange window, where graphical interface elements such as Regions are interacted with to create an arrangement, within the overall Arrange interface.

key The scale used in a piece of music, centered around a specific pitch. The specified pitch is called the root of the key.

key command Function which can be executed by pressing a specific key (or key combination) on your computer keyboard or MIDI controller.

Key Commands window The Key Commands window is used for the assignment of key commands to computer keys or to MIDI messages. You can access the Key Commands window by choosing Preferences > Key Commands.

latency You may notice a delay between playing your keyboard and hearing the sound. This is a form of latency. A variety of factors contribute to latency including audio interface, audio and MIDI drivers. One factor under you control, however, is the I/O buffer size, which is set in the Audio > Audio Hardware & Drivers preferences.

level meter   A meter that lets you monitor audio output levels from your computer. You use the level meters in Logic when recording, arranging and editing audio files.

Link mode Link mode is activated by clicking the Link button. It determines the relationships between windows. An editing window in Link mode shows the same contents as the top window.

Link button Button featuring the chain link icon in the top left corner of most Logic windows. It controls the linking between different windows.

local menu Menu in a window that only contains functions that are relevant to that particular window.

Locators Lower two sets of numbers, displayed to the right of the Transport buttons in the Transport window. The number on top is the left Locator; the number on bottom the right Locator. The Left and Right Locators control the time-range which Logic's playback will cycle or skip during playback. The Locators also can be used to define the editing area for certain functions.

Logic Setup Assistant A utility that guides you through the process of setting up your Macintosh, audio and MIDI hardware to work with Logic. The Logic Setup Assistant can be run at any time by choosing the Preferences > Start Logic Setup Assistant menu item.

loop An audio clip that contains recurring rhythmic musical elements or elements suitable for repetition. Logic also supports Apple Loops.

Loop function Loop is a Region parameter in Logic that creates "loop repetitions" for an Audio or MIDI Region. These repetitions will repeat until the song end point, or until another Region or folder (whichever comes first) is encountered on the same track in the Arrange window.

lowpass filter The lowpass filter defines the maximum frequency that can pass through without being affected, thus controlling the brightness of the sound. Every signal above this frequency will be cut. The higher the cutoff frequency, the higher the frequencies that can pass through. A lowpass filter that offers no slope or resonance controls is a high cut filter.

Magnifying Glass This tool allows you to zoom in on any part of the active Logic window. You can choose this tool from the Toolbox, or activate it when using other tools by holding down the Control key and clicking.

marker Markers serve three purposes in Logic: They mark time-positions in the Arrange window. They hold text notes and they delimit song settings. Markers can be placed in the Marker track, or they can be placed in the Bar Ruler. Markers are generally used for indicating and navigating to different song sections.

Marquee tool This crosshair-shaped tool in the Arrange toolbox can be used to select and edit parts of Audio and MIDI Regions.

Matrix Editor A MIDI event editor that displays note events as horizontal beams. Events can be cut, copied, moved and resized in a similar fashion to Regions in the Arrange window. The Matrix Editor is sometimes referred to as a piano roll editor.

main menu bar The bar at the top of the computer screen, offering global functions such as opening, saving, exporting or importing songs. It does not offer access to local functions.

merge Mix, or combine, two or more MIDI events or Regions into a single Region.

metronome A part of Logic that produces a sound that taps out the beat. It can set by click-holding the Metronome button in the Transport bar.

MIDI Abbreviation for Musical Instrument Digital Interface. Standardized, asynchronous, serial and event-oriented interface for electronic musical instruments. MIDI is an industry standard that allows devices such as synthesizers and computers to communicate with each other. It controls a musical note's pitch, length, and volume, among other characteristics.

MIDI channel A MIDI channel is a "tube" for MIDI data, which flows through MIDI ports in channels. Up to 16 separate MIDI channels can pass through a port simultaneously.

MIDI message A message transmitted via MIDI consisting of one status byte and none, one, two or many data bytes (with system exclusive commands). See event.

MIDI Region Data container for MIDI events which is shown in the Arrange window as a named horizontal beam. In earlier Logic versions MIDI Regions were called sequences.

mixing The process of shaping the overall sound of a song by adjusting the volume levels, pan positions, adding EQ and other effects, and using automation to dynamically alter aspects of the song.

modifier key Computer keyboard keys used in conjunction with alphabetical keys to change functionality. Modifier keys include; Control, Shift, Option and Command.

modulation Generally, a slight, continuously varying change. Logic's effects and synthesizers contain a number of modulators.

mono Short for monophonic sound reproduction. The process of mixing audio channels into a single track, using equal amounts of the left and right audio channel signals. Compare with stereo.

MP3 Abbreviation for MPEG-2 Audio Layer 3. A compressed audio file format, frequently used to distribute audio files over the Internet.

MTC See MIDI Time Code.

mute Switch off an Audio Object or track's audio output. You can mute a track by clicking the Track Mute button in the Track List. The output of an Audio Object is disabled by clicking the Mute button at the bottom of the channel strip.

Mute tool This tool allows you to stop a Region or events from playing by clicking on it/them.

nodes Positions in Hyper Draw and automation tracks that mark the positions where data manipulation begins or ends. Occasionally referred to as points.

Object If capitalized, the term Object is used to refer to the graphical representation of all elements in Logic's Environment. These elements can be used to create and process MIDI data in real-time, and can even be used to create processing "machines", such as virtual rhythm generators or step sequencers. Examples for Objects are Instruments, Multi Instruments, Faders, Arpeggiators and others. In the Environment's Audio layer you also find Objects used to process audio data. These Objects are correspondingly named Audio Objects. Also see Audio Objects.

Object Parameter box The Object Parameter box displays the properties of any selected Environment Object. In the Arrange window this Parameter box is located below the Toolbox and displays the properties of the selected Track's Object.

option 1) Alternative function, often in the form of a checkbox, sometimes also available as a menu entry. 2) Modifier key, in Windows terminology this key is also known as Alt key.

Output Object Audio Object in Logic's Environment controlling the output level and pan/balance for each output on your audio interface. They are assigned to a specific hardware output in their Object Parameter box.

pan, pan position The placement of mono audio signals in the stereo field, by setting different levels on both sides.

Parameter box Field on the left side of Logic's windows used to adjust the parameters of the selected Regions or Objects.

Parameters area Area at the left edge of the Arrange window and editors, containing the Parameter boxes, Toolbox and channel strip (Arrange window) of the selected track.

Pencil tool Tool used to create empty MIDI Regions in the Arrange window. It can also be used to add Audio Regions to the Arrange window, when used in conjunction with the Shift key. In the Sample Editor, the Pencil can be used to draw out transient signal spikes (pops and clicks) in signals.

pitch The perceived highness or lowness of a musical sound. Corresponds to the frequency of the sound wave.

playback Playing an Audio or MIDI Region or an entire arrangement, allowing you to hear it.

plug-in Software application that enhances the functionality of the main program (in this case, Logic). Logic's plug-ins are typically software instruments or effects.

Plug-in window A window that launches when a plug-in is inserted, or the Insert/Instrument slot is double-clicked. Allows you to interact with the plug-in parameters.

Pointer tool The default Toolbox tool. Used to select and/or edit Regions, events, menu or interface items and more in Logic.

position indicator Units: bars, beats, sub-divisions (often written simply as divisions in this manual) and ticks.

Preferences window A window that is accessed via the Logic > Preferences menu. All Logic preferences can be set in this window.

preset Set of plug-in parameter values that can be loaded, saved, copied or pasted via the Settings menu in the Plug-In window header. See setting and Settings menu.

project In Logic, the top-level folder that holds all media associated with a song, including audio files, Sampler Instruments and samples, Video and Settings of various kinds.

Quantize button Button labeled with a Q. It opens the pull-down Quantization menu in the Matrix Editor or Event List. See also Quantize tool and quantization.

Quantize tool Tool labeled with a Q. It is used to apply quantization to specific (selected) events, using the basis quantize value determined by the Quantization menu in the Matrix or Event List editors.

quantization Time-correction of note positions by moving them to the nearest point on a selectable grid. When quantization is applied to any selected event or Region, Logic will move all note events non-destructively to align perfectly with the nearest grid position.

QuickTime QuickTime is Apple's cross-platform standard for digitized, data-compressed films that can be run in individual windows. You can run QuickTime movies in a Logic window or on a global Video track, in sync with the song. Whenever you move the Song Position Line, the film follows and vice versa.

real-time effects Effects that can be applied to Regions in real time, without requiring rendering before playback. Real-time effects can be played back with any Macintosh computer qualified to run Logic.

ReCycle ReCycle is the name of an application from software manufacturer Propellerheads, which mainly serves as an editing and production tool for loops (repeatedly looped audio samples). ReCycle uses specific file formats (.REX) which can be imported by Logic.

Region Regions can be found in the tracks of the Arrange window: They are rectangular beams that act as containers for audio or MIDI data. There are three different types of Regions: Audio Regions, MIDI Regions and Folder Regions. Also see: Audio Region, MIDI Region and Folder.

Region Parameter box Box in the upper left corner of the Arrange window, used to non-destructively set the playback parameters for individual Regions, including; quantization, transposition, velocity, compression and delay. These parameters do not alter the stored data. Rather, they affect how the events are played back.

reverb Reverb(eration) is the sound of a space. More specifically, the reflections of soundwaves within a space. As an example, a handclap in a cathedral will reverberate for a long time as sound waves bounce off the stone surfaces within a very large space. A handclap in a broom closet will hardly reverberate at all. This is because the time it takes for the soundwaves to reach the walls and bounce back to your ears is very short, so the "reverb"' effect will probably not even be heard.

routing Generally refers to the way audio is sent through processing units. Also often used to describe specific input and output assignments.

rubber band selection technique for selecting consecutive Regions, objects or events by click-holding and dragging the mouse cursor around the desired items. A rubber band selection envelope (an outline) will span from the start position of the mouse cursor. All objects touched or enclosed by the rubber band selection envelope will be highlighted.

sample A digital recording of a sound at a particular instant in time.

Sample Editor Logic's Sample Editor allows stereo or mono audio files to be destructively cut, reversed, shortened, changed in gain and processed in a number of other ways. It allows editing of individual samples within an audio file consisting of thousands or millions of samples. The Sample Editor also provides access to a number of special sample processing tools, collectively known as the Digital Factory.

sampler Device used for sampling. In Logic, this generally refers to the EXS 24 software-based sampler.

sample rate When an analog audio signal is converted to a digital signal, this term refers to the number of times per second the audio file is sampled. Logic can record and edit audio at sample rates ranging from 44.1 kHz (44,100 times per second) up to 192 kHz (192, 000 times per second).

Score Editor Logic editor that deals with standard musical notation. MIDI note events are represented as quavers, crostchets, minims and so on. The Score Editor allows you to adjust and edit the layout of the score, and print it.

Screenset A layout of various windows, inclusive of all display parameters (zoom, position and size of each window and so on) is called a screenset. Each Logic song may store up to 90 Screensets. You can swap between different screensets, much as you might swap between different computer monitors.

scroll bar and scroll box Gray beam at the edge of a window. A movable box inside the beam is used to select the displayed song section in the window.

semitone Smallest interval between two pitches in the standard diatonic scale, equal to a half tone. Correspondingly a semitone is also called half step or half tone.

send Abbreviation for auxiliary sends. An output on an audio device used for routing a controlled amount of the signal to another device. Sends are for example often used to send several signals to the same effect, which is rather advisable for computationally-intensive effects such as reverb.

sequencer A sequencer is a computer application that allows you to record both digital audio and MIDI data and blend the sounds together in a software mixing console. There are editing tools that let you control every aspect of the production, down to the finest details. Effect processors and software instruments are increasingly being added to these applications. Modern sequencers such as Logic now can fulfill many, if not all, functions that were only possible in the most expensive and well-equipped recording studios a decade ago.

setting 1) A parameter value. 2) A set of plug-in parameter values that can be loaded, saved, copied or pasted via the Settings menu. A plug-in setting is also known as preset. Also see preset and Settings menu.

Settings menu Accessible via the Arrow button found in the gray header at the top of all plug-in windows. Allows you to save, load, copy and paste settings: the parameter values of effects and software instruments.

shelving EQ EQ type that allows reducing or increasing the frequency range above or below the specified frequency.

SMPTE Abbreviation for Society of Motion Picture and Television Engineers. The organization responsible for establishing a synchronization system that divides time into hours, minutes, seconds, frames, and subframes (SMPTE time code). The SMPTE time code is also used for synchronizing different devices. The MIDI equivalent of SMPTE time code is MIDI Time Code (MTC).

software instrument Logic's software counterpart to a real sound source or a sampler or synthesizer module.

solo A way to temporarily highlight one or more tracks or Regions or events, allowing them to be heard in isolation.

Solo tool Click-holding on individual Regions or events with the Solo tool temporarily allows them to be heard in isolation. All other objects are muted.

song Main Logic file, containing all MIDI events and parameter settings (including mixer automation data) plus information about the audio files to be played.

Song Position Line (SPL) The Song Position Line is a vertical gray line which indicates Logic's current playback position in all horizontal, time-based windows (the Arrange window, for example). The SPL can be directly grabbed and moved with the mouse (see scrubbing).

Song Settings The Song Settings, accessible from the File menu, are a collection of program settings that are specific to the current song. These are different to the global preferences that affect all Logic songs (see preference).

stereo Short for stereophonic sound reproduction of two different audio channels. Compare with mono.

Swing parameter Alters the rigid timing of a quantization grid by delaying every other note of a specified sub-division by a definable amount.

synchronization Method of keeping several recording/playback devices time locked.

synthesizer A device (hardware or software) that is used to generate sounds. The word is derived from early attempts with mechanical and electronic machines to emulate (or synthesize) the sounds of musical instruments, voices, birdsong and so on. Logic features several software synthesizers, including; the ES1, ES2, EFM 1, ES E, ES P and ES M.

SysEx Abbreviation for System Exclusive data. SysEx data forms the top tier in the hierarchy of MIDI commands. These messages are tagged with an identification number for each manufacturer (the SysEx manufacturer's ID number). The actual contents of these MIDI commands is left to the manufacturer. They are used for transferring individual or banks of sound programs and/or system settings, and for addressing individual sound generation or signal processing parameters.

template Logic allows you to create and save any song as a template file, which can be used as a basis for new projects. The Autoload Song is an example of a template file, but you may wish to create several templates for; scoring tasks, audio only projects, MIDI only projects and so on, as your personal needs require. Also see Autoload Song.

tempo The playback speed of a piece of music, measured in beats per minute. Logic allows you to create and edit tempo changes in the Tempo track.

tick The smallest unit of timing resolution in a sequencer. In Logic, this is 1/3840th of a note.

time signature Two numerals separated by a diagonal bar that appear at the beginning of a song. Common time signatures are 4/4 and 2/4. The first number denotes the number of notes in a measure, or bar. The second number denotes a unit of time for each beat. In a 2/4 signature, each bar has two beats; each beat is a quarter note long.

time stretch Changing the length of an Audio Region without changing its pitch. In Logic, you can do this in the Arrange window or Sample Editor with various menu functions or key commands.

timing Measure of the ability to play notes at the right time. Timing can also refer to synchronization between events, Regions and devices.

toggle To switch between two states such as on or off (applies to windows, parameter values and so on).

Toolbox A section in Logic's Parameters area that contains tools for editing, zooming, cropping and otherwise manipulating items in the window. Toolbox tools can also be opened at the cursor position.

track A horizontal row in the Arrange window that contains either Audio or MIDI Regions that can be played back over time. Each track has a specified destination that data is routed to. Logic allows hundreds of tracks to be used in a song.

Track List Situated to the left of the Arrange window's working area. Displays the Objects assigned to various tracks as well as the Track buttons.

Track Mixer Adaptive Mixer which automatically configures itself to show every audio and MIDI track, in the order that they appear in the Arrange window or in an open Folder. If you move the controls on the Track Mixer while recording, automation data is stored in the relevant tracks as MIDI controller information.

Transform window Logic editor that offers a number of mathematical modification functions for the processing of various aspects of MIDI events.

Transport window Window used to control recording and playback functions. The Transport window offers Record, Pause, Play, Stop and Rewind/Forward buttons plus other functions. You can also configure a fixed Transport window in the Arrange and Matrix windows by selecting View > Transport. This Transport window variation is named Transport field. The term Transport bar refers to both the Transport window and Transport field.

transpositon Transposition is changing the pitch of a Audio or MIDI Region or event by a number of semitones.

Undo function Function which reverses the previous editing operation.

velocity Force at which a MIDI note is struck; controlled by the second data byte of a note event.

Velocity tool This Toolbox tool, found in Logic's MIDI editors, allows the velocity adjustment of individual or grouped note events.

WAV, WAVE The primary audio file format used by Windows-compatible computers. In Logic, all recorded and bounced WAV files are in Broadcast Wave format, which include a high-resolution timestamp.

waveform A visual representation of an audio signal.

window class Status of the window as a float window or a normal window. Float windows always "float" in the foreground and can not be hidden by normal windows. Also see float window.

word length See bit depth.

zoom An action that enlarges (zooms in on) or shrinks (zooms out from) the display in a Logic window. The Magnifying Glass in the Toolbox, and the Zoom controls found in the lower left and upper right corners of windows, are both used for zooming tasks. Also see Zoom control and zoom level.

Zoom control The control that appears at the bottom left and top right of some windows, such as the Arrange. The Zoom control slider allows you to navigate through the entire length of the currently displayed song. The lines on the left and right of the slider can be clicked to zoom in and out by a fixed percentage.

zoom level The amount that a window's contents (tracks, Regions and Objects, for example) are magnified. Zooming in to a high level allows you to make more precise edits. Conversely, you can zoom all the way out to see the entire song and work on very large sections.

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