Logic Express 7
Reference Manual

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Logic Reference

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 loops plus MIDI and software instrument parts in Logic's Arrange window, add professional-quality effects, mix your music in stereo, and export the final mix to a standard audio file 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, including: ES 1 and EXS 24 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 file for mastering or further processing.
- Work in real time: You can work on Logic projects 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 Apple Loop Browser, part of the Logic interface, provides 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 Manual

This book is the final arbiter on all things in Logic, and covers all areas of the program in detail.

You will find descriptions of the most essential aspects of Logic's interface, commands, and menus in the *Using Logic* chapter. These descriptions are often paired with instructions or examples for accomplishing specific tasks.

Chapter 2 discusses the use of Logic's Transport functions and covers the navigation of your Logic projects.

The following chapters will provide you with an overview and complete description of all parameters and functions available in each of Logic's editing and file handling windows. You will learn how to make use of the arranging, recording, and editing facilities available—for MIDI and audio data—in these chapters.

Later chapters discuss mixing, automation, and Logic's preferences, Song settings and synchronization options.

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 basic operation of Logic's interface.

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 Manual…
Before commencing, we'd like to cover the following conventions used in this manual.

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.

Using Logic

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The following chapter will guide you through Logic's basic interface elements, file handling options and common input techniques.

You will also learn about a number of shortcuts and features that will accelerate your workflow, and assist you while learning about Logic.

Using the Mouse
The mouse can be used in the following ways in Logic:

Clicking
Place the mouse pointer on the object (button, input field and so on) and press the mouse button once.

Double-Clicking
The same as clicking on an object, but you press the mouse button twice, in quick succession. You can set a suitable interval between clicks in the System Preferences (Keyboard and Mouse pane).

Grabbing or Clicking and Holding
The same as clicking on an object, but you keep the mouse button held down.

Moving or Dragging
Grab the object, and move the mouse (keeping the mouse button held down) to the desired position.

Mouse Wheel Events
You can use the mouse wheel to scroll vertically in Logic. There are also some modifiers supported:
- If you press Command, the mouse wheel can be used to scroll horizontally.
- If you press Option, the mouse wheel can be used to zoom in/out vertically.
- If you press Option-Command, the mouse wheel can be used to zoom in/out horizontally.

- If you press Option-Control, the mouse wheel can be used to zoom in/out in both directions.

Note: Logic also supports mice with two wheels. The second wheel works like the first wheel, but with interchanged axes.

Input Options

This section discusses the various methods available for interaction with parameters, and data entry tasks.

Mouse Input
Checkboxes

Checkboxes are square boxes that are "checked" when you click them, in order to activate an option (or function). Click the checkbox a second time to remove the "check", and deactivate the option.

Pull-Down Menus
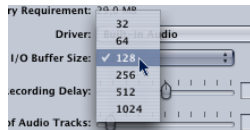
Pull-down menus open when you click-hold on certain input fields or buttons. You can select a function from within such menus by highlighting the desired item with the mouse, and releasing the mouse button. If you wish to select an item that is outside the visible section of the menu,
- move the mouse over the top or bottom edge of the menu; the further you move it, the faster you will scroll through the menu.
- hold down Shift as you do this. You can then release the mouse button, and use the scroll bar to the right of the pull-down menu to browse. When the mouse reaches the entry you wish to use, release Shift.

Mouse as Slider
You can set most numerical parameters (even note values or names) by grabbing the parameter value, and moving the mouse up or down. If the parameter consists of several separate numbers (song position, for example), you can adjust each number individually using this method.

Using the Mouse for In/Decrementing

Nearly all parameter values that can be set using the mouse as a slider (and even some of the pull-down menu parameters) may also be increased or decreased in single units by clicking on the top or bottom half of the value, while holding down Control.

Numerical Input

Double-clicking on a numerical parameter value opens an input field. The existing value is highlighted, and ready to be overwritten by a new entry. You can also use the mouse to make a partial selection in an input field, so that only the highlighted part is overwritten. As long as the input field is open, the computer keyboard may only be used for data entry, and may not be used for key commands (with the exception of the main menu functions).

Arithmetical Operations

You can enter numbers at any time by typing in an arithmetical operation: "+2" or "–5", for example, which changes the current value by/to that amount.

ASCII Code

You can also input numbers as ASCII code: just place a ` or " in front of the selected key, and the ASCII code will be input as a number. As an example:

• "! results in a value of 33
• "a results in a value of 97

This function is particularly useful for entering text in SysEx strings.

Cancel Numerical Input

Direct numerical input can be canceled by entering no text at all and pressing Enter or Return.

Text Input

You can input text names in the same way as numbers, but you only need to click a name field once to allow input. You can directly click on an object with the Text tool to rename it.

Numbered Names

Any number of selected Objects or Regions can be assigned same name. If the name ends with a number, this number will automatically be incremented by 1 for each subsequent Object or Region. This allows you to quickly, and uniquely, name all of the Regions on a track or all of the Fader Objects in the Environment, as examples.
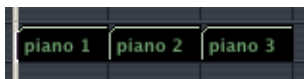
Note: To turn off automatic numbering, place a space after the number at the end of the Object or Region name. All selected Objects and Region will then end in the same number.

Tools and the Toolbox

Logic allows recorded data to be handled graphically. This means that you don't need to input instructions in command lines in order to perform operations, but rather, do so by manipulating graphical "objects". This is done with the help of Tools (see "The Tools" on page 18). Each edit window provides different Toolboxes that are suitable for the tasks performed in the editor.

The Arrange window Toolbox looks like this:
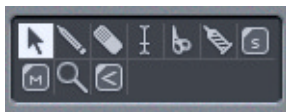
When editing objects graphically, you always have two tools available at the mouse pointer position: one is already active, the other is activated by holding down Command.

You can change the currently active tool by clicking on another tool in the Toolbox. The mouse pointer then adopts the shape of the tool you clicked on, allowing you to instantly identify the active tool by looking at the cursor graphic: the Eraser is used for deleting, the Scissors for cutting and the Glue Tool for merging Regions, as examples. To assign a tool to Command, click on the desired tool in the Toolbox, with Command depressed.

If you have a suitable mouse, you can also assign the right mouse button to a third tool, allowing the use of three assignable tools:
• left-click
• Command- (left) click
• right-click

Note: You can also assign the Toolbox to the right mouse button with the *Global > Editing > Right Mouse Button Opens Toolbox* preference. This allows you to open the Toolbox at the mouse cursor position by right-clicking anywhere in the working area of the open window.

Tools are only effective in the working area of the window in which they were selected. You can define individual tools for each opened window.

A tool (the Scissors, for example) basically affects the Objects or Regions that you click on. If multiple Objects or Regions are selected, they will all be affected by the tool (the Scissors would cut all selected Regions at the same song position, for example).

Note: The Toolbox can be hidden in the Arrange and Score Editor windows to save onscreen space, which can be very helpful if you only have a small monitor. The function is accessible via the *View > Toolbox* menu option.

Selecting Tools
You select the tool you wish to use by clicking on it (with the left or right mouse button) in the Toolbox (or clicking while holding down Command for the alternate tool).

Note: You can use the *Set next Tool* and *Set previous Tool* key commands to switch to the neighboring tool in the top window.

Opening the Toolbox at the Mouse Position
Use the *Show Tools* key command (default: Esc) to open a Toolbox at the mouse position. When a Toolbox is opened at the mouse position, you can also use one of the number keys to select a tool. The tools are always numbered from left to right and top to bottom. Press the *Show Tools* key command a second time to switch to the pointer, and close the Toolbox.

Using Key Commands

Each tool can be selected via a specific key command. Key commands that switch to a specific tool toggle between this tool and the previously selected tool.

The Tools

Here are two example Toolboxes, which contain most of the tools available in Logic:

Arrange Toolbox

Eraser — Text tool
Pencil — Scissors
Pointer — Solo tool
Mute tool — Glue tool
Magnifying Glass (Zoom tool) —
Crossfade tool —

Score Toolbox

Text tool | Layout tool
Eraser — Magnifying Glass
Pencil — Voice Splitter
Pointer — Solo tool
Mute tool —
Sizer tool — Glue tool
Quantize tool — Scissors
Velocity tool | Camera tool
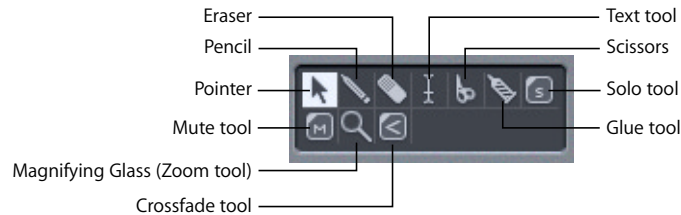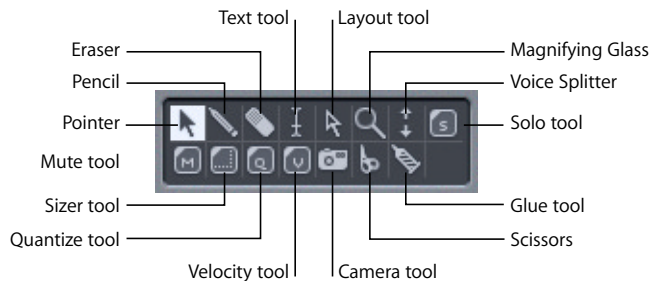
All tools, including a number of tools not displayed in the images, are described below. As mentioned earlier, some tools are specific to certain editing windows.

Pointer

The Pointer is the default tool. The mouse also takes on this shape outside the working area when making a menu selection or inputting a data value. Within the working area, the pointer is used for selecting (by clicking on Objects or Regions), moving (by grabbing and dragging), copying (by holding down Option and dragging), and editing lengths (by grabbing the bottom right corner and dragging). Grabbing and dragging anywhere on the window background activates a "rubber band", that allows the selection of multiple Regions or Objects.

Note: When changing the lengths of multiple Regions, you can make all lengths equal by holding Shift-Option.

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

Scissors
The Scissors tool is used to split Regions, allowing individual sections to be copied, moved or deleted.

Text Tool
The Text tool is used to name Regions, or add text to a musical score.

Layout Tool
The Layout tool is used to graphically move events in the Score Editor, in order to optimize the display (bars to lines: "Local Formatting", for example), without altering the timing of the actual MIDI events.

Size Tool
The Size tool is used to adjust the size of graphic elements in the score. It looks similar to the bottom right corner of a Mac window, which is also used for resizing tasks.

Magnifying Glass
The Magnifying Glass allows you to zoom in on a "rubber-banded" section, up to the full window size. You can revert to the normal zoom level by clicking on the background with the tool. You can also access this function when other tools are selected by holding down Control.

Solo Tool
Click-holding on a Region with the Solo tool allows you to listen to the selected Regions in isolation during playback. Moving the mouse vertically also outputs any events the cursor touches, even when the sequencer is stopped.

Mute Tool
Clicking on a Region with the Mute tool prevents it from playing. A dot is placed in front of the Region name (and the Region is shaded if the *Preferences > Display > Arrange > Muted Regions are textured* preference is active), to indicate that it is muted. You can unmute the Region by clicking on it again with the Mute tool. If multiple Regions are selected, the setting of the clicked Region applies to all selected Regions.

Finger Tool
The Finger is used to alter note lengths in the Matrix Editor.

Eraser Tool
The Eraser deletes selected Regions and Objects. When you click on an Object or Region with the Eraser, all of the currently selected Objects and Regions are deleted (as if you had used Backspace).

Glue Tool

The Glue tool performs the reverse operation of the Scissors tool. All selected Regions are merged into a single Region, which is assigned the name and track position of the first Region on the time axis.

Crosshair Tool

The Crosshair is used to input a linear series of MIDI events in the Hyper Editor.

MIDI Thru Tool

Clicking on an instrument in the Environment with the MIDI Thru tool assigns the instrument to the selected track in the Arrange window, thereby making it the active MIDI Thru instrument.

Voice Splitter Tool

You can separate polyphonic voices onto different staves in the Score Editor by drawing a dividing line with the Voice Splitter tool (provided you are using a polyphonic score style).

Camera Tool

The Camera tool is used to select, and export, sections of the Score Editor display as graphics files.

Quantize Tool

The Quantize tool is used to correct the timing of MIDI note events in the Matrix and Score Editors.

Velocity Tool

You can use the Velocity tool to change the velocity of notes in the Matrix and Score Editors.

Help Tags

A help tag appears just below the mouse cursor position—for as long as the mouse button is held down—when using many of the tools. The help tag provides useful feedback about the type of operation you are performing.

Important: You must enable the *Preferences > Display > Show Help Tags* option in order to view help tags during editing operations.

During operations involving Regions, the help tag will look something like this:
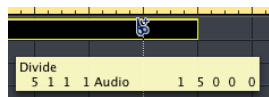
From left to right (and from top to bottom), the values indicate: (name of) operation, mouse (or Region) position, Region name, track number, and length of the Region.

During operations involving events, the help tag looks something like this:
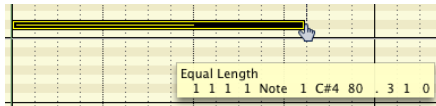
From left to right, the values indicate: (name of) operation, mouse (or event) position, event type, event MIDI channel, first data byte (note pitch, for example), second data byte (note velocity, for example), and event length (note length, for example).

Window Functions

The basic functions of the Logic windows are the same as those in other Macintosh applications. The display options available in Logic's windows are far more extensive, however, than those of other programs.

In Logic, you can open different combinations of windows (even several of the same type) and adjust each one individually. All open windows in a song are constantly updated. This means that the windows update to follow the song position, and any alterations made in one window immediately update the display of all other windows you are working with. It is also easy to save different window arrangements (called "Screensets"), and recall them with the push of a button.

Working With Windows

Opening Windows

All Logic windows can be opened from the Windows menu. The corresponding key command (*Open Arrange,* Command-1, for example) is displayed beside each menu item, allowing you to open the window without using the mouse. You can open as many of the same type of window as you like.

The *Toggle … Window* key commands allow you to define one key command to:
• bring an open window (of an assigned type) to the front,
• open a window of the assigned type,
• close a window of the assigned type, if it is in front (the active window).

Setting Window Size

You can adjust window size by dragging the lower right-hand corner of the window, as with any window in the Finder.

Window Buttons

The three buttons found at the top left of all windows (except the Transport) perform the following operations:
• Left button (black dot): closes the window.
• Center button (minus sign): minimizes the window, and places an icon on the Dock. The window can be restored by clicking on the icon in the Dock.
• Right button (plus sign); resizes the window to the maximum screen size. A second click on the icon will restore the original window size.

Moving Up One Level in the Display Hierarchy
Clicking the button featuring the square graphic (Up One Display Level button—or UDL button) in the top left corner of the window takes you to the next (higher) display level.

Note: Double-clicking on the background of the edit area of a window also takes you to the next highest display level.

Display Levels in the Editors
Normally, the editors are at the lowest display level, which shows individual events. Clicking the UDL button, at the upper left corner of the editor window, allows you to move up one level in the hierarchy. As an example, if you are currently looking at the events in a MIDI Region inside a folder, the display will switch to a view of the MIDI Region in the parent folder.
In the Matrix and Hyper Editors, this step up the display hierarchy means that you will then see an Arrange window. In this scenario, a change to the lowest display hierarchy level will cause the relevant editor to reappear. At the Arrange level, you will see the local menus of the Matrix or Score Editors, which also contain all of the Arrange window functions. Double-clicking on a MIDI Region opens the Hyper, Matrix, Score Editor, or Event List display of the contents of the MIDI Region. Use of this facility, in conjunction with the UDL button allows you to quickly switch to another MIDI Region, and edit its contents.

Clicking the UDL button in the Event List moves you up one level in the hierarchy, just like the other editors. In the Event List, however, the form of the display remains the same but instead of a listing of individual events, you'll see a list of Regions—along with their position, name, track number, and length. The MIDI Region that you were just editing will be selected in the list of Regions.

Once again, double-clicking on a MIDI Region (or using the *Go Into Folder or Region* key command) takes you back to the lowest display level, showing the contents of the MIDI Region.

Double-clicking on an Audio Region opens the Region in the Sample Editor.

In the Score Editor, clicking on the UDL button, or double-clicking on the background takes you to the higher display level. Unlike the other editors, individual events can also be edited while in higher display levels in the Score Editor. Double-clicking on a staff (at an empty point), takes you back to a lower display level.

Selecting the Working Area

The scroll bars are situated at the right and bottom edges of a window, if you can only see a portion of the total working area in either the vertical or horizontal dimension.

You can move the visible section by clicking the arrows, or grabbing and dragging the scroll slider. There are two points of note:
• The size relationship of the scroll slider to the entire scroll bar corresponds to the size of the visible section of the window, in relation to the overall window size.
• The visible section changes as you move the scroll slider.

The X/Y scroll element is situated at the bottom left corner of the window. By grabbing and dragging it, you can move the horizontal and vertical window section, as if you were dragging both scroll bars simultaneously. When the cursor hovers over the X/Y scroll element, a crosshair icon with four arrowheads is displayed.

You can also engage the X/Y scroll feature by holding down a third button (the mouse wheel button, for example), and moving the mouse. The distance of the mouse pointer position from the initial clicked position determines the scrolling speed.

Note: Touching the background of the Arrange Window while holding Shift-Control also allows you to scroll the window both horizontally and vertically.

Use the *Page Up, Page Down, Page Left,* and *Page Right* key commands to scroll one page up, down, left, or right, as if you had clicked in the grey region (in the scroll bar) above/below the vertical scroll slider, or to the left/right of the horizontal scroll slider. The *Page Top, Page Bottom, Page Left most* and *Page Right most* key commands move the visible section of the working area to the top, bottom, left, or right, just as if you had grabbed one of the scrollers, and moved it to one of its extreme positions.

In the Arrange window, Event List, Hyper, and Matrix editors, *View > Scroll To Selection* allows you to move the visible window section to the first set of selected events. This function is available as a key command in the *Arrange and Various MIDI Region Editors* area. The key command works in the currently-active window.

Closing Windows
You can close windows by clicking on the close symbol at the top left. If you hold down Option as you click, all windows of the active song will be closed. Holding Shift while clicking closes all windows of all currently loaded songs.

Zooming
The Zoom sliders are used to zoom in and out of the working area display. Selection of different Zoom slider values reduces or increases the size of Objects and Regions in the displayed screen section, allowing you to see more Objects and Regions in the same space (zoom out) or a detailed display of fewer Objects and Regions (zoom in).

While zooming, the top-left selected Object/Region is kept in the visible area of the screen, whenever possible.

The horizontal Zoom slider is located to the bottom-left of the working area of the screen—in the Arrange window, it's just under the Track List.

The vertical Zoom slider is found at the top right of the active window.

Clicking on the more closely spaced bars will reduce the zoom level. Clicking on the widely spaced bars will increase the zoom level. You can click-hold and drag the Zoom sliders to step through several zoom levels. Any relative size differences between tracks/objects will be retained when zooming. Command-clicking in the left/right (horizontal) or top/bottom (vertical) half of the Zoom slider decreases/increases the zoom factor by one step.

Storing and Recalling Zoom Settings
You can store three different zoom settings for each window via use of the *Save as Zoom 1–3* key commands. Use *Recall Zoom 1–3* to recall your zoomed settings. These commands only apply to the top (active) window.

Zooming in on One Section of the Screen
To enlarge a section of the screen to fill the whole window, use the Magnifying Glass tool to drag a "rubber band" over the desired area. You can do this more than once.

Auto Track Zoom
The Arrange menu *View > Auto Track Zoom* function automatically enlarges the currently selected track. The track size can be manually set by dragging the lower left corner of any track in the Track List (the cursor will change to a "finger" icon).

Reverting to the Previous Zoom Setting
Click on the background with the Magnifying Glass. This will return the zoom level to the original setting, by backtracking through the previous steps. You can access the Magnifying Glass functions from any other tool (apart from the Pencil) by holding down Control. The pointer will display the active tool, until you press the mouse button. As long as the button is pressed, it will display the Magnifying Glass tool.

Window Elements
Adjusting the Size of the Window Elements
If you move the mouse over the top left corner of the Arrange area, the mouse pointer turns into a crosshair. By dragging it, you can adjust the size of the Bar Ruler, Arrange area, Track List, and Transport field buttons. You can also adjust the window elements in the Score, Hyper, and Matrix Editors using the same method.
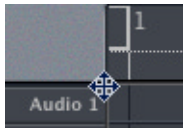
Concealing/Revealing the Transport Functions
Use *View > Transport* to display or remove the Transport panel from the top left corner of the Hyper, Matrix, or Arrange windows. The number of buttons and indicators shown is dependent on the amount of available screen space.

Concealing/Revealing the Parameters

The *View* > *Parameters* function allows you to display or remove the entire area (which contains the Region parameters, Instrument parameters, and the Toolbox) to the left of the Arrange, Environment, and other edit windows. Hiding these parameters provides more space for the editing window itself.

In many windows, you can hide and/or reveal further screen elements, such as the Toolbox. These display options are always available from the View menu.

Concealing/Revealing the Local Menu Bar and Scroll Bars

Command-Option-click on the window title bar to toggle the display of the local menu bar and scroll bars. This allows you configure small floating windows, which can be stored as part of a Screenset.

Resizing the Parameters Area

You can alter the size of the entire Parameters area in the Arrange, Score, Hyper, and Environment windows by moving your mouse cursor over the *resize bars* (the gray, vertical bar with the two vertical lines) between the Parameters area and the column to the right. As an example, the Arrange window's Track List. The cursor appearance will change, allowing you to click and drag horizontally. As you do so, the Parameters area is resized, until the mouse button is released. The smallest "unit" of the resizing grid is the width of a tool in the toolbox.

This facility makes reading parameter names and labels clearer.

Menu Handling

Given Logic's extensive range of data manipulation functions, it would be impractical to display all of them in the main menu bar. To ensure that only relevant functions are available in each editor, a local menu system is employed.
Logic's menus are accessed in the same way as in other applications: click-hold on the menu title, move the mouse over the desired item, and release the mouse button. In hierarchical menus, a right-pointing arrow is shown beside the item. If you highlight such an item, a sub-menu will be displayed to the right. To select an item from this sub-menu, move the mouse to the right, into the sub-menu, and then move vertically over the desired item. Release the mouse button to activate the selected function.

Note: A short click on any of the local menus will result in the menu remaining open, even after you have released the mouse button. A long click will result in the behavior described above.

Window Types

There are two different types of windows in Logic: normal windows and float windows. The contents of all windows that belong to the current song are always updated, regardless of type.

Normal Windows

You can open as many normal windows as you want, including several of the same type. Even though the contents of all windows are constantly updated, only one of the windows ever has the status of being the "top", or "active" window. This is the window that is in the foreground when several normal windows overlap.

Topped, or active, windows can be recognized by a title bar that is not dimmed out, and black name.
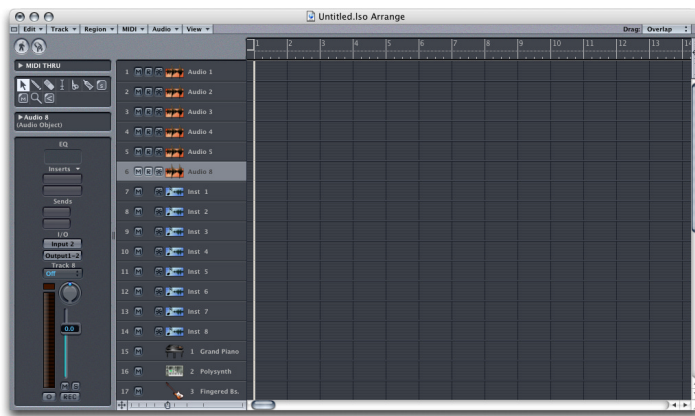
The illustration above shows the active, non-floating Arrange window

The main distinguishing characteristic of this window is that key commands only affect this window, and not any of the others. The *Windows > Next Window* menu function brings the next open window to the top, if it is fully obscured by other windows.

In background windows, you can not only observe changes, but make almost any kind of change, without having to bring the window into the foreground. To do so, simply long click on it. Background windows are identified by a white title bar (they can be positioned next to the top window, or tiled underneath it) and faded name. You can bring a window to the foreground by clicking on it, clicking on the title bar, or by accessing one of the local menu functions.

Float Windows

Float windows are so named because they always "float" in the foreground, even above the topped normal window (if there are a lot of open float windows, they will inevitably cover each other up—just click on one to bring it to the foreground).
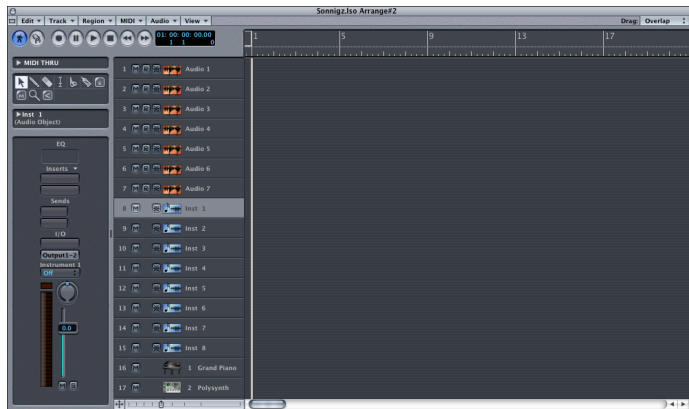
The illustration above shows the Arrange window as float window.

Float windows are recognizable by their narrower, gray title bar. Mouse operations can be carried out in the same way as in normal windows.

The most common example of a float window is the Transport window. You can open any other window as a float window by holding down Option while selecting the desired edit window from the Windows menu.

Note: Holding down Option while opening a window with a key command does not open the window as a float.

Relationships Between Windows

The two buttons at the top left of a window, determine its relationship to the song position (Catch), or to other windows (Link, Contents Link, or Contents Catch).
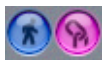
Catch

The Catch function ensures that the visible section of a window follows the song position as the song plays.

If the button featuring the walking man is lit, the window's display follows the song position as the song plays. If the button is not lit, the display does not update, even when the song position line moves past the right edge of the visible portion of the window (Catch Clock Position).

Note: If you move the visible section manually, Catch is automatically switched off, ensuring that the newly displayed section doesn't then disappear.

The *Catch when Sequencer starts* (*Preferences > Global > Catch*) option enables Catch mode whenever you press Play or Pause.

Link, Contents Link, and Contents Catch

You can define these display options to control how information is displayed when working with related editor windows.

Link

When the button featuring the chain link icon is activated in a given window, this window always displays the same contents as the topped window. The display is adjusted whenever the selection in the topped window is altered.

Here's an example: imagine the topped window is an editor. In Linked mode, the other editor windows can display the same data in another form (with the exception of the Arrange window, which does not display event data).

Here's another example, using the Environment window; The top window is the Arrange window. In Linked mode, the Environment window will display the instrument that corresponds to the selected track in the Arrange window. As you switch tracks in the Arrange, the Environment will update to reflect the selection.

Contents Link

Double-clicking on the Link button activates Contents Link mode. This means that the window always shows the contents of the Region or Object selected in the top window. The display is therefore always one level below that of the top window.

Here's an example: if the top window is an Arrange window, in Contents Link mode the editor windows can show the events of a selected MIDI Region. Selecting a different MIDI Region in the Arrange window will cause the display of the linked editor to switch to the newly-selected MIDI Region.

You could also use Contents Link mode in an Arrange window, to display the contents of the folders in another Arrange window.

Contents Catch
By simultaneously switching on Catch and Contents Link, you activate Contents Catch mode. Initially, this is equivalent to Contents Link mode, but when the song position reaches the next Region on the same track, the contents of this Region are then displayed.

You could use this mode in an Arrange window, much as you would in Contents Link mode. The editors would then show the events of whichever MIDI Region is currently being played on a track.

Screensets

Normally, you lay out your windows on the screen in a way that suits your working methods. This layout of various windows, including the display size, zoom, position of each window and other settings is called a Screenset, and can be stored. Once defined, you can freely switch between different Screensets, much as you might swap between different computer monitors.

Storing Screensets

Screensets are numbered from 1 to 99 (using only the 1 to 9 computer keys. The 0 key is used for the Stop command). You can see the number of the current Screenset beside the word *Windows* in the main menu. You don't need to save Screensets with an explicit command. It happens automatically, as soon as you switch to another Screenset. Thus, without any effort, your current working view is always stored in the current Screenset.

Switching Screensets

Just input the number of the desired Screenset (1 to 9). For two-digit Screensets hold down Control while entering the first digit.

Protecting Screensets

Use the *Lock/Unlock Current Screenset* key command or *Windows > Screensets > Lock Screenset* menu option to prevent the current Screenset from being altered. A • appears in front of the Screenset number to indicate that it is locked. Reuse the key or menu command (the default is Shift-L) to unlock the Screenset.

The *File > New* command deactivates all Screenset locks.

Copying Screensets

To copy the current Screenset to a destination Screenset, hold down Shift when you switch Screensets. Two digit Screensets are copied by holding Shift-Control 1+1, …, 9+9.

You can also use menu functions to copy Screensets via the Clipboard: Switch to the Screenset you would like to copy, and select *Windows > Screensets > Copy Screenset*, then type in the Screenset number that you wish to copy to, and select *Windows > Screensets > Paste Screenset*.

You can also copy individual Screensets between different songs using this method. To import all Screensets from another song, please make use of the *File > Song Settings > Import Settings* option.

Reverting to a Stored Screenset

The *Revert to Current Screenset* key command resets your screen to its state prior to importing the current Screenset.

Recalling Screensets 1 to 9

Screensets 1 to 9 can be recalled by freely-defined key and MIDI remote commands, not only the number keys. This allows you to define the number keys for other purposes, such as toggling windows on and off, as described above. The 1 to 9 key commands are called *Recall Screenset 1* (…*9*, respectively) in the Key Commands window.

Sequencer Controlled Screenset Switching

You can automatically switch Screensets through the use of meta event # 49—just add it to a MIDI Regionin the Event Editor.

To switch a Screenset automatically:

1 Set the song position to the point where you'd like the Screenset to change.

2 Hold down Command and click in the Event Editor on the button shown below.

3 The inserted meta event has a default value of 50 (Song Select).

4 Alter the number in the *NUM* column from 50 to 49. This changes the name to *Screenset*.

5 Input the desired Screenset number in the (*VAL*) column.

You can stop the switching by muting the MIDI Region that contains the meta 49 event.

Window Management Functions

The *Windows > Tile Windows* function tiles all open windows, and makes them all the same size.

The *Windows > Stack Windows* function stacks all open windows on top of one another, so that at least a part of the title bar is visible for each window, no matter which is the foreground window at the time.

The *Windows > Tile Windows horizontally* function tiles all open windows, using all available horizontal space for each individual window (if possible).

Edit Operations

The local edit menus in Logic's various windows all take the same form. The top two items are Undo and Redo. Below Redo are the typical Clipboard functions (see "The Clipboard" on page 32), and at the bottom of each are the main selection commands.

Undo

Undo allows you to reverse the previous edit. The default key command for Undo is Command-Z.

Multiple Undo and Redo

An unlimited number of editing steps can be undone. This also applies to the Redo function. You can determine the number of undo steps in the *Preferences* menu.

The Clipboard

The Clipboard is an invisible area of memory, into which you can cut or copy selected objects, allowing them to be pasted to a different location.

The Clipboard is universal, which means that it can be used to exchange objects between songs.

Cut

All selected objects are removed from their current position, and placed on the Clipboard. The previous contents of the Clipboard are overwritten in the process (key command is Command-X).

Copy

A copy of all selected objects is placed on the Clipboard. The selected objects are left in place. Here too, the previous contents of the Clipboard are overwritten (key command is Command-C).

Paste

All objects from the Clipboard are copied into the top window. The Clipboard is not erased in the process (key command is Command-V).

The contents of the Clipboard are added at the current song position (if they are events or Regions). The song position is incremented by the length of the pasted Region/event(s).

In the Arrange window, the contents of the Clipboard are pasted to the selected track. If events are pasted into the Arrange window, either a new MIDI Region or Region is created, or the events are added to a selected MIDI Region. Any existing Regions remain unchanged.

In the Environment window, the Objects are pasted into the layer currently being displayed, at their original positions.

Clear
Any selected objects are erased. Clear has no effect on the Clipboard, and is functionally identical to pressing the Backspace key.

Selection Techniques
Whenever you want to perform a function on one or more objects, you first need to select the objecs. This applies equally to Regions, individual events or Environment Objects. Selected objects are either displayed in an inverted color scheme, or will flash (in the Score Editor).

An object selected in one window will also be selected in all other windows that display that object. Changing the top window doesn't affect the selection (as long as you don't click on the background, which deselects everything. Be sure to click on the window's title bar).

Goto Selection Start/End
The *Goto Selection Start/End* key command moves the song position line to the location of the first/most recently selected event in the top window.

Selecting Individual Objects
Individual objects may be selected by clicking on them, and deselected by clicking on the background or by selecting another object.

You can also use the *Select next/previous Region/event* key commands (default: *right/left arrows*, *M/I* in the Event List). *Select first/last* selects the first/last object of the currently displayed level.

Selecting Alphabetically
The Tab key selects the next alphabetical object. In the Arrange or Environment windows, pressing any letter key selects the first object with a name that begins with the chosen letter (as in the Mac's Finder), provided that no key command is assigned to this key.

Selecting Several Objects

To select several non-contiguous objects, hold down Shift as you click them. As subsequent objects or events are selected, the previous selections are retained. This also works with horizontal or rubber band selection.

Horizontal Selection

To select all Regions on a track, click on the track name in the Track List. In the same way, you can select all events (of a specified event definition) in the Hyper Editor, by clicking on the event definition name, or all notes of a certain pitch in the Matrix Editor by clicking the relevant key on the Matrix Editor's keyboard.

In Cycle mode, the selection techniques covered above only affect events that fall within the Cycle area.

"Rubber-Banding"

To select consecutive objects, click on the background and drag a "rubber band" over them. All objects touched, or enclosed, by the rubber band will be selected.

Toggling the Selection Status

When you make any selection (including by rubber band or horizontal selection) while holding down Shift, the active selection status of the objects (events) will be reversed.

You can reverse the selection status of all objects (events) by using *Edit > Toggle Selection*. As an example of where this would be useful: if you want to select all Regions in a song, with the exception of a few, first select the Regions that you don't wish to use, and then *Toggle Selection*.

Selecting Following Regions/Events

To select all Regions/events after the currently selected one (or, if no Region/event is currently selected, to select all Regions/events after the song position line), use the *Edit > Select all Following* function.

Selecting Regions/Events Within the Locators (Vertical Selection)

Edit > Select Inside Locators selects all Regions/events lying wholly or partly inside the locator positions.

General Functions of the Editors

Logic's MIDI editors allow the editing of events (MIDI messages). Logic's MIDI editors include the Score, Matrix, and Hyper Editor, Event List and Transform windows.

Opening Editors

Double-clicking on a MIDI Region opens the Score Editor. There is a pull-down menu on the *Preferences > Global > Editing* page, which lets you select the editor that will be opened when you double-click on a MIDI Region. The options are: the Score, Event, Matrix, and Hyper Editor.

Control Output via MIDI

Switching on the MIDI Out button causes MIDI events to be sent when they are added, selected, or edited. This allows you to audibly monitor every editing stage, whether you are scrolling through the Event List (automatic selection) or transposing a note.

Deleting Events

The basic techniques are the same as those for deleting Regions:
- Backspace deletes all selected events.
- The Eraser also deletes all selected events, and any events that you click with it (whether previously selected or not).

Event and Note Quantization

The Event List and Matrix Editor have a separate quantization function, which can be applied to all selected events. Unlike quantization for MIDI Regions, event quantization applies to all events, not just notes. It irreversibly alters their positions (only notes can be returned to their original recorded positions).

Quantizing Events

Select the events that you want to quantize. Then open the pull-down Quantization menu by grabbing the Q button shown in the image (the Q button in the Matrix Editor looks slightly different).

This is identical to the pull-down menu found in the Region Parameter box, and contains its own quantization grid (see "Quantization" on page 120). As soon as you select an item from the menu, all selected events are quantized.

Note: You can only reverse note quantization. All other events are permanently shifted.

To apply the same quantization value to another series of selected events (even in other editor windows), select *Functions > Quantize Again*, or click (quickly) on the Q button a second time.

Note Quantization
Normally, all notes in a MIDI Region are quantized in accordance with the Quantization parameter value chosen in the Region Parameter box

Reversing Note Quantization
Note events can be returned to their original record positions, or moved manually, by selecting the *off* setting in the Quantization menu. Alternately, you can click on the Q button while holding down Option.

You can also achieve the same result by selecting *Functions > De-Quantize.*

Key Commands
You can activate nearly all Logic functions with key commands or MIDI messages. The Key Commands window is used for the assignment of key commands to computer keyboard keys or to MIDI messages.

Note: A number of Logic functions are only available as key commands.

Whenever this manual mentions a key command, this refers to a function or option that can be accessed by either a computer keyboard keystroke (or keystroke combination) or a MIDI message. This allows you to completely customize Logic to suit your own working style.

Saving Key Commands
Your personal key assignments are stored in a separate Preferences file. You should:
• Make a backup of this file at another hard disk location.
• Make a backup on removable media (a CD-ROM, for example), in case you need to use Logic on another computer.

Whenever you install Logic updates, your personal key commands will remain unaltered.

Note: Even the fixed global key commands of older versions are user-definable. Please keep in mind that some of these commands such as *Undo, Save, Quit, New, Open, Cut, Copy,* and *Paste* follow Mac OS X conventions, and probably shouldn't be altered.

Special Keys

Some keys have special functions:

- The Shift, Control, Option, and Command 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 key combinations assigned to the options in the main menu bar cannot be reassigned. The relevant key commands are displayed after the main menu items.
- The plus and minus keys increase or decrease any selected parameter value in single units. They can be assigned different functions which override this behavior.

Key Commands Window

The Key Commands window can be opened by selecting *Preferences > Key Commands.*
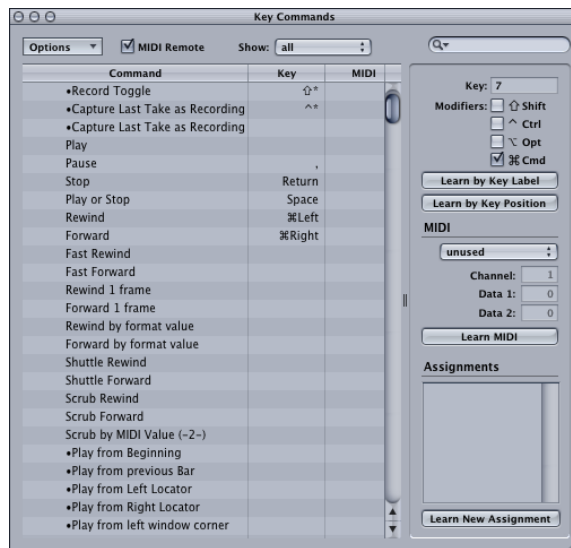
All available key commands are listed on the left side. They are grouped according to various categories. The global key commands work regardless of which Logic window is currently active; the other commands require the corresponding window(s) to be topped. This allows you the assign the same key command to different functions in different windows.

A "•" in front of the description of the function indicates that the function is only available as a key command or MIDI command. To the right of the key command listing, you can see the currently assigned key, and below this, the assigned MIDI message (if applicable).

Key Commands List

In the list shown to the left of the Key Commands window, the following applies:

- Groups can be extended or collapsed by clicking on the disclosure triangle to the left.
- Columns can be changed in width by dragging the separating lines between the headers (Command, Key, MIDI, and so on)
- When the list has keyboard focus, physically pressing a key command (or key command combination) selects the appropriate function in the list.
- If the triggered key command is located in a collapsed group, the group will automatically be expanded.

Options Menu
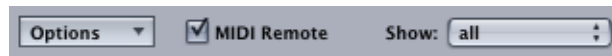
The *Options* menu offers:

- Import and Copy key command functions
- Expand/Collapse and Scroll to Selection functions for the Key Commands List window
- Several Initialize options

Importing Key Commands

This function is particularly useful if you need to work temporarily on someone else's system; you might want to use your personal key assignments on it, without altering the other system's settings.

The *Options > Import Key Commands* function allows you to import the key assignments from any Logic Preferences file. When selected, a file selector box allows you to browse any internal drive or removable media for the desired Logic Preferences file.

The existing Preferences file (on the target system) is automatically saved as a ∗.bak file. This file contains the old key commands.

Note: You don't need to restart Logic to begin using the new key command set.

Printing a Key Command List

The *Options > Copy Key Commands to Clipboard* function copies the key commands into the Clipboard as text. From here, it's a simple matter of pasting the results into any word processor, formatting as desired, and printing them out.

The *Copy to Clipboard* function also takes into account the *Show* and *Find* function settings (see below). You could, therefore, export a certain group of key commands (those containing a particular character string, for example). What you see in the window display is exactly what's exported.

Initializing Key or MIDI Event Assignments

The *Options > Initialize all Key Commands* menu item initializes all key assignments.

The *Options > Initialize all MIDI Commands* menu item initializes all MIDI assignments. Once initialized, default assignments will be used.

Note: You will lose your existing key command assignments if you make use of the Initialize functions, so ensure that you have created a copy of your Logic Preferences file before doing so.

Switching MIDI Remote On/Off

You can use the *MIDI Remote* checkbox to globally switch on/off responses to all defined MIDI messages. The MIDI command for this (Toggle MIDI remote) is always active, even when MIDI Remote is disabled, and is therefore always available.

If you have assigned MIDI Remote commands to all of the keys on your master keyboard, it's advisable to use a second foot pedal or a programmable button on your keyboard for Toggle MIDI Remote. If no such facility is available, use a key you are unlikely to press by accident (the lowest or highest key, for example) during recording—but you will no longer be able to use this key to record notes.

The *MIDI Remote* checkbox also applies to MIDI events that are created with Transformer or Fader Objects in the Environment, and are routed to the Physical Input Object.

Valid MIDI commands are recognized, and filtered, by the Physical Input Object, because it makes no sense to record them.

Show Menu

You can use the *Show* menu to filter all the used, or unused key commands from the window display. All other Key Commands window functions remain available for use.

Find Function

The Find field is used to find key commands by name or partial name:

[Q▼ quantize ⊗]
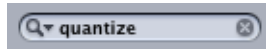
- The search is performed as you enter text. There is no need to press the Return key.
- The *Cancel* button to the right (that appears as soon as any text is entered) clears any entered text, and displays all key commands.
- The *Find* menu to the left (the magnifying glass) retains a history of recently used search terms. The *Clear* menu item erases the Find history.

Note: The Find history is limited to searches that were completed with a press of the Return key.

Key Command Properties

The box shown below displays the selected key command's properties:

```
        Key: [        ]
  Modifiers: □ ⇧ Shift
             □ ^ Ctrl
             □ ⌥ Opt
             □ ⌘ Cmd
  [ Learn by Key Label    ]
  [ Learn by Key Position ]
```

- *Key*: the key's name (or a negative number if it's a scan code). This parameter cannot be edited.
- *Modifiers*: the modifier keys which need to be held down in order to execute the key command function. These can be edited.
- *Learn by Key Label*: enables you to teach Logic to use a particular key or key combination to perform a function.
- *Learn by Key Position*: stores the code from the incoming key. This is different to the *Learn by Key Label* functionality in that a scan code allows you to use the number keys and plus/minus keys (above the keyboard and on the numeric keypad) for different functions. This also means that the key position remains the same if you switch between different operating system language settings or different keyboards.

MIDI
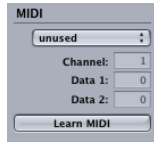
- The uppermost box, the *Status* menu, displays the type of MIDI message that is used for the key command.
- *Channel*: Indicates the MIDI channel number of the incoming message. This parameter is disabled if the *Status* menu is set to *unused*.
- *Data 1*: This field indicates the first MIDI data byte. As an example: This field will show and allow the entry of a MIDI note value if the *Status* menu is set to *Note*.
- *Data 2*: This field indicates the second MIDI data byte. It is disabled if the *Status* menu is set to anything other than *Control Change* or *Poly Pressure*.
- *Learn MIDI button*: Enables you to teach Logic a particular MIDI command to perform a key command function. You must enable this button before Logic will accept any MIDI data for use as a key command trigger.

Assignments
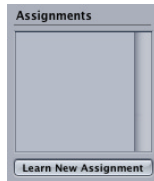
This field displays the control surface assignment associated with the selected key command. It is only relevant when a control surface is used with Logic.

Each line displays:
- The name of the control surface, or the MIDI string if the assignment is from an unsupported control surface.
- The name of the control. If the name is shown in gray, this indicates that the assignment is currently inactive (because it is part of an inactive mode).
- Zone and Mode that the Assignment belongs to, if applicable.

Note: The display is updated when a Zone changes its Mode (when holding down a modifier button, for example).

Double-clicking on a row will show the assignment in the Controller Assignments Editor (see "The Controller Assignments Window" on page 500).

The *Learn New Assignment* button allows you to "teach" Logic a new assignment for the selected key command. Click on the button, and use the desired control.

Note: If you wish to set up assignments for an entire control surface, be it supported or unsupported, make use of the *Preferences > Control Surfaces > Learn Assignment for xxx* function. This is discussed in detail in the Control Surfaces chapter of this manual (see "Customizing Control Surfaces" on page 498).

Assigning and Deleting Key Commands

This section discusses a number of Learn functions that allow you to assign particular computer keys or MIDI commands to Logic functions. Closing the Key Commands window automatically disables any active Learn button.

To assign a function to a key:
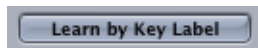
Learn by Key Label

1 Activate the *Learn by Key Label* button.
2 Select the desired function with the mouse.
3 Press the desired key, along with the desired modifier keys (Shift, Control, Option, Command), if necessary.
4 If you want to make another assignment, repeat steps 2 and 3.
5 Deactivate *Learn by Key Label* Key

Learn by Key Position works in the same way, but differs in that it's not just a reference to an ASCII code that is stored, but the actual code of the key that is pressed.

In practice, this means that you can, for example, assign different commands to the number keys on the numeric keypad and the number keys above the keyboard—and the same goes for the different plus and minus keys on the numeric keypad and main keyboard.

The only disadvantage is that the key code (a number), rather than the ASCII symbol, is displayed in the Key Commands window. The ASCII symbol is more useful for reference purposes.

To clarify the difference between these two functions, here's a short comparison:

If you use the Learn by Key Label function, and define only one key command for the key, it will be used, no matter which of the two keys (either plus key, for example) is pressed.

If you use the *Learn by Key Position* function, and define two key commands (one for the alphanumeric keyboard, one for the numeric keypad), then the appropriate key command will be used (one for each plus key, for example).

To delete key assignments:

1 Activate the *Learn by Key Label* or *Learn by Key Position* button.

2 Use the mouse to select the function/key assignment that you want 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 assign a function to a MIDI message:

> **Learn MIDI**

1 Activate the *Learn MIDI* button.

2 Select the desired function with the mouse.

3 Send the desired MIDI message from your controller.

4 If you want to make another assignment, repeat steps 2 and 3.

5 Deactivate the *Learn MIDI* button.

Note: If you want to assign a Note On message, remember to switch off *Learn MIDI* before you release the key in question (and thereby transmit a Note Off message). The assignment used is always the last message received.

To delete a MIDI assignment:

1 Activate the *Learn MIDI* button.

2 Use the mouse to select the function/assignment that you want to delete.

3 Press Backspace.

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

5 Deactivate the *Learn MIDI* button.

To learn a controller assignment:

1 Activate the *Learn Assignment* button.
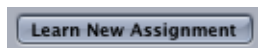
> **Learn New Assignment**

2 Select the desired function with the mouse.

3 Send the desired MIDI message from your controller.

Note: The *Learn Assignment* button will be deactivated automatically when the entire message has been received. This avoids reception of the message sent by the device when you release the button. To ensure reliable reception, hold the button for a short period before releasing it.

4 If you want to make another assignment, repeat steps 2 and 3.

Note: If you wish to set up assignments for an entire Control Surface, be it supported or unsupported, make use of the *Control Surfaces > Learn Assignment for xxx* option. This is discussed in detail in the Control Surfaces section of the manual (see "Customizing Control Surfaces" on page 498).

Step Input

The Step Input functions allow you to insert MIDI notes when Logic is not in a realtime Record mode. This allows you to input notes that may be too fast for you to play, or may be useful if replicating sheet music, but you don't sight read. You can use any of the following for step entry:
- a screen keyboard (Step Input Keyboard window)
- the computer keyboard
- MIDI

Notes are inserted in all modes at the current song position. All three methods can, and should, be combined to make full use of the features that each option offers. Here is an example: you can set the note length in the Step Input Keyboard Window, insert notes via a MIDI keyboard and locate the Song Position Line using key commands.

Note: It is also possible to enter note data in realtime with the computer keyboard (see "Caps Lock Keyboard" on page 49).

Step Input Keyboard Window

The Step Input Keyboard window can be opened via the main menu *Windows > Step Input Keyboard*. It allows you to insert notes in any MIDI editor.

Key Commands

There is a set of key commands for the insertion of notes via the computer keyboard. To activate Step Input mode, the *In* button (see picture below) must be switched on in the selected MIDI editor.

This mode (and the *In* button) is available in the Event, Matrix, and Score Editor. You will find the relevant key commands in the *Keyboard Input* section of the Key Commands window.

MIDI Input

When the *In* button is engaged, you can insert notes via an external MIDI keyboard. You can use the Step Input Keyboard window and/or the Input key commands to adjust any settings that are not available from the MIDI keyboard itself. These include: the length of the note and location commands. As with Key Commands Input, the MIDI Input is available in the following windows: Event, Matrix, and Score Editor.

Input via Screen Keyboard

You can open the Step Input Keyboard window via *Windows > Step Input Keyboard*.

If you decide to work in the Score Editor, you need to adjust the display settings for the selected MIDI Region accordingly: Interpretation (see "Interpretation" on page 378) should be off, the Display Quantize (Qua) setting (see "Qua—Display Quantization" on page 377) should be set to the smallest note value that you intend to insert.

Before starting note entry, set the Song Position Line to the spot where you want to insert the first note. This can be done in a number of ways, such as adjusting the song position in the Transport window, for example.

Single Notes

We suggest that you use the mouse while familiarizing yourself with step entry. Click on the key of the desired pitch in the Step Input Keyboard, and make use of the buttons for note length, velocity, and other parameters. This will insert a note of the selected pitch (at the current song position, in the selected MIDI Region), with the length and velocity that you chose earlier in the Step Input Keyboard window.

The *pitch* of an inserted note is determined by the key that you click in the Step Input Keyboard window.

Length and *velocity* are determined by the corresponding buttons in that window. If the buttons look like those shown in the illustrations below, a sixteenth note with a velocity setting of 96 would be inserted—this value (96) corresponds to the forte (*f*) indicator. The eight available velocity values are represented by the traditional volume indicators *ppp*, *pp*, *p*, *mp*, *mf*, *f*, *ff*, and *fff*, which correspond to velocity values 16, 32, 48, 64, 80, 96, 112, and 127, respectively.

The MIDI channel of an inserted note is determined by the *Channel* setting in the Step Input Keyboard window.

Note: The channel settings of individual notes usually have no effect on the playback channel and therefore the sound of the MIDI Region—this is determined by the track instrument settings in the Arrange window. The channel settings of individual notes are mainly used for polyphonic score display.

Proceeding
After a note is inserted, the Song Position Line will always jump to the end of the inserted note. The following note can be inserted immediately, following the same principles.

Chords
To insert several notes at the same bar position, *Chord mode* needs to be activated. To do so, click on the button at the far left side of the window or use the *Chord Mode* key command.

Chord mode prevents the Song Position Line from moving after insertion of a note, allowing the user to insert as many notes as desired at the same bar position, one after the other. Another click on the Chord button (or the key command) will deactivate *Chord mode* (this should be done before inserting the last note into the chord), and the Song Position Line will advance as per usual, after note insertion.

Input via the Computer Keyboard

Note input with the computer keyboard follows the same principles as input via the on-screen keyboard (see "Input via Screen Keyboard" on page 45). Where it differs is that key commands are used for all functions, rather than choosing pitch, velocity, note length, and so on with mouse clicks. It is recommended that the Keyboard window should remain open when you first start using these functions, to make the learning process easier. Once familiar, you can leave it closed as it is unnecessary to open the Keyboard window when using key commands.

All key commands for step input are user definable. They can be found at the very bottom of the list, under the header *Keyboard Input*, in the *Preferences > Key Commands*.

Note: It is also possible to enter note data in realtime with the computer keyboard (see "Caps Lock Keyboard" on page 49).

Pitch

The twelve *Note C* to *Note B* key commands will insert a note (of the selected pitch) with the set length and velocity at the current song position in the selected MIDI Region. To insert chords, use the *Chord Mode* key command. You can switch off chord mode with the same key command.

Rather than assigning key commands to all twelve pitches, you also have the option to only define key commands for the seven pitches of the C major scale, and use these in combination with the *Next note will be sharp* and *Next note will be flat* key commands to insert the other pitches.

When creating a system for these key command assignments, two approaches seem obvious: either to arrange these commands on the computer keyboard similarly to a piano keyboard (C D E F G A B in one row, next to each other, and C# D# F# G# A# above these at corresponding positions), or to assign keys to pitches of the C major scale according to their note names—especially when the second approach mentioned above is used.

Octave Ranges

The octave of an inserted note depends on the current position of the insert range bar. This can be seen in the Keyboard Window: There is a small horizontal bar above the piano key image that spans one octave exactly. The chosen note will always be inserted inside the range marked by that bar.

This bar continuously changes its position in accordance with the last inserted note: The center of the insert range bar will always be aligned to the last inserted note. The next note will be inserted in that range unless the range bar is moved via key commands or the mouse.

An example: If a G is inserted immediately after inserting a C, the G will be placed below the C. Inserting the C places the range beam between G (left end) and F# (right end), with the C in the center. Regardless of which note is chosen next, it will always be inserted inside this range. The range beam will, however, move as further notes are inserted, with the (range beam) center always aligned to the most recently inserted note.

Further key commands allow you to place the range bar in different octaves: Octave 0 to Octave 6, and also Octave +1/–1/+2/–2, which move the range bar up or down one or two octaves. The range bar can also be moved with the mouse.

Note Length and Velocity
Note Length and Velocity are determined before a pitch command is used to actually insert a note. The currently selected values can be seen in the Keyboard Window.

Rests, Correction, Moving Forward and Back
The *Rest* key command moves the Song Position Line forward (in accordance with the currently set note value) without inserting a note, thereby creating a rest.

The *Step backwards* and *Step forward* key commands also move the Song Position Line forward or back by the length of the selected note value.

The *Erase* key command will delete the most recently inserted note, and move the Song Position Line back to the position where the note (previously) began. This allows quick corrections—another note can be inserted immediately, replacing the erased one.

Triplets, Dotted Note Groups
The *Next three notes are triplets* key command is self-explanatory. The rhythmic value of the triplets corresponds to the currently selected note value in the Keyboard Window. If an eighth note is selected, an eighth note triplet will be created. After three notes have been inserted, binary values will be inserted, unless the command is reused.

Next two notes are a dotted group works in a similar way. The special thing about this key command is that a pair of notes that complement each other will be inserted. A dotted eighth and a sixteenth note, for example.

Interaction with Other Key Commands
If the input mode is activated in an editor window (Score, Matrix, or Event List), these key commands have priority over all other key commands.

This means that you may also assign keys or key combinations to these functions which are already assigned to other functions. As long as the input mode is active, these key assignments will apply; if the input mode is switched off, any other assignments (for the same keys) will have priority.

Note: As you can use key assignments that are already in use for other functions, you should take care to avoid using keys that are assigned to functions that you might also want to use when working in step input mode.

Input via MIDI
Note input via MIDI works as per input via the on-screen keyboard (see "Input via Screen Keyboard" on page 45). Obviously, you press keys on your real-world MIDI keyboard, rather than clicking notes on the on-screen keyboard. Incoming MIDI note Velocity information is stored when using MIDI Step Input. It is recommended that the Keyboard window should remain open when you first start using these functions, to make the learning process easier. Once familiar, you can leave it closed as it is unnecessary to open the Keyboard window when using key commands.
It is also recommended that you make use of the Input key commands (see "Input via the Computer Keyboard" on page 47) to quickly switch values such as the note length, or to determine the insert position.

Chords can be inserted by playing the chord on the MIDI keyboard. You don't need to switch on *Chord Mode* in order to do so.

Caps Lock Keyboard
This feature allows you to use the computer keyboard as a realtime MIDI keyboard. This is ideal for situations where no external MIDI or USB keyboard is available, such as when travelling with your PowerBook.

The Caps Lock Keyboard supports more than ten octaves, and even includes support of Sustain and Velocity information.

The Caps Lock Keyboard is enabled/disabled by pressing the Caps Lock key on your computer keyboard. As long as the Caps Lock LED is lit, your Caps Lock Keyboard is active.

Needless to say, while in this mode, many keys have different functions and their usual key command assignments are *not* active.

This is the English version of the CapsLock Keyboard—German, Spanish, or French versions will appear, dependent on your Mac OS X Keyboard setting.

The Escape key sends an *All Notes Off* command, should you encounter hanging notes.

The numeric keys (above the QWERTY keyboard) are used to define the octave for the MIDI keyboard.

The two rows below the numeric keys function as the actual MIDI keyboard keys, starting with the note *C*, assigned to the alphabetical *A* key (or *Q*, as would be the case if using a French keyboard, for example).

See the black and white keys in the picture above for details.

The lowest row of letter keys sets the velocity for MIDI notes. There are preset values ranging from pianissimo to forte fortissimo. Each value can be finely adjusted via the two keys to the right of this row (these are assigned to the comma and period keys on an English QWERTY type keyboard). This keyboard configuration allows you to send any MIDI velocity value from 1 to 127.

The Space bar provides a Sustain function—played with your thumbs rather than your feet. You can freely trigger new notes or switch between octave or velocity values while notes are sustained.

The current octave and velocity values for the MIDI notes are displayed at the upper edge of the Caps Lock Keyboard window. A Transparency fader is also available for this window, making visualization clearer or allowing the window to be "ghosted" over the background.

Caps Lock Keyboard Preferences

The *Enable Caps Lock Keys* option allows you to completely enable or disable the Caps Lock Keyboard functionality.

After familiarizing yourself with the operation of the Caps Lock Keyboard for a while, you may wish to prevent the window from appearing when using it. To do so, disable the *Show Window when Active* option in the *Preferences > Global > Caps Lock Keys* menu.

Should you wish to use the Space bar key command (usually Start/Stop), rather than as the Sustain function for the Caps Lock Keyboard (when active), you can disable the *Preferences > Global > Caps Lock Keys > Space bar acts as Sustain Pedal* option.

Additional Caps Lock Keyboard Info

Due to technical limitations of computer keyboards, there is a maximum number of six notes that can be played simultaneously. There are further limitations regarding timing precision, and when trying to play certain note clusters (which are musically unusual, at any rate).

Please keep in mind the original intention of this facility—as a useful aid when composing on a train or plane—not as a full-on replacement for a real MIDI keyboard.

Song Administration

All events, other objects and settings (apart from the preferences and key commands) are components of a song. Songs are handled in the main File menu.

Projects
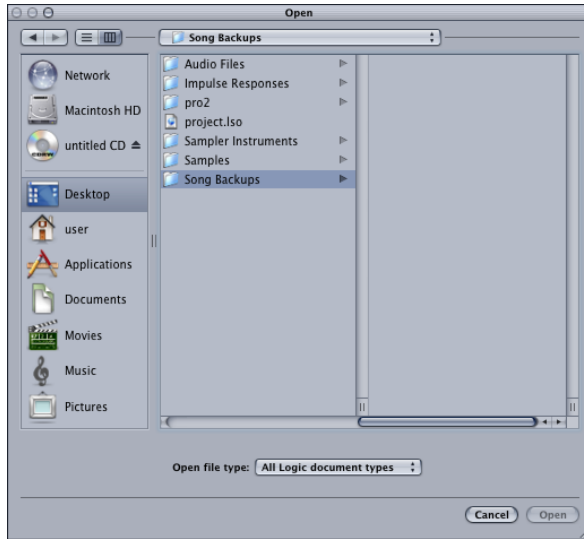
The illustration above shows a typical Project folder file structure in Logic's Open dialog.

Creating a Project

The *File > New* entry launches the following dialog:
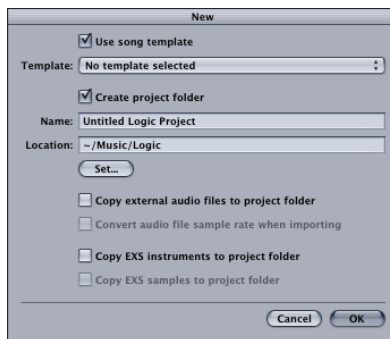
If the *Create Project Folder* checkbox remains unchecked and no template is selected in the Templates menu, functionality is as follows:

• The Autoload Song will be opened. The search for the Autoload Song is conducted in the following order:

- Preset Templates folder (/Library/Application Support/Logic/Song Templates/ Autoload or Autoload.lso)
- User Templates folder (~/Library/Application Support/Logic/Song Templates/ Autoload or Autoload.lso)
- the Application folder (Logic 6 series/Autoload or Autoload.lso).
- If no Autoload Song exists in any of the aforementioned locations, or the Option key is pressed, the empty default song (besed on the .plist created by the Logic Setup Assistant) will be launched.

Note: The search for the Autoload Song, as you'll note from the above, takes place in the Templates folders before searching the Application folder. In earlier Logic versions, the Autoload Song needed to be placed inside the Logic program folder. While this can still be done, we encourage you to move your existing Autoload Song into the User Templates folder (see "About Templates" on page 56).

If the *Create Project Folder* box is selected, followed by a click on the *OK* button, a project will be opened, rather than a song or template. This occurs in the following fashion:
- A folder is created in the chosen location, with the desired name—as typed in by you.
- A song is opened (either the empty default song if no template was chosen, or the chosen template song).
- This song is saved into the newly-created folder.
- An *Audio Files* folder is created within the new folder.
- The audio recording path is automatically routed to the new *Project > Audio Files* folder.

The checkboxes below the *Set* button represent the Project settings (these can be changed at any time). The project settings determine how files imported from external locations (locations outside the project folder) should be handled. They either:
- stay where they are (if the checkbox is unchecked)
- or are copied into the project folder (if the checkbox is checked).

Audio files are automatically moved as soon as they are imported into the Audio window (resulting in a sample rate conversion, if necessary).

Note: The *Convert Audio File Sample Rate When Importing* option is designed to allow the automatic sample rate conversion of imported audio files.

EXS instruments and samples are only moved into the project folder when the song is saved.
If you disable the *Copy EXS Samples to Project Folder* option, only the EXS instrument files will be automatically copied to the project folder when saving, not the samples associated with the EXS instrument files.

Project settings can be changed via the *File > Project > Settings* menu entry, which launches the following dialog:
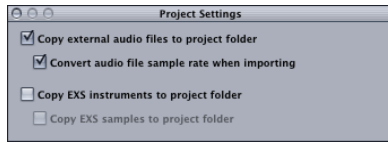
If *Copy* (or *Move*, see "Saving as Project" section below) is set for audio files, sampler instruments/samples the "copy" flag will be associated with that file type in the Project settings.

Warning: If a new project is closed without saving it, you will be asked if the created files and folders should be deleted. Clicking on *Delete* will result in all files (including any newly-recorded audio files) being moved to the trash—so take care!

Saving as Project
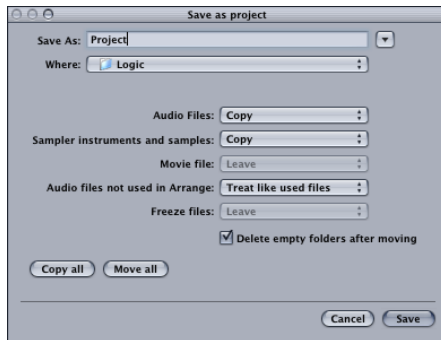
You can use the *File > Save as Project* function to save a song or project. If the open song isn't already a project, the saved song file is assigned "project" status. This allows you to set the Project settings (*File > Project > Settings*) which determine how imported files are handled. This also makes the project "safe", allowing you to move or copy the project folder without losing any file references that point to items within the folder.

In the *Save As Project* dialog you can choose, if the project files should be copied or moved into the project folder.

The *Sampler Instruments and Samples* pull-down menu in the *Save as Project* dialog features a *Copy Instruments Only* option which leaves the samples in their existing location.

The *Copy All* button presets all pull-down menus to the *Copy* state.

The *Move All* button presets all pull-down menus to the *Move* state.

Copying or Moving the Project Folder

If the project folder is moved or copied to another location, the files in the resulting folder will still be found correctly, provided that they are all in (or are in subfolders of) the appropriate project subfolder—audio files are found in the *Audio Files* sub-folder, samples in the *Samples* sub-folder, sampler instruments in *Sampler Instruments* sub-folder and so on.

Project Clean Up

Should there be any unused audio files or EXS instruments in your project folder, make use of the *File > Project > Clean up* menu option. If any unused audio or EXS instrument files are found, the following dialog will be displayed:
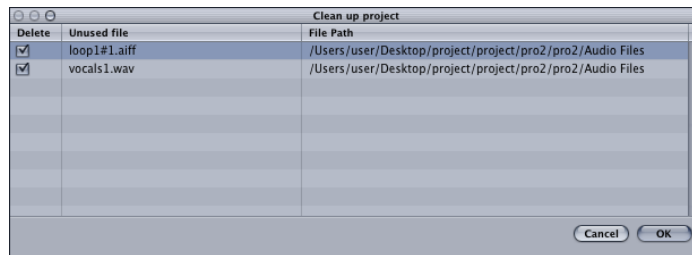
The checkboxes in the first column can be used to remove/add items to/from the deletion list. The name and path of the file to be deleted is shown in the last two columns.

Only files with active checkboxes in the first column will be deleted. All unchecked entries will remain untouched.

If multiple rows are selected, a click on any checkbox will switch all selected rows to the new state.

Note: Clean up will only delete unused audio files (WAVE, SDII, AIFF) and EXS instrument files. All other files will be ignored.

Note: Clean up takes into account the project currently loaded, and all other Logic songs in the project folder—only files that are not used by any of these songs will be displayed in the "Clean up" list.

Consolidate Project Settings

The *File* > *Project* > *Consolidate* function launches the following dialog:

```
                    Consolidate Project: Options
 The project files will be consolidated into folder:
   /Users/mfreudthaler/Music/Logic/Untitled Logic Project

                    Audio Files:  [ Copy Them        ▲▼ ]
   Audio Files Not Used In Arrange:  [ Like Used        ▲▼ ]
   Sampler Instruments And Samples:  [ Copy Them Both   ▲▼ ]
                     Movie File:  [ Leave It         ▲▼ ]

                         ☑ Delete empty folders after moving

 ( Copy all )  ( Move all )                  ( Cancel )  ( OK )
```

As you can see, it is basically the same as the *Save As Project* dialog, but with the *Song File* pull-down menu missing.

How Consolidate Works

- If *Consolidate* is used on a saved song, the song will be moved into a newly created folder (named after the song). Following the consolidation, the usual *Save As Project* functions (copying or moving files) can be performed.
  The newly saved song is assigned "project" status (see page 53), allowing you to change the Project settings after the fact, and making the song folder safe to move or copy.
- If *Consolidate* is used on a song which is already a project, all referenced files that are not yet in the correct location within the project folder are automatically moved or copied (dependent on the specified options) to the appropriate sub-folders.

Project Preferences

The dialog options for all of the abovementioned operations are saved into the preferences file.

The default settings for these dialogs are as follows:
- Move Song
- Copy Audio
- Copy EXS Instruments
- Delete Empty Directories
- Unused Audio like Used

Once any changes have been made to these options, and the dialog was closed by pressing the *OK* button, the default values are overwritten, and the new settings will be used.

ReCycle Import Handling in Projects

EXS instruments created via a ReCycle import are placed in a *Sampler Instruments/ReCycle* sub-folder of the project folder. All audio data generated by a ReCycle import are placed in the *ReCycle Audio* folder, alongside the song file.

About Templates

A template is a song file that is stored in either of two specific locations (see below). Any song file may act as a template. You can view templates much like having multiple Autoload Songs.

The advantage of using templates is that not all projects have the same needs, so customizing several songs to meet these needs offers an ideal "starting point" for different jobs. As examples:

- A template that is software instrument-focussed, for Dance projects. This would feature 32 Audio Instrument tracks, and say eight audio tracks.
- An audio track-centric template, featuring say 64 audio tracks, would be ideal for live recording.
- A specific live performance template that makes the job of quickly switching between parts faster, or perhaps makes heavy use of Environment Objects such as Arpeggiators or Touch Tracks.
- Several scoring templates for: choirs, a rock band, symphony orchestra, string quartet, jazz combo, and so on.
- A template for video work. This would typically contain a Video track plus specific dialog, foley, and music tracks.
- Screensets can be customized for each template, or you can make use of the Import functions to copy them between templates.

To use Templates:

- Choose *File* > *New* and select a template in the *Template* pop-up menu, that shows all songs in the */Library/Application Support/Logic/Song Templates* (system volume) folder and the *~/Library/Application Support/Logic/Song Templates (*user) folder.

To save Templates:

- Simply select the *File* > *Save as Template* menu option, and type in the desired name.

Loading a Song

You use *File* > *Open* (Command-O) to launch a typical file selection box. If there is already a song loaded, you will be asked if the currently-loaded song should be closed (select *Close*) or not (select *Don't Close*). You can disable this prompt by selecting *Preferences* > *Global* > *Song Handling* > *When Opening a song, ask to 'Close current song(s)?'.*

File > Open

The Open dialog offers an *Open File Type* menu, where you can activate the following options:

- All Logic document types—Displays all song file types supported by Logic.
- Logic Songs—Songs created with current or earlier Logic versions.
- GarageBand songs—Songs created in Apple's GarageBand application.
- Notator SL songs—Songs created in C-Lab/Emagic Notator or Creator SL.
- MIDI Files—Standard MIDI Files in either format 0 or 1 can be loaded.

Direct Access to Your Current Songs

You can open any of your most recently opened songs directly without the usual file selection dialog by selecting *File > Open Recent*.

Different Songs Open at the Same Time

If you have several songs open at once, you can switch the currently active song from the *Windows* menu—the active song is the one marked with a tick. Provided that the *Preferences > Global > Hide Windows of Inactive Songs* option is switched off, you can also switch the active song by clicking on one of the other song windows.

Song and MIDI File Import by Drag and Drop

Songs and Standard MIDI files can be dragged from the Finder, and dropped into the Logic Arrange window. The mouse position—when the mouse button is released— determines the clock position (rounded by bar) and destination of the first track for placement of the imported file.

Opening Pre Version 7 Songs

When loading a song created in a pre-version 7 Logic, the song format will be converted to the version 7 format. When saving this song for the first time, a file selector dialog will be opened, so that the old song file will not be overwritten automatically.

Note: Once saved in version 7 format, a song can no longer be opened with versions prior to version 7 (exception: Logic versions 6.4.3 and higher can open the song, but at the expense of all Logic 7 specific features). A song can be exported (see "Saving Songs" on page 58) as a version 4.8 song.

Special Functions
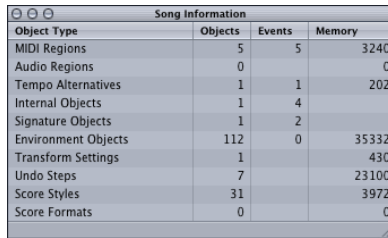
Checking/Repairing Songs

If you double-click on the remaining number of free events display (see "Tempo/Free Memory" on page 77) on the Transport Bar, the memory will be reconfigured. At the same time, the current song will be checked for any signs of damage, structural problems, and unused blocks.

If any unused blocks are found—which normally shouldn't happen—you will be able to remove these, and repair the song.

Song Information Window

The Song Information window can be opened via *Options > Song Information.*

Object Type	Objects	Events	Memory
MIDI Regions	5	5	3240
Audio Regions	0		0
Tempo Alternatives	1	1	202
Internal Objects	1	4	
Signature Objects	1	2	
Environment Objects	112	0	35332
Transform Settings	1		430
Undo Steps	7		23100
Score Styles	31		3972
Score Formats	0		0

It contains information about various aspects of your song. This information might not be directly useful for you, but you may be asked to provide this information (in case there is problem with a specific song) by the Support Team.

Saving Songs

When you select *File > Save* (or Command-S), the current song will be saved—with its current name intact.

If you don't wish to overwrite the last version of the song saved with this name (which is what will happen if you use *File > Save* or Command-S), make use of the *File > Save As* or *File > Save a Copy As* options. In the ensuing file selector dialog, you can enter a new name for the song (and select a new directory or even create a new folder).

• *File > Save as*—The next time you save using the straight *Save* (Command-S) function, the new file name and path will be used.

• *File > Save a Copy As*—The next time you save with the straight *Save* (Command-S) function, the existing file name and path will continue to be used. The "copy" is a replica of the existing song, stored in a different location. It does not update the file save path. *Save a Copy as* is ideal for archiving and moving data.

Important: Songs saved in version 7 of Logic cannot be opened in older versions.

Export Song as Logic 4.8 Song

Choose *File > Export > Song as Logic 4.8 Song* to save your song in Logic 4.8 format. This allows versions prior to version 5 to open a song file. Please note that not all song information can be stored in the older format, including any track automation data (see "Automation—Introduction" on page 225). You may wish to convert track automation data into Region data first, should you need to export in 4.8 Song format.

Automatic Backup Files

When you save a song, Logic will first make a safety copy of the previous file. You can switch off this function in the Global preferences (*Preferences > Global*), and also set the number of backup files that will be made—up to 100.

This function allows you to store up to 100 earlier versions of your song, thereby retaining a complete record of your song's development.

Backup files are saved in a backup folder within the Project folder, and are named after the song/project, but feature the ".bak" file name extension. The backup files themselves are also named after the song, but are sequentially numbered. As an example: if the song is called "My Song", the backup folder will be "My Song.bak", and the backup files within the folder will be called "My Song00", "My Song01", and so on.

Note: If you want to know what the latest version is, take a look at the contents of the Project > Backup folder in the Finder, making sure you sort the contents of the window by date (select "By Date" in the Finder's View menu with the backup folder open, and selected). The Finder cannot distinguish between files if they were saved during the same minute.

Reverting to the Saved Version

Any time you make a mistake, you can undo it by selecting *Edit > Undo* (Command Z).

If you have made some *really* serious blunders (as unlikely as that may be), or you decide that in the 15 minutes since you last saved, your creative efforts have resulted in material too unpleasant to describe here politely, you may find the *File > Revert to Saved* function very helpful. This replaces the current song with the previously saved version.

Closing and Quitting

Closing a Song

File > Close (Command-Option-W) closes the currently active song. If you have made any changes since the last save operation, Logic will ask you if the song should be re-saved before closing, to preserve any changes you have made.

Quitting the Program

Choose *File > Quit* (Command-Q) to leave the program. If you've made changes, but haven't saved them, you will be asked if you want to do so before quitting (press Enter to save).

Standard MIDI Files

Standard MIDI files are not specific to a particular sequencer program, or type of computer. They contain the following information:

- MIDI events, including time positions and channel assignments
- Names of the individual tracks
- Tempo changes
- Copyright marks

Logic supports the importing and exporting of Standard MIDI file formats 0 and 1:

- Format 0 can contain one track.
- Format 1 can contain multiple tracks.

Neither format recognizes any division of a track (into several MIDI Regions, for example).

Loading Standard MIDI Files

To load a Standard MIDI file, select *File > Import*.

Note: If you select the MIDI files option in the Open file type menu, only MIDI files will be displayed in the File Selector.

If a song is loaded, you will be asked to "Create new environment or copy current environment for MIDI File? New/Copy".

If you click *Copy*, the existing environment is copied. The tracks of the Standard MIDI file are automatically assigned to suitable instruments.

If no song is loaded, or you answer the question by clicking *New*, the default environment (the default song) is used.

Bank Select

When you open Standard MIDI files, program change and controller events occurring at the same position are moved by one tick, so that they will remain in their intended order. This prevents Logic from reversing the transmission order of events. The reason for this is that certain MIDI devices will not respond properly to program change and bank select events that do not occur in the correct order.

This also guarantees that there will be no timing problems, because the transmission of a MIDI event always lasts longer than one tick.

Saving Standard MIDI Files

If you want to play a Logic song on another sequencer, you can do so by saving it as a Standard MIDI File. Consult the other sequencer's instruction manual to see what Standard MIDI File formats it can read. Any sequencer should be able to interpret at least the type 0 file format.

Preparing the Song

Due to limitations of the Standard MIDI File format, you should prepare your Logic song in the following way:

- Neutralize all playback parameters with the normalize function (select them all by pressing Command-A, then select *MIDI > Region Parameters > Normalize Region Parameters*)
- Convert all playback quantization with the A*pply Quantization Settings Destructively* function (Command-A, *MIDI > Region Parameters > A*pply Quantization Settings Destructively)*
- Convert all aliases into real copies (Command-A, *MIDI > Alias > Turn to Real Copy)*
- Convert all loops into real copies (Command-A, *MIDI > Region Parameters > Turn Loops to Real Copies*)
- Convert all MIDI Regions on each track into a continuous MIDI Region (Command-A, *Region > Merge > Regions per Tracks*
- MIDI > Insert Instrument MIDI settings as Events

Additional Preparations for File Format 0

As Standard MIDI file type 0 format files can only save one MIDI Region, you must also merge all MIDI Regions into one (Command-A, *Region > Merge > Regions*).

Saving a Song as a Standard MIDI File

Select all of the required MIDI Regions, and select *File > Export > Export Selection as MIDI File.* You can now enter the destination directory. Remember that most hardware sequencers can only read MS-DOS formatted disks, so limit your file name to an 8.3 character name. As an example: "song0001.MID".

In File Format 0

Ensure that the *Preferences > Global > 'Export MIDI File…' saves single MIDI Regions as File Format 0* parameter is checked. If it is, selecting *File > Export > Export Selection as MIDI File* when only one MIDI Region is selected means that file format 0 will automatically be used.

Apple Loops

Logic ships with a number of Apple Loops. Apple Loops are musical phrases that can be repeated seamlessly. In comparison to "normal" audio loops, Apple Loops have a significant advantage: they can be transposed and (automatically) time stretched. Logic allows you to import Apple Loops, using the Loop Browser. You can also create your own Apple Loops with the Apple Loops Utility.

The Loop Browser

The Loop Browser allows the import of Apple Loops. When you add an Apple Loop to a Logic song, it will automatically be matched with the tempo and key of the song. This function allows you to use several Apple Loops simultaneously, even if they are of different speeds and keys.

The Audio menu contains a Loop Browser option that launches the following window, when selected.
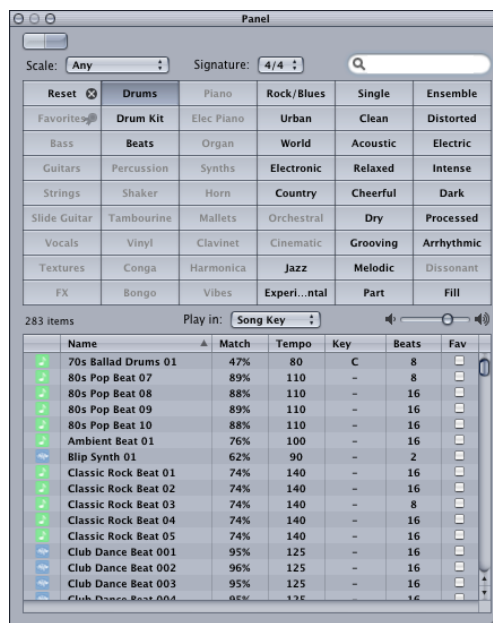
The new Apple Loops file format adds tags that allows you to quickly locate files by *Instrument, Genre,* or *Mood*. Further search refinements can be made by *Scale* and *Signature*.

The *View* buttons at the top left switch between a matrix display and a traditional Mac OS X file menu that is hierarchically separated into *All*, *By Genre*, *By Instruments*, *By Moods,* and *Favorites* search criteria.

The *Scale* pull-down menu offers Minor, Major, Neither, and Good For Both options. Use of these options limits the search for Apple Loops to the selected Scale type, within the chosen category. As an example, if Country, Acoustic, and Relaxed categories were selected, you would be presented with twenty files that matched your choices. Selection of the Minor Scale option would reduce this list to ten possible Apple Loops, making the task of auditioning and selecting the most appropriate material faster.

The *Signature* pull-down menu performs a similar task to the Scale menu, but limits searches to Apple Loops that match the selected time signature.

The *Search field* is used to find Apple Loops by name or partial name:
• Type in the desired search term, and press the Return key. Any files that match your search term will be displayed in the file browser at the bottom of the window.
• The *Cancel* button to the right (which appears as soon as any text was entered) clears any entered text. It also clears the search history.
• The *Find* menu to the left (the magnifying glass) retains a history of recently used search terms.

The categories matrix shows categories by instrument, genre, or mood. Simply click on the desired boxes in the matrix to narrow your search for appropriate Apple Loops. Selected boxes are highlighted. Multiple categories can be selected, either in conjunction with the Scale and Signature pull-down options, or without.

Note: You can switch a displayed category via the pop-up menu that opens when you Control-click the category box.

The *Key* pull-down menu determines the playback key of the selected Apple Loop.

The *Volume* fader adjusts the playback level of the selected file in the Loop Browser window.

The list at the bottom of the window displays all Apple Loops that match the criteria set with the parameters discussed above.
• Clicking on any of the column titles will sort the list of results by Name, Tempo, Key, and so on.
• Clicking on the arrow in any *selected* column title will sort the list in ascending or descending alphabetical, tempo, key, beat, or favorite order.
• Columns can be resized by dragging the vertical lines between column titles.
• Selection of any entry in the list of files will automatically begin playback. You can stop playback by clicking on the speaker icon in the left-hand column.

There are two types of Apple Loops: those featuring a blue sound wave 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. These files 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 may further be added to all Audio Instrument and MIDI tracks. On such tracks, these files they 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, effect, and input setting are automatically inserted.

Note: The *Transpose* Global track will only transpose Apple Loops used on audio tracks by ±36 semitones. This is a designed limitation in Logic, as Apple Loops don't sound that great when transposed further. This is also true for the Transpose parameter of the Region Parameter box.

To add an Apple Loop to your song:
▪ Simply drag the desired loop to the appropriate track and desired position.

Apple Loops Utility
The Apple Loops Utility allows you to create your own Apple Loops. Apple Loops are simply audio loops that include metadata "tags" with your loops. These tags provide information about the audio recorded in a file.

Logic uses tags in one of two ways:
• to help locate files when using the Search features of Logic's Loop Browser.
• to provide information that Logic uses when matching the file's tempo and key to the project tempo and key, this ensuring the best possible playback quality.

Tagged audio files can also contain information about transients. Transients indicate where beats occur in the file, and Logic uses these transients to play back audio files at the highest level of quality. The Apple Loops Utility can detect transients present in an audio file, and you can use the utility to add markers for additional transients, and move them to new locations.

If you select a Region in Logic's Arrange window and choose *Audio > Open in Apple Loops Utility* the following window opens:

The Apple Loops Utility window consists of the *Tags* and *Transients* panes. The bottom of the window includes a set of playback controls and file management buttons. The Apple Loops Utility also includes an *Assets* drawer, located to the right of the main window, where you manage open files.

Tags Pane
The Tags pane includes areas for different types of tags. It also includes a set of playback controls that you can use to listen to an open file.

Property Tags
- Number of Beats field: Displays the number of beats in the file.
- File Type button: sets the file type, which can be *One-shot* (One-shots are audio files not suitable for repetition) or *Looped*.
- Key pop-up menu: Sets the key of the file.
- Scale Type pop-up menu: Sets the file's scale type. The choices are Major, Minor, Good for Both, and Neither.
- Time Signature pop-up menu: Sets the file's time signature. The choices are 4/4, 3/4, 5/4, 6/8, and 7/8.
- Author field: Displays the name of the file's author.
- Copyright field: Displays the file's copyright date, if one exists.
- Comment field: Displays any comments about the file.

Search Tags
These tags are used by the Search feature in Logic's Loop Browser when you search for files matching specific criteria.
- Genre pop-up menu: Displays choices for the musical genre of the file.
- Instrumentation list: Displays choices for the musical instrument or instrument category recorded in the file. Selecting an instrument category in the left column displays the list of instruments in that category in the right column.

File Info
This area of the Tags pane includes rows with Kind, Length, Date Modified, Sample Rate, Channels, Tempo, and File Location information. This information is for viewing only, and cannot be edited in the Tags pane.

Descriptors
Descriptors are complementary pairs of keywords that describe the mood or character of the music recorded in the file. Each pair of keywords offers a row of buttons, allowing you to choose either one keyword from the pair, or neither keyword.

Transients Pane
The Transients pane contains a large waveform display, with a Beat ruler and a horizontal scroll bar. Markers indicate the position of transients in the file. Typically, transients correspond to the widest parts of a sound's waveform. The Transients pane includes controls for the beat division and transient detection sensitivity. You can also listen to the file (using the playback controls) to determine where transients occur.

The Transients pane includes the following controls:
- Transient Division pop-up menu: Sets the beat value used for transient detection by the Apple Loops Utility. Choosing a larger beat value results in fewer transients being detected. Choosing a smaller beat value can also result in fewer transients being detected, if they are present in the audio recorded in the file.

- Sensitivity slider: Sets the degree of sensitivity for transient detection. When you increase the sensitivity of transient detection, the Apple Loops Utility considers points of higher amplitude in the waveform as transients, regardless of whether or not they occur at a beat value.

When you open a file in the Apple Loops Utility, it looks for transients at every 16th note position, based on the file's tempo and number of beats tags. You can change the beat value used for transient detection via the Transient Division pop-up menu.

To display a file in the Transients pane:
▪ Select the file in the Assets drawer, then click the Transients tab.

Note: The Transients window can only display one file at a time. If multiple files are selected, no waveform is displayed in the window.

The waveform display in the Transients pane displays both the transients detected by the Apple Loops Utility and transients you add to the file. You can add transients and move existing transients in the Transients pane.

To add a new transient:
▪ Click in the darker area above the Beat ruler in the waveform display.

To move a transient marker:
▪ Drag the marker by its handle in the area above the Beat ruler.

To remove a transient, do one of the following:
▪ Click the transient's handle in the area above the Beat ruler, then press the Delete key.
▪ Drag the transient out of the area above the Beat ruler.

Assets Drawer
The Assets drawer lists the files open in the Apple Loops Utility. The drawer contains a Name column that lists the name of each open file, and a Changes column, which indicates any files that you have altered.

Playback and File Management Controls
The bottom of the Apple Loops Utility window contains a set of playback controls, allowing you to audition the selected file. These controls do not affect the file's tags.
- Go to Beginning button: Starts playback from the beginning of the selected file.
- Play button: Plays back the selected file.
- Stop button: Stops playback of the selected file.
- Key pop-up menu: Transposes the selected file to a new key for playback.
- Tempo slider: Sets the playback tempo of the selected file.
- Volume slider: Sets the playback volume of the selected file.

Note: When multiple files are selected, the playback controls are not available. You cannot play more than one file at a time.

There are two additional buttons at the bottom of the window, the Assets button and the Save button.

• Assets button: Shows and hides the Assets drawer.
• Save button: Saves your changes to the currently selected files in the Assets drawer.

GarageBand File Import

Logic supports the importing of *GarageBand* files via the *File > Open* menu option.

On opening the file:
• Logic will automatically create the required number, and type, of tracks to mirror those used in the GarageBand song.
• Apple Loops audio data should import without issues.
• The tempo of the GarageBand song will be used.
• Software Instrument parts will be played by GarageBand Instruments in Logic. Further to this, any mixing data and effects (plus their Settings) used by Software Instruments or Apple Loops-based tracks in GarageBand will also be imported into Logic.

Once the GarageBand song is loaded into Logic, you may freely change parts, mixing levels, instrument, and effect parameters as in any Logic project.

GarageBand Instruments are automatically installed with Logic.

You can insert them exactly as you would with other software instruments:
1 Click-hold on an Audio Object's Instrument slot.
2 The Instrument menu appears, showing all of Logic's available instruments. Move the mouse through the different levels to *Mono/Stereo > Logic > GarageBand Instruments* and choose an Instrument by releasing the mouse.

The Channel Strip settings of GarageBand translate 1:1 into Logic—with the nice exception that you can now access the individual plug-ins that are inserted into a GarageBand channel strip. The GarageBand Channel Strip setting files are visible in Logic's Channel Strip menu in a subfolder called GarageBand. Logic's Channel Strip menu is accessible via a long click on the word *Inserts* on each channel strip.

GarageBand's two bus effects (Reverb and Echo) are also translated when opened in Logic. They are replaced by the Platinum Verb and Tape Delay on Busses 1 and 2.

Note: GarageBand projects will only open in Logic Express 7 and Logic Pro 7—not in older Logic versions. It is not possible to open Logic songs in GarageBand.

More information about GarageBand file support in Logic can be found in the "Introduction to Logic for GarageBand Users" tutorial.

ReCycle Import

ReCycle is the name of a software application by manufacturer Propellerhead, which mainly serves as an editing and production tool for loops (repeatedly looped audio samples). ReCycle uses specific file formats that can be imported by Logic.

Recognized ReCycle File Formats

Logic can import the following file formats:

Old ReCycle File
- File Suffix: .rcy
- Abbreviation: RCSO

Old ReCycle export file
- File Suffix: .rex
- Abbreviation: REX

ReCycle 2.0 file
- File Suffix: .rx2
- Abbreviation: REX2

Importing ReCycle Files Into the Arrange Window

To import a ReCycle file to an audio track use the same options as for normal audio files:
- Select *Audio > Import Audio File* and select a ReCycle file instead of a regular audio file, or
- Command-Shift-click on an audio track and select a ReCycle file, or
- Drag a ReCycle file from the Macintosh Finder onto an audio track.

As a result, Logic will create a folder containing one audio track (using the same Audio Mixer Object as the track it is created on) which in turn contains the slices of the ReCycle file at the appropriate positions. Each of these slices will reference the same audio file, which can be found in the Audio Window, as usual.

Important: If you move the created folder to another audio track, the Audio Mixer Object references will not change accordingly! You will need to open the folder and change it manually if that is what you want to do.

Copying Audio Data Into the Clipboard

You can copy audio data into the Clipboard for further use in ReCycle by selecting local window *Audio > Copy ReCycle Loop*. This option will only be active if you have selected one audio part in the Arrange window, and will copy the selected region of the referenced audio file into the Clipboard. You can then use the *Paste as new document* function in ReCycle to create a new ReCycle document using this audio data. In conjunction with the *Paste ReCycle Loop* function (see below), you can perform a complete data transfer from Logic to ReCycle, and back, without using any file selector dialogs!

The size of the transferred audio region is limited to 10 MB, due to the fact that the Clipboard resides in the computer's RAM. 10 MB, however, should be sufficient for most ReCycle loops (an eight bar stereo loop in 4/4 at 70 bpm uses approximately 5 MB, for example).

Pasting ReCycle Loops Into the Arrange Window
If you use the "Copy Loop" option in ReCycle to copy the loop currently being edited into your computers Clipboard, you can paste this loop into the Arrange window by selecting *Audio > Paste ReCycle Loop*. The result will be the same as if a ReCycle file had been imported.

ReCycle File Import Overlap Function
On occasion, you may encounter a dialog regarding overlaps, when importing ReCycle files.

The launching of this window results from:
• The tempo used in Logic being higher than that of the imported Recycle file.
• Use of the Stretch function in ReCycle.

You may handle the imported file in the following ways:
• *Don't Fix*—imports the file as is. All "slices" of the file will overlap, to match Logic's tempo.
• *Add tracks*—will distribute the slices across multiple audio tracks, allowing you to adjust the position or delete slices freely. The *Number of additional Audio tracks* panel in the window determines how many tracks are used for the distribution of the slices. These tracks are in addition to the original audio track, on which the Recycle file was imported.
• *Crossfade*—All slices of the file are imported to the same track and automatically crossfaded. The crossfade is equal powered. The length of the crossfade is determined by the value (shown in milliseconds) displayed in the *Crossfade length* panel.
• *Render into single file*—When importing Rex files this function writes all ReCycle slices into a single audio file using the current Logic song tempo for the rendering process.

The adjustment of the numerical values is via use of the mouse as a slider, or double-clicking on the panel(s), and direct numerical entry.

OPEN TL Import

Logic has the ability to import song contents using the*OpenTL* (Open Track List) file format.

The OpenTL format is mainly used for data exchange with Tascam hard disk recorders, such as the MX2424. It only supports the exchange of audio data (audio media and the use of this audio media in a song)—MIDI and automation data will be ignored when using the export functions.

To import an OpenTL file, choose *File > Import*. A file selector opens, which allows you to choose OpenTL files. Note that if you choose the *Open TL files* option in the Open File Type menu, only files with the ".TL" extension will be shown in the file selector. If the first event in the imported song starts at a time greater than 1 hour, the following dialog appears:

Set SMPTE start time of song so that events start at the same SMPTE time as they do in the imported project?

Confirm it by pressing *Set* if you want the SMPTE start time of the song to be changed accordingly, or *Don't set* if the song's SMPTE start time should not be changed.

Should the first audio part found by OpenTL import have a start time greater than zero (less than zero is impossible), Logic will ask if you wish to: *Set the start time of first imported event to start of song?* If you answer with *Set*, the first audio part imported will be placed precisely at the song start position.

This solves the problem of the song on the Tascam machine starting at a large time value, but less than 1 hour (such as 59 minutes). In this situation, the user can't immediately see the imported audio parts because they are usually imported beyond the song's end point (possibly even beyond the largest possible song end point, depending on the song tempo).

Bouncing and POW-r Dithering

Logic provides you with the leading professional POW-r dither algorithm, designed for the conversion of 24 bit recordings to 16 bit files—as required for CD burning, for example. POW-r (Psychoacoustically Optimized Wordlength Reduction) is licensed from the development team of the POW-r Consortium LLC.

POW-r dithering is applied when:
• bouncing audio files to disk

Bouncing can be performed directly in the Arrange (and other) windows by selecting the *File > Bounce* menu option, which will launch the Bounce dialog. Bouncing can also be initiated by clicking on the *Bounce* button found on Audio Output Objects (see "Bounce" on page 204).

POW-r offers three distinct dithering modes.

- *No Dithering*: No dithering is applied.
- *POW-r #1*: uses a special dithering curve to minimize quantization noise.
- *POW-r #2: (Noise Shaping)*: uses additional noise shaping over a wide frequency range, which can extend the dynamic range by 5 to 10 dB.
- *POW-r #3: (Noise Shaping)*: uses additional, optimized noise shaping which can extend the dynamic range by 20 dB within the 2 to 4 kHz range—the range the human ear is most sensitive to.

Note: Noise Shaping minimizes side effects caused by bit reduction through spectral displacement of quantization noise above 10 kHz—the range the human ear is least sensitive to.

The mode which will sound the best to you is primarily dependent on the program material and on your personal taste. The "right" setting is best determined by auditioning the audio material with each of the dithering modes.

Important: Dithering the same audio signal multiple times should be avoided.

Transport

<div style="text-align:right; font-size:3em;">2</div>

In this section, 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 all about Logic's Transport window. This also includes a brief introduction to Logic's recording functions.

The Transport Window

The Transport window is used to control and display Logic's recording and playback functions.

These are the different sections of the transport window:

Transport buttons (see "Transport Buttons" on page 79)

Mode buttons (see "Mode Buttons" on page 81)
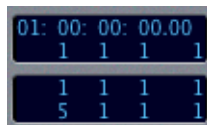
Position display, Locators (see "Position Display" on page 76)
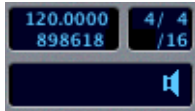
Tempo and Time Signature display (see "Tempo/Free Memory" on page 77)

MIDI Input—Output/Song End (see "MIDI Monitor/Song End" on page 78)

Note: As a floating window, the Transport window is always in the foreground, and can not be covered by other (non-floating) windows.

All display fields in the Transport window (apart from the song name) can be used for data input. You can either: double-click on the desired display field and input the numbers with the keyboard, or adjust the individual numbers by using the mouse as a slider.

Note: All Transport functions are also available as preset (but also user-definable) keyboard commands, even if the Transport window is not open.

To open the Transport window:
▪ Select *Windows > Transport*, or press Command-7.

Note: Logic allows an unlimited number of Transport windows to be simultaneously opened. Additional Transport windows can be used as giant displays for the Bar or SMPTE position, as examples.

To close the Transport window
▪ Click the close button at the top left of the Transport window.

Note: The bar that contains the close/open and minimize buttons is normally found at the top of most windows. In the Transport window, this bar is located to the left.

To reposition the Transport window onscreen:
▪ Grab anywhere in the gray area of the Transport window (not on a function or field), and drag it to the desired position.

The Transport Bar in Other Windows
You can also configure a fixed Transport window in the Arrange and Matrix windows. Select *View > Transport* and a Transport field appears in the top left corner of the window. The number of visible buttons and displays is dependent on the size of the area available. You can adjust this area by click-holding on the intersection of the Track List, Arrange area and Bar Ruler (the cursor will change to a four-headed arrow), and dragging.

Altering the Display
The Transport window pull-down menu opens when you click on the arrow at the bottom right. This menu is used to reconfigure the Transport window's appearance.

Smaller/Larger
You can adjust the size of the Transport bar to nine different size settings. This is achieved by dragging the bottom right corner of the Transport window.

Legend

This display option conceals/reveals a description of all window elements, and is very helpful if you are still getting to know the program.

Position Slider

This hides/shows a bar along the bottom edge of the window. The size of the bar is directly related to the current portion of the song shown in the Arrange area, and this portion's relationship to the overall song length (see "MIDI Monitor/Song End" on page 78). You can click-hold on the bar and drag left or right to quickly move to a different song position.

Use SMPTE View Offset
This alters the display of the SMPTE time shown at the song startpoint, regardless of the true SMPTE start time being read from an external time code source. More information on this can be found in the SMPTE View Offset section (see "General" on page 453).

SMPTE View Offset
This menu option launches the *Song Settings > Synchronization > General* tab, allowing you to define the Bar Position and/or SMPTE time for *both* the actual song position and the SMPTE view offset.

Position Display
The current song position is shown in two formats:

Above: SMPTE time
Hours: Minutes: Seconds: Frames/Subframes.

Below: bar position
Bar—Beat—Division—Ticks.

A beat corresponds to the denominator in the time signature, a division is a freely-definable part of a beat. A tick is the smallest possible bar sub-division or system quantization—of just 1/3840 note.

Locators

You can define two sets of locator points: one for the Cycle (see "Cycle Mode" on page 84), and the other for the Autodrop (see "Autodrop" on page 88) zone. The left-hand side locators on the Transport window define the Cycle—a passage that is constantly repeated.

The locators shown at the bottom/to the right on the Transport window define the *Autodrop* range (see Autodrop)

Note: Both sets of locators are only displayed when the Cycle and Autodrop functions (buttons on the Transport) are switched on.

Note: Any mention of the "left or right locators" refers to the Cycle locators, rather than the Autodrop locators. The top value denotes the left locator position, and the bottom one, the right locator position.

Adjusting Locators to Fit Selected Regions
Set Locators by Regions matches the locator positions with the start and end points of one (or more) selected Region(s). The *Set Rounded Locators by Regions* key command rounds the locator positions to whole bars.

Tempo/Free Memory

Tempo

Tempo is displayed as quarter notes per minute, or beats per minute (bpm). It ranges from 5 to 9999 bpm, and is adjustable to four decimal places after the whole value.

Programming Tempo Changes

This functionality is described in the Tempo chapter (see "Display and Functions" on page 447).

Free Memory

Below the Tempo display, you will see the amount of free memory (events) available in the record buffer. You can increase the amount of free memory by reconfiguring the memory.

To reconfigure the memory:

1 Double-click on the free memory display.

2 A "Reorganize Memory?" dialog will appear.

3 Confirm by clicking the Reorganize button.

This reorganization is also carried out automatically after saving or loading a song. A common (and good) use of this feature is to free up memory after closing a song, if two or more songs were open at the same time.

Time Signature and Division

This is where you can see, and set the time signature of the song. The format is:

Bar numerator—Bar denominator—Division

The division defines the third format value in all position displays (such as in the Event Edit window), and forms the grid for various length and placement operations. The division is normally set to 1/16 notes, but has a value range of 1/4 to 1/192 note. If the note value of the division is equal to or greater than the bar denominator, the third value of the position display is automatically removed.

Apart from the features described below, you can also use the Global Signature track to edit time signatures.

Time Signature Changes

If you alter the bar numerator or denominator in the Transport window, a time signature is created at the start of the bar occupied by the current song position. This is shown in the Bar Ruler, to the left of the bar number and in the Global Signature track, if visible. A time signature change does not affect the absolute positions of any existing time signature events that are already inserted.

Note: You can also add time signature changes directly in the Score Editor (see "Time Signatures" on page 362) by double-clicking on any MIDI Region that spans the signature change.

To edit time signature changes:

▪ Move the Song Position Line to the target bar, and set the new time signature in the Transport window. Alternately, you can activate the Signature track via the *View > Global Tracks* menu option, and manually insert them (see "Signature Track" on page 244).

You can also edit the time signature in the Score Editor.

To erase time signature changes:

▪ Simply change the time signature to match the value of the preceding/previously used time signature.

Note: You can also erase time signatures in the Score Editor by selecting them, and hitting Backspace. To erase all time signature events, select *Edit > Select Similar Objects* before doing so.

MIDI Monitor/Song End

MIDI Monitor and Panic Function

MIDI Monitor
The top line shows the last MIDI message received, and the bottom line the last MIDI message transmitted. The monitor is mainly used for checking MIDI connections.

Automatic Chord Interpretation
The MIDI activity panel of the Transport window shows chord symbols when Logic receives more than one MIDI note simultaneously. The respective, held intervals (between notes) are interpreted and displayed as chords.

Panic Function
Click on the MIDI monitor to silence any hanging notes. If this doesn't work, double-clicking on it will initiate a Full Panic reset, which should do the trick (see "Reset Functions" on page 132).

Song Title
The title of the active song is shown below the MIDI monitor.

Song End
Below the song title, you'll see a numerical field that indicates the song end position. As soon as Logic reaches this position, it will stop automatically, except when recording. In this situation, the song end point is automatically moved to the end of the recording.

The maximum length of a Logic song is 8550 quarter notes, or about 2158 bars in 4/4 time.

A song can therefore last a maximum of around 70 minutes at a tempo of 120 bpm. At 95 bpm, the maximum length is over an hour and a half.

If you need to increase this length, for film synchronization as an example, just halve the tempo. You can achieve the same result by using 4/8 time instead of 4/4 time, and treating quarter notes as eighth notes. A 4/8 song at a tempo of 60 bpm (equivalent to 4/4 at a tempo of 120) has a maximum length of more than 4273 bars, or over 2 hours and 22 minutes.

Transport Buttons
Record
Recording normally starts after the count-in, at the start of the current bar. In Cycle mode, it starts at the left locator. You can also choose to have one beat constantly repeated, until a MIDI message is received, at which point recording begins.

Pause
Pauses recording or playback, until you press pause or play again. During paused recording, you can add individual events which will be recorded.

Play

Starts playback at the current position, or from the left locator position when in Cycle mode.

You can use the *Play from beginning* key command to start playback at the beginning of the song.

Stop

Ends recording or playback—the sequencer stops. If the sequencer is already stopped, pressing stop moves the song position line to the song start point, or to the left locator position if Cycle mode is active.

Rewind/Forward

If the sequencer is stopped, these buttons work as you would expect. If the sequencer is running, you can monitor as you go (cueing/scrubbing), with MIDI events being output at a faster rate. This also occurs when rewinding.

A click on either button will jump one bar forward or backward. Click-holding on either button will rewind or forward. Moving the mouse left or right will increase or decrease the rewind/forward speed.

Note: Both normal (*Rewind/Forward*) and fast (*Fast Rewind/Fast Forward*) winding are available from the keyboard.

Shuttle—Winding Like a Reel-to-Reel Tape Recorder

There are two key commands for "winding the reels"—moving the Song Position Line—called *Shuttle Rewind* and *Shuttle Forward*. You will find them in the Key Commands window (see "Key Commands" on page 36) by searching for the *Shuttle* character string. Repeated hits of the key will increase the winding speed. Repeated hits of the opposing "shuttle" key will slow down the shuttle speed, and eventually change the winding direction. Shuttle disables Cycle mode. Shuttling is halted by the Stop command.

Mode Buttons

The mode buttons do not immediately trigger an action. Rather, they switch operating states. The relevant button will illuminate to indicate that the mode is activated.

Cycle, Autodrop, and Replace

More information about the Cycle switch can be found in the Cycle Mode section (see "Cycle Mode" on page 84). For more details about Autodrop (see "Autodrop" on page 88), and the Replace switch (see "Options" on page 87).

Solo and Solo Lock

In Solo mode, only the selected Regions are played. The data output from all other Regions is muted. This is known as: "soloing the Regions". You can of course, change the Solo mode of Regions by changing your selection (default key command: *S)*.

If you want to carry out specific functions on individual Regions, regardless of the solo status of other Regions, you need to be able to select these Regions without affecting the Solo status of others.

This is what the Solo Lock function is for. After soloing the desired Regions, double-click on the solo button, and a padlock symbol will appear on it to indicate "solo lock" status. You can now alter the selection without affecting the solo status of other Regions.

Sync

This button allows you to synchronize Logic with an external source (make Logic the synchronization "slave" to another device). If Logic is running by itself, or acting as the synchronization source (it is the synchronization "master"), this button should not be activated. When you first boot Logic, manual Sync mode is automatically switched off.

Click-holding the Sync button opens a pull-down menu, where you can define the following:

• the type of external synchronization.

- direct access to the tempo editors (see "Display and Functions" on page 447).
- direct access to the Synchronization settings.

Metronome

This button (default: *C*) is used to turn the metronome on and off. Logic remembers the Metronome status for recording and playback.

Click-holding the Metronome button offers pull-down menu access to the *Recording* and *Metronome Settings*.

The Bar Ruler

There is a Bar Ruler at the top of the Arrange, Matrix, Hyper, and Score windows.

This ruler is used to display, and set, the:
- song position.
- start and end of the song or folder.
- cycle and autodrop locators.

Color and Display

The Bar Ruler changes color depending on the transport mode:
- Red—Record
- Yellow—Solo
- Blue—External Synchronization.

Dependent on the zoom settings (see "Zooming" on page 24), the bars are shown at the top edge in units of 1, 4, 8, or 16. Changes in time signature are also shown here.

In the bottom third, there is a vertical line for each bar. The shorter lines represent one beat, but are not always visible (depending on the zoom setting).

Start and End Markers

The song start point is normally at position 1 1 1 1. You can move the song start point to an earlier position for playing upbeats or program change commands, by grabbing and dragging it with the mouse. The position display in the top left of the window will indicate where it is. The song end (default: bar 201) can be set using the same method, or with the numerical Song End display (see "MIDI Monitor/Song End" on page 78).

In folders, the start and end markers refer to the folder rather than the song. The length of a folder can also be adjusted from within the folder itself.

Song Position Line

The Song Position Line (SPL) is a vertical line which indicates the current song position in all horizontal, time-based windows. You can grab the line with the mouse, and drag it to the desired position (but only if there is no Region or event at the mouse position when you drag it). Selecting *Wide Song Position Line* in the *Preferences > Display > General* page switches to a thicker SPL.

Direct Placement

As it can be difficult to grab the SPL in the window itself, you can also directly position it by using the bottom third of the Bar Ruler. Just click at the desired position in the lower third of the Bar Ruler to make the SPL jump to the point you've clicked.

Double-clicking on the bottom third of the Bar Ruler repositions the SPL, and also toggles between playback (or record) and stop modes.

Numerically
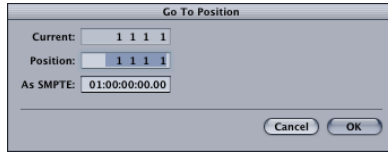
Selecting *Goto Position* opens the dialog box shown above, allowing you to input the song position numerically. The last division used (bar position or SMPTE time) is automatically selected, with the last input value as a default. As the numbers are registered from the left, it is enough just to enter the bar number.

In the Score Window, you can set the SPL position directly by clicking into a staff at the desired point while pressing Option. This function is only available when the sequencer is stopped. The selected position is displayed in the help tag for as long as the mouse key is pressed. This method is especially handy when working in page view mode, as no Bar Ruler is visible in this mode.

Scrubbing
Start playback, and grab the bottom third of the Bar Ruler. By moving the mouse to the left or right, you can now scrub through the song, moving the SPL to hear all "cued" events. As soon as you stop moving the mouse, normal playback is resumed.

Cycle Mode
In Cycle mode, a selected passage of the current song is constantly repeated. This is useful for:
*   composing a song section.
*   practicing a recording.
*   recording individual tracks consecutively.
*   editing events.

The Cycle area is shown as a green stripe in the top part of the Bar Ruler.

There are four ways of switching Cycle mode on and off:
*   clicking on the Cycle button.
*   using the *Cycle* key command.
*   clicking on the top part of the Bar Ruler.
*   inputting a Cycle area graphically in the Bar Ruler.

How Logic behaves in Cycle mode:
- The Song Position Line jumps from the end of the Cycle to the beginning.
- When this happens, the playback from Environment Objects that are generating notes is interrupted.
- The Play command starts playback from the beginning of the Cycle.
- To start playback from another position, hit Pause twice, or Pauseand then Play.
- At the cycle jump point, you can use the Chase Events (see "Chase Events" on page 89) function—*File > Song Settings > MIDI > Chase > Chase on Cycle Jump*.
- You can determine the way recording works in Cycle mode, by using the various options on the *File > Song Settings > Recording* page.

Defining the Cycle

There are a number of different ways to define a Cycle.

Defining the Cycle graphically in the Bar Ruler:
- Click-hold in the top third of the Bar Ruler, and define the desired Cycle area by dragging the mouse from left to right. Dragging from right to left generates a Skip Cycle (see "Skip Cycle" on page 86).

Grab the Cycle "bar" in the middle to reposition it.

Grab the bottom corners to move the start or end points of the Cycle (you can even do this while the sequencer is still running.). If you set the start and end points to the same position, Cycle mode is switched off.

Note: You can reset the nearest edge of the Cycle beam by clicking on it while holding down Shift, even if the beam is outside the visible range, or Cycle mode is switched off.

When you set the size of a Cycle graphically in the Bar Ruler, its size is quantized to the nearest bar. Locator positions can only be changed by division at high zoom resolutions, or if you hold down Control as you drag (the Cycle). If you hold down Shift and Control, at a really high zoom resolution, you can drag and change the size of the Cycle in ticks.

To set locator positions that do not lie on whole bar lines, regardless of the zoom resolution, enter your locator positions numerically in the Transport window.

Numerical Entry
The positions of the left and right locators (start and end points of the Cycle) are shown in the Transport window, where they can also be altered.

By Regions
You can use the *Set Locators by Regions* (default: B) and *Set Locators & Play* key commands to set the locators at the start and end of selected Regions; the latter command also starts playback.
- *Set rounded Locators by Regions* rounds the position of the locators to the nearest bar.

- The *Set rounded Locators & Play* key command achieves the same result, but also starts playback.

Skip Cycle

You can skip a passage in play mode, which is useful for trying out the musical effect of various transitions.

To set up Skip Cycle:

- Drag the Skip Cycle area from right to left in the Bar Ruler. If a (normal) Cycle area already exists, just move the left locator to the right of the right locator.

The Skip Cycle area is shown as a very thin strip at the top edge of the Bar Ruler.

Features of Skip Cycle Mode

When the SPL reaches the right locator position, it skips to the left locator (the "right" and "left" locators swap positions).

You can use Skip Cycle mode when editing, to leave out parts of the song that you don't want to be affected by the edit.

Recording
Selecting a Track

To select the desired recording track, simply click on it.

Only one MIDI track can be record enabled in Logic Express, which may be on another folder level.

During recording, incoming events are stored in a Region on the selected track.

Note: Audio tracks must be record enabled, and a recording path (a hard disk drive) defined before audio files can be recorded.

Changing MIDI Tracks

If you record MIDI information, you can change the record track, without stopping recording—just select a new track, using the *Select previous/next track* key commands (default keys: *Up* or *Down Arrow*).

Count-In

The *Count-in* and *Record Pre-roll* values can be defined in *File > Song Settings > Recording (see "Metronome Settings" on page 466)*.

This is often useful if the section of the song (just before the part you're recording) lacks the sort of rhythmic information necessary to play new parts in time, but there's plenty of rhythmic material, once the section you're recording to gets going.

Options

Record Toggle—Record Repeat

The *Record Toggle* key command switches between playback and record mode. *Record Repeat* repeats the recording from the previous drop-in point.

Record into Selected MIDI Region

Normally, a new MIDI Region is created during every recording. In the Recording Options (see "Recording Settings" on page 468) of the *Song Settings* you can activate *Merge New Recording With Selected Region*, so that any new data is incorporated into an existing (and selected) MIDI Region.

Replace Mode

To activate Replace mode, press the *Replace* button. In replace mode, any newly recorded data is always stored in a new Region. In addition, any existing Region on the destination track are cut at the punch in/out points of the recording, and any data between these points is deleted.

Destructive MIDI Recording

If you select *File > Song Settings > Recording > Merge New Recording With Selected Region (r)*, and switch on Replace mode, newly recorded events will replace those in existing MIDI Regions.

The Merge/Replace combination can itself be coupled with the Autodrop and/or Cycle functions.

Recording in Cycle Mode

All settings for recording in Cycle mode can be made in the *Song Settings > Recording Options* (see "Recording Settings" on page 468). You can either use several cycle passes to record a single Region (*Merge only New Regions in Cycle Record (*checked), or you can create a new Region for every cycle pass (unchecked).

A new track can be automatically created for each of these Regions (*Auto Create Tracks in Cycle Record*). The Regions you create can also be automatically muted (*Auto Mute in Cycle Record*). This mode is very well suited to recording several consecutive versions of a solo, and then picking the best one.

Cycle and Replace

During a cycle recording in Replace mode, existing Regions are deleted during the first cycle pass—from the punch-in point to either; a punch-out point or the end of the Cycle. When the second cycle pass begins, recording continues, but no further Regions are deleted. If you want to replace the end of an existing Region, you don't need to stop recording before the second cycle pass begins: the start of the existing Region remains intact.

Recording With Skip Cycle

If Skip Cycle is switched on, the Cycle area is bypassed during recording.

Autodrop

The term Autodrop means the automatic activation and deactivation of record mode at predefined positions. Autodrop mode is most commonly used to re-record a badly played section of an otherwise flawless recording. The advantage of Autodrop mode is that you can concentrate on your playing, rather than starting and stopping record mode.

If Cycle mode is inactive, the left and right locators serve as drop-in and drop-out points. Autodrop is activated by clicking on the *Autodrop* button.

Defining the Autodrop Area

If both Cycle and Autodrop modes are active, you will see an independent pair of locators available for the Autodrop range. There are two stripes in the Bar Ruler, the top one representing the Cycle area, and the bottom one the Autodrop range. The Autodrop range can be graphically altered in the Bar Ruler, just as you would with a Cycle area.

Note: If the Bar Ruler display is narrow, hold down Option to ensure that any alterations made to the Cycle only affect the Autodrop range.

The grid scale—for graphic operations in the Bar Ruler—can be reduced to division resolution by holding down Control, and to tick resolution by holding down Shift-Control.

Setting Autodrop Numerically

The positions of the Autodrop locators are displayed numerically, to the right of the Cycle locators on the Transport window. These positions can be altered by using the mouse as a slider, or by direct numerical entry in this display window.

Recording in Autodrop Mode

To make an autodrop recording, place Logic in Record mode at any position before the drop-in point. Any events played before the drop-in or after the drop-out points are channelled through the sequencer as usual, but are not recorded.

If the SPL is positioned after the right locator when you start recording, recording automatically begins at the drop-in point, following the count-in.

If Autodrop is enabled during recording, the *Record* button will flash while the song position is outside the drop locators. This indicates that no recording takes place.

Combining Cycle and Autodrop

If you want to improve a difficult part of a certain passage, you can use a combination of the cycle and autodrop functions. Cycle mode allows you to practice as many times as you like before the "final take". On each cycle pass, only events that fall within the autodrop range are recorded. This allows you to make use of the preceding song section to "get into the groove".

Chase Events

Chase Events searches all MIDI Regions playing at a specified "jump-in" point. The function examines what all MIDI Regions are doing before the jump-in point, to determine which events would have affected playback at the jump-in point, if reached by playing through the song, rather than by just jumping there.

This is a difficult concept to grasp, so here's another explanation:

If you start playback in the middle of a song by jumping straight to that point (via Cycle mode looping or by direct SPL placement), you might expect a problem or two with note playback. If an important note started playing just before the playback start point, you would expect Logic to overlook it, and the note wouldn't be heard. Notes, however, are not the only potential problem. If there were a maximum pitch-bend message just before the playback start point, you would miss out on this too. Fortunately, Logic is smarter than your average MIDI sequencer, to misquote Yogi Bear…

Open the *File > Song Settings > MIDI > Chase* page, to set up the *Chase Events* function.

The Chase Events function searches all MIDI Regions at the playback start point. It looks for a selection of the following *before* the playback start point:
- any notes due to start playing at the playback start point.
- any notes that are still playing at playback start point—held-down sustain pedal (Chase sustained Notes).
- program changes.
- pitch-bend information.
- continuous controllers 0 to 15.
- continuous "switch" controllers 64 to 71.
- all other controllers (all other Controls).
- monophonic (channel) aftertouch.

There is a potential problem when chasing notes that are used to trigger a drum loop in a sampler. Unless you are lucky enough to start the MIDI Region precisely at the beginning of the sample loop, the sample will be triggered at the wrong time and will, therefore, be played out of sync with the rest of the MIDI Region (at least until the next trigger note). The problem is that most samplers can only play samples from the beginning, and cannot synchronize them to the beat when started in the middle.

To solve this potential issue:

Activate the *No Transpose* parameter of your drum loop instrument, in the instrument's Object Parameter box, and switch off the *In 'No Transpose' instruments* option in the *MIDI > Chase* page of the *Song Settings*. The result of this selection is that whenever the song jumps to a new position, your drum loops will not play until they reach the next "trigger note".

The *No Transpose* parameter actually prevents transposition by the Region playback parameters, which is also not desirable for drum sounds or loops.

Arrange Window

The Arrange window is the heart of Logic. It is the view that you will see most often when working with the program.

You will learn all about the different interface elements, functions, and features of the Arrange window in this section. You will also discover how to handle both MIDI and audio tracks plus a number of other important techniques.

Overview
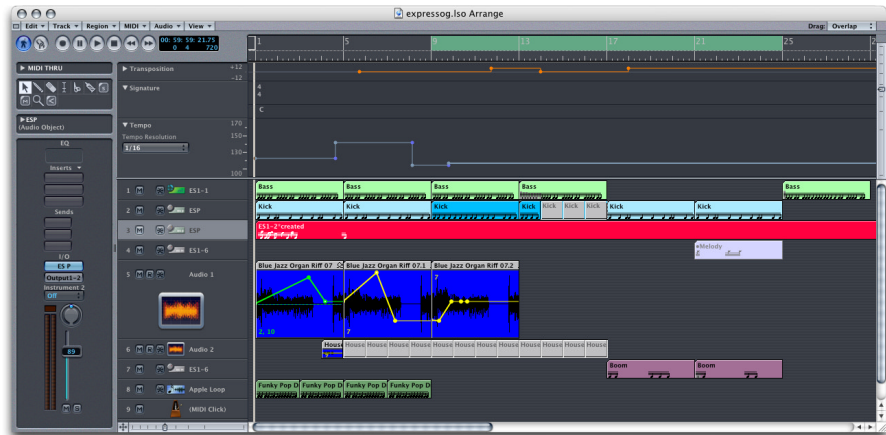
The *Arrange area* is where all MIDI and audio information is recorded, on horizontal *tracks*. Individual MIDI recordings are called *MIDI Regions*, audio recordings are called *Audio Regions*. Both Region types are displayed as horizontal "beams". Above the Arrange area is the *Bar Ruler*, which displays position information.

To the left of the Arrange area is the *Track List* (see "Tracks" on page 92). This is where you determine which (Audio) Object should play the MIDI or audio information on each track. You can make various settings for these Objects in the *Object Parameter box* in the lower left corner.

As the Regions are arranged graphically, you can also use specialized mouse tools from the Toolbox to help you perform different operations.

The *Region Parameter box* (see "MIDI Region Playback Parameters" on page 116) is used to set playback parameters, such as transposition and quantization (see "Quantization" on page 120), for individual Regions.

The channel strip at the bottom left corner of the Arrange window always shows the mixer channel strip of the currently selected track.

Opening the Arrange Window

The Arrange window can be opened by selecting *Windows > Arrange* in the main menu, or by pressing Command-1.

If preferred, you may define an alternate key command for *Open Arrange Window* in the Key Commands window (see "Key Commands" on page 36).

Note: Many Arrange window features apply to MIDI and Audio Regions, but some are only relevant to one or the other. This chapter describes general and MIDI features. Specific audio features are dealt with in Chapter 4, "Audio in the Arrange Window," on page 133.

Tracks

A track is where audio signals and MIDI events are recorded (into Regions and MIDI Regions, respectively). They are stacked vertically and extend horizontally across the Arrange area. Most of the functions described in this section are identical for MIDI and audio tracks.
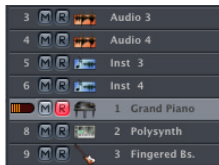
Overview

There are basically three types of tracks:
- Audio tracks: for playback, recording, and automation of audio signals.
- Audio Instrument tracks: for playback, recording, and automation of MIDI data sent to software instruments.
- MIDI tracks: for playback, recording, and automation of MIDI data sent to external MIDI devices.

In addition to these tracks, there are also tracks with very specific functions, such as the Global tracks (see "Global Tracks" on page 239). The descriptions in this section don't deal with these special tracks.

Each track is numbered from top to bottom in the Track List. During playback, a small level meter appears next to the track number.

For MIDI or Audio Instrument tracks:
This indicates the velocity of the recording, and turns red to denote a maximum velocity value. MIDI tracks also indicate MIDI controller data playback via a small *c* that appears temporarily over the track number.

For audio tracks:
The level meter denotes the output level.

Note: The level indicator is only displayed if selected via the Arrange window *View > Track Numbers/Level Meters* menu option.

To the right of the track number (and possibly, the *Mute, Record, Solo,* and *Freeze* buttons—dependent on track type and *View* menu settings) is an icon and a name. Click-holding on the track name allows you to assign a *destination* for the track—regardless of track type.

If you wish to route a track (containing MIDI events in a MIDI Region) to a MIDI sound generator or software instrument, select a suitable *instrument* as the track destination.

If you wish to route a track (containing audio data in an Audio Region) to a specific audio channel number, select the desired *audio channel* as the track destination.

Note: Strictly speaking, tracks don't need to be routed to an *instrument* or *audio channel*, as you can assign any Environment Object to the output of a track. The track data could conceivably be sent to a folder, or directly to a MIDI port (a MIDI Region). Obviously, audio data would not be understood by a MIDI sound module, so there is no point in routing a track that contains audio data (in a Region) to an *instrument*. Similarly, there is no point in routing a track that contains MIDI data (in a MIDI Region) to an *audio channel*.

To aid understanding, we will use the term "instrument" rather than "audio channel" (or the correct, but long-winded, "track data destination object") in this section.

A MIDI track is automatically record enabled when selected. The Record Enable button turns red to indicate this "armed" state. During recording, a MIDI Region (containing the recorded MIDI events) is created on the selected (and armed) track.

An audio track is *not* automatically record enabled when selected. You must press the Record Enable button on the desired track, which will turn red to indicate an "armed" state. During recording, an Audio Region (a pointer to the recorded audio file) is created on the selected (and armed) track.

Track Icons
Logic offers high resolution, scalable (from 128 × 128 pixels downwards), and user-definable icons.

User-Definable Icons
You can create your own icons for tracks. These icons must be of 128 × 128 pixels in size, must have an alpha channel for transparency and must be saved in the *portable network graphics* format (with the ".png" suffix). The filename must also start with a three-digit number. If this number is below 325, the corresponding built-in Logic icon will be replaced with your new graphic (you can check the number of existing Logic icons by clicking on them in the Object Parameter box).

There are two possible locations for user icons:

The *~/Library/Application Support/Logic/Logic Resources/Icons* folder can contain icons which are only valid for the particular user (~ is the user name). If you save your icons in the root directory—*/Library/Application Support/Logic/Logic Resources/Icons*—the icons are valid for all users. If icons with identical numbers exist in both folders, the icons found in the user folder have priority.

Icon Color

The small, monochromatic icons adopt the color of their "parent" Audio Object or MIDI Instrument Object—which is also used for newly recorded Regions in the Arrange window.

The high resolution Arrange icons have their own color and, therefore, cannot adopt the color of the "parent" Object.

Selecting a Track

You can select a track by clicking on its name or icon in the Track List. This also selects all Regions on the track (or if the Cycle function is switched on, it only selects the Regions that fall within the defined Cycle area).

Use the *Select Next/Previous Track* key commands to select the track above/below the selected track in the track list (default key assignments: *Up Arrow/Down Arrow*).

Changing Tracks While Retaining Your Selections

If you click on a new track while holding down Option, the track will be selected without changing the existing selection of Regions.

Sorting Tracks

To change the position of a track in the Track List, grab the track number, and drag it up or down. The cursor will turn into a hand graphic, to indicate that the track can be repositioned vertically.

Creating Tracks

To create a track, use the *Track > Create* command. The new track is created at the currently selected track position, and all ensuing tracks (below it) are moved down the Track List.

To create a track at the bottom of the Track List, double-click below the lowest track in the track list.

Creating a Track with the Next Instrument

The *Track > Create with next Instrument* function, creates a new track below the selected track, and assigns the next instrument to it (from the instrument selection list). Under most circumstances, this would be the next MIDI channel in the same sound module.

You can also hold down Option while double-clicking under the Track List when you create a new track.

Copying a Track

If you hold down Option when moving a track, a copy of the track is created at the destination position. All selected Regions on the old track are also moved to the new track.

Note: If you hold down Option before grabbing the track number, no extra Regions on the track will be selected. If no Regions were selected in the first place, an empty track with the same track instrument is created at the destination position.

If the Cycle function is switched on, all Regions in the Cycle area are moved from the old track to the new track. The musical result is not any different, because the new track is played by the same track instrument.

Moving Regions onto a Track
The function *Region > Move Selected Regions to Current Track* moves all selected Regions from different tracks onto the selected track. The time position of all Regions is retained.

Deleting Tracks
To delete the selected track, use the *Track > Delete* function. If there are any Regions on the track, a warning message appears first.

If there is no Region selected in the Arrange area, you can perform the same function by pressing Backspace.

A third method is to grab the track as if to reposition it (see above), and remove it from the Track List by dragging it to the left.

Deleting Unused Tracks
Use the *Track > Delete Unused* function to delete any tracks that don't contain any Regions.

Naming Tracks
To name a track independently of its assigned instrument, select *Track > Create Track Name*.

You can also change the name of an existing track by double-clicking on the instrument name in the Track List, while holding down Command, and typing in the text input field that appears.

The track name is then displayed in place of the instrument name in the Track List, and will be used as the default name for recorded Regions.

If there is enough room vertically (achieved by zooming in vertically), both the track and instrument name will be displayed.
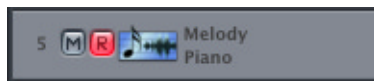
You can see the instrument name in the Object Parameter box, or check it by clicking on the track name and holding down the mouse button.

Name While Creating a Track
When you create a track (by double-clicking below the bottom track in the Track List) you can hold down Command at the same time to open the input box for the track name.

Deleting Track Names
To delete a track name, select *Track > Delete Track Name.*

You can also double-click on the track name while holding down Command. This opens the text input field for the track name. The name can be deleted using Backspace. The instrument name will then appear in the Track List again.

Muting Tracks
Both MIDI and audio tracks have Mute buttons to the left side of the Track List, between the track number and the icon. Muting a track stops it from playing. To show or hide the blue Mute buttons, select *View > Track Mute Buttons.*
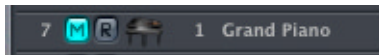
Muting When the Mute Buttons Are Hidden
If the Mute buttons are hidden—to save space—you can still mute a track to the left of the track number.

If you move the mouse to the left edge of the Track List by the track number, the mouse pointer turns into a hand; clicking the mouse shortly now mutes the track (or if the track is already muted, it cancels the mute). Muted tracks are then indicated by a •.

You can also use the *Mute Track* key command to mute a track.

Muting All Tracks
If you hold Command while clicking on a Mute button in the Track List, all tracks in the currently-selected display level (or folder) are muted. If they were already muted, they will be unmuted.

Mute Instrument
If you mute a track while holding down Command-Option, all tracks in the current song with the same track instrument (including those in all folders) are muted.

Soloing Tracks

Both MIDI and audio tracks (and folders) offer *Track Solo* buttons to the left side of the Track List, between the track number and the icon. Soloing a track isolates it while playing—and mutes all other tracks. To show or hide the yellow *Track Solo* buttons, select *View > Track Solo Buttons*.

Activating any Track Solo button enables Solo Lock mode (see "Solo and Solo Lock" on page 81), if necessary, and adds all Regions on that track to the Solo Lock Group. The button turns yellow when active. Deactivating a Track Solo button removes all Regions on the track from the Solo Lock group and—in cases where no other Track's Solo button is active—disables Solo Lock. Disabling the global Solo (Lock), sets all individual Track Solo buttons to the *Off* position.

Soloing When the Track Solo Buttons Are Hidden

If the Track Solo buttons are hidden—to save space—you can still solo a track with the Solo button on the Transport bar.

Simply press the Transport Solo button, and click on the desired track. Soloed tracks are indicated by a yellow outline.

Soloing Multiple Tracks

If you hold down Shift while the Transport Solo button is active, and click on the desired track names, you will solo them (when the track Solo buttons are hidden).

If you hold any modifier while clicking on a Solo button in the Track List, all tracks in the currently-selected display level (or folder) are soloed. If they were already soloed, they will be unsoloed.

Note: You can make use of the Track Button Slide Activation feature for both the Track Solo and Mute button functions (see "Track Button Slide Activation" on page 98).

Track Button Slide Activation

Buttons on Arrange tracks (Solo, Mute, Record Enable, Freeze) support "slide activation", which is similar to running your finger across several channel strip buttons on good hardware mixing consoles.

As a usage example of slide activation in Logic, click-hold on the Mute button of one track, and drag the mouse up or down. The Mute buttons of all "swiped" tracks will switch to the same state.

Simply drag over the Mute buttons of the same tracks to undo the Mute.

Selecting an Instrument

Click-holding on an Instrument's name (or icon) in the Track List opens a hierarchical pull-down menu. The sub menus of this pull-down menu correspond to the Environment layers (see "Layers" on page 154) of your song. This is where you select and assign Instruments to a track.

Changing an Instrument Assignment Globally

If you hold down Option while selecting an Instrument, the previously selected Instrument will be replaced in every track in the current song by the new Instrument (even in tracks in folders).

Selecting Track Instruments by Drag and Drop

You can select any of the Objects in the Environment window to be the current track Instrument, by simply dragging one out of the Environment window, and dropping it onto the Track List.

If you move a Multi Instrument into the Track List, the selected sub-channel is set as the track Instrument. If no sub-channel is selected, all initialized (the sub-channels that are not crossed out) sub-channels are set for the destination track, and the tracks below that. If there are no tracks below the destination track, new tracks will be created.

In all cases, the Environment Objects involved are completely unaltered.

Special Types of Instruments

In addition to the normal instruments which are described in the Instruments section (see "MIDI Instruments" on page 101), there are two other possible track settings for which there is no corresponding Environment Object:

No Output

Tracks assigned as *No Output* send no data. This can be useful in situations where you wish to store data (such as SysEx) that you don't wish to send.

Folder

This setting is used when you want the track to play a folder (see "Overview" on page 122). Normal Regions will not play on a track set to the Folder instrument.

Protecting Tracks

Tracks can be protected, preventing any alterations:
• Existing Regions and their contents cannot be altered.
• No recording is possible on protected tracks.
• New Regions cannot be created.

If the Track Protect button is not visible in the Track List, you can switch it on via the Arrange menu *View > Track Protect Buttons*. Clicking on the Lock button(s) toggles between locked and unlocked mode.

If you hold Command while clicking on a Track Protect button in the Track List, all tracks in the currently-selected display level (or folder) are protected. If they were already protected, they will be unprotected.

Arrange Channel Strip

The channel strip of the currently selected Arrange track will appear in the Parameters area of the Arrange window, provided that there is sufficient space to display it.

If there is not enough vertical room, click the upper left triangles in the Region Parameter and/or Object Parameter boxes and/or hide the Toolbox (*View > Toolbox*).

Note: The *Channel Strip Only* option in the *View* menu (and key command) allows you to hide all elements of the Parameters area — except the Arrange channel strip.

The Arrange channel strip allows you to access all of the mixer channel functions (volume, pan, sends, inserts, and so on) directly from the Arrange window. Any adjustments you make to a track's Arrange channel strip will be reflected in the corresponding Track Mixer and Environment channel strip as well.

Resizing the Arrange Channel Strip

You can alter the size of the Arrange channel strip (and the entire Parameters area), by moving your mouse cursor over the "resize bars" (two vertical lines) between the Parameters area and the Track List. The cursor appearance will change, allowing you to click and drag horizontally. As you do so, the Parameters area is resized, and both it and the Track List will move left or right, until the mouse button is released.

This facility makes reading parameter names and labels clearer.

MIDI Instruments

In order to know where specific MIDI messages are to be sent, Logic needs to have some idea of how the MIDI devices in your setup are connected. This is portrayed graphically in the Environment, which shows the sequencer's connection with many other Objects, which we will refer to as "Instruments" in this section. Each instrument is an Environment Object, which represents a physical MIDI device. You can think of the Instrument Object as being a virtual instrument, or a representation of a real instrument.

To learn how to configure the Environment, refer to the Environment section (see "Environment—Introduction" on page 153).

To make an instrument visible:
▪ Double-click on the instrument name in the Track List. This directly opens the Environment window, with the Object selected.

Creating a New Instrument

It is best to create Instruments directly in the Environment, but you can also do so from the Arrange window, by using the Create New Instrument key command. The selected track will then contain a new Instrument, whose parameters can be adjusted in the instrument's Object Parameter box. The new Instrument will also be present in the Environment. All Instruments in the Arrange window exist in the Environment, no matter where they were created originally.

The Instrument Parameters

The Instrument's Object Parameter box is located at the bottom left corner of the Arrange window.
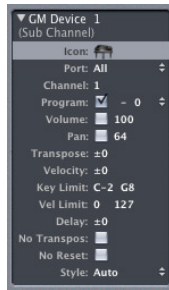
The Instrument parameters belong to the Instrument Object, not to the track per se, so if you alter the parameters here, it will affect all tracks playing (addressing) the Instrument.

Note: The Instrument's Object Parameter box in the Arrange window is identical to the corresponding Object Parameter box for the same Instrument in the Environment.

To open/close the Instrument's Parameter box:
- Click the small triangle at the top left to open or close the Instrument's Parameter box.

Name
The top line shows the instrument name, which can be edited by clicking on it.

Object Type
The Object type is shown in brackets, and cannot be altered. Normally this will be: (Instrument) or, if you're using Multi Instruments: (Sub Channel).

Selecting an Icon
Grabbing the icon opens a pop-up menu, where you can assign a new icon to represent the Instrument.

Note: If you have closed the Object Parameter box, or it is hidden from view, you can select an icon directly from the Track List by clicking on the icon while holding down Option-Command.

Color of the Instrument Icon
If you selected a single-colored icon, you can change its color, using the usual color palette with: *View > Colors*, as long as no Region is selected. The color of the instrument icon serves as the default color for all Regions recorded on this track.

Hiding an Instrument

The small box to the left of the icon determines whether the instrument appears in the instrument selection pop-up menu of the track list. You will generally always have this checked for Instrument Objects.

Note: This option is primarily used to reduce the size of the instrument pop-up menu, by hiding other Environment Objects, such as faders or MIDI ports.

MIDI Channel and Port Connection

The *Port* parameter, found in the Instrument's Object Parameter box (see "Global Preferences" on page 476), defines the MIDI Output that the instrument's data is sent to. Your MIDI sound module is connected to this output jack.

Note: If the instrument has not been connected with cables in the Environment, this line can be used to set the Instrument's output port via a pop-up menu (containing the names of all installed MIDI drivers). This means that the instrument is directly connected to one of your MIDI interface's MIDI Out ports. As such, this line represents an unseen direct connection, as there is no visible cable connection for the instrument in the Environment window.

The purpose of a hidden direct connection is to enable you to address the individual MIDI ports directly from the Arrange window without needing to access the Environment window. For most situations, this is the best way to assign instruments to ports, as it eliminates the need for cabling.

Keep in mind that if you directly assign a port, and also connect the instrument to a MIDI Out Object with a cable, all MIDI data sent via that instrument will be doubled. If you attempt to do this, Logic displays a dialog box asking whether or not you should "Keep or Remove?" the direct connection. You will generally select Remove in this situation.

The MIDI channel is set with the *Channel* parameter. This defines the channel used for MIDI data output by the instrument, allowing your "real" instrument to receive the data.

Setting the MIDI Channel: Multi Instruments

In the Instrument's Object Parameter box, you can also alter the MIDI channel of an instryment part (a "sub-channel" or "part" of a Multi Instrument). This does not reassign the channel for the current part, but rather selects another sub-channel from the current Multi Instrument.

You can't actually change the receive channel of a part in the multitimbral synthesizer. This is only possible in a few models (and is not particularly useful when using a multitrack sequencer, at any rate). The Channel parameter is really an alternative way of changing the track instrument, allowing the track to be played by a different part (sub-channel) in the multitimbral synthesizer.

If the MIDI channel is set to *All*, you can edit the parameters of the whole multi instrument. A useful facility for globally changing the MIDI port, for example.

Adjusting the Sound of a Track

The *Program*, *Volume,* and *Pan* parameters transmit program changes, volume controllers (#7) and pan controllers (#10) respectively.
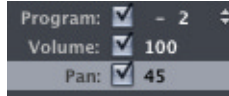
If the respective box is unchecked, the default value of the MIDI device itself is used. The corresponding value is only transmitted if you place a check in the box, by clicking in it. If the box is already checked, any value changes are transmitted immediately.

A program change may be selected on the right, via a pull-down menu. Volume and panorama are set by using the mouse as a slider. Control-clicking just above or below any current value increases or decreases it.

To the left of the program number, there is an extra parameter which is used for Bank Select. If your sound source can receive Bank Select messages (MIDI controller #0 or #32—check your synth manual for format details), you can switch between different banks, each containing a maximum of 128 sounds.

As many devices cannot receive these messages, you can deactivate this parameter by making the setting shown here.
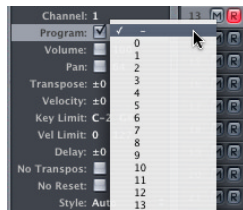
For more on the other instrument parameters, take a look at the descriptions in the Standard Instrument section (see "Standard Instrument" on page 163).

Recording Program Changes, Volume, or Pan Controllers

Any of the listed event types available in the Instrument's Object Parameter box can also be stored when in Record mode.

As an example, in Record-Pause mode, you can store program changes at specific positions in the following way:

1 Deactivate the Program (or Volume/Pan) checkbox.

2 Click on the Pause button in the Transport bar.

3   Activate the Record button in the Transport bar.

4   Move the Song Position Line to the desired song position.

5   Select the desired sound (program) and/or the volume/pan setting you want to use.

6   Activate the Program (or Volume and Pan) checkbox(es). Each selected event will be sent and recorded.

7   Click the Stop button in the Transport bar to exit recording mode.

The values of the *Program*, *Volume,* and *Pan* parameters will not be updated every time such control change events are played back. These parameters are initial values, when you load a song, or use the *MIDI > Insert Instrument MIDI Settings as Events* command— before you begin to record mixer automation data.

Further Parameters

You also find the following parameters in the Instrument's Parameter Box:

Transpose

The *Transpose* parameter allows you to define the number of semitones that all note events will be transposed by on output. Negative values transpose downwards.

Velocity

The *Velocity* parameter allows you to increase or decrease the "note on" velocities of all note events by an amount adjustable between –99 and 99.

Key Limit

The two note values of the Key *Limit* parameter define a pitch range. All notes outside this range will be ignored by the instrument when it plays a MIDI Region.

Vel Limit

The two values of the *Vel Limit* parameter define a velocity range. All notes whose velocity is outside this range will not be played by the instrument.

Delay

The *Delay* parameter causes all MIDI events to be sent early or late by from –99 to 99 ticks. This allows you to adjust for any differences in reaction time between your various MIDI devices. For delay effects use the Region parameter of the same name, as this allows longer delay times.

No Transpose

If the box next to the *No Transpose* parameter is checked, all Regions on any tracks played by this instrument are protected from transposition. In other words, the Transpose Region parameter is ignored. This is very useful for instruments assigned to drum or other multi-timbral samples, as transposition will cause the sounds rather than the pitches to change for these instruments.

No Reset
If the box next to the *No Reset* parameter is checked, no reset messages will be sent to this instrument. This can be useful if controllers are being used for non-musical purposes, for example when an Instrument is used for mixer automation. The *Preferences > MIDI > Reset Messages* window controls what reset messages are normally sent, but these messages are not sent to "No Reset" instruments.

Style
The *Style* parameter is located at the bottom of the Parameter box. It displays *Auto* by default but can be changed to any of the available score styles. Whenever a Region is created on one of the Instrument's tracks it will be assigned the score style displayed here. In the case of *Auto*, Logic will pick an appropriate style based on the pitch range of the notes in the Region.

Don't forget: you can change a MIDI Region's Score Style at any time in the Display Parameter box in the Score window.

You can change the score styles of all MIDI Regions on an Instrument's tracks by holding down Option when selecting the Instrument's default score style.

Additional Audio Instrument Object Parameters
All of the abovementioned parameters are available for Audio Instrument Objects, which also share the following additional checkboxes with Audio tracks/Objects. There is one exception, however: Audio Instrument Objects have a *Device* parameter instead of a *Port* parameter, which allows you to specify the audio device, rather than a MIDI port.
• *Show EQs*: Hides/shows the Track EQ button at the top of the channel strip.
• *Show Inserts*: Hides/shows Insert slots on the channel strip.
• *Show Sends*: Hides/shows Sends on the channel strip.
• *Show I/O*: Hides/shows the Input and Output slots on the channel strip.

A further *Value as* pull-down menu is available, which allows you to display parameters numerically (Num) or in decibels (dB).

MIDI Regions

MIDI Regions are containers for the MIDI events within them. Containers for audio data are referred to as Audio Regions (or simply Regions). Audio Regions can be compared (see "MIDI and Audio Regions Compared" on page 140) to MIDI Regions as far as how they are used and edited. The purpose of MIDI Regions is to make things clearer and easier to deal with. They also correspond to the musical convention of treating a phrase or a riff as a single unit. It's often better to perform operations (such as quantization) on these units, rather than on individual notes.

Note: MIDI Regions can overlap one another, partly or completely, within a track. This should generally be avoided, for clarity's sake.

Remember that all operations described in this section with a plural in the heading (MIDI Regions, for example), apply to one or more *selected* MIDI Region(s).

Creating a MIDI Region

Normally a MIDI Region is created automatically when you record on the selected track. It begins at the start of the bar in which the first event was recorded, and stops at the end of the bar in which the last event was recorded.

Note: MIDI Regions can also be created by directly inserting events (see "Special Functions" on page 115) from the Clipboard into the Arrange window.

Creating an Empty MIDI Region

Click at the desired position in the Arrange area with the Pencil tool to insert the empty MIDI Region. You can now manually enter events into this new MIDI Region in one of the editors.

Deleting MIDI Regions

You can delete all selected MIDI Regions by clicking on them with the Eraser tool, or by pressing Backspace. You can also delete any non-selected MIDI Region by clicking on it with the Eraser.

Retrieving Deleted MIDI Regions

Should you accidentally delete a MIDI Region, you can restore it by selecting *Edit > Undo* (Command-Z) immediately after making the error.

Drag Menu

Before looking at moving and editing Regions in the following sections, we'd like to cover the *Drag* pull-down menu. It allows you to set preferences for edits that you may perform on Regions within the Arrange window.

The Drag pull-down menu provides: No Overlap, Overlap and X-Fade modes. These are all audio editing modes that alter the behavior of Audio Regions when different operations are performed:

- X-Fade mode will automatically crossfade two Regions when they are moved to an overlapping position.
- No Overlap is used in situations where you don't want Regions to overlap. In this mode, the first Region (the one positioned earlier on the track) will be "clipped" (shortened) so that no overlap occurs.
- Overlap mode will preserve the original Region borders, even when you move Regions to overlapping positions. This was the standard mode of earlier Logic versions.

Note: The Drag menuis also available in several other editors.

Moving Regions

Regions may be moved by grabbing and dragging them with the mouse pointer. You can move Regions along the timeline and from one track to another. You can also move them between two Arrange windows.

Note: If Hyper Draw is enabled for the Region, you'll need to grab above the blue area in order to move it.

Tying Regions by Length Change

The *Region > Tie Regions by Length Change* option lengthens the selected Region(s), making them end exactly at the startpoint of the next Region on the track.

Tie Regions within Locators

Region > Tie Regions within Locators makes all selected Regions within the Locators longer, closing the gaps between them. The last Region on each track (within the locator boundaries) won't be affected.

Editing the Start Position Numerically

You can edit the start point of a MIDI Region (and its length) numerically. This can be done from an Event List set to view objects at the same level (see "… on Arrange Level" on page 304) as the Arrange window or in a floating event window (see "Event Float Window" on page 310).

Copying Regions

To copy Regions to another point in the song, or to other tracks, hold down Option while moving the Region.

Note: Holding Option-Shift while moving a MIDI Region allows you to create an Alias (see "Aliases" on page 124) of it.

If Hyper Draw is enabled for the Region, you'll need to grab above the blue area in order to copy it.

Note: Copy/paste and Option-drag create a independent copy of the Region. This copy will not reflect changes made in the original Region. If you want this type of behavior, make use of the *Loop* parameter.

Making Multiple Copies of Regions

The *Region > Repeat Regions* menu allows you to repeat one or more selected Regions. The repetition always starts at the end of the Region itself, or at the end of the last (along the time line) Region.

Number of Copies

This is where you enter the number of copies (excluding the original).

Adjustment
Used to determine whether you want a copy to begin exactly at the end of the original or the previous copy (setting: None), or whether you want the startpoint to be "quantized". In most cases, the Auto setting will be suitable.

"as"
This parameter determines whether the repeats are copies or aliases of the original.

Altering the Length of Regions

Grab the Region at the bottom right corner, with the pointer or pencil tool, to move the endpoint of the Region to the desired position. The data in Regions is never deleted, even when they're shortened; playback simply stops at the end of the Region. Restore the length of the Region in the same fashion to hear the playback of events/audio data at the end of the Region.

If Hyper Draw is enabled for the Region, you'll need to grab above the blue area, in order to adjust the endpoint.

Multiple Selection
You can change the length of multiple Regions in the same way. The length will be changed by the same absolute amount.

Same Absolute Length
If you want to make all selected MIDI Regions the same absolute length—even if they had different original lengths—simply hold Option-Shift while changing the length (just as in the Matrix Editor or the Event List).

Adjusting the Region Startpoint
You can also adjust the length of the MIDI Region by grabbing it at the bottom left corner. It should be noted that you can never move the left corner beyond the first event in the MIDI Region—you can never "hide" events from the beginning of the MIDI Region. If you want to remove the start of a MIDI Region you need to cut it, and mute or delete the new start segment (new MIDI Region).

Rounded to Whole Bars
The *MIDI > Snap Region Start to Bar* function rounds the Region startpoint to the nearest whole bar.

The position of events within MIDI Regions is not affected by changes to the Region length.

If you wish to alter the position of the events:
▪ Hold down Option while altering the length of a MIDI Region to alter the timing of events. The events will be stretched or compressed, proportionately, by the amount that the MIDI Region was altered in length.

Note: You can make a rhythmic MIDI Region play in "half-time" by stretching it to twice the original length, or in "double-time" by shortening the length to half the original length.

… to Adjust It to Fit Its Contents

The *MIDI > Set Optimal Region Sizes* function reduces or increases the length of a Region, making it just large enough to contain the events (or Regions, if a Folder) within it. The Region borders are rounded to the nearest bar.

Holding down Option when using this function rounds the borders to the nearest beat.

… to Adjust It to Fit Other Regions

The *Region > Remove Overlaps* function searches all selected Regions in a track for overlaps. If an overlap is found, the earlier Region is reduced in length, thus removing the overlap.

Using a Finer Grid

All of these operations (moving/copying, lengthening/shortening) snap to the bar or beat grid, depending on the current resolution of the Bar Ruler, and the setting of the zoom function. There are two ways to override the grid, allowing finer adjustments. All you need to do is hold these keys during the particular operation:
• *Display Format values as grid scale*: Press Control during operation.
• *No grid (ticks as grid scale)*: Press Control-Shift during operation.

Let's say you want to shorten a Region in a 4/4 bar so that the "4" is played but not the "4 and" of the last bar.

This can be done by following these steps:
1 Zoom the screen display until you can see quarter notes in the Bar Ruler.
2 Grab the bottom right corner of the Region, and move the mouse to the left, until the Region is shortened by one quarter note.
3 Press (and hold) Control, and move the mouse carefully to the right, until the Region has become one division longer. While you're doing this, the help tag shows the Region start position, track number, and the current length of the Region in bars, beats, divisions, and ticks. The three right-hand numbers should be "3 1 0".

Dividing MIDI Regions

Click on the Scissors (see "The Tools" on page 18) in the Toolbox. Now click-hold on the desired MIDI Region(s). The help tag shows the current mouse position. When you release the mouse button, all selected MIDI Regions are cut at the position shown in the help tag. The grid is based on the Display Format value. This value is displayed and is adjustable in the Transport window, just below the Time Signature indicator.

If any notes overlap other notes by more than a 1/16 note, the following dialog will appear on-screen:

Overlapping Notes found! Do you want to keep, to shorten or to split those?

Keep (default) leaves all notes unaltered. The MIDI Region is cut as usual, but when you do this, you can end up with notes in the left-hand half that are much longer than the MIDI Region containing them. Such notes will play normally, unless "Clip Length" is set to *On*, which cuts off all sustaining notes at the end of a MIDI Region.

Shorten truncates all overlapping notes, so that they end at the point where the MIDI Region was divided.

Split divides overlapping notes across the two MIDI Regions created when a cut is made; two notes are created, with the same pitch and velocity as the original, and with the same total length as the original note.

Multiple Divisions With the Scissors

If you hold down Option while cutting a Region with the Scissors tool, the selected Region will be cut into multiple pieces of the same length as the first segment.

As an example: To divide a 16-bar Region into eight 2-bar Regions, cut the Region at the start of bar 3, while holding down Option.

Graphically

You can achieve the same effect by defining a cycle area with the mouse in the Bar Ruler, while holding down Command.

Merging MIDI Regions

You can merge two or more selected MIDI Regions into a single MIDI Region, by clicking on one of them with the Glue tool (see "The Tools" on page 18).

The function of the Glue tool is the same as *Region > Merge > Regions*. This merges all selected MIDI Regions—even those on different tracks—into a single MIDI Region. All events from each individual MIDI Region retain their original time positions. Be aware that the individual MIDI channels are replaced by the MIDI channel of the current track's Instrument. The new (merged) MIDI Region adopts the name and track of the first (along the time line) of the merged MIDI Regions (see "Fixing/Neutralizing MIDI Region Parameters" on page 120).

The *Region > Merge > Regions per Tracks* function has the same effect as *Merge Regions*, but if the selected Regions are on several different tracks they are combined into one Region per track.

The *Region > Merge > Regions,* the *Region > Merge > Regions per Tracks* and the Glue tool functions handle the *Transpose*, *Velocity,* and *Dynamics* Region parameters intelligently. If these parameters are not identical in all selected Regions, the Regions are normalized before the merge. If one of the Region parameters (the Transpose value, for example) is set identically in all selected Regions, that value is preserved, and the events remain unchanged.

Demixing Regions

The *Region > Split/Demix > Demix by Event Channel* function searches the selected Region for events with different MIDI channels. A separate Region, containing all matching events, is created for every MIDI channel that is found. Each of these Regions is created on a track with an Instrument that matches the MIDI channel. If no such tracks exist, new tracks are created, using the original Instrument's track.

This function is useful for the import of Standard MIDI Files (Format 0), when all note events are placed in a single MIDI Region.

The *Region > Split/Demix > Demix by Note Pitch* function searches the selected MIDI Region for notes with different note numbers. A different MIDI Region of the same length is created for every note number found. The tracks created for these MIDI Regions is assigned to the same Instrument as the original MIDI Region. This feature is especially useful for separating drum parts that have been recorded into Logic from a drum machine.

Muting Regions

Often, when arranging, you'll want to test musical ideas by muting certain Regions. This is what the Mute tool (see "The Tools" on page 18) is designed for.

You can mute individual or selected Regions by clicking on them with the mute tool. Clicking a muted Region reverses this state (unmuting). Muted Regions are indicated by a dot that precedes the Region name, and are shaded (dependent on the *Preferences > Display > Arrange > Muted Regions are textured* setting).

Note: You can perform the same function with the *Mute Folders/Regions* key command.

Soloing Regions

You can solo any selected Regions by using the Solo button in the Transport window, or the key command of the same name.

Double-clicking on the Solo button "locks" the soloed status, so that changing the selection doesn't affect what is being soloed. This is especially useful when you want to make changes to the playback parameters of a Region, while listening to a specific solo group.

Another click (or reusing the key command) exits solo mode. For more on this, read the Solo and Solo Lock sections (see "Mode Buttons" on page 81).

When the Solo function is activated, the Bar Ruler will change from gray to yellow, making it easy to see that Solo is engaged.

The Solo tool (see "Selecting Tools" on page 17) enables you to solo individual or selected Regions, by click-holding on them. You can also scrub the Region by moving the mouse horizontally. If Logic is in play mode, solo playback starts as soon as you stop scrubbing. Release the mouse button to end solo auditioning.

Naming a Region

Click the Region with the Text tool (see "The Tools" on page 18), and a text input box will appear. Enter the desired name and press Enter, or click another Region or the Arrange area background to exit text input mode.

The same applies if entering a name in the Region Parameter box.

Multiple Naming

Select a group of Regions (with the rubber band, for example), and click one of them with the Text tool. A text input box will appear, allowing you to name the Region. All Regions are assigned same name.

With Incrementing Numbers

If you end the name of the Region with a number, all selected Regions are assigned the same name, but are incrementally numbered (region 1, region 2, region 3, and so on). They are numbered in accordance with their temporal (time) positions. If you want all Regions to end with the same number, just add a space after the number.

The above also applies if you enter the name in the top line of the Region Parameter box, rather than use the text tool.

Special Functions

Inserting Events

MIDI events can be added directly to the selected track in the Arrange window, at the current song position, via the Clipboard. Events can be copied from one of the edit windows (even from another song).

This function allows you to insert MIDI events—from the Matrix Editor, for example—directly into the Arrange window. Logic checks for a selected MIDI Region (for use as a destination), and adds the data to it. If no MIDI Regions are selected, Logic will create a new MIDI Region on the selected track.

Deleting Duplicate Events

The *Erase Duplicates* key command searches all selected MIDI Regions and all MIDI Regions in selected folders, for identical events with the same time position. Any events occurring twice or more at the same position are deleted (allowing one to remain).
• The search looks for notes, controllers, monophonic aftertouch and program change data.
• Events of the same type, but on different channels, are not viewed as being identical.
• The "same time position" includes two notes which are output simultaneously because of the current quantization setting.

MIDI Region Playback Parameters

The Region Parameter box is located to the left of the track list, above the Toolbox.
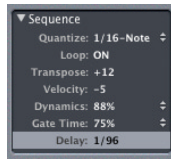
Displaying Region Parameters

When you select a Region, its parameters are automatically displayed in the Region Parameter box. If the Region Parameter box isn't visible, select *View > Parameters*.

None of these parameters alter the original data of the Region, they only affect playback.

Note: The Region parameters also apply to folders, affecting all Regions within them.

Opening and Closing

Clicking on the small triangle to the left of the name shows or hides the contents of the box, just as with folders in the Finder (if you are viewing the contents By Name). Closing the box provides room for the elements below.

Name

The top line in the Region Parameter box simply shows the name of the selected Region.

Quantize

Covered in the Quantization section (see "Quantization" on page 120).

Defaults and MIDI Thru

Default Region Parameters

If no Region is selected, the upper line of the Region Parameter box will display *MIDI Thru*. Any live MIDI input (in stop mode, as well as during recording or playback) will be played with the instrument and settings chosen here. When you record a new Region, the settings in the *MIDI Thru* Parameter box are carried across to the new MIDI Region's Parameter box. The MIDI Thru Parameter box can be viewed as an adjustable "default" Parameter box.

Realtime Processing

An important concept to understand is that incoming MIDI data is always relayed "through" the instrument assigned to the currently selected track. This data is also processed through the MIDI Thru Parameter box, described above. The MIDI Thru parameters are always displayed, and are adjustable when no Regions are selected. Click on the window background to deselect all Regions.

Editing Several Regions Simultaneously

If several Regions are selected, the number of selected Regions is displayed, in place of a Region name. If you alter any Region parameter, all selected Regions will be affected. If a given parameter (Transpose, for example) is set differently in the individual Regions, a "*" appears in the Parameter field. You can alter this parameter for all selected Regions, and the value differential will be retained (relative alteration). If you want to set all selected Regions to the same value, hold down Option while changing the value (absolute alteration).

Loop

Value range: On or Off. Normal value: Off

When switched On, the Region is repeated until it encounters another Region on the same track. A loop will also terminate at the end marker of a folder (if the looped Region is inside a folder), or the song end marker. These loop repeats are displayed as grey beams, named after the parent Region. The length of each loop is identical to that of the parent Region, so if you want to create polyrhythmic structures, try experimenting with the length of the original Region.

One way of ending a loop early is to create an empty Region (on the same track) with the Pencil. Perhaps a better method is to place the looped Region in a folder. You can then control the total number of loops by simply altering the length of the folder.

Looped Regions can be selected by clicking on the light-gray bar at the top of the loop-repetitions. A short click will select the looped Region. Click-holding behaves like a click on the background. All Regions are deselected and rubber-band selection becomes active, allowing multiple Regions to be selected.

The *Toggle Loop* key command may be used to switch the Loop parameter on and off for selected Regions.

Region > Parameters > Turn Loops to Real Copies transforms the loops into real copies of the original Region, and simultaneously switches the Loop parameter *Off* for the resulting Region(s).

Region > Parameters > Turn Loops to Aliases changes MIDI Region loops to aliases. This function is also available as a key command.

Transpose

Value range: ±96 semitones. Normal value: 0

All note events contained in the MIDI Region are transposed up or down by the selected amount during playback. Even complete folders can be instantly transposed in this way. If several individual MIDI Regions within the folder have already been transposed, the relative differences between them are retained.

If you want to transpose by octaves, click on the arrows to the right of the Transpose parameter. This opens a pull-down menu that allows direct octave transpositions.

To guard against drum notes, and so on being transposed, the MIDI Instrument's Object Parameter box contains a *No Transpose* checkbox. If you place a check in this box, the transpose parameter is ignored in all MIDI Regions played by this Instrument.

Velocity, Dynamics, and Gate Time
Velocity
Value range: ±99. Normal value: 0

All notes in the relevant Region are offset by the selected value. Positive values add to the originally recorded velocity, and negative ones subtract from it, although naturally it is impossible to go outside the limits defined by the MIDI Standard (0–127). If you select a velocity offset that exceeds the maximum or minimum possible value for a particular note, that note will play at the extreme possible range. As an example, a setting of +20 will cause a note with a velocity of 120 to play at 127.

Dynamics
Value range: in percent. Normal value: 100%

This parameter also affects the velocity values of notes, but instead of adding or subtracting a fixed amount, the differences between "soft" and "loud" notes (the dynamics) are increased or decreased. This works in a similar way to a compressor or expander. Values above 100% expand the dynamics, thereby increasing the difference between "loud" and "soft", while values below 100% compress the dynamics, reducing the differences between "loud" and "soft".

The *Fix* setting causes all notes to be transmitted at a velocity value of 64. When used in conjunction with the *Velocity* parameter (see above), it is possible to set any fixed velocity value.

Gate Time
Value range: in percent. Normal value: 100%

The term "gate time" stems from the technology used in analog synthesizers, and refers to the time between pressing and releasing a key. This parameter affects the absolute note duration or length. This should not be confused with the musical note value, which normally refers to the amount of time until the next note. The practical effect is to make the notes in the Region more staccato or legato. The parameter range is related to the original note lengths. "Fix" produces extreme staccato. Values below 100% shorten the note lengths. Values above 100% lengthen the notes. The "leg." setting produces a completely legato effect for all notes, no matter what their original lengths, eliminating all space between notes in the affected Region. If this is used on a folder, all notes in all MIDI Regions in the folder will be affected.

Delay

Value range: −999 to 9999 ticks. Normal value: 0

This parameter alters the time position of selected Regions. Positive values correspond to a delay (laid-back playing style or dragging), negative values cause a pre-delay (driving or rushing).

The units are ticks. A tick is the smallest time resolution in a sequencer, which is 1/3840th note in Logic. On the right side of the delay value field you can use the mouse as slider to input the value.

If you on the arrows to the right of the Delay value, the pop-up menu allows you to set the delay in note values (1/16, 1/8 and so on).

Select *View > Delay in ms* to switch the display to milliseconds.

This can also be used to calculate delay times for different note values at various tempos:

1 Set the desired note value by clicking on the Delay value.

2 Go to the View menu and switch on *Delay in ms*.

3 Set the desired tempo in the Transport panel.

4 The delay parameter will now show the delay time.

The delay parameter is mainly used for musical purposes. It is also a way of fixing timing problems that may occur for a variety of reasons. Some examples of these are:

 • The attack phase of the sound is too slow. A good musician will automatically compensate for this by playing the notes slightly early. With very slow sounds, you may need a pre-delay of over 100 ms to even them out.

 • The sound generator is reacting too slowly to the incoming note-on messages. Older multitimbral sound generators often take tens of milliseconds before outputting a voice. This effect may be better compensated for with the Instrument's Parameter box *Delay* parameter, as this will affect all Regions on all tracks that are transmitted to the slow-reacting device.

- The delay in outputting the voice is not constant as it is dependent on the order of notes arriving serially at the sound generator. You should therefore try pre-delaying rhythmically important tracks by as little as one tick—it can work wonders!

Fixing/Neutralizing MIDI Region Parameters

You can normalize the MIDI Region parameter settings of all selected MIDI Regions and Folders with the *MIDI > Region Parameters > Normalize Region Parameters* command.

This means that all settings are actually written as data, and playback parameters revert to normal values. The audible result remains the same. The Loop parameter is not affected. Use of this function is effectively like saying "make these MIDI Region/instrument parameter values permanent". In most circumstances, it is better not to do this, as leaving the original data untouched provides more flexibility. This includes unlimited opportunities to change your mind about MIDI Region edits.

Merge/Normalize and MIDI Channels

As per the Merge function or the Glue tool, the Normalize function is intelligent in the way it handles stored MIDI channel numbers. If all stored events have the same MIDI channel number, the channel will be changed to that of the Instrument assigned to the current track. If the events are on different channels, Logic will ask whether or not you would like to convert the event channels.

Quantization

Quantization is the rhythmic correction of notes to a specific time grid. Any inaccurately played notes are moved to the nearest position on this grid.

As an example, if the smallest notes in a passage are 1/16th notes, you should use 1/16th quantization to move all recorded notes to their ideal rhythmic value. This will only work if no note was played more than 1/32nd from the ideal position, otherwise the note will be moved 1/16th later or earlier than the desired position.

How It Works

Quantization settings are made in the Region Parameter box. They are non-destructive playback parameters, so they can be replaced by another setting at any time. This also means that you can always revert to the unquantized, original recording by setting the *Qua* parameter to *Off*. Unlike other playback parameters, quantization affects the way notes are displayed in the editor windows, thus allowing you to see what effect the quantization parameters are having by looking at the position of the notes. Region quantization only affects notes, not other types of events (controllers, for example).

For every note event, two positions are stored internally: the original recorded position, and the playback position (also shown in the editor windows). For unquantized MIDI Regions, both positions are the same. Each time you quantize, a new playback position is calculated in relation to the original position.

The A*pply Quantization Settings Destructively* (see "Applying the Quantization Settings" on page 122") command overwrites the original position with the playback position. The same thing happens if you manually change a note in one of the editors.

Which Events Can Be Quantized?

Region parameter quantization only works on notes, not on other types of events like controllers. Apart from notes, all events have just one position parameter, which can be left alone or permanently changed by Event Quantize, or dragging with the mouse.

Essentially, quantization works on the whole MIDI Region. To quantize individiual notes or other event types, use Event quantization (see "Event and Note Quantization" on page 35) in one of the Editor windows. You should note that this overwrites the original record position of the quantized note.

If you want to quantize various parts of a MIDI Region differently, you can divide the MIDI Region, and use different quantization settings on each part of the MIDI Region. You can then recombine the parts of the original MIDI Region without affecting the way the parts are played.

The quantization grid always begins at the start of a MIDI Region. If the MIDI Region does not start at the beginning of the bar, neither does the quantization grid.

Quantization

The quantization grid is accessed from a pull-down menu beside the *Quantization* parameter in the Region Parameter box.

This function sets the quantization value for all selected MIDI Regions.

Quantization Off

The *Off* setting plays the notes at the finest possible timing resolution: 1/3840 note, which is unquantized playback, in practical terms.

Normal Quantization

The *1/1, 1/2, 1/4, 1/8, 1/16, 1/32* and *1/64* note settings quantize the MIDI Region to the equivalent note value.

Triplet Quantization

The *1/3, 1/6, 1/12, 1/24, 1/48* and *1/96* note settings quantize the MIDI Region to triplet note values. A 1/6 note is equivalent to a quarter triplet, 1/12 note to an eighth triplet, 1/24 note to a sixteenth triplet and 1/48 note to a thirty-second triplet.

Mixed Quantization

The *8 & 12* setting corresponds to eighths and eighth triplets, *16 & 12* to sixteenths and eighth triplets and *16 & 24* to sixteenths and sixteenth triplets. Mixed quantization always applies to both note values, and requires greater playing precision when recording.

Odd Quantization

The *9-Tuplet* setting means novetuplets (1 bar = 9 beats), *7-Tuplet* is septuplets (1 bar = 7 beats), *5-Tuplet/4* is quarter quintuplets (1 bar = 5 beats), and *5-Tuplet/8* is eighth quintuplets (1 bar = 10 beats).

Applying the Quantization Settings

In the same way that other Region parameters can be normalized, the quantization settings can also be applied permanently to stored data.

To do this, use the *Apply Quantization Settings Destructively* key command.

Of course, once this is done, it is impossible to revert to the original recording, unless you use *Undo* immediately after performing the operation.

Pre-Quantization

The *Apply Quantization Settings Destructively* function is especially well suited to pre-quantization. As an example, if a recorded MIDI Region cannot be quantized to a 1/16 swing without producing a few incorrectly timed notes, quantize it to 1/16th notes and then use *Apply Quantization Settings Destructively*. You can now apply any swing quantization to this cleaned-up version of the MIDI Region.

If you are recording a hi-hat pattern consisting of 1/16 notes and one single 1/32 note, first play the rhythm (quantized to 1/16 notes) without the 1/32 note and choose *Apply Quantization Settings Destructively*. You can now raise the quantization to 1/32 notes, and add the extra note without incorrectly quantizing any badly-played 1/16 notes.

Folders
Overview

A folder is a Region that can contain other Regions, much like a folder in the Finder that can contain other folders or files.

One way to imagine a folder is as a song within a song. A folder can have as many tracks, featuring Regions, as required. When opened, folders look just like the Arrange area and track list in a song.

Within a track of the song, a folder looks like a MIDI Region, but has a dotted surface.

This could contain tracks like trumpet, saxophone, and trombone arranged into a brass section, or 14 tracks of drum instruments, which you may want to treat as a single drum pattern Region.

In the same way, your entire song, including all tracks and Regions, could itself be a folder, appearing as a grey beam in another song. In this way, you could arrange several songs for a concert.

This is not all that folders can do. You could use folders to represent the parts of a song (choruses and verses). As in the Finder, you can place as many folders as you like within other folders, and within yet more folders (for the instrument groups within the different parts of the song, as an example), with no limit to the number of levels you can create.

Another possible use might be to store different arrangements of a song in different folders, allowing you to switch between them rapidly… That's enough for you to be thinking about for the moment. We'll leave the rest up to your imagination…

The "Folder" as a Track Instrument
A folder is normally placed on a track assigned to a Folder in the Track List, rather than an Instrument.
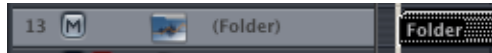
All Regions in the folder are played by the instruments set in the folder's track list. All instruments within the folder will play back as they normally would on the top level of the Arrange window.

If you place a folder on a track that is set to a normal instrument, its entire contents are played by this instrument. This usually only makes sense if the folder contains tracks for just this instrument. This could be a quick way of listening to a string arrangement, if some of the intended sound sources are unavailable, for example.

Working With Folders
Creating Folders
The *Region > Folder > Pack Folder* function places all selected Regions into a folder. The folder is created on an existing folder track. If no track with a folder instrument is available, Logic creates one.

In a similar way, if no Region is selected, Logic creates a track with a folder on it. This contains no Regions—just tracks assigned to all instruments from the current level.

Changing Display Levels
Entering a Folder
To change to a lower level (go into a folder) of the Arrange window, double-click the folder itself.

Double-clicking on a track assigned as folder in the track list, opens the Track Mixer (see "Track Mixer" on page 218).

Exiting a Folder

To change to a higher display level of the Arrange window, double-click on the background.

Moving Regions Into Folders

…is as easy as drag-and-drop. Drag the Region(s) from the original track onto the folder at the desired position and release the mouse. If the folder does not already contain a track with the same instrument as the original track, Logic creates one. When you look inside the folder, you will see the Region at the drop position.

Folder Editing: Just Like Regions

In principle, you can do anything with folders that you can do with Regions (see "MIDI Regions" on page 107).

Unpacking Folders

Unpacking Individual Regions

If you want to move individual Regions from a folder to a higher level, there are two ways of doing so:

• Go to the display level that you want to add the Region to. Now, open a second Arrange window by pressing Command-1 (default). Go into the folder that you want to remove the Region from, and drag it from one Arrange window into the other.

• Go to the display level that you want to remove the Region from. Select the Region and transfer it to the Clipboard by pressing Command-X. Change to the display level that you want to add the Region to. Select the desired track, and set the song position line to the desired position, then add the Region by pressing Command-V.

Unpacking Folders

Use the *Region > Folder > Unpack Folder* command to dismantle the selected folder. Logic will create new tracks on the same level that the folder was located on (below the former folder track).

Aliases

An alias in Logic is the same as an alias in the Finder. It looks like a Region, but contains no actual data. It is just a reference to the data of the original Region—a virtual "reflection" of the original. You can always recognize an alias, because its name is written in italics.

Note: Aliases can be created for MIDI Regions and Folders. Only cloned Audio Regions can be created for Audio Regions (see the "Making Multiple Copies of Regions" section on page 109). When the term Region is used in the following section about aliases, it only refers to MIDI Regions and Folders.
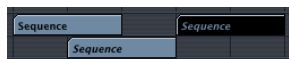
If the data in the original Region is altered, this immediately affects all aliases of the Region.

In fact, this is the whole point of aliases. As an example, if a riff or phrase keeps recurring throughout a song, it makes sense to use aliases, rather than have full copies of the original eat up your storage space.

Furthermore, when using aliases, if you feel something is not quite right, you only need to alter the original, and the correction will automatically take effect throughout the whole song. If you just want to alter a detail at one point in the song, you can turn that particular alias into an independent Region.

Creating an Alias

To create an alias, just hold down Shift when copying the Region as per usual (hold down Option-Shift and drag).

There is also the *Alias > Make* command in the *MIDI* menu. The alias appears on the selected track, beginning at the current song position.

If several Regions are selected, their relative time and track positions are retained. The selected track is the destination track for the first Region along the time line.

When you use the *Region > Repeat Regions* (see "Copying Regions" on page 109) function, you have the "as Alias" option.

Playback Parameters

Although an alias is a "slave" of the original, it has its own playback parameters. The exception is the original's quantization parameters, which have a special status and always apply to aliases too.

Alias and Real Regions

Search Functions for an Original or Alias

Finding the Original of an Alias

If you have forgotten where the original is for a certain alias, select the alias, and choose the *MIDI > Alias > Select Original* function, which will find and select the original Region.

Finding the Alias of an Original

Conversely, you can select the original of a particular Region, and find any aliases you've made from it. Select *MIDI > Alias > Select All Aliases of Region*. All existing aliases will then be found and selected.

"Orphan" Aliases

If you erase a Region that one or more aliases were created from, Logic will display the following warning message:

One or more Aliases are made from Regions to be cleared! Do you still want to clear these?

"Don't Clear" cancels the erase procedure, while "Clear" deletes the Region. If you do this, it makes no sense to keep the aliases after you've deleted the original. As Logic doesn't do this for you, you could end up with "orphan" aliases—aliases without an original. Although such Regions serve no useful purpose, Logic doesn't automatically delete them, as you might decide to assign them to new originals at a later stage.

Selecting All Orphan Aliases
MIDI > Alias > Select All Orphan Aliases selects all aliases that reference original Regions that no longer exist.

Deleting Orphan Aliases
MIDI > Alias > Delete All Orphan Aliases deletes all aliases that no longer have originals. You can use this function to tidy up after deleting a number of Regions, as this may possibly leave several unnecessary aliases in your song file.

Turning the Alias Into a Real Region
You can use *MIDI > Alias > Turn to Real Copy* to make a real Region from an alias; its contents will be identical to those of the original Region referenced by the alias.

Editing the Events in an Alias
It is not possible to edit aliases of MIDI Regions. If you double-click on an alias, Logic assumes that you either want to edit the original, or turn the alias into a real Region. A dialog box appears, asking whether you want to create and edit a real copy, or to edit the original instead.

Click on the desired button; Enter opens the editor window for the original MIDI Region.

Merging Two or More Regions
If you edit an original Region by merging it with others, any existing aliases are automatically updated to reflect the changes.
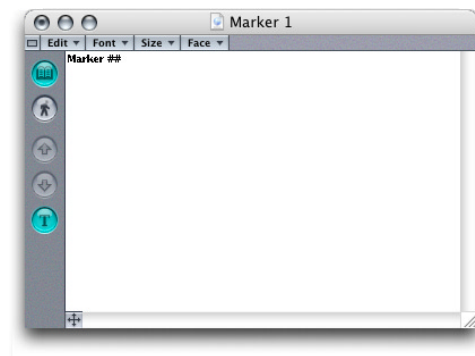
Time and Key Signature Editor

The Time and Key Signature Editor window allows you to copy, move, and delete time signature changes, key signature changes and global score symbols (repeat signs, special barlines and so on).

Choose *Signature/Key Change List Editor* from the *Options* menu to open this window. This editor is very similar in use to the Event List editor, except that new list entries can only be created by copying existing ones.
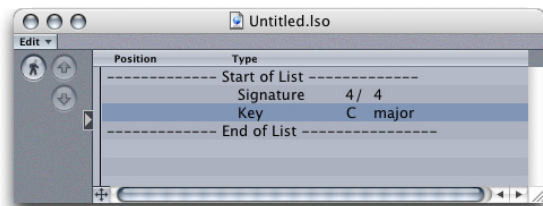
The following score symbols are displayed in this window as list entries, if they are present in the score of the song (note: the initial time and key signature of the song is always displayed here, without bar position indications at the top of the list):
• Time signature changes
• Key signatures/key changes, as displayed in the Score Edit window
• Repeat signs (repeat start, repeat end, repeat end and start, brackets for first and second endings)
• Special barlines: double barlines, final double barlines ("end of score"), half/short barlines, hidden barlines (displayed as dotted lines on the screen) and manually inserted regular barlines.

Note: None of these symbols affects Logic's MIDI and audio playback. Time signatures do, however, affect both the score display and the bar position display in all windows. All functions reliant on the chosen time signature and bar positions (such as MIDI metronome click or Transform window functions) are affected, if bar positions are used to restrict a function to a certain part of the song.

Functions
Copying Time and Key Signatures
Time signatures, key changes, repeat signs, and special barlines can be copied in this window, exactly as in the Event List:
• Select all list entries that you want to copy by clicking on them (Shift-click for multiple selections) and use *Edit > Copy* (Command-C) to copy them to the Clipboard.
• Insert copied entries by choosing Edit > Paste (Command-V).

- Copied list entries are inserted into the list, and an entry box for the bar position of the first inserted list event will open. Type in the desired bar position and close the box by pressing Return. Subsequent list entries are inserted at bar positions that correspond to their original distance from the first copied list entry.

Moving and Deleting List Entries

All list entries in this window (except the initial time signature and key indication at the top of the list) can be moved or deleted. Again, this works like the Event Edit window:
- To delete a list entry, select it and press Backspace.
- To move an entry, you can either; click on its bar position with the mouse, keep the mouse button pressed and move the mouse up or down, or double-click on the bar position of the list entry, and type the desired bar position into the box that appears.

Changing Time and Key Signatures in the List Editor

Existing time signatures and key changes can be altered directly in this list:
- Their position can be changed as described in the previous section.
- Time signatures can be changed by click-holding on the nominator or denominator in the list, and dragging the mouse up or down to increase or decrease the value.
- To alter a key signature, either; click on the word major or minor to switch between parallel major and minor keys, or click and hold on the root of the key: This opens a pop-up menu of root notes for all available keys. Select the desired key by highlighting the corresponding note in the pop-up menu.

Altering the Display

For information on basic window functions, please refer to the section on Window Functions (see "Window Functions" on page 21).

If you want to maximize the room available for the Arrange area, please refer to the section on Relationships between Windows (see "Relationships Between Windows" on page 28).

Display Options for the Track List

You can use the *View* menu to show or hide various parts of the track list:

Track Numbers/Level Meters

Allows you to show or hide the track numbers and level meters.

Mute Button

Every track has its own *Mute* button. If the Mute buttons are hidden, you can still mute any track by clicking to the left of the track number.

Track Solo Button

Every track has its own *Solo* button.

Record Enable Button
Allows you to show/hide the Record Enable buttons.

Track Protect Button
Shows/hides the Track Protect Buttons.

Track Freeze Button
Shows/hides the Track Freeze Buttons.

Track Instrument Channel
When on, this option displays an abbreviated Track Instrument label.

Instrument Icon
Selecting *Instrument Icon* shows/hides the track instrument icons.

Instrument Icon (Large)
Selecting *Instrument Icon (Large)* allows the display of large track instrument icons.

Track Instrument Color
Selecting this option uses the track instrument color for all newly-created Regions.

Instrument Name
Shows/hides the Instrument Name (see "Instrument Name and Track Name" on page 129).

Track Name
Shows/hides the Track Name (see "Instrument Name and Track Name" on page 129).

Instrument Name and Track Name
Hiding one of the names makes more horizontal space available. To distinguish between them, the instrument name is always shown in bold type.

Horizontal Layout
If both the instrument and track names are shown, the names are divided by a line. You can move this dividing line by dragging the mark at the top of the track list with the mouse.
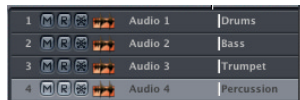
Instrument and Track Name Stacked on Each Other
If you zoom in far enough vertically, you will be shown both names, one above the other: the instrument name (in bold) on top, and the track name below. This even occurs if one of the names is hidden.

Sorting the Tracks
You can sort tracks by grabbing the desired track number and moving it vertically. You can use the right edge of the track list for sorting as well.

Here are the rest of the track list functions involving names:

Selecting a Track Instrument
You can assign an instrument to a track by click-holding the left half of the name or the icon.

Opening the Environment Window for an Instrument
You can open an Environment window (with the relevant instrument highlighted), by double-clicking the instrument name.

Editing Instrument Names
You can edit the Instrument/Audio Object name by Option–double-clicking directly in the track list. You can also use the Instrument Parameter box.

Editing Track Names
You can edit track names by Command–double-clicking directly into the track list—even if it's only the instrument name that is shown.

Region Display
Contents Visible in MIDI Regions
If you vertically zoom the display, you will be able to see the actual events contained within MIDI Regions.
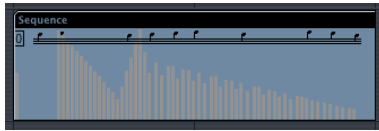
MIDI Regions show notes or controller events, folders show the Regions they contain, and aliases show the name and position of the original.

The *View > Region Content* option allows you to see a display of contents, at large enough zoom settings. If you uncheck this option, the contents will not be displayed, no matter what the zoom setting.

Region Colors
Newly recorded Regions initially adopt the color of the track instrument. You can change the color of a Region via the local *View > Colors* menu, which opens a color palette. A double-click on a color field opens the system color palette, allowing you to create custom colors. Color edits are stored in the Preferences file and are available for all songs.

After copying Regions between tracks, you could find the Arrange area will start to resemble a patchwork quilt. In this situation, the *Region > Instrument Colors To Regions* function replaces the colors of all selected Regions with the colors of the Instruments playing these Regions. Instrument colors can be set in the Environment.

Altering the Background of the Arrange
Use the *View > Grid* function to switch on/off a track/bar number grid in the arrange area's background.

Plain Background toggles the background between a plain background and a high resolution pattern. You can choose both a background color for the plain background and a high resolution pattern via *Preferences > Display > Arrange.*

Show/Hide Channel Strip Only
A *View* menu option (and key command) allows you to hide all elements of the Parameters area — except the Arrange channel strip.

This is extremely handy in cases where a high number of active Inserts and Sends are used, and displayed, on small screens (such as that of a 12" PowerBook).

The same command can be reused to toggle back to the full view of the Parameters area.

Reset Functions

To switch off stuck notes, click on the MIDI monitor in the Transport window, or hit Stop twice in rapid succession. In both cases, reset messages are sent, as defined in *Preferences > MIDI > Reset Messages* (see "Interface Language" on page 484).

For Hanging Notes—Panic Function

If the notes continue to sound, then your sound sources may not be able to respond to "All Notes Off" messages. If this happens, try the following:

Double-click on the MIDI Monitor in the Transport window (or use the *Send discrete Note Offs* key command). Separate Note Off messages will then be sent for every note, on all channels of every MIDI port.

This should do the trick!

Unwanted Modulation—Controller Reset

Options > Send to MIDI > Reset Controllers transmits a control change message #121, with a value of 0 (reset all controllers), on all MIDI channels and outputs used by defined instruments. This neutralizes all MIDI controllers, such as modulation or pitch bends.

If Some Sounds Are Suddenly Too Quiet—Volume Reset

The *Options > Send to MIDI > Maximum Volume* function transmits a control change message #7 (main volume), with a value of 127, on all MIDI channels and outputs used by defined instruments. This sets all channels to their maximum volume, providing the optimum signal/noise ratio for your sound sources.

If You Suddenly Hear the Wrong Sounds—Send Instrument Settings

The *Options > Send to MIDI > Used Instrument MIDI Settings* function sends all Prg, Vol, and Pan settings from all Instrument's Object Parameter boxes used in the current song. This could help to reset your sound sources for the current song, if your synths suddenly change patches mid-performance.

You can set this function to operate automatically after loading any song by activating the *After loading Song, send: Used Instrument MIDI Setting* option, in the *Song Settings > MIDI* page.

Audio in the Arrange Window

4

This chapter discusses the importing, creation, editing, and handling of Audio Regions in the Arrange window.

You will also learn a number of automated recording techniques, discover crossfading, looping, and tempo matching. Further to this, you'll find out about the Freeze facility, which allows you to create projects that are beyond the real time capabilities of your computer.

Regions

Creating Regions

MIDI Regions are containers for MIDI events in the Arrange window. Containers for audio data are referred to as Audio Regions, or simply Regions.

Audio Regions can be compared to MIDI Regions in the ways that they are used and edited. When you record audio in real time, Logic not only creates an audio file on the hard disk, but also automatically creates a Region, which represents the recorded audio file. Regions can be seen in both the Arrange window (on tracks), and in the Audio window (see "Audio Window—Introduction" on page 249), which lists all audio files and Regions used in the song.

Drag and Drop Into the Arrange Window

You can import existing audio files into a song by dragging and dropping them directly into the Arrange window from either; the Audio window, or directly from any folder on your hard disks. A Region, encompassing the entire audio file, will automatically be created at the "drop" point.

Note: You can only drag Regions onto Audio tracks.

Multiple File Dragging
You can drag multiple audio files from the Audio window or a Finder window into the Arrange window. To do so, simply rubber band contiguous files, or command-click non-contiguous audio files in the Finder or Audio window, and drag them to the desired Arrange window position. The following dialog will be launched:

- *Create new tracks*—creates new tracks for each dragged file, using the next available Audio Object. As an example, if three audio files are dragged into the Arrange window onto Track/Audio Object 4, three new audio tracks (Track/Objects 5, 6, and 7) will be created, and the audio files will be placed onto these tracks (as Regions) at the selected song position.
- *Use existing tracks*—will sequentially place the dragged files (as Regions) onto existing tracks, starting with the currently selected track. As an example, if three audio files are dragged into the Arrange window (where track 4 is selected), the first file will be placed on track 4 and the following two files will be placed on tracks 5 and 6.
- *Place all files on selected track*—does just this, with all files being placed sequentially on the desired track.
- *Copy audio file names to track names*—uses the file names to rename tracks, and is only available for use with the *Create new tracks* and *Use existing tracks* functions.
- *Create new audio regions*—will add the desired files to the Arrange window, and will create a new audio Region for each. A numeric value will be appended to each audio Region in the Arrange window, and a new Region will be created for each file in the Audio window. As an example, a Region called "folk-04" will become a new Region called "folk-04.1". The original Region will be retained in the Audio window (and Arrange, if used).

Inserting Audio Files Using the Pencil Tool
Audio files can be inserted on Audio tracks by Shift-clicking at the desired Arrange window position with the Pencil tool. A file selector appears, allowing you to select the file that you wish to insert. The length of new Regions inserted in this way defaults to the complete file length, which can be freely edited later.

Inserting Apple Loops
Apple Loops are special types of audio files. The insertion method for Apple Loops is different to that of other audio file types. Further information can be found in the Apple Loops section (see "Apple Loops" on page 62).

Editing Regions

Dividing Regions

When you divide a Region using the Scissors tool, you create two new Regions. The newly created segments of the Region are named after the original, with a sequential number appended to the end of the name.

Region Display

The Arrange window displays the actual waveform of an audio file, all the way down to single sample resolution (at higher zoom levels). The *Waveform vertical zoom* key commands make this feature even more useful; for precise Arrange edit operations, and for operations on audio Regions with low signal levels.

Resolution

When selecting a cut point with the Scissors tool, you can move backwards and forwards in steps of one division. If you need a finer resolution, press Control after you have selected the Region with the Scissors. To obtain the maximum resolution (ticks) press Shift, as well.

On Zero Crossings

If *Edit > Search Zero Crossings* is switched on in the Audio window, the division-point is moved to the nearest position that the waveform crosses the zero amplitude axis. When enabled, this also applies to all other methods of altering the start or endpoint of a Region in the Arrange window.

Note: This can cause the precise startpoint and length of a Region to differ slightly from the selected value. In most cases, this will be inaudible.

Erasing Regions

Regions can be erased by either; selecting them and pressing Backspace, or by clicking on them with the Eraser tool.

Erasing Recordings

When you erase a Region that you have just recorded (since opening the song), Logic will ask if you also want to erase the corresponding audio file. This is a good way to avoid wasting hard drive space unnecessarily by retaining bad takes and unwanted recordings.

If the recording was made before the song was loaded for the current session, this dialog box will not appear. This prevents you from accidentally deleting valuable recordings. Pressing Backspace will only remove the Region from the Arrange area. If you want to delete the corresponding audio file from the hard disk, you can do so by selecting *Audio File > Delete File(s)* in the Audio window.

Copying Regions

Creating New Regions

Copies of Audio Regions are made in exactly the same way as MIDI Regions—by dragging them while holding down Option. This automatically creates a new Region in the Audio window. The new Region will retain the name of the original, with a sequential number added.

This allows you to alter the start and endpoints of the copied Region independently of the original. It is comparable to a genuine copy of a MIDI Region, which is created in the same way.

Using an Existing Region More Than Once

You can also create another version of the same Region in the Arrange window—a cloned Region, if you will. To do this, hold down the Option and Shift keys as you are copying. This is comparable to an alias of a MIDI Region, which is created in the same way.

Whenever you adjust the start or endpoints of any of these Regions, all other cloned Regions will also be adjusted.

Making Cloned Regions Independent

To make several cloned Regions independent of each other, select *Audio > Convert Regions to New Regions* in the Arrange window. This converts all selected clones into individual Regions.

Making Multiple Copies of Regions

You can make multiple copies (see "Copying Regions" on page 109) of both Audio and MIDI Regions with *Region > Repeat Regions*. This function creates clones of the Region (the Regions are not independent).

Another way to make Regions repeat is through use of the *Loop* parameter in the Region Parameter box (see "Loop" on page 117).

The *MIDI > Region Parameters > Turn Loops to Real Copies* command will change loops of selected Regions into "real" copies. The Regions that are created, however, represent the same Region. As such, any alterations to the length of the Region or audio material affects all "real looped" Regions (as with cloned Regions).

Moving Audio Regions

You can grab Audio Regions in the Arrange window with the mouse, and move them around, just like MIDI Regions.

If you hold down Control while moving Regions, you can move them in steps of one division (in sixteenths, for example).

If you hold down Control and Shift while moving Regions, you can move them by single ticks (maximum resolution).

You can also use the Delay parameter in the Region Parameter box to shift the playback position of Regions.

In practice, a resolution of one tick will usually be fine enough.

To move a Region by a finer resolution than ticks (such as a resolution of one sample word), please use the Anchor point in the Audio window or Sample Editor.

Note: All cloned Regions in the Arrange window are affected as well.

You can also move Regions by adjusting their positions in the Event List:

1 Select the Region that you wish to edit.

2 Choose *Windows > Event List.*

3 Click on the button (featuring the square graphic) in the Event List's top left corner to move up one level in the hierarchy.

4 Move Regions as desired, by changing the value in the *Position* column.

Moving Regions Back to Record Position

You can move any selected Region in the Arrange window back to it's original recorded position by selecting *Audio > Move Region to Original Record Position*.

This function only works if the corresponding audio file was recorded in the current song. Audio files imported via *Add Audio File* have no original record position.

This command is also available as a key command: *Set Region(s) to original Recording Position.*

Changing Start and End Points

You can shorten or lengthen any Region by grabbing it's lower right hand corner with the mouse and dragging it—if track based automation is displayed, grab the corners above the automation layer. You cannot make a Region longer than its original audio file. This means that all other Regions derived from this Region will be lengthened by the same amount (cloned regions—see the "Copying Regions" section on page 136).

Of course, the same goes for any changes you make to the startpoint of a Region. Such changes can be made by grabbing, and dragging, the lower left edge of the Region.

You can edit a Region's start and endpoints far more accurately with the Sample Editor, which can be opened by double-clicking on the Region. Simply slide the "S" and "E" markers to change the Start and End points of the region. While moving the Start point, use the Option-key, to ensure that the Anchor (and therefore the timing of the audio, relative to the rest of the arrangement), remains unchanged. The Anchor must be positioned inside the Region.

If you wish to move the start point to the right, first move it to the approximate target position while in the Arrange window. Then open the Sample Editor, and use the Option-key to precisely move the start point to the desired location.

Adjusting the Grid to Zero Crossings
If *Edit > Search Zero Crossings* is switched on in the Audio window, the adjustment will snap to the nearest zero crossing point of the waveform every time you alter the start or endpoint of a Region in the Arrange window. The Anchor is not affected.

The disadvantage of this option is that altered start or endpoints never land exactly on the selected musical grid, and will always be a few ticks out. Normally, this won't matter, because the Anchor reference point is unaffected. Should this ever cause a problem, you can simply switch off the *Search Zero Crossings* option. The primary reason for activation of the zero crossings option, is that it prevents clicks and pops at region start and endpoints.

Region Parameter Box
Name
As with MIDI Regions, the top line of the Region Parameter box displays, and allows you to edit, the name of the Audio Region. You can name several selected Audio Regions simultaneously; the Regions are assigned the same name, with sequential numbers added to the end of the name. Logic inserts these numbers automatically, unless you deliberately leave a space at the end of the name.

When you change the name of a Region in the Arrange, the corresponding Region is also renamed in the Audio window.

Loop
As with MIDI Regions, you can use the Loop parameter to make a Region repeat automatically. The loop repeats until it reaches the next Region on the track, the end of the song, or the end of the folder that contains the Region.

Don't forget that these loops are based on the Region's sample grid. This means that even if the Region is precisely matched to the song tempo, loop repeats may start to go out of sync after a while. You can avoid this problem by setting the endpoint of the Region to an exact measure boundary. In these cases, it may be better to use the *Region > Repeat Regions* function (see "Copying Regions" on page 109).

Delay

Just as with MIDI Regions, you can advance or delay the playback of Audio Regions, the smallest available units being ticks.

The Region Anchor

The Anchor is an Audio Region's temporal reference point. When you move an Audio Region, it's not the start point that is displayed in the help tag (as with MIDI Regions)—it's the Anchor point.

As an example, to guarantee perfect synchronization between a one-bar drum loop and your MIDI Regions, the Anchor must be assigned to a well-defined musical point. If the loop begins with a significant level peak (say a kick drum beat), set the Anchor to the point where the volume of that beat is at its precise peak.
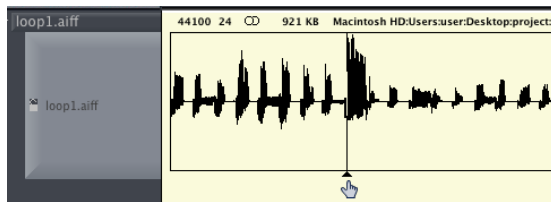
Any changes made to the position of the Anchor in the Audio window will directly affect the corresponding Region in the Arrange window. The position of the audio will shift in relation to Logic's time axis, while the Anchor remains tied to the same bar value, and is marked by a dotted line.

MIDI and Audio Regions Compared

The following overview sums up the main differences between Audio and MIDI Regions. There are some notes at the bottom of the table to clarify the most important points.

Feature	MIDI Regions	Audio Regions
Composed of discrete data	Yes	No, because Regions are just references to parts of audio files
Can be given names	Yes	Yes
Loop Region parameter available	Yes	Yes
Quantize Region parameter available	Yes	No, but but the position of Regions themselves can be quantized, using the Event List display on the Arrange level.
Transpose Region parameter available	Yes	No, but you can use the Time Machine and Pitch Shifting functions. Apple Loops can be transposed.
Velocity Region parameter available	Yes	No
Dynamics Region parameter available	Yes	No
Gate Time Region parameter available	Yes	No
Delay Region parameter available	Yes	Yes
Can be freely positioned	Yes	Yes
Left or right corner edit	Yes	Yes, and this affects the Audio Region, but not the position of the audio waveforms relative to the time axis of the sequencer
Can be cut with the *Scissors* tool	Yes	Yes, creates a new Audio Region.
Can have aliases made of them	Yes	Yes
Left corner may be dragged to conceal data at beginning	No	Yes
Have a variable musical reference point	No	Yes, a variable Anchor. This affects all Regions derived from a given Region, and can change the position of the audio, relative to the time axis of the sequencer
Can be turned off with the Mute function	Yes	Yes
Can be grouped into folders	Yes	Yes
Can be soloed	Yes	Yes

Naturally, some of the parameters that can be applied to MIDI events have no effect on audio signals. Equivalent operations for most of these are available as destructive edit operations in the Sample Edit window.

Only Audio Regions have the flexible reference point provided by the Anchor.

The fundamental functions (such as a freely determinable position and length, the ability to create complex arrangements with the aid of folders, and the ability to name, mute, and solo) are generally available to all types of Regions (MIDI Regions, Audio Regions, Folders, and Aliases).

Audio Recording

For details on preparations for audio recording, please refer to the relevant sections in the Audio Driver section (see "Audio Drivers" on page 271).

Creating Audio Tracks

To create an audio track, you must first assign an Audio Object as a track instrument. Click on a track name in the Arrange window, while holding down the mouse button. This opens the hierarchical Instrument list pull-down menu, where you may select an Audio Object via *Audio > Audio Track > Audio X*. To help things along, Audio Objects "Audio 1" to "Audio X" are preset for your hardware by the Logic Setup Assistant.

If you want to make adjustments to Audio Objects, you can do it directly from the Arrange window. The Object Parameter box is located below the Toolbox.

Arming Tracks
First Method:
- Click the button marked with an *R,* on the desired track in the track list. To show/hide these switches, select *View > Track Record Button*.

If you have checked *View > Track Record Button* but the switch is still not visible, you should switch on the driver for the relevant audio hardware in the *Audio > Audio Hardware & Drivers* window.

Second Method:
- Open the Environment Layer containing your Audio Objects (by selecting *Audio > Audio Mixer*).

- Click on the REC button of all Audio Objects that you wish to record to. Click the Audio Object REC button a second time to disarm the track. You can also arm the current track by clicking the Record Enable button on the Arrange channel strip.

You can only make audio recordings on armed tracks, no matter what track is highlighted in the Arrange window.

- If you select a MIDI track, you'll record MIDI events.
- If you select an Audio Instrument track, you'll also record MIDI events.
- If you select an Audio track, you'll record on all tracks that have been armed (record enabled).
- Space is reserved on the hard disk for armed tracks, and will no longer be available for Undo files. For this reason, Logic will automatically disarm audio tracks when editing in the Sample Editor, or if the hard disk is nearly full.
- You can record simultaneously on one MIDI trackand several audio tracks, by clicking the Record Enable button on the MIDI track and the audio tracks you want to record to.

Note: Shift-clicking arms additional audio tracks, following the selection of a MIDI track for recording.

If several Arrange window tracks are assigned to the same Audio Object ("Audio 1", for example), the new audio file (Region) will be recorded to the selected track.

"Disarming" All Tracks
If several tracks are record-enabled, you can instantly disable them all by Option-clicking on *any* of the flashing REC buttons.

Standard Recording With Count-in
You can start recording at any point in a song by setting the Song Position Line to the desired location. If the target audio recording tracks are correctly set, and the necessary inputs (and audio signals) are connected and properly adjusted, just hit the Record switch on the Transport, or press "✻".

A "count-in" is heard. Signals will be recorded during this time. Depending on the number of tracks required, Logic will pause for a short interval between the time you press the Record button, and the start of recording.

During recording, the Recording float window opens. This displays the remaining recording time.

Logic will automatically create a Region in the Arrange window after recording (press Stop on the Transport to end recording), and will create an overview of the audio file. This is a graphic file that is used to display the waveform in the Arrange window. You can listen to the new recording in the Arrange window while the overview is created.

Record and Pause Mode
If Logic is in pause mode, you can start audio recording by clicking "Record Toggle", "Pause" or "Play". Recording begins at the current song position.

Punch-In Recording

You can actually engage recording while in playback mode—"on the fly". To do this, start playback and press Shift-asterisk (the key command for *Record Toggle*) at the point where you want to start recording. Audio recording will start immediately. Recording can be stopped at any time, by pressing Stop in the usual way, or by pressing Shift-asterisk again. If you use this second option, recording ceases, but the sequencer will continue to play.

Pre-Programmed Drop-Record

Logic's autodrop function can be used on audio tracks, just as it can with MIDI Regions. Autodrop is enabled by clicking on the autodrop switch on the Transport window. Here is a step by step breakdown of the procedure:

- The Autodrop button must be turned on.

- You can set the autodrop locators numerically in the Transport window.
- The autodrop recording zone is indicated by a thick bar in the middle third of the Bar Ruler.
- Recording only takes place within the autodrop zone, with the exception of a short "lead-in" just before recording is due to start.
- The autodrop zone start and end points can be set from either; the Bar Ruler, or by using the locators in the Transport bar. Please note that if the Cycle function is switched on, you can set the Autodrop Locators in the window to the right of the Cycle Locators (under tempo in the Transport bar).
- Start recording. Logic will begin recording about one bar before the drop-in locator. Press Stop to end recording, and a Region that corresponds exactly to the length of the autodrop zone will be created. This method allows the startpoint of the Region to be adjusted later, allowing the lead-in to become audible. This way, the beginning can be easily recovered if the performer anticipates the autodrop zone slightly. Adjustments to the lead-in portion of the Region does not change the position of the recording, relative to the time axis.

Tip: You can even define a small autodrop zone within a larger Cycle Zone (see below), if desired. This can be handy if a player needs to re-record a difficult passage in the middle of a song, and requires several attempts to get it right.

Audio Cycle Recording

You can make audio recordings even when "Cycle" is switched on. A new track is created for every cycle repeat. All newly-created tracks are played by the same Audio Object. This prevents the different "takes" from being played simultaneously.

If you stop recording just after a full cycle has ended, no new Region is created for the cycle that has just begun. The audio material is not lost, but is recorded after the last Region in the audio file.

The whole recording (all cycle repeats) is stored as a single audio file. This audio file is split into Regions, each as long as the Cycle length. The Region of the preceding cycle is automatically muted when playback of the ensuing cycle/Region begins.

Audio cycle recording also works when you're simultaneously recording two channels.

After Recording, Please Note…

After you've made your first audio recording in a song, you should not make any further adjustments to the tempo of the song. Decide on a tempo, and any changes in tempo, well before the first audio recording, and stick to it. Audio recordings have a fixed playback rate, and can only be matched to new tempos if you're prepared to go through a great deal of hassle.

The time compression/expansion algorithms available in Logic only permit you to match audio to new tempos when the tempo differences involved are relatively small; if you try and use them to significantly change the tempo of your recordings, audio quality may be significantly compromised.

Note: You can, of course, change your audio recordings into Apple Loop format files. This file type makes transpositions and time stretching tasks much easier (see "Apple Loops" on page 62).

If you've made your audio recordings in real time, playing them over the top of an existing MIDI arrangement, it is not particularly recommended that you move the Anchor of any of your Regions. You can make slight adjustments to the timing of your Regions using the Delay parameter.

Stereo Recordings

For information on creating stereo recordings, please read the appropriate Mixers, Effects, and Audio Objects sections; Stereo Objects (see "Stereo Objects" on page 203) and Channel Strips (see "Logic's Mixing Facilities" on page 191) and the section on Faders and Level Adjustment (see "Level" on page 200).

Stereo recordings will normally be saved as Interleaved Stereo files. A stereo symbol, consisting of two overlapping circles (see left image below), is shown beside the names of Interleaved Stereo files (that appear as Regions) in the Arrange window.

Split Stereo Regions are indicated by a stereo symbol consisting of two adjoining circles (see right image above).

You can freely mix both formats, even on the same track. We recommend that you use the Interleaved Stereo format if your audio hardware supports it.

Split Stereo files require around twice the hard disk I/O performance of mono files. Interleaved Stereo files, by comparison, only require about one and a half times the throughput of Mono files.

Functions

Automatic Tempo Matching

Logic offers an automatic function that matches the length of a free-form musical passage with the length of an audio Region. The length of the Region remains constant, but the sequencer tempo is varied automatically, with the Region and musical passage ending up exactly the same length.

To illustrate the use of this function, we'll use a one-bar drum loop as an example:

Imagine you've recorded a drum loop live, or imported it from a sampling CD. You've used the Audio window and Sample Editor to adjust the start and endpoints of the audio Region, ensuring that the loop cycles perfectly, without any glitches.

Now, drag the drum loop into the Arrange window, where it appears as a Region. Make sure that you place the front (left) edge of the Region at the start of a bar.

Construct a Cycle in the Arrange window Bar Ruler. Set the length to match the intended musical length of the Region. The drum loop is one bar long, so you should set a Cycle length of one bar, to match.

Once the Cycle is set to the desired musical length in the Bar Ruler, you'll note that the current length of the Region will be different to that of the Cycle.

Select *Options > Tempo > Adjust Tempo using Region Length and Locators*. The default key command is "T".

The tempo is recalculated, making the Region exactly one bar long, and fitting the length of the Cycle perfectly. This does not change the playback tempo of the audio, but rather, makes the song tempo conform to the audio.

Digital Mixdown
Logic allows you to digitally mix down audio data from within the Arrange window. This is done with the Glue tool. This function is non-destructive, as Logic always creates a new file for the mixed-down material. This new audio file is stored on your hard drive.

To carry out a mixdown, select the Glue tool from the Toolbox, and use it to select the required Regions for mixdown (if necessary, using Shift as well).

The mixdown process can be aborted by pressing Command-period. All audio files will remain unchanged.

No Mixdown Situation
• If there are several Regions (mono or stereo) in a row on the same track, which have been cut out of one Region using the scissors tool, no mixdown is carried out. In this situation, a single Region is simply created over the entire area. This delivers the desired result, without using any additional disk space.
• Logic can recognize associated Regions, even if there are gaps between them. The determining factor is that the relative position of the Regions in the Arrange window corresponds to the relative position of the Regions in the underlying audio file.
• No mixdown occurs when you try to mix two Regions on tracks that are panned to opposite sides.

- The two resulting mixdown files would be identical to the original audio files (in the areas used for the Regions). If you don't need the unused areas of the audio files, select "Optimize Files".

"Mixdown" of Regions in a Track

If several Regions that overlap each other are selected on a single track, no mixdown occurs. You are asked to create a new audio file, which is named after the first Region on the track. The selected Regions are then mixed together, with no changes to volume, and without clip scanning.

If there are empty sections between two Regions, these are added into the new audio fileas silent passages.

Genuine Mixdown With Clipscan

If you combine audio data from two or more tracks, the current pan and volume values for the individual tracks will define the pan and volume settings in the new audio file. If you want to combine both sides of a stereo audio file (a mono channel on each of two tracks), first set the pan controls of the component mono sides to hard left and hard right, respectively.

You can perform a mixdown while the sequencer is playing.

Following the digital clipping scan (Clipscan) and completion of the mixdown, Logic replaces the previously selected Regions with one Region that contains the new, mixed-down audio file in it's entirety. You can use the undo function to restore the original audio Regions, if desired. If you do so, you'll be asked if you'd like to keep, or delete, the newly created mixed audio file. If you decide to keep it, it will remain in the Audio window, and can be further processed.

During a mixdown, the 32-Bit resolution Clipscan function ensures that the highest possible level is maintained, without clipping.

Audio Crossfades in Digital Mixdown

The Digital Mixdown function (Glue tool, menu, or key command) in the Arrange window supports audio crossfades of selected Regions.

The parameters are defined in the General Audio preferences pane, which can be opened either via the *Audio Crossfade options for Merge* key command or by selecting: *Preferences > Audio > General*.
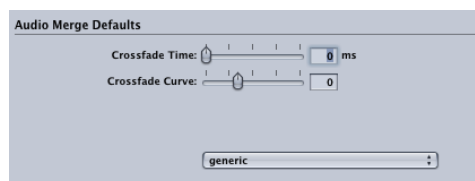
There are two parameters:

Crossfade Time [ms]: This is the length of the entire crossfade. To switch off the crossfade, set this value to zero.

Crossfade Curve: To obtain a linear crossfade, set this value to zero. Other values (positive or negative), produce various exponential fades. The fade-outs and fade-ins are always symmetrical, to avoid deviations in level. The preset values are: *Time = 20 ms, Curve = 0* (linear).

The graph shows the actual shape of the crossfade; the original algorithms are also used to calculate the curve display. Values over about 250 ms are scaled in the graph, to ensure that the entire crossfade is visible.

Freeze

The Freeze function saves almost 100% of the CPU power used for software instruments and effect plug-ins. You can apply it, individually, to audio or Audio Instrument tracks.

Concept

Internally, Freeze performs individual offline bounce processes for each "frozen" track. 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".

As long as a track is frozen—following the freeze process—the freeze file will play back in place of the original track (and its CPU-hungry plug-ins). The original track and plug-ins are temporarily deactivated, and use no CPU resources.

Due to technical reasons, the Freeze function is not available for the tracks of DSP-based audio hardware systems (such as ProTools), tracks that use plug-ins calculated on DSP cards (Powercore, UAD-1, Pulsar, and so on) or tracks that use external signal processing devices via the I/O plug-in. You can, however, freeze tracks that use Sends to Busses—with DSP-based or I/O plug-ins used on the busses.

The Freeze function always bounces the complete channel signal. If you are using more than one track for the same audio or instrument channel in the Arrange, then all (sub)tracks of this channel will be frozen, and cannot be edited independently.

When to Freeze a Track

In real-life situations, Freeze allows you to:
• use additional plug-ins or software instruments in further audio or instrument tracks, which would normally not be possible as it would exceed the CPU processing limits of your computer.
• Play back songs created on computers with greater CPU power.

Freeze was made for very CPU-intensive processes, which are generally (from higher to lower demand) outlined as follows:

- Software synthesizers with a complex voice architecture
- Plug-ins with a complex structure (reverbs, filter banks or FFT-based effects)
- Software synthesizers with a simple voice architecture
- Software sampler with active filter
- Software sampler with deactivated filter
- Plug-ins with a simple structure

As long as your computer is able to calculate all active processes in real time, it's unnecessary to freeze tracks.

Freeze is recommended whenever your system's power runs short and one, or multiple, existing tracks with CPU-intensive instrument and/or effect plug-ins are in a finalized state, or at least seem to require no further changes for the meantime—in other words, a "close to final" mix.

As long as a track is frozen, its CPU usage is reduced to that of a high resolution audio track, without any effect plug-ins inserted—regardless of the number, or processing demands, of the plug-ins that were used originally.

How to Freeze a Track

It's extremely easy to freeze a track: simply activate the Freeze button—the button that features a small ice crystal icon (light gray when active). If the Freeze buttons are not visible, activate the *View > Track Freeze Buttons* menu option in the Arrange window.
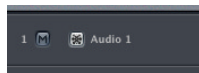
If you hold Command while clicking on a Freeze button in the Track List, all tracks that contain data in the currently-selected display level (or folder) will be frozen. If the Freeze buttons were already enabled, they will be disabled.

You can also use track button slide activation to enable Freeze on multiple tracks.

Logic will create freeze files after receiving the next "Play" command. This allows you to activate the Freeze buttons of multiple tracks, and render their freeze files in one go.

During the Freeze process, the SPL will follow the currently rendered position. A floating progress bar window is also displayed.

Freeze files are always rendered between the song start and end marks—it is recommended that you check the song end mark in the Bar Ruler before starting a Freeze process. Please note that the end mark should be adjusted to include feedback-dependent delay repetitions or reverb tails. Empty areas (digital zero) at the end of freeze files will automatically be removed after the Freeze process.

You can abort freeze processes by pressing Command-Period—in this scenario, the portion of the frozen tracks that has already been rendered will remain in the freeze files, and will be used for playback. Frozen tracks will remain silent beyond this point.

The freeze process uses 100% of available CPU power. If, for example, a track uses 40% of the CPU for real time plug-in calculations, its freeze file will be created in two and a half times (faster than) the realtime speed. If the original track uses 100% of the CPU power, the freeze process will happen in (approximately) realtime—even if offline bouncing is used.

Working With Frozen Tracks

Once a track is frozen, you cannot edit any instrument or plug-in parameters (or related automation data). You can, however, still edit the:
- effect send levels and destinations,
- panorama parameters,
- volume, mute, and solo

of frozen tracks—including their automation data.

Whenever you try to edit "forbidden" parameters of frozen tracks, (such as plug-in parameters that were rendered into the freeze file), Logic will display an error message:

"Current track is frozen. Do you want to unfreeze it?"

In this situation:
- *Unfreeze* will deactivate the Freeze button of the track.
- The freeze file will be deleted.

Please note that the track will now use the amount of CPU processing power that it originally required, if you enter "Play" mode.

Now,
- perform your edits,
- activate the *Freeze* button again, if required.

It is not possible to cut and re-arrange the freeze files in any way, nor is it possible to mix the freeze files with their originals on a single track—you can use one or the other, not both!

It is also not possible to record audio on frozen tracks. In fact, the Record button will be hidden when a track is frozen.

Freeze Files

The temporary freeze files are saved in a folder named "Freeze Files" which is created in the root directory of your project folder. Usually, you won't need to access these freeze files directly.

Logic manages these freeze files automatically in the background: They are created during the Freeze process, will play back in place of the original tracks (as long as these tracks are frozen), and will be deleted as soon as the Freeze button of the corresponding track is deactivated.

In some cases, however, it might be handy to use freeze files directly: One example would be if you wanted to freeze all of your tracks, and use the freeze files for a remix in another studio (on DSP-based systems, for example).

Refresh Freeze Files

The *Audio > Refresh Freeze Files* menu function (and key command of the same name) allow you to refresh the current freeze files. This may become necessary when global changes are made that also affect the playback of the frozen tracks (tempo changes, for example).

The Environment

<div style="text-align: right; font-size: 3em;">5</div>

The Environment is Logic's "brain". It allows you to control all MIDI input and output.

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—Introduction

The Environment refers to Logic's "virtual" environment inside your computer. It was developed to allow you complete control over your MIDI setup from within Logic.

Imagine that the Environment window provides a virtual view of your MIDI studio, including port objects which represent the MIDI inputs and outputs of your MIDI interface, instruments which are virtual representations of each device in your MIDI setup, and various objects for modifying the MIDI signal flow.

In order for this to work properly, you need to connect the different Objects in the Environment via virtual MIDI cables. This allows you to control the overall MIDI signal flow.

You can also create virtual faders that generate MIDI events when you move them. The movements of these Fader Objects can be remotely-controlled by other MIDI events, and recorded by Logic. In addition, there are specialized Objects which can split a MIDI signal into different channels, make pre-programmed alterations, or even re-route the signal path.

Layers

As you can probably imagine, the Environment can quickly fill up with a large number of Objects. To keep things organized, you can assign Objects to different display levels, referred to as "layers". Think of these layers as being different, partial views of the overall Environment. Naturally, you can easily connect Objects between different layers.

Opening the Environment Window

To open an Environment window, select *Windows > Environment* (default key command: Command-8). Double-clicking on an instrument in the track list of the Arrange window also opens an Environment window, to the layer containing the corresponding Instrument Object. When the Environment window opens, the Object that represents the track Instrument you double-clicked will be highlighted.

Basic Operation
Layers
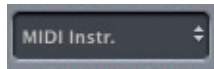
Layers are "display levels" of the Environment window. They allow you to configure the Environment's display, allowing you to view and work with specific groups of related Objects (Audio Instruments, for example), rather than dealing with all Environment Objects at the same time. The name of the current layer is displayed in the Layer box.
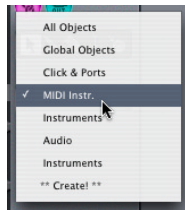
The distribution of Objects on different layers has no affect on their function—it's simply a system of organization. There are some exceptions: Objects in the Global Objects layer also appear on all other layers; and the All Objects layer shows all Environment Objects in a list.

Switching Between Layers

Click-holding the Layer box opens the layer pull-down menu, used to switch between layers.

Select *Options > Goto previous Layer* to switch back to the most recently active layer. This allows you to toggle between two layers.

Remember that you can assign key commands to this and many other Environment menu functions, for faster navigation and greater ease of use.

Creating Layers
Selecting ***Create!*** from the layer pull-down menu creates a new, empty layer called "*(unnamed)*", at the end of the list. You can add a new layer above the current position in the list by selecting *Options > Layer > Insert*.

Naming Layers
Double-clicking on the layer box opens a text field, allowing you to enter a name for the current layer.

Deleting Layers
You can remove the current layer from the list by selecting *Options > Layer > Delete*. As all Objects contained in the layer are also deleted, an alert box appears, to warn against the unwitting deletion of Objects. You must click *Delete* to complete the operation. *Cancel* or Enter cancels the operation.

Special Layers
The position (and existence) of the first two layers is protected, and they cannot be deleted:

All Objects
The top layer in the pull-down menu always displays all Objects in the Environment. The Objects in this layer are normally shown as a list. (You can change this in the Environment's View menu, but doing so is not recommended.)

If you turn off the *Preferences > Display > Other > Allow 'All Objects' Layer option,* the All Objects layer will be removed from the layer pull-down menu.

The *Options > Goto Layer of Object* function switches to the selected Object's layer.

Global Objects
You can place Objects (output ports, for example) that you want to be visible in all layers in the second layer from the top. These will appear at the same position, in all layers. We recommend that you place as few Objects as possible on this layer, due to the on-screen clutter that global Objects can create.

Hiding/Showing Parameters
As in other windows, you can hide the column containing the buttons, Toolbox, layer menu, and Object Parameter box by selecting *View > Parameters*. This will create more room onscreen for the Environment workspace display.

Hiding/Showing the Cables
Choosing *View > Cables* toggles the display of cables. This also hides/shows the positioning bar to the right of the individual Objects (used for moving and sizing of several Environment Objects).

Protecting Cabling and Object Positions
You can prevent the accidental alteration of the position, size, and cable connections of all Objects by selecting *View > Protect Cabling/Positions*.

Background
If the cabling and Object positions are protected, and the cables are hidden, the background color changes. This usually looks better for virtual mixing desks and fader setups.

List Display
Selecting *View > by Text* switches the graphic display of the layers to a list display. The cables are not shown in the list display. This type of display is most useful in the *All Objects* layer.

Objects
Creating Objects
When you select an Object type from the *New* menu, an Object of this type is created in the current layer. Clicking on a layer background with the pencil tool creates a new "Standard Instrument" Object.

You can copy existing Objects by dragging an Object while holding down Option. Cabling is preserved; so groups of Objects copied in this way will be connected in the same way as the originals. (When you copy a single Object, only its output cables are preserved).

Deleting Objects
Click with the Eraser tool, or press Backspace, to delete all selected Objects.

Adjusting the Size of Objects
You can adjust the size of fader, keyboard, and monitor Objects by grabbing and dragging the bottom right corner (just as with windows). Changing sizes when multiple Objects are selected (by "rubber-banding" or Shift-clicking) will alter each Object's size, while preserving their sizes, relative to each other.

Selecting *Options > Clean up > Size by Default* sets the size of each selected Object to its default value.

Moving Objects
You can move Objects by grabbing their icon or name, and dragging them to the desired position. The surface of Keyboard and Fader Objects is used for their operation. You must therefore either grab the name (if available), or the positioning bar to the right of the Object in order to move them.

If you hold down Shift, you can also grab Keyboard or Fader Objects by their surface. Remember to first deselect any other selected Objects by clicking on the layer background, to avoid moving them as well.

Snapping Objects to a Grid

Select *View > Snap Positions* to align the Objects to an invisible grid. It's a good idea to leave snap positions switched on. You only need to switch it off if you want to manually move an Object by a few pixels.

Aligning Objects …

… in a row or column

To align several selected Objects horizontally or vertically, select the *Options > Clean up > Align Objects* function. The top left Object stays where it is. The position of the next Object determines whether the Objects are aligned in a column or a row. If it is to the right of the top left Object, all Objects are aligned horizontally (row). If it is below the top left Object, all Objects are aligned vertically (column).

…to grid positions

If you choose *Options > Clean up > Positions by Grid*, all selected Objects are aligned to the invisible grid.

Moving Objects Between Layers

…with the layer selection box

To alter the layer assignment of a group of Environment Objects, first select the Objects, and then select the desired layer, while holding down Option. This moves the selected Objects to the chosen layer.

… with a second Environment window

Another way of moving Objects to a different layer is to open a second Environment window. Select the target layer and drag the relevant Objects from one window to the other. You can also use this method to copy Objects between layers (by holding Option).

… via the Clipboard

Another option is to move Objects via the Clipboard (*Edit* menu or the usual key commands):
• Select the Objects that you want to move and choose *Edit > Cut* (default key Command-X).
• Switch to the destination layer.
• Make sure that no Objects are selected (by clicking on the layer background).
• Select *Edit > Paste* (default key Command-V).

Replacing Objects

If any Objects are selected when attempting to add Objects to the current layer via *Edit > Paste,* a dialog box asks if you want to "Replace current selection? No/Replace". If you press Enter or click Replace, the selected Objects will be replaced by the Objects in the Clipboard. The existing cabling remains intact.

Assigning an Object to the Selected Track
You can assign any Environment Object to the selected Arrange window track by clicking on the Object with the MIDI Thru tool.

Remember: Logic's MIDI Thru function diverts all incoming MIDI events to the Environment Object assigned to the selected track.

Special Selection Commands
Selecting All Used Instruments
The *Edit > Select Used Instruments* function selects all Objects that are assigned to tracks in the Arrange window, or are connected to such Objects via cables.

Selecting All Unused Instruments
The *Edit > Select Unused Instruments* function selects all Objects that are neither; used in the Arrange window, nor connected to any such Objects via cables.

Selecting Cable Destination Objects
The *Edit > Select Cable Destination* option highlights the destination Object of a selected cable connection. This is particularly useful in two cases:
• The destination Object is in a different layer. You can use the function to select and display the destination Object in its layer;
• From the list display (*View > By Text*), you can locate the destination Object of a source Object, because selecting the source Object also selects its cable connections.

This function allows you to follow the cabling from one serially-cabled Object to the next. If several Objects are connected, or several cable connections are selected, the path of the top cable is followed.

Toggling Your Selection
Just as in the Arrange and editor windows, you can change the status of any selected Objects in the current layer by choosing *Edit > Toggle Selection*.

The MIDI Signal Path

Before any MIDI events received at your computer's MIDI inputs can be recorded by Logic, there must be a connection between two Environment Objects, namely: the physical input and the sequencer input.
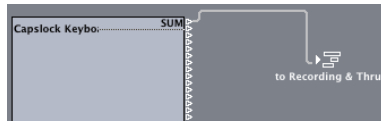
In the sequencer, the events are always directed to the selected track, where they can be recorded. The events played by the track are mixed with any incoming events and sent to the Environment Object assigned to the track in the Arrange window's track list. From here, the events are directed to a MIDI output (see "Direct Output Assignment" on page 159).

You can insert Objects into the signal path between the physical input and the sequencer input, as well as between the instrument and the MIDI Out port, to accomplish other Environment processing. This is done by using cables (see "Cabling" on page 160).

Direct Output Assignment

You can create a direct output connection from any Instrument Object to a physical MIDI output by setting the desired output in the *Port* parameter line, just above the Channel parameter.

If you click and hold in this line, a pull-down menu will list all individual ports, an *off* setting and one general setting (All) for each output connection. The *off* setting completely disables the connection to the MIDI interface port. The *All* option routes the Object's output to all available MIDI ports. This may be useful if the device is sending a pulse, for example.

Note: If you have a MIDI interface with more than one output port (or even several interfaces which can be stacked, like products belonging to the Unitor family), you can set up a direct connection to one of the individual ports (1 to 63) of that, or those, interface/s (for example "Port 1 (Unitor 8)" or "Port 14 (Motu)").

Any Object with a directly assigned output is indicated by a shaded triangle on its right-hand side. The triangle is hollow when there is no direct assignment.
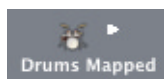
Breaking the Direct Output Assignment
To break the direct output assignment, set the Port parameter to off, the top entry in the pull-down menu.

Cabling
The cabling between Environment Objects provides control over the entire MIDI signal path. A cable is normally shown as a gray line between a source and destination Object.

Objects always have an input on the left, and an output on the right-hand side. The output of an Object is shown as a small triangle, pointing to the right.

If you grab the triangle, the mouse pointer turns into a patch cord that represents a cable connection coming from the Object's output. Move the mouse over the destination Object to connect it to the source Object with a cable. Once you have selected the destination Object (this happens automatically when you touch it), release the mouse button.
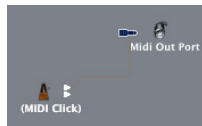
If the source Object has already been directly assigned to an output, a dialog box will appear, asking whether or not you want to replace the direct assignment. You have three options:
• *Cancel*: the connection is not made, and the direct output assignment remains intact.
• *No*: your cabling is carried out, but the direct output assignment remains intact. This means that the Object is connected in two places—one via the visible cable and one via the direct output assignment.
• *Remove* (or Enter): your cabling is carried out, and the direct output assignment is removed. (This is the default selection, because you generally won't want an Object connected to two different destinations).

Cabling Between Layers
If the destination Object of the cable is on a different layer, you can connect it by using the Instrument List. To do this, hold Option as you grab the output triangle and scroll to the desired destination Object when the Instrument List (see "Object Parameters" on page 162) appears.

You can also open a second Environment window showing the destination layer, and connect the Objects graphically between the windows.

A cable connection to another layer looks like this:

Deleting Cables

To remove a cable connection, click the cable with the eraser, or select the cable and press Backspace. You can also remove a cable by grabbing it and plugging it back into the input of its source Object.

You can use *Edit > Clear Cables only* to remove all selected cables, without also clearing any Objects that happen to be selected. This is handy if you want to clear all cables leading to (or from) one or more Objects, given that selecting Objects also selects all associated cable connections.

Cable Color

Cables are assigned the same color as the source Object. You can switch off cable coloring, and render them all in gray with the *View > Colored Cables* function.

Multiple Cabling

Multiple Inputs

There is no limit to the number of cables that you can "plug" into a target Object. All MIDI signals are then mixed at its input.

Multiple Outputs

Once an output from an Object is used (cabled to another Object), another output triangle automatically appears. You can thus cable outputs from the Object to as many other destination Objects as desired.

Note: Some Objects have special outputs, and are exceptions to this rule.

Special Outputs

Some Objects, such as the Channel Splitter (see "Channel Splitter Object" on page 173), feature several—functionally different—outputs. In these Objects, each output is only available once. If you want to route the signal to several destinations from these outputs, you must first create a monitor (see "Monitor Object" on page 173) (*New > Monitor*), plug the cable into it, then connect it to as many other destinations as you like. The monitor Object also allows you to view the MIDI events flowing through it.
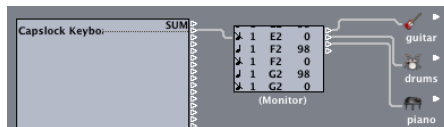
To select a common destination for several existing cables, first select the cables. (If the cables are already leading to a common destination, the simplest way of doing this is to select the destination Object.) Next, grab one of the cables and plug it into the new destination Object. A dialog box will appear, asking "Do you want to connect all selected cables with new Destination? No/Connect". Click *Connect*, or press Enter.

Cabling Serially

To cable a group of Objects serially, first select all Objects and then choose *Options > Cable serially*. The Objects will be cabled in series, starting with the top-left Object. This is handy for quickly connecting groups of faders in a mixing console, for example.

Environment Objects
Object Parameters

Each Environment Object has several parameters that control its operation. These parameters can be viewed and changed in the Object Parameter box. The Parameter box also appears in the Arrange window when you select a track assigned to the Object. It also appears in the Environment window when you select the Object. These are the same parameters—changes in one location will be reflected in the other.

Opening/Closing the Object Parameter Box

By clicking the triangle at the top left, you can hide all parameters except the Object name and type. This reduces the box to its minimum vertical size.

Common Parameters

The following parameters are shared by all Object types:

Name

The name of the Object is shown next to the triangle, and can be selected for editing by clicking on it. You can also edit the name by clicking on the Object with the text tool.

Object Type

The Object type is shown in brackets, and cannot be edited.

Icon/Display Filter for the Instrument List

Click-holding on the icon in the Parameter box opens a pull-down menu, where you can choose an icon to represent the Object in the Environment and Arrange window track list.

Placing a check in the box next to the icon means that the Object will appear in the Instrument List, and can therefore be assigned to a track via this menu. Objects not on the track list can still be assigned to tracks by dragging them from the Environment window to the track list, or by using the Environment's MIDI Thru tool.

If the box is not checked, the Object will not appear in the Instrument List, and a diagonal line through the icon is shown. This will not hide the Object or its icon in the Environment.

You should only check the icon box if the Object will be used as a track instrument, or you need to connect cables to its outputs by using the instrument selection menu.

Color
You can change the color of an Object via the *View > Colors* local menu, which opens a palette of various colors. A double-click on a color field opens the system color palette, allowing you create customized colors. These color edits are stored in the Preferences file, and are available for all songs. The color of an Environment Object is used as the default color for any newly created Region in the Arrange window.

Standard Instrument
This is the simplest track playback Object. It provides a direct connection to a single MIDI port and channel, which can be set in its Parameter box.

You can also set a number of other playback parameters, including program bank and number, initial volume and pan, transpose, velocity scaling, and MIDI delay.

To create a new standard instrument, select *New > Instrument*, or click on the layer background with the pencil tool. Instruments serve as the interface between Logic's tracks and your MIDI sound sources.

The Standard Instrument Object Parameter box will be familiar to you from the Arrange window. Here are the details of the individual parameters.

Channel
Use the Channel parameter to set the MIDI channel for the instrument's output. All events at the output of the standard instrument Object are sent via the channel set here. Exception: If you set this parameter to All, all events will be sent with their original channel settings—as they appear in the Event List window.

Port
Below the channel parameter, a direct connection to one of the MIDI output ports can be set. Remember that you can also directly cable the standard instrument Object to other Environment Objects for MIDI processing. If no MIDI output port is defined in the Object Parameter box for the instrument, the Port parameter will display "off".

Prg, Vol, and Pan

The *Prg, Vol,* and *Pan* parameters transmit program changes, volume controller (#7) and pan controller (#10) data.

```
Program: ☑  –  4 ⬍
 Volume: ☑  90
    Pan: ☑  74
```
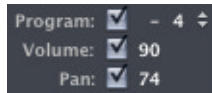
You can edit the values of any of these parameters, but no data will be sent until you check the corresponding box (by clicking on it). If the box is already checked, any value alterations will be sent immediately, and the values will also be sent whenever the track is selected.

To the left of the program number, directly to the right of the checkbox, you'll see the bank select parameter. If your MIDI sound sources recognize Bank Select messages (check their manuals), you will be able to switch between sound banks. If your sound sources respond to the standard Bank Select message (Controller #32), you will be able to use this parameter directly. If not, you may define your own Bank Select commands (see "Defining Custom Bank Selects" on page 169).

Transpose

The *Transpose* parameter defines the number of semitones that all note events will be transposed by, on output. Negative values transpose downwards.

Velocity

The *Velocity* parameter allows you to increase or decrease the "note on" velocities of all note events, by an amount adjustable between –99 and 99.

Key Limit

The two note values of the *Lim* parameter define a pitch range. All notes outside this range will be ignored by the instrument when it plays a MIDI Region.

Vel Limit

The two values of the *VLim* parameter define a velocity range. All notes with a velocity that falls outside this range will not be played by the instrument.

Delay

The *Delay* parameter causes all MIDI events to be sent early or late. This "delay" ranges from –99 to 99 ticks. This allows you to adjust for any differences in reaction time between your various MIDI devices. Use the Region parameter of the same name to create delay effects, as this allows longer delay times.

No Transpose

If the box next to the *No Transpose* parameter is checked, all Regions on any tracks played by this instrument are protected from transposition. In other words, the "transpose" Region parameter is ignored. This is very useful for instruments assigned to drum or other multi-timbral samples, as transposition will cause the sounds (rather than the pitches) to change in these instruments.

No Reset

If the box next to the *No Reset* parameter is checked, no reset messages will be sent to the instrument. This can be useful if controllers are being used for non-musical purposes, such as when using an Instrument for mixer automation. The *Preferences > MIDI > Reset Messages* window controls what reset messages are normally sent. These messages are not sent to "No Reset" instruments.

Style

The *Style* parameter is located at the bottom of the Parameter Box. It displays *Auto* by default, but can be changed to any of the available score styles. Whenever a Region is created on one of the instrument's tracks, it will be assigned the score style displayed here. In the *Auto* style's case, Logic will pick an appropriate style based on the pitch range of the notes in the Region.

Don't forget: you can change a MIDI Region's Score Style at any time in the Display Parameter box of the Score window.

You can change the score styles of all MIDI Regions on an instrument's tracks by holding down Option when selecting the instrument's default score style.

Multi Instrument

A multi-instrument is like a collection of 16 standard instruments (see "Standard Instrument" on page 163) in one package. There is a "sub-channel" for each of the 16 MIDI channels—as indicated by the numbered squares on the multi-instrument icon. Clicking on any of these numbered squares selects the corresponding sub-instrument, and displays its parameters in the Parameter box.

All sub-channels of a multi-instrument use the same output port.

Multi-instruments have 15 name banks—each of which will hold 128 preset names. If the multi-instrument's program parameter is checked, selecting names in the name bank will send MIDI program change messages to the corresponding port and channel.

You will generally use multi-instruments to address multi-timbral synths or samplers in your studio. A multi-timbral synth is one that can receive on several MIDI channels at once—playing back a different sound on each channel. As most modern MIDI devices are multi-timbral, the multi instrument will probably be the most commonly used instrument Object in your Environment.

To create a new multi-instrument, choose *New > Multi Instrument*.

A multi-instrument is intended for use with multi-channel MIDI sound devices. It combines 16 separate sub-instruments (one for each MIDI channel) with 15 name banks, and a number of common bank select options.

A multi-instrument consists of 16 sub-channels, each of which has a complete set of instrument parameters. The name, MIDI channel and output of each sub-channel is determined by the multi-instrument. All sub-channels share the 15 banks of program names, and use the same format for their bank select message.

Multi-Instrument Parameter Box
Once you have created a multi-instrument, you will see the multi-instrument Parameter box.

You should already be familiar with the meaning and operation of the individual parameters (as they're identical to those of the standard instrument Object). The settings made here apply to all sub-channels and should be left at their neutral, default values, with the exception of the output port setting. Set the output port in the line below the "Cha" parameter line (Port parameter). For more information on this subject, please read the Direct Output Assignment section (see "Direct Output Assignment" on page 159). Direct output assignment can also be replaced by manual cabling to other Environment Objects—so keep it in mind.

Activating and Selecting Sub-Channels

To select a sub-channel for a specific MIDI channel number, click the appropriately numbered button on the multi-instrument Object. The first time you click it, the sub-channel is activated, making it available from the Instrument List. To avoid menu clutter, you should only activate as many sub-channels as you actually need.

As with any other Environment Objects, you can remove sub-channels from the Instrument List, by unchecking the icon box. The button for that sub-channel will then be shown with a diagonal line through it. If you want to select the entire multi-instrument rather than a particular sub-channel, click on the top edge of the multi-instrument Object, or next to the icon.

In the above diagram, sub-channel 1 is selected, sub-channels 1 to 8 are activated, and 9 to 16 have been removed from the Instrument List.

The Sub-Channel Parameter Box

The sub-channel parameters are the same as those of standard instrument Objects (see "Standard Instrument" on page 163). The only parameter you can not change is the MIDI channel. (If you change the output port, this will affect the entire multi-instrument and all other sub-channels.) If you try to change the channel from the Parameter box in the Environment window you'll see the following warning: "Channel protected! Please select a sub-channel from the Instrument pull-down menu." You can, however, change the channel in the Arrange window's Parameter box to a sub-channel shown in the Instrument List (one without a slash through it on the multi-instrument), and the track's instrument will change to the selected sub-channel.

Cabling

To connect the output of an Environment Object directly to the input of a sub-channel, hold down Option, and connect it the via the Instrument List (see "Cabling" on page 160).

Multi Instrument Window

Double-clicking on a multi-instrument opens the multi-instrument window:

Program Names:							
Grand Piano	DrawOrgan	Acoustic Bs.	Strings	Soprano Sax	Square Wave	Ice Rain	Tinkle Bell
Bright Piano	PercOrgan	Fingered Bs.	Slow Strings	Alto Sax	Saw Wave	Soundtrack	Agogo
ElectricGrand	RockOrgan	Picked Bs.	Syn. Strings1	Tenor Sax	Syn. Calliope	Crystal	Steel Drums
HonkyTonkPno.	Church Organ1	Fretless Bs.	Syn. Strings2	Baritone Sax	Chiffer Lead	Atmosphere	Woodblock
E. Piano1	Reed Organ	Slap Bass 1	Choir Aahs	Oboe	Charang	Brightness	Taiko
E. Piano2	Accordion Fr	Slap Bass 2	Voice Oohs	English Horn	Solo Vox	Goblin	Melo Tom
Harpsichord	Harmonica	Synth Bass 1	SynVox	Bassoon	5th Saw Wave	Echo Drops	Synth Drum
Clavinet	TangoAcd	Synth Bass 2	OrchestraHit	Clarinet	Bass&Lead	Star Theme	Reverse Cym.
Celesta	Nylonstr. Gt.	Violin	Trumpet	Piccolo	Fantasia	Sitar	Gt FretNoise
Glockenspiel	Steelstr. Gt.	Viola	Trombone	Flute	Warm Pad	Banjo	Breath Noise
Music Box	Jazz Gt.	Cello	Tuba	Recorder	Polysynth	Shamisen	Seashore
Vibraphone	Clean Gt.	Contrabass	MutedTrumpet	Pan Flute	Space voice	Koto	Bird
Marimba	Muted Gt.	Tremolo Str.	French Horn	Blown Bottle	Bowed Glass	Kalimba	Telephone 1
Xylophone	Overdrive Gt.	Pizzicato Str	Brass 1	Shakuhachi	Metal Pad	Bag Pipe	Helicopter
Tubular-Bell	Distortion Gt	Harp	Synth Brass1	Whistle	Halo Pad	Fiddle	Applause
Dulcimer	Gt.Harmonics	Timpani	Synth Brass2	Ocarina	Sweep Pad	Shanai	Gun Shot

☑ Use GM drum program names for channel 10

Name and Short Name

At the top left, under *Device Name*, you can enter the full name of the multi-instrument. To the top right, under *Short Device Name*, you can also enter a short name. This short name is used in the Arrange window track list, when the program name is displayed. The short name is shown directly beside the icon, so leave a space in front of it, if you want uniform (name) spacing in the track list.

Depending on whether or not you have checked the sub-channel's Prg box, the following information will appear in the Arrange window track list:
• the name of the multi-instrument and channel number (if the box is not checked) or
• the short name, channel number and program name (if the box is checked).

Program Names

There are 128 program names in the multi-instrument window. A total of 15 banks of 128 program names are available. There are several ways of entering the program names:
• by double-clicking on the name (via the text input field),
• by copying (via the Clipboard) from a different multi-instrument, or from a word processing program. The Clipboard functions for a whole sound bank are available in the text import pull-down menu (downwards arrow at the top right). First, copy the program numbers or General MIDI names to the Clipboard, and add them to a word processor document. You can then edit the names and copy the whole section back again.
• if you want to use program numbers instead of names, select *Init Names as Numbers* from the text import menu.
• if you want to use General MIDI program names, select *Init General MIDI Names*.

If the *Use GM Drum Names for Channel 10* box at the very bottom is checked, the standard GM drum set names will be shown in the Prg pull-down menu of the Parameter box for sub-channel 10.

If the *Prg* box in the selected sub-channel's Parameter box is checked, you can send a program change message by selecting a program name in the multi-instrument window (either by clicking, or using your computer's arrow keys).

Banks

On the left, above the program names, you can choose one of 15 available sound banks (0 to 14) via a pull-down menu. The top item ("No Bank specified. Names of Bank 0 used.") can be used if that particular sound generator does not understand bank select messages, or only has 128 sound programs. Bank 0 is always initialized. The first time you choose one of the banks numbered 1 to 14, you will be asked whether or not you want to initialize this bank. Press Enter or Cancel if you don't want to initialize the bank. Non-initialized banks do not have their own program names, but use the names of the equivalent program numbers from bank 0. You should only initialize additional banks if you want to enter program names for those banks, because each initialized bank uses more memory.

In the pull-down menu to the right, labeled *Bank Message*, you can define the MIDI events that are sent when you switch between the banks of the multi-instrument. Different bank select formats are used by different MIDI instrument manufacturers—please consult your instrument's manual to see whether it supports bank select messages and if so, what format it uses. With modern synths, there's a good chance the format will be one of the top items in the pull-down menu: either controller# 32 or controller# 0. There are also presets to accommodate several of the more common types of synth. If your synth doesn't use one of the formats listed, check out the section on defining your own bank select commands (see "Defining Custom Bank Selects" on page 169).

Defining Custom Bank Selects

Logic provides 63 bank numbers (0 to 62) for each single standard instrument, multi-instrument sub-channel, or mapped instrument. You can create custom lists, consisting of as many events (of any kind, even SysEx) as you wish—for each of these banks. Whenever you change the bank manually or send a standard bank change message from Logic, the entire list for that bank will be transmitted to your synth.

If you need more than 63 banks for a particular MIDI device, use several instrument Objects.

To set up custom bank select messages, first select the instrument, then choose *Options > Define Custom Bank Messages.* A window similar to the Event List will open, with a single, default, bank select message for banks 0 to 15. (The default used is a MIDI controller #0 message, with a value equal to the bank number).

You can create MIDI events here in exactly the same way as in the Event Editor, by cutting, copying, inserting, and editing. The only difference is that you enter the desired bank number, rather than a time position.

The letter in parentheses next to the bank number allows you to control the order of transmission, when a bank select requires more than one message.

As an example:
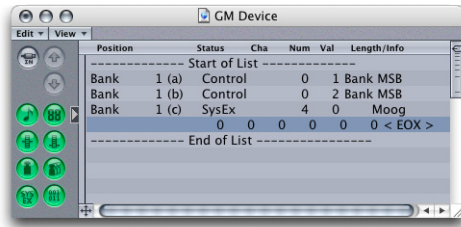
Here, the Bank Select command "Bank 1" was set up to send three events: first, (a) a controller #32 message with a value of 1, then (b) a controller #0 message with a value of 0 and finally, (c) a SysEx message.

If there are no events defined for a particular bank, a standard Bank Select message will be sent for that bank.

The custom bank select information becomes part of the instrument, and will be automatically copied with it, should you replicate the instrument Object.

For bank messages that need a channel (MIDI controller messages, for example), the channel of the instrument is used. This feature is especially useful for multi-instruments, as you only need to create one set of bank messages for all 16 sub-channels. If an instrument's channel is set to *All*, channel 1 is used.

On multi-instruments, the bank select message (whether it's a standard controller or a string of events you've configured) is also used by SoundDiver, if Autolink is switched on. This enables it to request the program names in the current bank.

Mapped Instrument
This instrument is particularly useful for drum instruments or any drum-mode MIDI device.
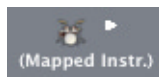
A drum-mode device is one which assigns different sounds to different MIDI notes on the same MIDI channel. Any input note may be routed to a different output note and assigned its own velocity setting, notation, name, and output cable. You can also protect mapped instruments from being accidentally transposed.

To create a new mapped instrument, select *New > Mapped Instrument*.

A mapped instrument is useful for drum programming. It is used just like a standard instrument, but has the following special features:

Each individual input note can be:
- named (snare, hi hat and so on);
- mapped to an output note (F# and G# for the same hi-hat sound, allowing you to play rapid repeats);
- given a velocity offset;
- assigned its own MIDI channel;
- sent to one of up to 16 output cables (this allows you to create a single instrument that addresses multiple sound sources);

Object Parameter Box
The mapped instrument's parameters are a subset of the standard instrument (see "Standard Instrument" on page 163) parameters. The missing settings are available on a note-by-note basis in the mapped instrument window.

GM Mixer Object
The GM Mixer is a collection of 16 fader "modules", configured to emulate a virtual mixing desk for 16 MIDI channels. Each module has controls for volume, mute, preset, bank, and four assignable knobs (one of which is typically used for pan). There are optional controls for standard XG and GS effects.

The GM Mixer can be directly connected to an output port, via its Parameter box.

To create a new GM Mixer, select *New > GM Mixer*.

The GM Mixer is intended for controlling the 16 channels of a MIDI device which conforms to the GM, XG, or GS standard. This includes the GM set of 128 program names (with variation banks for XG or GS), MSB/LSB bank select messages, and standard controller names (#1 for mod wheel, #2 for breath, #7 for volume, #10 for pan, #11 for expression, and so on).

Most of the GM Mixer's set up is done in the mixer itself, but there are also a few parameters in its Parameter box.

Cha/Port

Like other instrument Objects, the GM Mixer can also have a direct MIDI output connection. This is set in the line below the channel in the Parameter box. The Channel parameter determines the channel number of the lowest GM Mixer module. You can use this, together with resizing the GM Mixer window, to create sub-mixers for any continuous string of channels (3 to 7, for example).

Legend

The Legend checkbox toggles the display of the legend along the left edge of the GM Mixer. The Legend not only indicates what the rows of controls do, it is used to set the function of the top four rows of knobs. After the GM Mixer is set up, you can hide the legend to save space.

Bank

The *Bank* checkbox toggles bank MSB/LSB display below the program name display, at the bottom of the GM Mixer. You can save space by hiding bank display, unless you need to select program banks numerically.

Keyboard Object

The keyboard Object is used for creating notes with the mouse. It will also display all notes passing through it. In this sense, you can think of it as a realtime, note-on monitor.

You can create a virtual keyboard by selecting *New* > *Keyboard*.

The keyboard Object generates MIDI note events when clicked with the mouse. It also displays note events passing through it—when a note is being held, the corresponding key is reversed in color. Although you can record the output of the keyboard in Logic, its main purpose is for testing and monitoring in the Environment.

Apart from the standard parameters, you can also set the MIDI channel, a fixed velocity for all notes and the octave of the lowest note on the keyboard (which is always a C). You can re-size the keyboard to control its range above the lowest note. Shift-click the keyboard to select, and move it.

Monitor Object

The monitor Object displays all MIDI events passing through it, and retains the last 32 such events. You will need to resize it to see more than 5 events at a time.
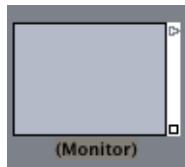
(Monitor)

To create a monitor Object, select *New > Monitor*. The monitor shows all events (MIDI and meta) passing through it. It remembers the last 32 events, with the newest events shown at the bottom of the list. You can resize it to show from 1 to 32 events. (You can make it even bigger, if desired).

Monitors are very handy as both testing, and branching devices. When coupled with Objects that have functionally different outputs (the channel splitter and mapped instrument, for example), monitor Objects can be used to attach more than one output cable to the same function.

Click in the body of the monitor to clear it.

Channel Splitter Object
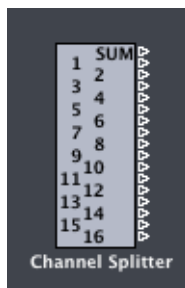
Channel Splitter

The channel splitter routes MIDI events by channel. It offers an output for each of the 16 MIDI channels, and an additional "SUM" output. If a particular channel output is not connected to anything, events for that channel will appear at the SUM output.

To create a new channel splitter Object, select *New > Channel Splitter*. You can use the channel splitter to reroute MIDI events to different cables, in accordance with their MIDI channels. Every MIDI event received at the channel splitter input is automatically routed to the output that corresponds to its MIDI channel. If no cable is connected to the corresponding output channel, the event is rerouted to the SUM output (at the top). The SUM output is used for the events of channels with no individual output connections.

Arpeggiator Object

The arpeggiator turns chords into arpeggios. It plays the currently held notes—individuallyin a selectable pattern (up, down, random, and so on), and at a selectable speed that ranges between whole-notes and 768th-notes.

The arpeggiator features a number of useful parameters including; note-length, repeat on/off and octave doubling. All of its parameters can be changed in real time through the use of MIDI controller messages.

Important: Logic must be in play (or record) mode for the arpeggiator to work.

To create a new arpeggiator, select *New > Arpeggiator*.

The arpeggiator cycles through all held notes (arpeggiates chords) within its range. You can set the range to be as wide or narrow as you wish. There are parameters for direction, velocity, speed, note length, start quantize (snap), repeats, octaves, and velocity offset. All of the arpeggiator's parameters can be MIDI controlled in real time, which adds immensely to its versatility.

To use the arpeggiator, you must place it in the MIDI signal path, and Logic's Transport must be running. (For technical reasons, the arpeggiator resets on cycle jumps). Typically, you would assign the arpeggiator to an Arrange track, and cable its output to an instrument or port Object. You can, of course, insert it anywhere else in the MIDI signal path.

Once set up, you can use the arpeggiator with live MIDI input, or for MIDI Region playback. You can also record the output of the arpeggiator by cabling it into the sequencer input Object. If you do this, be sure you either record to a no output track, or break the arpeggiator's connection to the MIDI output.

Arpeggiator Parameters

The arpeggiator features the following parameters (the numbers in parentheses are Control Base offsets—see below):

Direction (+0)
The direction of the arpeggiated chord:
- *Up*: Lowest note to highest note
- *Down*: Highest note to lowest note
- *UpDn*: Up and down—highest and lowest notes repeat
- *Auto*: Up or down depending on whether the second chord note arrived before or after the first chord note
- *UpD2*: Up and down—highest and lowest notes don't repeat

- *Rand*: Notes play in random order
- *All*: All notes play at once (useful when repeat is on)

Vel (+1)
Velocity values of the arpeggiated notes.
- *1* to *127*: Fixed velocities,
- *Orig*: the velocities of the recorded notes are retained,
- *Rand*: random velocities between 1 and the original value.

Lim (Low: +2, High: +3)
This is where you can define the pitch range (between C-2 and G8) for the chord arpeggiation. Any chord notes outside this range are passed directly to the output. This is useful when you want to solo above, or play a bass line below an arpeggiated chord.

Res (+4)
This is where you set the rhythmic note value (the speed in note divisions) of the arpeggio via a pull-down menu. None = arpeggiator switched off.

Len (+5)
This is where you define the length of the arpeggiated notes. The Orig setting retains the lengths of recorded notes.

Snap to (+6)
Unless this value is set to None, the arpeggiator will wait for Logic's transport to reach the next indicated note division before starting the arpeggio. This is useful for rhythmically synchronizing the arpeggio with other MIDI data.

Repeat (+7)
On continues the arpeggio for as long as the chord is held down. Off finishes the arpeggio after one run.

Octaves (+8)
The arpeggio can be repeated over 1 to 10 octaves.

Crescendo (+9)
The velocity value set here (–99 to +99) is added every time the arpeggio is repeated (provided *Repeat* is set to On, of course).

Control Base
All 10 parameters of the arpeggiator can be remote-controlled by controller events. The *Control Base* parameter determines the controller number for the first parameter (Direction). The other parameters will be controlled by subsequent controller numbers. To figure out which controller number will be used for a certain parameter, add the number shown in brackets (behind the parameter names in this document) to the *Control Base* value. When *Control Base* is set to Off, MIDI control of the arpeggiator is disabled.

Delay Line Object

The delay line echoes MIDI events passing through it—at intervals ranging from one tick to 256 whole notes.

(Delay Line)

There are parameters for the number of echoes, (echo) transposition and velocity offset.

The echoes of each incoming event are cycled through each cabled output of the delay line.

Important: Logic's transport must be running for the delay line to work.

To create a new Delay Object, select *New > Delay Line.*

This Object repeats any MIDI events, much like a delay line effect. Pitch and velocity offsets can be added to note events. As with the arpeggiator, you will need to place the delay line in the MIDI signal path, and will need to start Logic's Transport for it to work.

The delay line can send up to 99 repeats, at intervals ranging from one tick to 256 whole notes. You can suppress the original note. Repeats leaving the delay line will cycle through all cabled outlets, allowing you to play each repeat with a different sound.

Delay Line Parameters

The Delay Object has the following parameters:

Thru Original
If this box is checked, the original signal is passed thru. If unchecked, the original signal is suppressed.

Repeats
Number of event repeats (1 to 99). Setting 0 = delay switched off.

Del
The delay time between the individual repeats. The left value is in divisions, and the right value in ticks.

Trp
The transposition of note events per repeat (±99 semitones).

Vel
The change in the velocity values of note events per repeat (±99).

Physical Input/Sequencer Input Objects

The physical input Object represents the physical inputs of your MIDI interface; the sequencer input represents Logic's MIDI input. You can only have one of each of these Objects in the Environment. The default sequencer input Object is named "to Recording & Thru".
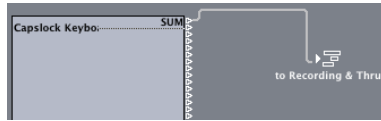
To create either type of input Object, select *New > Physical Input* or *New > Sequencer Input*. To make use of an existing Object, drag it onto the relevant layer. This will not affect its cabling.

Physical Input Object

The physical input represents the MIDI inputs of your MIDI interface. Each song can have only one physical input Object. You only need to create a physical input Object if you have deleted the one that existed when the song was created. Do so by selecting *New > Physical Input*.

The physical input Object receives MIDI signals from the inputs of the MIDI interface(s) connected to your computer.

Sequencer Input Object

MIDI events arrive at Arrange window tracks thru the sequencer input Object. If nothing is cabled into the sequencer input Object, nothing can be recorded in Logic. Typically, the physical input Object is cabled directly to the sequencer input Object but other Objects can be inserted between them. Typical candidates are; a monitor, keyboard, or cable switcher Object—feeding various processors such as an arpeggiator, a delay line, and so on (See the *Clicks & Ports* layer of the Logic default Song.) You can also cable the output of complex Environment processes into the sequencer input Object, in order to record the processed signal.

Each song can have only one sequencer input Object. You only need to create a sequencer input Object if you have deleted the one that existed when the song was created. If you do need to create one, select *New > Sequencer Input*.

MIDI Metronome Click

The MIDI metronome click Object is used to create note events at bar, beat, and division intervals. These can be sent to either; a MIDI port or the internal speaker.

There is a button on the Transport that turns the MIDI metronome click on and off.

A long click on this button will allow you to open the *File > Song Settings > Metronome (see "Metronome Settings" on page 466)*. In this pane, you can also set the MIDI metronome click to play during recording and/or playback. This dialog mirrors the settings in the Parameter box of the MIDI metronome click Object: Checkboxes for *Bar*, *Beat*, and *Division* allow you to generate note events separately for bars, beats, and divisions. The Cha, Note, and Vel parameters define the MIDI channel, note number and velocity of generated notes. The MIDI port parameter allows you to set a direct output port for the metronome.

Each song can have only one MIDI metronome click Object. You only need to create a MIDI Metronome Click Object if the one that existed when the song was created has been deleted. If you do need to create one, select *New > MIDI Metronome Click*.

Internal Objects

"Internal" Objects include instruments located inside your Macintosh (such as a PCI card and/or software synthesizers). Although communication with sound sources inside the computer does not actually use MIDI, it still conforms to the MIDI communication protocol. Internal Objects have an input, but no output. They therefore act like extra output ports, which are hard-wired to the relevant sound generator.

Using Internal Objects

If you want to address internal sound sources, you must first create an equivalent internal Object (see below). Then create a standard instrument, multi-instrument or mapped instrument for the device. Next, connect the output of the instrument to the internal Object. Then use the instrument as you normally would.

Apple QuickTime

The QuickTime system extension offers a software-based GM sound generator. The "QuickTime Musical Instruments" file must be present on your System.

To create a virtual representation of the QuickTime synth, choose *New > Internal > Apple QuickTime*.

This software synth is 16-part multi-timbral. As usual, you can switch sounds via program changes; these are arranged according the GM table. Channel 10 is always set to drum sounds, with GM key assignments. The QuickTime synthesizer reacts to notes and program change commands, as well as to pitch bend (±2 semitones) and the main volume controller (#7).

The first note is used to initialize the relevant MIDI channel of the QuickTime synthesizer, and is not played.

Internal—ReWire

New > Internal > ReWire allows you to send MIDI data to ReWire2 compatible applications and their software instruments.

Starting/Stopping the ReWire Connection

To connect to a ReWire compatible software instrument, first launch Logic and then the ReWire application. When shutting down, first quit the ReWire application, then Logic.

Settings

Apart from common parameters, the Rewire Object offers three settings:

Device: This setting refers to the ReWire application(s) that Logic can connect to. If one or more ReWire applications are running, it will display the names of these applications.

Bus: Lets you choose the ReWire Bus from all available ReWire busses. If a ReWire application provides bus names, they will be shown. If using Reason, the names of the instruments available in the Reason Rack will be shown from Bus 6 upwards, in place of numbers.

Cha: Sets the MIDI channel of the ReWire Object.

Reason Settings

When using Reason, the Bus numbers translate as follows:
• *Bus 1*: addresses the instrument chosen as the Live Track in Reason.
• *Busses 2 to 5*: address Busses A-D of Reason's MIDI In device.
• *Busses 6 and higher*: addresses the instruments of the Reason Rack.

ReWire Behavior

In *Preferences > Audio > Driver*, you can set the ReWire behavior for each ReWire compatible audio driver type. When sending MIDI data to a ReWire compatible software instrument, you can choose between these modes:

- *Playback mode*: use this mode when playing back MIDI tracks via ReWire. This setting requires less CPU power.
- *Live mode*: use this mode when playing a ReWire instrument live. This setting requires more CPU power.

MIDI Outs

Port Objects represent the MIDI output(s) of your MIDI interface(s). You can also use them to address the internal synth on your soundcard (if applicable).

To create a port Object choose *New > MIDI Out Port*.

The lowest line in the Parameter box sets the MIDI output driver for the port Object. The signals from all MIDI cables plugged into this Object will then be sent via the selected MIDI output.

Remember that you can also address any MIDI output port directly from instrument Objects (and the GM Mixer Object).

Faders

Faders (see "Faders—Overview" on page 181) are used to send MIDI events by clicking or click-dragging on them. Faders come in different forms (knobs, sliders, numerical, and buttons). Fader Objects respond to incoming MIDI events.

Audio Objects

The Environment's audio Object (see "Audio Objects in the Audio and Track Mixer" on page 194) is the "building block" of the Environment Audio Mixer. They are also used to create audio tracks in the Arrange window—audio tracks are simply tracks with Audio Objects assigned to them.

Although audio Objects are not part of the MIDI signal flow, they still allow MIDI controller messages to control aspects of Logic's audio playback. Any MIDI Object can be cabled into an audio Object, thereby feeding control data into the audio Object.

Faders

Faders—Overview

To create a new fader, select *New > Fader > …* A sub-menu appears, where you may select the style of fader you want.
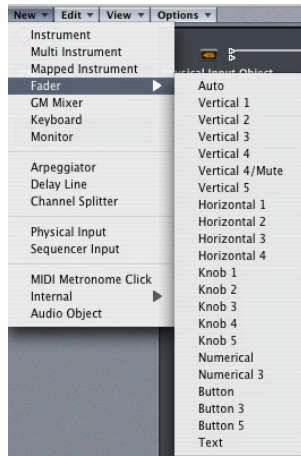
The style of a fader determines it's onscreen appearance (slider, knob, menu, numerical) and how it responds to the mouse (click and drag, double-click and type a number, click, and select from a menu). The Auto style fader—the default style if you create a fader with a key command—changes styles as you alter its shape and size.

The type of fader determines what events the fader sends out and responds to.

In general, a fader's style is completely independent of its type. A cable switcher can look like a button, a knob can send out MIDI events, and so on. Don't worry about selecting the wrong fader style or type from the New menu—you have complete control of a fader's style and type from its Parameter box.

Some of the styles have numerical displays. When there is a numerical display, you can double-click it, and type in the desired values. When you drag on any of the sliders or knobs, the series of values that are sent out depends on the fader size and scrolling speed—not every consecutive value is sent out at smaller sizes. If you drag slowly on the numerical field, however, you will send all consecutive values.

The text-style fader behaves like a pop-up menu. If double-clicked, a window will open, allowing you to enter text for each of the menu positions. A checkbox enables the names to be scrolled, rather than chosen from a menu.

Fader Operation

Normally, you'll grab the surface of a fader, and drag it vertically or horizontally, depending on it's style.

Knobs can be dragged either vertically or horizontally.

When the fader features a numerical display, you can grab this number and use the mouse as a slider. The advantage is that if you drag slowly, the fader output will move in increments of 1 value unit, regardless of the size of the Object. When using the fader itself as a slider, values may jump in larger increments, depending on the size of the fader and dragging speed. You can also change values in single steps by dragging on the slider or knob while holding down Control.

Buttons only send two values, the lowest and highest of their range set in the Parameter box. You change a button's state by clicking on it.

Names with Numbers

If you name one Object in a selected group of Objects with a name that ends in a numeral, the remaining Objects will be renamed with this name, but with sequentially increasing numerals. As an example: Selecting several Objects and naming one of them "Object 1" will result in the ensuing Objects being renamed as "Object 1", "Object 2", "Object 3" and so on.

Special Functions
Grouping Faders
If you select several faders and move one of them, all selected faders will move proportionately. As long as all faders remain selected, their relative positions will be retained (even after one or more of the faders has reached its minimum or maximum position).

Moving the fader group with Option pressed changes all values in a linear fashion (the absolute value differences are maintained).

Moving the fader group with Shift-Option pressed changes all faders to the same value.

Sending Fader Values
You can use the *Options > Send All Fader Values* and … > *Send Selected Fader Values* functions to make all fader Objects or all selected fader Objects send their current values. Use of this function in conjunction with Logic's Record/Pause mode allows you to record a "snapshot" of all current fader positions. This is especially useful for virtual mixing desks, or synthesizer panels. (*Send All Fader Values* only sends values for faders that are cabled to other Objects.) The *Song Settings > MIDI Options > Send All Fader Values after loading* option automatically sends all fader values after a song is loaded.

Resetting Fader Values
Options > Reset Selected Faders sets all selected faders to zero, and transmits this data.

Recording and Playback of Fader Movements
Recording Fader Movements
You don't need any special cabling to record the data generated by a fader. All data generated by faders is recorded on the selected track when Logic is in record or record/pause mode. The recorded events correspond to the out definitions of the faders.

Playing Back Fader Movements
Any fader will react to incoming events that match its In definition. The fader must, of course, be in the MIDI signal path. Typically, you accomplish this by cabling the track instrument into the fader. For automated mixing tasks, it is useful to create a new (standard) instrument for the sole purpose of fader automation. Ensure that the instrument (which might be named "playback") has no direct MIDI output, that its channel setting is All, and that it is connected to the first fader in any chain of serially-cabled faders.
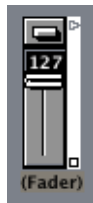
Fader Styles

The fader's style is shown in the line under the icon. It can be changed by clicking on the current style name, and selecting the new style from the pop-up menu.

Remember that a fader's style does not usually affect its function—you can select the most convenient style for the desired use of the Object.

The following section provides notes on some of the fader styles:

Vertical/Mute

This is exactly like the Vertical 4 fader style, with an added mute switch. When you press the mute switch, the fader sends an event matching its Out definition with a value of 0. The fader's movements are not sent while the mute switch is on (down). The current fader value is sent when you turn the mute switch off (up).

Numerical

You can double-click the numerical field of a numerical fader, and type in a new value. If you click and drag slowly on the numerical field, fader values will change in single step increments.

Buttons

Button style faders send only two possible values, corresponding to the minimum and maximum values of their range. When on (hollow or Xed in the illustration), the maximum value is sent. When off (filled or not Xed in the illustration) the minimum value is sent. If the minimum and maximum range parameters are set to the same value, the button sends this value each time it is clicked.

Text

Text faders function like Numerical faders, but can display text for each of the 128 possible MIDI values (0 to 127). Double-clicking on the surface of a text fader opens the text fader window.

Clicking on a position in this window will cause the corresponding fader value to be sent. (This is similar to selecting programs by name in the multi-instrument window). Double-click on a position in this window to type in the desired text. By default (when you create a text style fader), the text positions contain numerical values. You can use this feature to create numerical style faders with colored backgrounds.

Clipboard Functions

The pull-down menu located at the top right of the text fader window provides cut, copy, and paste Clipboard functions. You can use these facilities to transfer the entire list of names to a text editor, for more convenient editing. Note that empty lines (and lines that only contain spaces) are ignored. If you want to insert blank positions in the list, use Option–Space bar.

Behave as Menu

Check the *Behave as menu* box to make the text fader act like a pull-down menu. When this box is unchecked, the text fader acts like a scrolling menu.

Text Fader Range

A text fader only allows the entry of as many names defined by its range. To clarify, if you set a text style fader's range to 0, 1 you can only enter two values. You should always set the minimum necessary range for a text fader, as this saves memory. In any case, remember that the first name corresponds to the lowest value in the range (not necessarily 0) and the last name corresponds to the highest value (not necessarily 127).

If you force a text fader to a value outside its range (with MIDI input) it will display "---" for values below its range and "+++" for values above. The one exception is when the fader's range is 0, 1 in which case all values above 1 will display the name for value 1.

Fader Functions: MIDI Events

Each fader has an *In* and an *Out* definition. The *In* definition determines the types of MIDI events that can remote control the fader (the event types it reacts to). The *Out* definition determines the types of MIDI events the fader sends out. (A fader can, therefore, convert one type of MIDI event to another).

Most MIDI events consist of three bytes. The first byte indicates the type and channel of the MIDI event (a note on channel 3, for example). The second byte indicates the first data value (the pitch of a note event, for example) and the third byte indicates the second data value (the velocity of a note event, for example). A few MIDI events only use two bytes (program change and aftertouch). Some, such as faders (and transformers) always provide for 3 bytes, with the second byte being discarded for these special, 2-byte messages.

Fader parameters are provided for setting the message type, MIDI channel and the first data value. Note that the message type and MIDI channel are actually combined in the resulting MIDI event. The second data value is determined by the fader setting, or in the case of remote control, by the incoming MIDI event.

Here are the *In* and *Out* definition parameters:

Out (or *In*): defines the event type (use the pull-down menu shown in the diagram).

Channel (1 to 16): defines the MIDI channel of the event.

-1- (0 to 127): defines the first data byte of the event. In some cases, such as pitch bend, this is an actual data value. In other cases (MIDI controllers), this indicates the controller type (volume, pan, and so on, as examples). In other cases, such as aftertouch, this byte is unused.

Here is the meaning of the -1- parameter and fader position for each of the *In* and *Out* definition choices:

Note On
The -1- parameter sets the pitch, and the fader position sets the velocity. This is most useful as an *In* definition—for trapping specific notes and converting them to other MIDI events, or simply monitoring their velocity. If you move a fader with an *Out* definition set to Note On, a note-off MIDI event will immediately follow the note-on. This might be useful for creating onscreen drum pads from button style faders, for example.

P-Press
The -1- parameter sets the pitch, and the fader position sets the amount of Poly Pressure (key pressure or polyphonic aftertouch).

Control
The -1- parameter sets the MIDI controller number (the controller type), and the fader position sets the controller value. The controller type can actually be selected by name, via the pull-down menu that appears when you click-hold on the -1- parameter.

Program Change
The -1- parameter is ignored. (In earlier versions of Logic, this sets the program bank.) The fader position determines the program number.

C-Press
The -1- parameter is ignored. The fader position sets the channel pressure (monophonic aftertouch) amount.

PitchBd
The -1- parameter sets the pitch bend LSB, and the fader position sets the MSB. Typically, you would set the -1- parameter to 0, and use the fader to control the "coarse" pitch bend amount. A -1- setting of 0, and a fader position of 64 results in no pitch bend.

Fader Functions: Range, Val as
Range
The range parameter contains two numbers—the left one sets the lowest possible fader value, and the right one sets the highest. Note that these limits can be exceeded by MIDI remote control. When the fader style is a button, the range determines the in and out position values of the button.

For text style faders, the first name always corresponds to the low end of the range, and subsequent names correspond to incremental range values, up to the top range. The number of names that can be entered into the window is limited by the range.

Val as
This parameter determines the way that numerical values are displayed by the fader:

Num
The fader value is displayed directly as a number (0 to 127).

Pan
Fader value 64 is displayed as "0"; smaller values appear as negative numbers and larger values as positive numbers (–64 to 63).

Hz, Oct, dB, ms
These display formats are tailored to various DSP functions.

bpm
An offset of 50 is added to the fader value. This displays the correct tempo settings for the special tempo control fader.

If none of the above formats is suitable, consider using a text style fader, and entering the desired display values as text. Examples include percentages, note names and program names.

Fader Functions: Filter
This parameter provides various filter options for MIDI events:

off
All incoming MIDI events are allowed to pass through. All events that match the input definition are converted, in accordance with the output definition.

Other
All MIDI events that do not correspond to the input definition are filtered. All events that match the input definition are converted in accordance with the output definition, and allowed to pass through.

Match
All MIDI events that match the input definition are filtered, all others are allowed to pass.

All
All incoming MIDI events are filtered.

Thru
All MIDI events coming from the physical input Object are filtered. This is the same as turning off all events coming from Logic (from Regions or the Environment).

Use this filter mode to prevent MIDI feedback, by blocking incoming MIDI events from being sent back out.

Shot
When the fader is moved with the mouse, only the final value (the value when the mouse button is released) is sent.

14 Bit
Used in conjunction with pitch bend, this allows 2-byte (fine tuning) pitch bend events. Used with controller messages, this causes the fader to send two MIDI controller messages—one for the MSB and one for the LSB.

For the 14 Bit setting to work, the fader's In and Out definitions must be the same. For controllers, the MSB uses the In definition controller number, and the LSB uses the controller number 32 higher. This conforms to the MIDI standard for sending 14-bit controller data.

Note that with this filter setting, the fader's range maximum can be set to 16,383, and a fader value of 8192 represents no pitch bend.

Feedback
When the Feedback parameter is unchecked, the fader will automatically prevent feedback loops resulting from circular cabling (the fader remembers when a specific MIDI event has passed through it and will not allow it to pass through again). Checking the *Feedback* checkbox will allow this.

Environment Exchange
One of the main reasons for the Environment is to customize Logic to your MIDI studio. As each Logic song has its own Environment, you may occasionally need to move Environment patches from one song to another.

Whenever you want to exchange Environments between songs, there is a source song containing the desired Environment and a destination song with an Environment that you want to change. The destination Environment must be the song in memory (the song that is currently open). The source song will be a file on your hard drive (or any other media such as a CD, Zip, and so on). Logic will present an Open dialog, allowing you to select the source song when importing an Environment.

The Environment Objects you wish to import should be contained on a single Environment layer, especially if you are importing a complete Environment patch— several Objects that are cabled to each another. If these Objects are not on one layer, you should first open the source song and rearrange the Environment patch by moving all desired Objects to the same layer.

To import an Environment layer, select *Options > Import Environment > Layer*, select the source song in the resulting file selector box, and then choose the desired layer in the dialog that appears. This layer, and all of its Objects will be inserted in the destination song, at the same layer position (the same place on the Layer's pop-up menu) that it occupied in the source song. Note that this inserts a new layer into the destination song—its original layers will be shifted as needed. This process can also be repeated, to import other layers from the same source song.

Logic's Mixing Facilities

6

Logic provides you with different Mixer windows, designed to make mixing a painless and intuitive process.

Logic's two major Mixer windows—the Audio Mixer and the Track Mixer—are the topic of this chapter. We will first have a close look at the specific characteristics of the Audio Mixer. Before we move on to the Track Mixer, we will provide you with detailed information on Audio Objects, which are the building blocks of the Audio and Track Mixers. Finally, you'll get in touch with all of the Track Mixer's special features. We'll also have a look at MIDI channel strips, which are displayed right alongside audio tracks in the Track Mixer.

If you compare both Mixer windows, you can see that they look quite similar. There are, however, some differences in the Parameters area: The Audio Mixer is a layer of the Environment and therefore offers not only the Layers menu, but also the appropriate Object Parameter box. In the Parameters area of the Track Mixer, you can see several Filter buttons, labeled *Global*, *MIDI*, *Input*, *Track*, *Inst*, *Aux, Bus*, and *Output*. These Filter buttons make the Track Mixer a very convenient tool for mixing, as they allow you to limit the display to the tracks you're interested in.

Another obvious difference between the two Mixer windows is that the Audio Mixer consists solely of Audio Objects; you will not find any MIDI channel strips in it. The Track Mixer displays MIDI tracks beside audio tracks, allowing you to mix all song tracks in one window.

Audio Mixer

The Audio Mixer is one of the Environment layers in the default song (the template loaded by Logic after launching). To open it, select *Audio > Audio Mixer*, or go to the Environment (*Windows > Environment* or Command-8), and choose *Audio* from the Layer menu.

Note: If you press Option while opening a Mixer window, the Mixers will appear as float windows.

The specification and size of the Audio Mixer depends on the hardware used; it configures itself when you start Logic, or create a new song. The Environment's Audio Object is the "building block" of the Audio Mixer. All Audio Objects used in your current song are shown in the Audio Mixer. If plug-ins and auxiliary sends are included, the size of the Mixer increases automatically.

Setting Up Your Audio Mixer

The Audio Mixer provides you with various functions that allow you to build your virtual Audio Mixer with all required components. The following Audio Object types can be used for this purpose:

- *Track*—Recording and Playback
- *Input*—Controls the Input Signal
- *Instrument*—Virtual Software Instruments
- *Output*—Controls the Output Signal
- *Bus*—Routing and Effects
- *Aux*—Auxiliary Object

To create an Audio Object:

1   Select *New > Audio Object* in the Environment's local menu.

2   Double-click the newly-created Audio Object icon, to make the channel strip appear.

3   Now go to the Audio Object's Parameter box, and set its Channel parameter to the desired Audio Object type.


To delete an Audio Object:

1   Select the Audio Object by clicking on its upper edge, or on its name.

2   Press Backspace. This sets the level of the track controlled by this Object to zero. If a duplicate of the Object being erased exists, it will remain in place, and its level will not be set to zero.

Connections

The signal within the various Audio Objects requires no cabling, or any kind of manual connection. The signal is routed via the corresponding slots in the Audio Object. As an example: the Send slots connect a Track or Instrument Object to the Bus Object; the Output slot connects the various Objects to an Output Object. Logic's virtual audio mixer resembles the routing and connection options of traditional mixing consoles.

Object Parameter Box

If the Parameter column is visible (select *View > Parameters* if it's not), a box will display the parameters of the selected Audio Object. Clicking on the triangle at the top of this box (next to the name) conceals/reveals its contents.
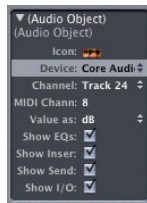
The name in the uppermost line of this box can be changed by clicking on it. This will also change the name displayed below the Object itself, and in the Arrange window (if no Track Name is specified). The check box to the left of the icon indicates whether or not the Audio Object will appear in the instrument selection menu of the Arrange window track list. You can change the icon via a pull-down menu if you wish, although the default icon is usually suitable.

Device

The *Device parameter* selects the hard disk recording system that the Audio Object is connected to. The default setting will be for the hard disk recording hardware installed on your system; entries referring to hardware not connected to your system are "grayed out" (see "Audio Drivers" on page 271).

Channel

The *Channel* parameter determines the type and channel of the signal controlled by an Audio Object.

The various options are:
- Track (see "Track Object" on page 211)
- Input (see "Input Object" on page 212)
- Instrument (see "Audio Instrument Object" on page 213)
- Bus (see "Bus Objects" on page 216)
- Output (see "Output Objects" on page 215)
- Aux (see "Auxiliary Object" on page 217)

Note: Stereo Inputs and Outputs are available as separate menu items.

When you select Audio Object types, you'll notice the following text styles are used:
- *Outline*: This indicates that the Object is not available. This happens when a song was produced on a system with more tracks than yours (track 9 on an 8-track system, for example).
- *Normal*: This is used for Objects that haven't been defined in the Environment, and are therefore not in use.
- *Bold*: Objects in bold have been defined in the Environment, and are in use.
- *"*"*: The Object is unavailable as it already exists in its stereo form.

MIDI Channel
The *MIDI Channel* parameter determines the MIDI channel that the Audio Object will respond to. You can control the Audio Object remotely, using MIDI controller information.

This also works the other way around. Once a MIDI channel number is set, you can generate controller information on this MIDI channel, by moving the sliders and knobs of the Audio Object itself.

When the Channel parameter is set, the MIDI channel is automatically set to the same number, as this usually makes things easier to remember. For channels above 16, 16 is subtracted from the track number, so that a Channel setting of 17 will default to MIDI channel 1, Channel 18 to MIDI channel 2, and so forth.

Audio Objects in the Audio and Track Mixer
Audio Objects are the building blocks of the Audio Mixer, and an important part of the Track Mixer. In the following section, you will learn about the differences between Audio Object types and how you can use them.

Multiple Selection of Audio Objects
Logic allows multiple Audio Object faders to be selected (by Shift-clicking) in the Track Mixer and Audio Mixer. The class (Instrument, Audio, Bus, Aux, and so on) of the channel doesn't matter.

To deselect multiple channels, click on any *un*selected channel. You can also select a previously unselected track in the Arrange window.

Once selected, all channels behave as a temporary "group", allowing you to quickly adjust a number of settings on all selected faders by performing an operation on one of the grouped faders. To adjust the listed parameters on all selected channels, follow these instructions:
- *Volume:* Simply drag the Volume slider on any selected channel. All volume changes are relative and logarithmic.
- *Pan:* Drag the Pan knob on any selected channel. All pan changes are relative.

- *Mute:* Click the Mute button on any selected channel. The Mute buttons of all selected channels will switch to the new mode.
- *Solo:* Click the Solo button on any selected channel. The Solo buttons of all selected channels will switch to the new mode.
- *Record Enable:* Click the Record enable button on any selected channel. The Record Enable buttons of all selected channels will switch to the new mode (note that only channels with different input sources can be record enabled simultaneously).
- *Send Level:* Drag the Send level knob on any selected channel. All Send level knobs of the corresponding Send slots change accordingly (relative changes).
- *Send Destination:* Click-hold on any of the selected channel's Send slot(s), and make your selection from the list. The corresponding Send slots of all selected channels will be routed to the chosen destination.
- *Inserts:* Click-hold on any of the selected channel's Insert slot(s), and make your selection from the list. The selected effect will be inserted into the corresponding Insert slot on all selected channels.
- *Input:* Click-hold on any selected channel's Input slot, and make your selection from the list. All selected channels will receive their signal from the chosen input(s).
- *Output:* Click-hold on any selected channel's Output slot, and make your selection from the list. All selected channels will be routed to the chosen output (pair).
- *Automation Mode:* Click-hold any selected channel's Automation mode pop-up menu, and make your selection from the list. All selected channels will be switched to the chosen Automation mode.
- *Group Assignment:* Click-hold any selected channel's Group display, and make your selection from the list. All selected channels will be assigned to the chosen Group.

Important: You can only perform the multi-channel *Send* and *Insert* options if no active Send or Insert is in the same slot on *any* selected channel. In other words, ensure that all selected channels have an unused Send 3, or Insert slot 4, for example, before using this facility.

Note: Clicking a fader or knob while holding Option resets the value to a neutral value: Option-clicking a volume fader sets it to 0 dB (90, if the *Value As* menu in the Object Parameter box is set to the *Num* option), Option-clicking a pan pot sets it to the center position, Option-clicking a send pot sets it to 0 dB (90).

Elements of the Audio Object

Here is an overview of all Audio Object elements. The list shows what elements are available in the different types of Audio Objects.

Element	Audio Object
Channel EQ	Track, Instrument, Input, Bus, Aux, Output
Inserts	Track, Instrument, Output, Bus, Aux
Sends	Track, Input, Instrument, Aux
Input	Track, Instrument, Aux
Output	Track, Instrument, Bus, Aux
Automation	Track, Input, Instrument, Output, Bus, Aux
Pan/Balance Control	Track, Instrument, Output, Bus, Aux
Levelmeter	Track, Instrument, Output, Bus, Aux
Headroom/Clip Indicator	Track, Instrument, Output, Bus, Aux
Volume Control	Track, Instrument, Output, Bus, Master, Aux
Mute	Track, Instrument, Output, Bus, Aux
Solo	Track, Instrument, Aux, Bus
Mono-Stereo	Track, Output, Aux, Bus
Track Arm	Track
Bounce	Output

Channel EQ

The Channel EQ is inserted into the first available Insert slot by double-clicking the EQ area on the upper portion of mixer channel strips. This area will change to a thumbnail view of the Channel EQ display. The thumbnails provide an overview of the EQ settings used in each individual channel.

Option–double-clicking will insert the EQ as the first plug-in, and move all existing plug-ins of this channel one slot down (and redirecting their automation data accordingly, if necessary).

Alternately, you can insert the Channel EQ in any desired slot as per other plug-ins. You'll find it in the EQ section of the plug-in list. This is the only way to insert multiple Channel EQs. It should be noted that only the first (topmost) Channel EQ can be displayed as a thumbnail.

More information about the parameters of the Channel EQ can be found in the *Logic Pro 7 Plug-In Reference*.

Inserts

If you have enough processing capacity, you can use up to 4 Inserts per Audio Object. An extra blank Insert is created, as soon as all of the currently displayed insert slots are used, up to the maximum allowed.

The Insert pull-down menu displays all available Logic plug-ins, as well as all correctly installed Audio Units plug-ins.

Note: Shift–double-clicking on a used (active) Insert slot will open the Plug-in window as a non-float window. Clicking on the minimize button at the top left of the window will place the Plug-in window on the Dock. It can be restored by clicking on the Dock icon.

Channel Strip Settings Menu

If you click on the word Insert on any channel strip, the Channel Strip Settings menu opens. This menu allows you to load and save the entire routing configuration of a single channel strip, including all loaded plug-ins and settings.

The ability to save an entire routing configuration can be used in a number of ways, such as:
• Setting up and storing complex multi-effect configurations—on any type of channel.
• Similarly, the configuration of a particular routing configuration for use with multi-output software instruments.
• Copying a routing or effect configuration between Projects.
• The rapid creation of new Templates.

The Channel Strip menu offers the following items:
• Next/Previous Channel Strip Setting: Loads the next or previous Channel Strip setting in the list.
• Copy/Paste Channel Strip Setting: Allows to you to copy and paste Channel Strip settings between channels or projects.
• Save Channel Strip Setting as: Saves the Channel Strip setting, and allows you to name it.
• Once you have created one or more Channel Strip settings, a list of settings will be shown below the menu functions. The active Channel Strip setting is denoted by a bullet.

As there are obviously different classes of Audio Objects, a number of sub-folders (Audio, Instrument, Aux, and so on) are automatically created in the /Applications/ Logic/Channel Strip Settings folder when you first save a Channel Strip setting. Channel Strip settings are identified by the "cst" file extension.

Important: Please do not attempt to change the Channel Strip Settings folder structure.

Note: Further information about Inserts and the use of plug-ins can be found in the first part of the Plug-In Reference.

Sends

The Sends allow you to send a portion of the Audio Object signal into an internal Bus or Auxiliary Object. The Sends connect the Track Object with a Bus Object or Auxiliary Object. No cabling is required for this or any other connection within the Audio Mixer.

Note: The Send routing options available vary, depending on the hardware you are using.

To create a Send:
1 Click on an empty Send slot and select one of the possible send destinations, using the pull-down menu that appears.
2 When you have selected the Send destination, you can regulate the amount of signal supplied by using the Send Amount control *knob*. As you are adjusting the level, the relevant value appears in the Send slot. You may assign up to 8 sends per track.

To remove a Send:
▪ Open the pull-down menu of an active Send slot, and select *No Send*.

To normalize the Send level:
▪ You can reset a Send to 0 dB (90) by Option-clicking on its Send Amount knob.

To bypass a Send:
▪ You can switch a Send to Bypass mode by Option-clicking on its Send slot. If a Send is active, its name will be blue. If a Send is switched off, its name is gray (bypass mode).

Post and Pre Fader Aux Sends

Sends in analog mixers are positioned either before ("pre") or after ("post") the fader. To select one of these options in Logic, click-hold the Send slot. The Bus menu opens, and you may select either Post or Pre at the top of the list.

A post fader signal level, routed to the Send, changes along with volume fader movements. If you are using the Send to route a signal from the channel to a reverb, this means that the relationship between the original signal and the effect signal remains constant. When you pull the channel's volume fader all the way down, the reverb disappears as well. This setting is generally the most useful, and is the default in Logic.

If a Send is set to be pre fader, the level of the signal routed to the Send remains constant, regardless of any volume fader movements on the source channel. The signal is still fed to the selected bus—even if the channel's volume fader is completely pulled down. Pre fader sends are mainly used for monitoring tasks; headphone monitoring in the studio, or foldback monitoring on stage. Pre fader sends are also useful when you want to hear the effect signal in isolation (without the original signal). The equalizer still affects the sends in "pre fader" mode (pre fader, post EQ).

Stereo Sends

Logic allows you to assign the sends of mono tracks to stereo busses (or stereo outputs). It's unnecessary to assign two sends to address a true stereo reverb plug-in.

Double-Click on Send

Double-clicking on a Send slot of any audio channel will "jump" to the allocated Bus channel fader, making navigation easier in the Mixer windows.

In/Output
Input Selection

The Input field allows you to select the desired audio input of your audio hardware. This input (or input pair) supplies an audio signal to the track when recording. If Monitoring is switched on, the signal of this audio input will be routed to the output (or bus) selected in the Output field, when the track is record enabled. The number of available inputs is determined by the audio hardware in use.

Note: The Input slot is used for the insertion of software instruments on Audio Instrument Objects, and is known as the "Instrument Slot" on these channels. Further information can be found in the first section of the Plug-In Reference manual.

Output Routing

The slot directly below the Input slot determines where the signal of the Audio Object (mixer channel) will be sent. The number of outputs that are available is determined by the audio hardware in use.

Hold Option while selecting the inputs or outputs of a single channel to change all selected Audio Objects simultaneously. (See also "Multiple Selection of Audio Objects" on page 194.) Please note that inputs are only changed on (selected) Audio Objects of the same status: mono or stereo. This facility allows you to easily select a single input for all audio tracks.

Double-click on Output slot
Double-clicking on the Output slot on any audio channel will "jump" to the allocated Output channel fader, accelerating navigation in the Mixers.

Pan/Balance

Mono Objects feature a Pan control, which determines the position of a signal in the stereo image.

Stereo Objects, on the other hand, possess Balance controls. The Balance control differs from the Pan control in that the former controls the relative levels of two signals (L/R) at their outputs. The latter merely apportions one signal between two outputs.

Note: You can reset the Pan control to it's centered (0) position with an Option-click.

Level

Audio Objects feature level meters that display the playback or input monitor level.

When you arm a track, in preparation for recording, the meter displays the input level.

The playback level is also displayed to the left of the track number in the Arrange window, if *View > Track Numbers/Level Meters* is selected.

Peak Hold
As with conventional mixing desk meters, peak values are "held" on the display for a few seconds, making them easier to read. The most recent maximum level is always reliably displayed, even if your CPU power is insufficient for a smooth real time display of levels.

Clip Detector
The clip detector above the level meter shows you the headroom of a track in dB.

When a signal clips, the clip detector will turn red; the value indicates the amount that the signal needs to be reduced, in order to prevent clipping.

Up to + 6 dB will be shown. If a track clips now and then, it doesn't really matter—as long as the master doesn't clip. Clicking on any clip detector will reset all clip detectors. The *Clear Overload Flag in Audio Channel Display* key command has the same effect.

Pre Fader Metering
Activation of *Audio > Pre-Fader Metering* ensures that the level displayed by the level meters is measured pre fader (pre pan/balance), but post Equalizer and inserts. This guarantees the display of track levels, even if the fader is dragged all the way down.

Adjusting the Level
The fader on each Track Object sets its playback level. The recording level is not set in Logic. It is set at the source (the device supplying the input signal). You cannot adjust the level on the digital input. Logic's fader is only used to control the monitoring level.

The level meter of the Audio Objects and aux sends can be shown in decibels (dB) (default), or MIDI controller values. To change the scale, select the appropriate Object, and alter the "Val as" parameter. A MIDI volume of 90 is equivalent to 0 dB.

The maximum boost is + 6 dB. You can reset the volume fader to 0 dB (90) by Option-clicking on it.

When multiple Audio Objects are selected, changing their level by moving one fader is dB-proportional. The mixing ratio of the selected channels remains constant.

An independent monitoring level is available when a Track Object is record enabled. After arming the track, set the fader to the desired level. The original level will be restored when the Object is disarmed. The global *Toggle (Mute) Audio Tracks* key command switches the levels of all Audio Objects between two different values. Each Object may be set to any value for both toggle positions, allowing you to quickly switch between two basic mixes.

You can switch other Object types in the same way, using the global *Toggle (Mute) Audio Inputs*, *Toggle (Mute) Audio Bus* and *Toggle (Mute) Audio Outputs* key commands.

Solo/Mute
Solo
All Audio Objects have a Solo button. This mutes all other Audio Objects.

Muted Objects are indicated by a flashing *M* in the Mute button. Please note that this does not mute MIDI tracks.

You can also solo several Objects at once.

Option-clicking a previously unsoloed Object releases other active Solo buttons, allowing the selected channel to be heard in isolation ("Interlocking Solo" or "Solo Toggle").

Option-clicking any activated Solo button disables the solo status of all Audio Objects.

Solo Safe
If you want to hear the signal of a soloed channel with any bussed effects, the effect return channels obviously shouldn't be muted. Unlike conventional mixing desks, Logic can scan the entire signal path, and leave the effect return channels open.

The same applies when you solo an effect return signal. The channels fed into the effect are muted, but their effect sends remain open, ensuring that the effect continues to receive a signal.

This automatic mute-suppression only applies to the internal effect returns. If you are using external effect units via Bus Objects, the scan will keep the effect master sends open. Logic cannot, however, know which of the Input Objects you are using as effect returns for external effect units. You need to manually switch these Input Objects to "solo safe"—just like on a conventional mixing desk.

Control-clicking an inactive solo switch makes an Audio Object "solo safe". This prevents it from being muted when you solo another channel. "Solo safe" status is indicated by an X on the solo button. A second Control-click defeats the solo safe status.

Mute Button
You can mute any Audio Object by pressing the button marked with an *M*. Pressing the button a second time restores the previous level.

Stereo Objects
All Audio Object types (Track, Input, and Output) may be configured as stereo. Logic uses true stereo tracks, provided that *Preferences > Audio > Drivers > Universal Track Mode* (UTM) is activated. This means that Track 2 is unaffected when you configure Track 1 as stereo. Audio Regions on the tracks of stereo Objects are always dealt with together, no matter what type of operation being performed. If you open the Sample Editor, both sides of the stereo pair are shown, and are processed together.

Creating Stereo Objects
To do this, select the desired Object (we'll use the one named "Audio 1" as an example—click on its name, at the bottom). Click on the Mono symbol, at the bottom left of the Object, next to the REC button.

The button will now show two interlinked circles, indicating that it's a stereo Object.

If you click-hold on this button, you will see a pop-up menu that offers four choices:

Mono: Sets the track to play mono files.

Stereo: Sets the track to play stereo files. These may be either "interleaved" or "split" stereo files.

Left: If a stereo region is assigned to the track, only the left side will be played. If a mono file is assigned to the track, it will play normally. In either case, the output of the track will be mono.

Right: If a stereo region is assigned to the track, only the right side will be played. If a mono file is assigned to the track, it will play normally. In either case, the output of the track will be mono.

Any combination of stereo and mono recordings is permitted. As an example, you can set both tracks 1 and 2 to stereo, and use tracks 3 and 4 for mono recordings, if you wish.

Whatever parameters you adjust for stereo Objects, the changes affect both sides equally. The pan control becomes a balance control.

Track Arming

The Record Enable button (see below) "arms" a track, making it ready for recording. Once armed, the Record Enable button flashes red. It remains constantly lit during the actual recording.

If the control flashes between gray-red, this indicates that no audio track is selected in the Arrange window, and no recording can take place. Please select the corresponding Audio track in the Arrange.

Rec controls only exist for Track Objects. Please note that the number of Track Objects that can be simultaneously armed is limited to the number of tracks that your audio hardware can record to concurrently. This would typically be the number of inputs offered by the audio hardware.

You can select the input that the Track Object will record from, via the input selector slot, found in the I/O section of the Track Object. Click-holding on the slot will reveal a pull-down menu, showing all available inputs for your hardware. If the record track is stereo, the inputs will be displayed in pairs (Input 1–2, Input 3–4, and so on). They will be displayed individually for mono tracks. Arming a track set to a specific input will automatically disarm any other track that is currently using the same input.

Bounce

Output Objects feature *Bounce* buttons. Bounces for Output Objects 1 and 2 can also be initiated by choosing *File > Bounce* from any Logic window (although the Arrange would be the most appropriate).

The Bounce process allows you to create an audio file based on all audio Objects routed to the selected Output Object. All parameters, including volume, pan, and effects are recorded as part of the "bounced" file. Bouncing takes place in either realtime or faster than real time ("offline" bounce).

To create a bounce file:

1 Press the *Bounce* button on the Output Object or choose the *File > Bounce* menu option.

2 Set the parameters in the Bounce dialog window (see below).

3 Press the *Bounce* button in the Bounce dialog window.

4 The ensuing file selector allows you to enter a destination folder and name for the bounced file.

Note: Mono bouncing is possible when the Output Object is set to mono. In this situation, a mono audio file is generated.

Global Options in the Bounce Dialog Window
Several global options are available in the Bounce Dialog window, regardless of the file type(s) being bounced.

Destination
You can select between a *PCM* file (in SDII, AIFF, or Wave format) or *MP3, AAC*, and *Burn CD* (to a Red Book compliant Audio CD) options by simply clicking the desired radio buttons.

PCM, MP3, and AAC files can be individually bounced and added to the iTunes library if the *Add to iTunes library* checkbox is enabled in each sub-pane.

PCM files in SDII, AIFF, or Wave format—can be added to the Audio window if the *Add to Audio window* checkbox is enabled—in the PCM sub-pane.

Start and End Position
These fields define the boundaries of the song segment that you want to write to the bounced file. The defaults for these fields is the whole song, from the beginning of the first Audio Region to the end of the last. Note that the defaults will be the locator positions, if the Cycle function is engaged. In any case, you can adjust the start and end positions manually. As an example, should you want to take into account a MIDI sound module (mixed via an Input Object) that falls outside the preset Region.

It's often a good idea to set the End position of the bounce a little bit past the end of the last Region, ensuring that reverb tails and echoes from delay plug-ins are not chopped off. The amount of extra time needed will, of course, depend on the effect settings used.

As you adjust the Start and End position parameters, you are shown the hard disk space requirements for the bounced file above the *Cancel* and *Bounce* button.

Bounce Mode
• *Realtime*: Creates the bounce file in real time. Use it whenever you wish to bounce audio and Audio Instrument tracks, plus external MIDI sound sources that are routed into the Logic Mixer via (Live) Input Objects.

- *Offline*: Accelerates the bounce process—depending on the complexity of your arrangement and available CPU processing power. It also allows the bouncing of complex arrangements that would normally exceed the power of your CPU, if trying to play them in real time. Offline bouncing, however, is limited to internal sources (audio or Audio Instrument tracks). The MIDI tracks and Input Objects of Logic's Mixer are deactivated during offline bouncing.

Please note that the Offline Bounce mode is only available to the Output Objects of mixers that belong to native audio driver systems. DSP-based audio hardware can not make use of offline bouncing due to the nature of its stream-oriented technology. Other software applications that are fed into your Logic Mixer via ReWire technology are available for offline bounce processes.

PCM Options in the Bounce Dialog Window

File Format
You can select between a PCM file (in SDII, AIFF, or Wave format) or MP3, AAC, and burn to an Audio CD in one go.

PCM, MP3, and AAC files can be individually bounced and added to the iTunes library.

PCM files in SDII, AIFF, or Wave format can be added to the Audio window.

Resolution
This is where you define the resolution of the bounced file. The options are 16 Bit, 8 Bit (for multimedia productions) or 24 Bit (for mastering to DVD).

Sample Rate
This pull-down menu allows you to define the desired sample rate for your bounced audio file(s). Options range from 11,025 to 96,000 Hz, and include the three most commonly used sample rates: 44,100 (CD-DA), 48,000 (DAT) and 96,000 (DVD).

Stereo File Type
You can select between split stereo (for use in ProTools), or interleaved stereo (for further use in Logic or for CD writing software) here.

Setting *Stereo File Type* to *Split Stereo* disables *Burn* (following a warning message).

Dithering
Dithering (see "Bouncing and POW-r Dithering" on page 70) is recommended when bouncing 24 bit recordings into 16 bit files.

"Add to" Options
The *Add to Audio window* option adds the bounced PCM file(s) to the Audio window

The *Add to iTunes library* option adds the bounced PCM file to the iTunes library. Note that iTunes does not support SDII. Should the file be in SDII format, this switch will be disabled.

MP3 Options in the Bounce Dialog Window

Logic allows the bouncing of MP3 (MPEG-2-Layer-3) format files. This well-known data reduction format for digital audio signals was developed by the Fraunhofer Institute, and allows high compression rates while maintaining quite good audio quality (depending on the compression rate). MP3 is the current standard for audio file exchange via the Internet.

Due to the fact that encoding an MP3 file equates to a loss of audio quality, you should not use MP3 files during production if you have access to the same audio data in linear formats such as: AIFF, WAV, or SDII.

Bounced PCM file(s) is/are also used for encoding to MP3/AAC or burning a CD. It should be noted that this occurs before dithering takes place.

Note: Should the selected sample rate be higher than 48 kHz, a temporary copy of the bounced PCM file is created—with an automatic sample rate conversion to 48 kHz before encoding. This conversion takes place because the MP3 format does not support sampling rates higher than 48 kHz.

If the *PCM* option is disabled in the *Destination* menu, a temporary PCM file is bounced as a source for encoding to MP3/AAC and/or burning to a CD—in accordance with the options selected in the *PCM* page.

Bit Rate (Mono/Stereo)

MP3 bit rates are selectable between 8 kbps and 320 kbps, but default to 80 kbps mono, and 160 kbps stereo. These rates offer acceptable quality and good file compression. If you can afford the extra file size, we recommend selecting 96 kbps for mono and 192 kbps for stereo streams, as this provides better audio quality. You can, of course, choose even higher rates, but the quality improvement afforded by bit rates above 96/192 kbps is nominal.

Use Variable Bit Rate Encoding (VBR)

Variable Bit Rate encoding compresses simpler passages more heavily than passages that are (more) harmonically rich, generally resulting in better quality MP3s. Unfortunately, not all MP3 players can accurately decode VBR-encoded MP3s, which is why this option is turned off by default. If you know that your target listener/s can decode VBR-encoded MP3s, you can switch this option on.

Quality

Keep this set to *Highest* whenever possible. Reducing the quality accelerates the conversion process, but at the expense of audio quality.

Use Best Encoding

Again, like the *Quality* parameter, if you uncheck this option, you will gain encoding speed at the price of audio quality. This should always be kept on, unless conversion time is an issue.

Filter Frequencies Below 10 Hz

When this option is checked, frequencies below 10 Hz (which are usually not reproduced by speakers, and are not audible to human ears at any rate) will be removed, leaving slightly more data bandwidth for the frequencies that we can hear, resulting in an improvement of the perceived "quality". Only uncheck this if you're experimenting with subsonic test tones, or exporting MP3s for whales!

Stereo Mode

You can select joint stereo or normal stereo mode. Depending on the original file, these settings may (or may not) offer any audible difference. Experiment with both settings to determine your preference.

Write ID 3 Tags/ID3 Settings
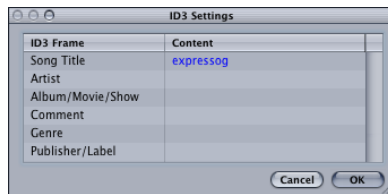
When the *Write ID3 Tags* option is enabled, ID3 tags are written to the file. These tags can be edited/configured in the dialog launched via a click on the *ID3 Settings* button. All entries are made by double-clicking on the desired *Content* field(s) to the right of the corresponding *ID 3 Frame* entry, and typing in your text.

Add to iTunes Library

The *Add to iTunes library* option adds the encoded MP3 file to the iTunes library.

AAC Format Options

The AAC options are not directly available in the Bounce Dialog window (due to a limitation in QuickTime), with the exception of the *Add to iTunes library* option which adds the encoded AAC file to the iTunes library.

You first need to type in a file name, and press the *Bounce* button before you can access the AAC (*Sound Settings* and *Options > MPEG-4 Audio Compressor*) options.

Should the selected sample rate be higher than 48 kHz, a copy of the bounced PCM file is created—with an automatic sample rate conversion to 48 kHz before encoding. This conversion takes place because the AAC format does not support sampling rates higher than 48 kHz.

AAC Sound Settings

Compressor

Selects the compression algorithm used for AAC encoding. By default, this is MPEG-4 Audio.

Rate

A number of predefined sample rates are available in this pop-up menu, ranging from 8000 kHz to 48,000 kHz.

Size

These radio buttons allow you to select either an 8 or 16 bit output file.
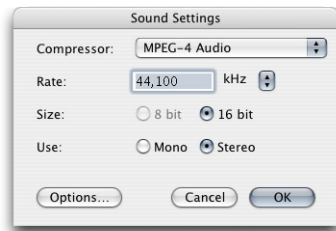
Use

These radio buttons allow you to select either a mono or stereo output file.

Options

The *Options* switch launches the *MPEG-4 Audio Compressor* window, discussed below.

MPEG-4 Audio Compressor Window

Compressor

Selects the compression encoder. By default, this is AAC (Low Complexity).

Bit Rate

A number of predefined bit rates are available in this pop-up menu, ranging from 16 kbits/second to 320 kbits/second.

Output Sample Rate

A number of predefined sample rates are available in this pop-up menu, ranging from 8000 kHz to 48,000 kHz. The *Recommended* option selects a default option, based on other encoder choices you have made.

Encoder Quality

Keep this set to *Best* whenever possible. Reducing the quality will speed up the conversion process, but at the expense of audio quality.

Burn Options

Logic can directly burn Red Book audio to blank CDs.

Should the selected sample rate be higher than 44.1 kHz, a copy of the bounced PCM file is created—with an automatic sample rate conversion to 44.1 kHz before encoding. This conversion takes place because the CD Audio format (Red Book) does not support sampling rates higher than 48 kHz.

Note: Should your system contain multiple CD burners, the first one detected is used.

Important: Some of the options listed below will only become active when blank CD media is physically placed in the CD recording mechanism.

Simulate write only

The *Simulate write only* option requires that a blank CD be inserted into the SuperDrive or ComboDrive. As the name suggests, this will simulate a CD burn, but will write no data to the blank media. This can be used either alone, or in conjunction with, the *Write as multi session* option.

Write as multi session

The *Write as multi session* option allows you to add a data session to the same CD at a later date—to add the Project folder, for example.

Speed

The first time you use the *Speed* pull-down menu, a request is made to the CD burning mechanism, which may take a while. Once the scan is complete, you may freely select from the available speeds.

Dithering

Use of the *Dithering* parameter is recommended when bouncing 24 bit recordings into 16 bit files.

Burn

Clicking the *Burn* button initiates the Bounce and burns the audio to CD.

Note: Following confirmation of the file location(s), you may encounter further dialogs that will ask if you want to overwrite existing files. Use these as required.

Audio Object Types

The following section introduces you to Logic's different Audio Object types.

Track Object

The Track Object is used for playing back and recording audio signals in the Arrange window. You also control the signal of recorded tracks via the different elements of the Track Object.

The number of tracks available depends on the CPU power of your computer.

You can limit the number of tracks via the *Audio > Audio Driver > Max. Number of Audio tracks* setting for the driver/hardware, thereby limiting the amount of memory and processing power required.

The Track Object features the following elements (see "Elements of the Audio Object" on page 196): EQs, Inserts, Bus Sends, Input/Output, Automation, Pan, Level, and Level meter, Mute/Solo, Mono/Stereo, Track Arming.

Monitoring With Effect Plug-ins

Record-enabled (armed) audio tracks—with assigned audio inputs—can be monitored with effects plug-ins inserted into the armed audio channel. In this type of setup, the effect plug-ins are monitored but not recorded. This can be useful during an overdub session, for example. If you'd like to record the audio track with effects, insert the effect plug-ins into the corresponding input channel (see below), rather than the audio track channel.

Example: During vocal recording, many artists prefer to monitor their performance with a little reverb, while the track is actually recorded dry. To do so, insert a reverb plug-in into the audio channel, arm the track and start recording. The reverb will be part of the monitor mix, but will not be recorded.

It is possible to combine pre-processing and monitoring with effects. You can, for example, destructively record a signal with compression by inserting a compressor into the respective input channel, while simultaneously monitoring the compressed input signal with a reverb (inserted on the track channel) that is not recorded.

The *Audio > Audio Hardware & Drivers > Software Monitoring* preference must be enabled if you wish to monitor/record with effects.

Input Object

The Input Object allows you to directly route and control signals from your audio hardware's input. Once an Audio Input Object is assigned to an audio channel, it can be monitored and recorded directly into Logic, along with its effect plug-ins.

The signal is processed—inclusive of plug-inseven while Logic is stopped. In other words: Input Objects behave just like external hardware processors. Bus sends can be used pre or post-fader.

The Audio Input Objects can effectively replace your old mixing desk, or at least save time while bouncing:

Audio Input Objects make the bouncing procedure much easier, as there's no longer any need to record the audio signal of your MIDI devices before bouncing (mixing down) their output with the audio recordings. The live Audio Input Objects allow you to mix down the audio signal from your external hardware MIDI synthesizers and sound modules into a stereo mix (by bouncing an Output Object).

The Input Object features the following elements: Inserts, Bus Sends, Output, Grouping, Automation, Pan, Level, and Level meter, Mute/Solo, Mono/Stereo.

Pre-Processing of Input Signals

Audio Input channels now process an incoming audio signal destructively: The input signal is processed by plug-ins inserted into the input channel. This means that once an Audio Input Object is assigned to an audio track, it can be recorded, and monitored, with its effect plug-ins.

Example: To avoid large jumps in level, it is often useful to record a vocal track with light compression. To do so; insert a compressor plug-in into the input channel and assign the Input Object as the input source of an audio track. During recording, the effect of the compressor is recorded with the track.

Note: To use the Audio Input Object as a "live input", ensure that the Input Object has an assigned Output. This allows monitoring of the Input Object (with all effects) directly, without the need to assign it to a record-enabled audio channel.

Audio Instrument Object

The Instrument Object allows you to use virtual Software Instruments within Logic. Currently, the following are supported: Logic's own suite of software instruments and AU compatible instruments. Logic supports up to 64 discrete Audio Instrument channels, dependent on available CPU resources and system RAM. The advantage of the integration of sampling and synthesis within Logic is that all tools necessary for audio recording, sample playback and synthesis plus effects and mixing can occur within your computer.

The Input Slot of the instrument Object serves as an insert slot for the software instrument.

After inserting an instrument, the Audio Instrument Object can be used just like a MIDI track in the Arrange window. The Audio Instrument Object can also receive MIDI notes via Environment cables from other MIDI instrument Objects. This is useful for creating sound layers of hardware MIDI instruments and virtual instruments.

Please note that the *Preferences > MIDI > General > Use Unified Virtual and Classic MIDI Engine* setting must be switched on to make use of these features.

When an Audio Instrument track is selected, it is ready to be played in real-time and consequently produces some system load. Normally, Logic releases system resources used by the Audio Engine when the sequencer is stopped. This is not true, however, if an Audio Instrument track is selected in the Arrange and is therefore available for real-time playing. Selecting a MIDI track or a normal audio track exits this "stand by" mode and releases reserved system resources the next time the sequencer is stopped.

Note: Muting an Audio Instrument track in the Arrange does not reduce system load.

The Audio Instrument Object features the following elements (see "Elements of the Audio Object" on page 196): Inserts, Bus Sends, Input, Output, Automation, Pan, Level, and Level meter, Mute/Solo.

Accessing Multiple Outputs

Logic supports the EXS24, UltraBeat, and AU-compatible instruments that are capable of addressing multiple outputs. In addition to the "Mono" and "Stereo" submenus of the Audio Instrument menu, a "Multi Channel" submenu lists all Instruments that offer multiple outputs. A plug-in needs to be inserted from the "Multi Channel" submenu, in order to access its individual outputs.

Please note that not all plug-ins (Logic and third-party) are multi-output capable. If the Instrument does not appear in the Multi Channel submenu, it is not equipped with multiple output facilities. Please make sure that the instrument you wish to use is properly installed and authorized.

The first two outputs of a multiple output instrument are always played back as a stereo pair by the Instrument channel that the plug-in is inserted into. Additional outputs (3 and 4, 5 and 6, and so on) are accessed via Auxiliary Objects (see "Auxiliary Object" on page 217).

Software Instrument Pitch

The *Song Settings > Tuning > Software Instrument Pitch* parameter remotely controls the main tuning parameter for all software instruments by ±50 Cents. Some instruments created by other manufacturers may not recognize this remote command.

ReWire

Logic supports the *ReWire* software interface from Propellerhead, a software manufacturer. ReWire is an interface between sequencer and audio applications. ReWire works with hardware supported by Logic's native audio engine (see "The Audio Hardware and Drivers Dialog" on page 271).

Please start Logic first, and then start your ReWire application(s). ReWire scans for ReWire-compatible applications or system extensions; Propellerhead's *Reason*, for example.

Logic will display the audio returns of ReWire-connected applications as Audio Objects: You're able to insert plug-ins and create sends to busses on these returns, as per a normal audio track.

In order to use the audio returns of ReWire-connected applications, select an Audio Object and choose the desired ReWire audio-return in the *Channel* pull-down menu of the Audio Object. You will find ReWire channels listed by name, along with the audio tracks, inputs, busses, and outputs in this menu. ReWire (or the application that the connection belongs to) generates the names for these channels. The name of a ReWire channel is irrelevant to Logic.

As an example, if a channel is called "Mix", it has no specific function related to that name as far as Logic is concerned. It's up to you to decide what to do with whatever channel. If there is no Audio Object for a ReWire return created in the Environment, no audio is transferred between a ReWired application and Logic. How does this work in practice with ReBirth, for example? In this scenario, you will find two channels called "Mix L" and "Mix R" within Logic. The two Mix channels return the summed mix of ReBirth's outputs. You will also find channels for every individual instrument. When creating an Audio Object for another channel such as the bass drum, for example, you will only hear the bass drum through that channel, and it is removed from the mix returns.

Logic is always Synchronization master. As Logic is also the Cycle master, *Skip Cycle* works, too.

The following functions are shared between the applications:
- start/stop,
- repositioning,
- cycle start and end,
- tempo change

Output Objects
Output Objects represent Logic's audio outputs. This is where level and stereo balance are adjusted; mastering plug-ins can also be inserted here, such as multi-band compressors or the Fat EQ. The number of available Outputs is determined by the audio hardware in use.

Output Objects also provide the Bounce (see "Bounce" on page 204) function, which can be used for either; recording all audio into one stereo audio file (comparable to a master tape), or to merge several tracks (including all plug-ins and so on) into one stereo or mono track (depending on whether the Output Object is set to mono or stereo).

The Output Object features the following elements (see "Elements of the Audio Object" on page 196): Inserts, Automation, Pan, Level, and Level meter, Mute, Stereo/Mono, Bounce.

Bus Objects

The Bus Objects can be used in several ways:

They can be used to route audio signals to external devices via the individual outputs of the audio hardware, allowing you to change their level and pan settings, and apply plug-ins, if you wish.

They can be used as subgroup channels, which control the level of several audio channels at once. As an example, all drum tracks or all different vocal takes could be routed to one stereo bus for control of their overall level—while still retaining the relative differences between the individual channels.

To record the signal of a particular subgroup (for later use as a stereo track in the arrangement), route it to an unused Output Object, and use the Bounce function (see "Bounce" on page 204).

The Bus Objects can be used as effect returns: in this case the plug-ins serve as internal effect processors.

Effects such as reverb and delay are generally used as bus inserts. These Bus Objects are usually addressed with the send knobs of the audio channels, and act as effect returns.

These busses are routed to an Output Object.

In the default song, the pre-set Bus Objects have been named "Returns".

The Bus Object features the following elements (see "Elements of the Audio Object" on page 196): Inserts, Automation, Pan, Level, and Level meter, Mute, Stereo/Mono.

Auxiliary Object

The native Aux Object can be either mono or stereo. Aux input sources will appear as either stereo pairs, or single mono channels, dependent on the mono/stereo status of the Aux channel. It is possible to use the same input source for several Aux channels. Aux channels process audio signals non-destructively, in real time. Two Aux channels are pre-configured in a new song, by default. As with all other Audio Objects, additional Aux Objects can be created, and accessed, via the Audio layer of the Environment. Aux Objects are automatically made available as needed, in the Cha pull-down menu of the Object parameter box. When four Aux Objects are in use, a fifth is offered in the pull-down menu, when using six Auxes, a seventh is added and so on. This makes it possible to create up to 8 Aux channels in the Environment.

The input source of an Aux channel is selected with the input assignment pop-up menu. Possible input sources are: All software instrument outputs provided by Instrument plug-ins (Logic or AU). These additional outputs are only available to plug-ins inserted into an instrument channel via the "Multi Channel" sub menu. Aux channel Input sources—sent from suitable Instrument plug-ins—start from output 3.

Aux channels can also be displayed in the Track Mixer. Note: If the Aux channels are used as tracks in the Arrange window, ensure that the view filter of the Track Mixer is set to show Aux channels by activating the Aux button (track view). Activate the Aux and Global button (global view) if the Aux Objects are only used as Environment Objects (in other words, they're not used as Arrange window tracks).

The Aux Object features the following elements (see "Bus Objects" on page 216): Inserts, Sends, Input, Output, Automation, Pan, Level, and Level meter, Mute, Stereo/Mono.

Aux Objects and Software Instruments With Multiple Outputs

By default, all outputs of a Multi Channel (see "Audio Instrument Object" on page 213) Instrument plug-in are routed to the main output pair of the respective Audio Instrument Object. Subsequent Multi Channel Instrument outputs are sent to Aux Objects.

Track Mixer

To open, select *Windows > Track Mixer.*

Note: If you press Option while opening a Mixer window, it will appear as a float window.

Unlike the Audio Mixer, the Track Mixer deals with both audio and MIDI tracks. Each channel represents an Object in the Environment: the audio channels are Audio Objects, the MIDI channels are instruments or parts (sub-channels) of multi instruments.

Tracks that don't have their own mixer parameters are not visible in the Track Mixer. These include Delay Objects (see "Delay Line Object" on page 176), Arpeggiators (see "Arpeggiator Object" on page 174), and so on. If several tracks in the Arrange window address the same track instrument Object, the instrument is represented by a single channel in the Track Mixer.

Note: You can adjust the vertical and horizontal display of the Track Mixer with the Zoom controls.

Display Modes

The Track Mixer has two display modes: *Global* and *Track* view.

In *Global* view, all MIDI instruments and all Audio Objects that exist in the Environment are displayed as mixer channels.

In *Track* view, Logic creates a mixer based on all tracks currently assigned in the Arrange window track list. It contains as many channels as there are tracks. The channels are laid out in the same order as in the Arrange window. Redundant tracks are suppressed, where multiple tracks represent the same output (Object). This could be two MIDI instruments with the same port and channel setting, or two Audio Objects with the same device and audio channel/track setting.

If you miss an Object you need for mixing (an Audio Output Object, for example), open *Global view* and double-click on the Object in question. It will then be added to the Arrange track list, and will appear in the Track Mixer when in Track view mode.

Track Filter

The *Track* menu is used to define the types of tracks displayed in the Track Mixer.

Track Filter Switching Techniques

You can set Global and Track views separately with the Filter buttons.

- Command-click doesn't change the Track Filter setting when switching *Global view* on and off.
- Clicking without a modifier on a disabled track type will enable the view of this type, and disable all other types.
- Clicking without a modifier on a currently enabled track type will enable all types. A second click will cause the display to revert to a single enabled type.
- Shift-clicking allows you to individually enable and disable types, in any combination.
- Command-clicking if *Global* view is disabled enables *Global* view, and also enables the display of the current track type.
- Command-clicking if *Global* view is enabled simply disables *Global* view.
- Option-clicking moves the window position to the first track of the current type. Filter and Global view modes are not changed—with one exception: If the clicked type is currently disabled, it will be enabled.

The Global view can display tracks that don't exist in the current arrangement or recording folder. In this situation, it's impossible to select such tracks for recording. If you double-click on one of these tracks, it will automatically be created (and selected) in the current recording folder.

View Options

The *View* menu is used to customize the display to suit your requirements. You can individually switch off the display of; instrument names, program numbers, bank numbers, the user-defined knobs on the MIDI mixer channels (Assign), pan pots (Pan), faders (Volume) and track names and numbers to create more onscreen space. If you choose to remove the instrument and program names from the display, the channel retains its rectangular shape—without the tabs needed for long names. If you switch off the display of the instrument name alone, the track name is shown in it's place.

If you enable the *Same Instrument Tracks* option, identical Arrange window tracks are also displayed in the Track Mixer. These tracks have redundant settings for volume, pan, and so on, so it's usually unnecessary to display more than one. The mute settings, however, may be different for each track.

Like the other editors, the Track Mixer can be stored as part of any Screenset (see "Screensets" on page 30).

Folders and the Track Mixer

The Track Mixer can not only display the contents of the highest level of the Arrange window, but also the contents of folders. The Track Mixer automatically registers any change in the folder structure, or instruments assigned to tracks.

If a folder is selected, or if the top window is an Arrange display of a folder when you open the Mixer, it will only show the tracks within the folder. If you click the directory close-box (the square button below the window close-box at the top left), you will switch the Track Mixer to the next-highest level; in this case, the level containing the folder. Double-clicking the folder channel restores the display of the folder. The display of *Folder Tracks* must be switched on in the *Tracks* menu for this to work.

General Tips for Using the Track Mixer

The following tips might help you make the most of the Track Mixer.

To create an arrange track using the Track Mixer:
- In Global view, a double-click on the background of a channel will insert a new (corresponding) track into the current Arrange window, provided that no corresponding track already exists.

To mute arrange tracks using the Track Mixer
- Option-clicking on the Mute button of an Audio Object will mute the corresponding Arrange window track, but will *not* mute the Audio Object. A second Option-click will un-mute the track.

Note: If the current Track Mixer view does not contain the Output or Bus Object, Global view will automatically be enabled. The appropriate view filter (Output/Bus) will also be enabled, ensuring that the selected Object type is visible.

The MIDI channel strips have little "LEDs", which turn green for Note On events, and yellow for all other MIDI information.

Send All Mixer Data
The selection of *Options > Send All Mixer Data* transmits all currently visible mixer knobs and fader settings to MIDI.

Track Selection When Playing or Recording
You can prevent the track selection from changing when making an adjustment to a channel, while Logic is in recording or playback mode. There's an independent parameter for each situation; *Options > Change Track in Record Mode* and *Options > Change Track in Play Mode.*

MIDI Channel Strips
Operation
This section deals with the MIDI channel strips of the Track Mixer, as well as those of the GM Mixer (see "GM Mixer Object" on page 171).

The MIDI channel strips work as a remote control for the mixing parameters of your sound modules and synthesizers (volume and pan, for example). This is the nature of a sequencer. The controls send MIDI Control Change Messages. They do not control any audio signal flow within Logic. Switch on all options in the *View* menu of the Track Mixer, so you can see all of the parameters described below.

Saving the Mixer Settings
The Mixer settings directly affect the Object Parameter box at the bottom left of the Arrange window. The current settings are saved with the song. If the memory of your sound module is not maintained by battery every time you switch it off, it will forget any settings made in Logic. To restore these settings after reloading the song, select *Options > Send to MIDI > Used Instruments MIDI Settings* from the main menu.

Extended GM, GS, and XG Functions

In addition to the GM Standard, there are extended standards created by Roland (GS) and Yamaha (XG).

GS and XG mode allow you to select different effect programs, and to control the level of the reverb and chorus effects.

1 Click-hold the GM field on the right side of the Mixer window. A pull-down menu appears.

2 Select the extended standard (GS or XG). Depending on your selection, the controllers for the extended effects will appear.

3 Select the desired reverb or chorus effect from the pull-down menu.

4 Program the desired reverb or delay time (*Time* parameter*)*, by using the mouse as a slider.

Reset Button

The Reset button transmits a *GS On* or *XG On* command, and resets all controllers to neutral positions. This allows you to reset all connected sound modules to their standard settings, and begin a mix from scratch. The Reset button is only available in the Environment GM Mixer.

Controls

The *Track Mixer > View > MIDI Track Components* menu allows you to switch the display of the different MIDI Channel Strip controls on or off.

Bank

If your sound source "understands" bank select events, you can choose the bank number for each of the 16 MIDI channels. Please remember that not all synthesizers support bank select events. You can use several different bank select formats (see "Defining Custom Bank Selects" on page 169).

Program

The Program pull-down menu is used to select a sound by name. Each channel has its own pull-down menu. The top row selects programs for odd-numbered MIDI channels (1, 3, 5 … 15), and the bottom row is used for even-numbered channels (2, 4 … 16).

To select the sound for a MIDI channel:

1 Click-hold the sound name.

2 A pull-down menu opens, containing all GM sound names.

3 Select a sound from the menu, and release the mouse button. Logic selects the sound in the sound module.

Volume

You can use the volume fader to control the level of each individual channel. Controller 7 is sent.

Mute

The Mute button switches the volume of the channel between zero and the current fader position. In practice, this means that if the button is "down", the channel is muted. If you switch the Mute button off, the current fader position (and value) is used.

If you want to mute a channel:

1 Click the Mute button of the desired channel.

2 Click the button again to reactivate the channel.

Pan

The Pan knob allows you to directly control the pan position of the sound.

To control the pan position of a sound:

1 Click-hold the Pan knob.

2 Move the mouse up and down. The knob moves according to the mouse position.

Note: Clicking a fader or knob while holding Option resets the value to a neutral value. The neutral value is zero for all controls except Volume (#7) = 100, Panorama (#10), Balance (#8), Resonance (#71), Release Time (#72), Attack Time (#73) and Cutoff Frequency (#74)—all of which have a default value of 64 (center position).

Other Controllers

You can send any controller data—to control different parameters of your sound source—with each of the upper rows of knobs.

Selecting Other Controllers

In the Track Mixer, you can simply click on the label above the knob to choose a different controller. In the *View > MIDI Track components* menu you can determine the number of controller knobs by choosing *Assign 1–5*. The default is set to two knobs.

In the Environment GM Mixer, use the text boxes on the left to choose different controllers.

Here's a description of the predefined General MIDI functions. Not all MIDI instruments will understand these Controllers:

Reverb (Controller Number 91)

This knob controls the reverb level. The further right you turn the knob, the louder the effect signal becomes (in other words, more signal from the channel is fed into the effect processor).

Chorus Depth (Controller Number 93)

This knob controls the depth of the chorus effect. The further right you turn the knob, the stronger the effect becomes.

LPF Frequency (Controller Number 74)
This knob controls the overtone content of the sound. Higher values make the sound brighter.

Automation

Logic features a very sophisticated, yet simple to use, track-based automation system that allows you to create and play back fully automated mixes.

In addition, Logic offers a range of automation features that complement the track-based automation system. These can be used in isolation, or in conjunction.

Automation—Introduction

"Automation" is the ability of a mixing desk to record, edit, and play back the movements of its volume faders. Fully automated consoles not only record the motion of the volume faders, but the motion of all knobs and switches, including pan, EQ, and aux send controls.

All of Logic's mix functions can be automated, without restriction. This applies to all plug-ins—the parameters of all effects and software instruments, plus all third-party plug-ins can be totally automated.

Logic offers two types of automation: Track based and Region based.

Track Based Automation

The Track Based Automation system (see "Display" on page 227) is independent of MIDI and Audio Regions and takes place, as the name suggests, on the tracks themselves. Track Automation is also independent of Play or Record status.
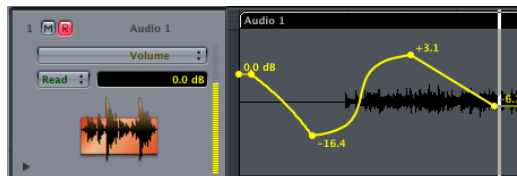
There are three ways of writing and editing automation data in a track:
- Moving the on-screen faders and controls using different automation modes.
- Drawing automation data with Hyper Draw (see "Hyper Draw Functions" on page 234).
- Using Logic Control or another control surface.

Track Based Automation is the recommended method for all automation tasks. It is sample accurate, and therefore, very precise. As sample accurate automation is processor-intensive, Logic provides options to partially or completely switch off the sample accurate mode via *Audio > Audio Settings.*

Moving Automation Data When Moving Regions
It's possible to move Regions with, or independent from, Track Automation data. Switch the modes by selecting *Options > Track Automation > Track Automation Settings > Move Automation with Regions*. You can choose between *Never, Always*, and *Ask*, which should be self-explanatory. *Ask* is the default setting.

Region Based Automation
Region Based Automation (see "Region Based Automation" on page 232) writes automation data directly into Regions as MIDI controller data.
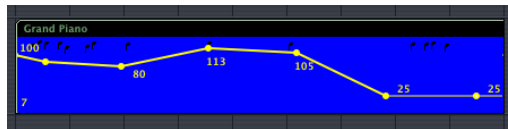
There are three ways of writing and editing this data:
- Moving the on-screen faders and controls in Record Mode.
- Drawing automation data with Hyper Draw (see "Hyper Draw Functions" on page 234); this is possible for both MIDI and Audio Regions; furthermore, the Score and Matrix Editors both allow the insertion of controller data via Hyper Draw.
- Drawing controller and other data in the Hyper Editor (see "Hyper Editor— Introduction" on page 311). You can also insert and edit controller data in the Event List (see "Using the Event List" on page 297).

Track Based Automation

Display

Select *View > Track Automation* to display Track Based Automation data in the Arrange window. This is also available as a key command. As long as this function is unchecked, Regions appear as per usual. The gray shaded Track Automation area is only displayed when the vertical zoom is set to a sufficient height, as is the case with Region Based Automation (Hyper Draw). As opposed to Hyper Draw, engaging the Track Automation data display will automatically set a sufficient zoom level. Track Automation data is displayed on a transparent gray shaded area, allowing you to see the audio waveform in Audio Regions, and notes in MIDI Regions, at a reduced contrast level.

You can edit Track Automation data directly in this display.

Zooming of Individual Tracks

Each track can be displayed at an individual vertical zoom level: Click-hold on the very left lower edge (to the left of the track number) of the desired track in the track list, and drag downwards. Zooming of all tracks is performed with the Zoom Bars. Alternatively, you can use the magnifying glass of the Toolbox. The *View > Auto Track Zoom* function automatically enlarges the currently selected track.

Choosing the Parameter to be Displayed

You can select the parameter that you wish to display and edit in the pull-down menu of the panel which appears in the Arrange window track list. This can be the volume fader, pan pot, or any other parameter of the corresponding Mixer channel strip. The parameters are represented by different preset colors when displayed as a curve in the automation track. The most recently edited parameter will be displayed whenever you edit a parameter in the Track Mixer, a plug-in-window, or via a Logic Control unit.

Context Sensitive Display

In order to reduce the number of displayed parameters, the display is context sensitive, which greatly simplifies operation. This means that only parameters which actually control something in the selected Mixer channel strip (or its plug-ins) are displayed. The display of parameter names is also context sensitive: this is a major plus, because rather than seeing a meaningless number, you can see the name of the function you're dealing with in plain text. Parameters that already exist in the track (as automation data) are displayed in bold lettering in the context-sensitive menu.

Viewing Multiple Parameters
Background Display of Other Parameters
The background of the automation track shows all other automation data (not the currently selected parameter) at a lower contrast level—when the track is at a sufficient zoom level. Volume is beige (dark yellow), Pan is dark green, everything else is dark blue.

Automation Modes
You can independently select the automation mode of every channel strip in the Track Mixer or Audio Mixer. The automation mode parameter is also visible in the Arrange track list, at higher vertical zoom levels. The automation mode can also be set via key commands. Given that Track Automation data can be recorded during playback mode, the default setting is *Off*, as any mix automation recording may prove disconcerting while arranging. You can choose between the following automation modes in any MIDI or audio (including Audio Instrument, bus, and output) Region:

Off
Off will disable the current Track Automation data without deleting it. No automation data will be written, read, or played back. If the current automation mode is *Off*, any edits to Track Automation data in the Arrange window will automatically switch the automation mode to *Read*. This ensures that the data, as currently edited, will be played.

Read
Read will automate the current track, using the existing automation data.
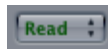
The data cannot be changed in realtime by touching/moving the fader.

Touch
Touch will automate the current track in the same fashion as *Read*.

Should the fader be touched, the existing Track Automation data of the current fader type will be replaced by any new fader movements—while the fader is pressed/touched. *Touch* is the most appropriate, "standard" mode, used for creating the mix. It allows you to correct and improve the mix at any time, when automation is active. The time required by a parameter to return to its previously recorded setting, is set via *Options > Track Automation > Track Automation Settings > Ramp Time (ms)*.

Latch

Latch basically works like *Touch*, but the current value will replace any existing automation data, after releasing the fader—when Logic is in playback (or record) mode.

To finish, or to end parameter editing, stop playback (or recording).

Write

In *Write* Mode, existing Track Automation data is erased as the Song Position Line passes it.

If you move any of the Mixer's controls, this movement will be recorded—if you don't, existing data passed by the SPL is simply deleted. Use *Options > Track Automation > Track Automation Settings* to determine the type of data that should be erased. The *Write Mode changes to* setting determines the mode that Logic switches to after a *Write* operation has been executed.

Be careful with the *Write* mode (and its settings), to ensure that you don't erase your pan, bus, and EQ automation data by mistake, if your intention was only to erase volume fader information!

The Write mode of traditional mix automation systems will rarely be needed when working with Logic's advanced Track Automation features. It's mainly there to complete the selection of automation modes. It's easier to erase automation data by selecting *Options > Track Automation > Delete All Automation Data of Current Track* (or *All Tracks*, respectively). In earlier analog mix automation systems, the Write mode was the only way to erase automation data from tape when beginning a new project. The *Options > Track Automation > Write to End* and *Write to Right Locator* commands are self explanatory. One writes Track automation data to the end of the song, and the other to the right locator position.

MIDI

MIDI disconnects the Mixer controls from the Track Automation system, and switches to Region Based Automation (see "Region Based Automation" on page 232).

The fader will act like a standard external MIDI source, and will be recorded and played back as normal MIDI data in MIDI Regions.

Switching Automation Modes for All Channels Simultaneously

Hold Command when switching the mode of a channel strip, and all channel strips that were previously set to the same automation mode will switch to the selected mode.

Writing Track Automation Data

You have the following write options for Track Automation data:

• Move any fader or control of the selected channel strip—in the Track Mixer or Environment Mixer—with the automation mode (see "Automation Modes" on page 228) set to *Touch*, *Latch,* or *Write*. In real world usage, you'll rarely (if ever) use the destructive *Write* mode, which erases all automation data. The standard write modes are *Touch* and *Latch*.

• Choose a parameter in the Arrange track list, and move the value slider to the right of the track list, with one of the write modes engaged.

• Move the external faders (and other controllers) of your Logic Control or another suitable hardware controller that has been set up on your system, with one of the write modes engaged.

• Use Hyper Draw (see "Hyper Draw" on page 233) to manually draw in automation data

Important: The recording of Track Automation data takes place if Logic is in record or playback mode! The Arrange window track selection or audio record ready status is irrelevant. Whatever you touch/move will be recorded, when a channel strip is set to one of the write modes. The movement of Mixer controls (when in a write mode) can be used to overwrite and/or edit existing automation data, in real time.

Behavior in Stop Mode

In Stop mode, the Automation write modes are ignored, and no data is written if the fader is moved. There is, however, one exception: if there are no dynamic changes (no automation data), the current fader setting becomes valid for the whole song. This is the default behavior for all mix parameters, when you start a fresh song.

Deleting Track Automation Data

The following, self-explanatory, automation data erasure options are available. Choose *Options > Track Automation >*

• *Delete currently visible Automation Data of Current Track*
• *Delete All Automation Data of Current Track*
• *Delete Orphan Automation Data of Current Track*
• *Delete All Automation Data of All Tracks*

Shift-Option–double-click opens a dialog that allows all automation data of the current type to be deleted. This is as per the *Delete All Automation Data of Current Track* option.

It is also possible to delete a selection of Hyper Draw nodes with Backspace. If no Region is selected, the selected nodes will be deleted when pressing Backspace. Use this function with care, to avoid the accidental deletion of Regions.

Editing of Track Automation Data in an Event List

Logic allows Track Automation data to be edited in a dedicated event editor. You can also open the folder which contains the (normally invisible) Track Automation data. As a core element of the program, Logic will always display every event as plain text in an Event Edit window. Please note, however, that this functionality won't be needed in normal music production situations, and is a real "expert" function. You can open the Track Automation event editor via the *Automation Event Edit* key command.

Track Automation Folder

Track Automation data is represented by a new class of "meta" events. These are an internal Logic event type that control processes that are not output via MIDI—although their data structure is somewhat similar to MIDI events. These meta events reside, like every event, in MIDI Regions, on tracks. The tracks, in which Track Automation data resides, are found in a dedicated folder which is normally hidden. You can display it via the *Automation Folder* key command. You will find a single MIDI Region that only contains Track Automation data on each track within this folder. This MIDI Region ends with the last Track Automation meta event. (Only tracks that contain automation data are shown in the Automation folder window).

You can edit these events with Region Hyper Draw (*View > Hyper Draw*) and Track Hyper Draw (*View > Track Automation*).

The display of the contents of the automation folder makes it easier to edit the automation data independently from Regions. In normal circumstances, however, it's usually quite useful to see the Regions while designing the mix. As such, you'll probably find that you rarely open this folder view.

Automation Quick Access

This feature makes Track Automation extremely fast and simple if you only have one hardware MIDI controller available (one fader on your MIDI keyboard, or maybe just the Modulation wheel). You can use this single hardware controller to access (and automate) the currently visible Automation parameter of the selected Track in the Arrange window.

Setting Up Automation Quick Access

Open the Automation Settings dialog: *Options > Track Automation > Track Automation Settings.*

There is a section called *Automation Quick Access,* which can be enabled or disabled via On and Off radio buttons. Once enabled, a dialog will prompt you to move the desired controller. Move the hardware controller that you'd like to use for Automation Quick Access. Click the *Done/Learn Message* button below. The other parameters shown (via a click on the *Edit* button) here will immediately identify and indicate the type of control element you are using (even quite exotic formats are supported). Disable the *Learn Message* button, by clicking on it a second time (the *Done* button), or close the *Automation Quick Access* dialog.

Once set up, you will have hardware control over any currently visible Automation parameter that is selected in the current Arrange track.

Enable/Disable Automation Quick Access

Should you choose the Modulation Wheel for Automation Quick Access (AQA), you might want to switch between it's use for AQA and "normal" Modulation Wheel duties—as MIDI controller #1.

This is most efficiently done with the global *Toggle Automation Quick Access* key command.

Region Based Automation

Region Based Automation writes automation data directly into Regions as MIDI controller (or other) data.

Recording of MIDI Automation Data

Region Automation data is recorded just like regular MIDI events. Logic must be in Record Mode to capture this type of automation.

You have the following options for MIDI automation data recording:
• Set the automation mode of a Track Mixer channel strip to "MIDI". The movement of any channel strip fader or control will be recorded on the corresponding track as MIDI controller data. In the case of audio channels, the track must not be in record enabled mode.

- Moving any Environment Fader (see "Recording and Playback of Fader Movements" on page 183) records the fader's MIDI events to the currently selected track.
- External MIDI controllers can also be used to create and record events. (Please note that it is currently not possible to use Logic Control for this purpose, due to it's high fader resolution).

In audio channel strips, all settings (including plug-in parameters) can be recorded as MIDI controller data. Record different parameters to find out which controllers are used for what parameters. It's also possible to cable other Environment Objects, such as Instruments, Channel Splitters or MIDI Faders into Audio Objects. You may use these Environment Objects as track instruments in the Arrange, for the automation of the Audio Object they are connected to.

Drawing MIDI Automation Data
Controller data can be directly inserted with Hyper Draw (see "Hyper Draw" on page 233) in the Arrange, Matrix, and Score Windows. The Hyper Editor (see "Hyper Editor—Introduction" on page 311) serves a similar purpose, in a dedicated window.

Editing MIDI Automation Data
As MIDI automation data consists solely of MIDI events, it can be edited just like any other MIDI events, using the Event List (see "Using the Event List" on page 297), Hyper Editor (see "Hyper Editor—Introduction" on page 311) or the Transform window (see "Transform Window—Introduction" on page 437).

Hyper Draw
Hyper Draw is the easiest way to create and edit Automation data in the Arrange window. Changes to automation data are made by graphically inserting points, which represent fixed controller values. The points are then interpolated automatically by Logic, which creates a series of events that smoothly connect the first event with the last. These automatically generated events are recalculated every time you edit the curve points.

Hyper Draw is available for both the Track Based (see "Display" on page 227) and Region Based Automation (see "Region Based Automation" on page 232) systems. The use of Hyper Draw is almost identical for both automation systems.

Hyper Draw for Tracks
Track Hyper Draw is automatically activated when Track Automation is enabled in the Arrange Window (*View > Track Automation*).

Hyper Draw for Regions

Region Automation is switched on for the selected Region by choosing a certain event type via *View > Hyper Draw > …* This type of Hyper Draw is also available in the Matrix window (see "Hyper Draw in the Matrix Window" on page 327)and the Score window (see "Hyper Draw in the Score Edit Window" on page 347), where a blue Hyper Draw section is added below the editing area. You must set a large enough vertical zoom resolution in order to see the Hyper Draw curves.

Hyper Draw Functions

Hyper Draw makes use of various tools, maximizing efficiency when drawing and editing automation data. In principle, the following applies to both Track Hyper Draw and Region Hyper Draw.

Arrow Tool

This tool can be used for a variety of actions within the Hyper Draw area.

- A short click into the empty Hyper Draw area will add a new node.
- The very first click into an empty Hyper Draw track creates a new node at that position, and another node at the beginning of the (Hyper Draw) track. This ensures that you can't create parameter controls with "gaps" in the middle of a MIDI Region, but have full control over the parameter from the beginning of the automation track.
- A short click on a node will delete it.
- A short click on, or just outside, a line (not a 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 short and a long click outside a line will create and select a new node, allowing you to move the newly-created node immediately.
- Option-long clicking on a selection allows you to copy the selection.
- Option-clicking, without a selection will select all automation data behind (following) the current mouse position, allowing you to drag the selection.
- An Option–double-click, without a selection will select all data.

Rubber Band Selection

Shift-click and dragging allows you to make a rubber band selection. There are three options:

- Without further modifier keys, no new nodes will be created.
- With Option held, a new node will be created on each side of the rubber band area.
- With Option-Control held, two new nodes will be created on each side.

Multiple Selection of Nodes

- A short Shift-click on a node will toggle the selection of the node.
- A short Shift-click on a line will toggle the selection of the line.
- A short click on the background will deselect all.
- A click outside of the Track Automation data in the Arrange will deselect all.
- A long click in a selected area allows all selected nodes to be moved.

- A long Shift-click allows a rubber-band selection. The selected area will toggle.
- Moved automation data will automatically erase any data which exists in the destination area.

Relative and Absolute Value Changes of Selections
There are two choices available when changing the values of a selection of nodes:
- Clicking on a line or node enables you to change all values by the same absolute amount.
- Clicking outside a line, within the selected area (a node or outside a node), changes all values proportionately, by a percentage value.

Track Automation: Select All, Scaling
Command-clicking on either; the numerical or graphical value displays in the Arrange track list allows the following:
- A short Command-click selects all (current parameter) automation data of the track.
- A long Command-click scales all (current parameter) automation data of the track.

Pen Tool
The Pen Tool allows you to freely draw automation events.

Eraser Tool
The Eraser Tool allows you to erase automation events.

Value Display in Hyper Draw
Numerical values are automatically displayed at Hyper Draw nodes, if there is sufficient space onscreen. Numerical values are context-sensitive—the centered pan position is displayed as 0 (not 64), and volume is displayed in dB, as examples.

If no events exist for volume and pan, Logic draws a horizontal line of the current value (if available). If clicked, a single event of that value will appear on the Hyper Draw track/area. Further clicks work as per usual.

Activating Region Hyper Draw
To activate Hyper Draw for the currently-selected Region(s), select *View > Hyper Draw…*
You can select different Hyper Draw modes for different Regions.

Event Type
You can select the following types of events directly from the Hyper Draw menu:
- Volume
- Panning

The chosen event type is displayed as a controller number, or by name, in the upper left corner of the Hyper Draw area.

MIDI Channel

The *View > Hyper Draw > Channel …* menu item allows you to define the MIDI channel used for event display and editing. The chosen channel number will also displayed alongside the event type.

Hyper Draw—Note Velocity

Once active—by selecting *View > Hyper Draw > Note Velocity*—click-holding at any point in a Hyper Draw window will activate the note velocity line tool, much like that found in the HyperEdit window. Releasing the mouse button change the tool icon to a line, which can be visually placed onscreen. The end of the line is inserted by clicking a second time. This will automatically scale all note velocities, aligned to the inserted line. Please note that use of this option only makes sense when the Region area actually contains notes.

The Note Velocity Line Tool works in different modes:
* *Absolute*: With no modifier key pressed, the velocity of notes will be changed to match the values of the line.
* *Relative*: Command-click, the original and new note velocity will be analyzed. The resulting velocity is the average of both.
* *Just Selected*: with Option pressed, only previously selected notes will be affected.

Both Relative and Just Selected modes can be combined.

Deactivating Hyper Draw

To switch off Hyper Draw for selected Region(s), select *View > Hyper Draw > Disable*.

Conversion of Automation Data

Track Automation data can be converted into MIDI data for Region Based automation, and vice versa. These commands are found in the *Options > Track Automation* menu. These functions allow you to move data (Volume, Pan, plug-in parameters, and so on) from Regions in the Arrange window to the Track Based Automation system, and vice versa—moving data from the Track Based Automation to Region Based (last two functions). Ensure that at least one Region is selected when using these functions.

Converting Automation Data

In the automation view:
* Command-clicking on an automated parameter will activate the parameter pop-up menu.
* Select a destination parameter in the menu.
* A dialog will ask you to "convert" or "copy & convert" the original parameter's automation data into automation data for the destination parameter. A "copy & convert" of the original parameter data is kept, in addition to the destination parameter.

Moving from Region Data to Track Automation

Move Current Region Data To Track Automation

Moves the currently visible Region data (Volume, for example) to the Track Based Automation system.

Move All Region Control Data To Track Automation

Moves all Region Based automation data to the Track Based Automation system.

Moving from Track Automation to Region Data

This option only moves Track Based Automation data that falls within the boundaries of the selected Region.

Move Current Track Automation Data To Region

Moves the currently visible Track Based Automation data to a selected Region.

Move All Track Automation Data To Region

Moves all Track Automation data to a selected Region.

Global Tracks

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8

</div>

Global Tracks provide a perfect way to view and edit global events, such as Tempo, which affect all tracks in the arrangement.

Global tracks can be displayed in the following windows, just below the Bar Ruler:
- Arrange window
- Matrix Editor
- Score Editor (in linear view)
- Hyper Editor
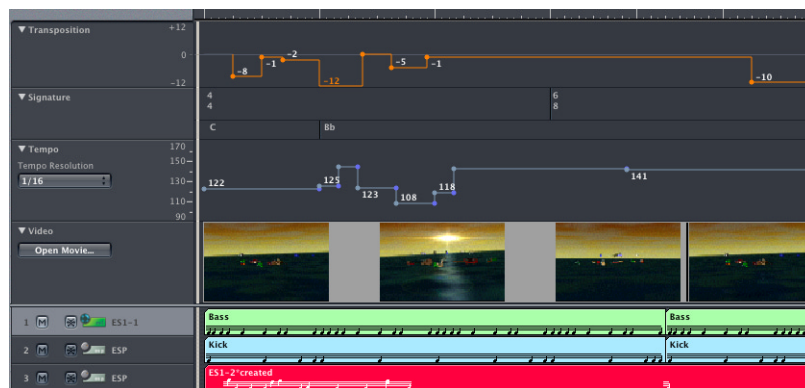
There are several types of Global tracks:
- Tempo track: contains all tempo changes of a song.
- Signature track: contains the basic key of the song and all time and key signatures, as they are displayed in the Score Editor.
- Transposition track: shows global transposition events.
- Video track: displays frames of a QuickTime movie as "thumbnails" that are perfectly synchronized with the music, making it ideal for film scoring. Cuts in the movie can be automatically detected and marked.

Display Options for Global Tracks

Global tracks are displayed or hidden by repeated use of the *View > Global Tracks* menu option. The *View > Global Track Components* submenu lists the individual Global track types. You may use these submenu items to toggle the display of each track type, one by one, or all at once with the *Show All/Hide All* options. Following the use of any of the *Components* commands, the *View > Global Tracks* command will only toggle the display of components previously chosen in the submenu.

Please note that there are also key commands for all of the following options:
• *Toggle Global Tracks*
• *Toggle Transposition Track*
• *Toggle Signature Track*
• *Toggle Tempo Track*
• *Toggle Video Track*
• *Hide All Global Tracks*
• *Show All Global Tracks*

In the upper left corner of each Global Track name column, there is a small disclosure triangle pointing to the right. If clicked, the track height is expanded and additional controls become visible. A further click on the triangle reduces the track height. You can freely adjust the horizontal borders between tracks by dragging them up or down with the mouse.

The order of Global tracks can be reconfigured by grabbing any of them with the mouse in the track list (anywhere except the control elements), and dragging them up or down. The display order of Global tracks is saved independently for each window.

If the Track Protect buttons are visible (Menu *View > Track Protect Buttons*), any of the Global tracks can be protected by clicking on its Protect button, which will turn blue. This will prevent the track from being edited unintentionally.

How to Create, Move, Copy, and Delete Global Events

The data on most Global tracks are called *global events* (except on the Video track, to which the following descriptions do not apply).

Creating Global Events

To create a global event (a tempo change, for example), use the Pencil tool and click at the desired position in the track. (If you haven't changed the default tool assignments, this is done by clicking while holding the Command key). Watch the help tag while holding down the mouse button: It displays the exact position and value (if applicable) of the event to be inserted, until the mouse button is released.

Selecting and Moving Global Events

Global events are selected with a simple click, and are moved and/or changed by dragging them with the mouse. We recommend that you keep an eye on the help tag while doing so. Multiple selection is achieved by Shift-clicking on the desired events. This can even be done in combination with the selection of Regions on Arrange tracks.

To select several subsequent events on the same Global track, you can use the rubber band selection method, while holding the Control key.

To select all events on a particular Global track, click in the desired Track List.

If menu or key commands for multiple selections are made in the Arrange window (such as *Select All, Toggle Selection, Select Inside Locators*), they will also apply to global events on all visible Global tracks. This can be useful for copying or moving an entire song section, inclusive of all signature and tempo changes, for example.

Note: Events on protected tracks will not be selected and—if currently selected—will be deselected by these commands. Consequently, there are several choices available should you wish to avoid having global events selected by any of these selection commands: Either you activate the Track Protect buttons of the desired tracks; or you choose *Edit > Deselect Global Tracks* after the use of any of these commands; or you simply turn off the Global track display temporarily, using the *View > Global Tracks* menu option or the corresponding key command.

Copying Global Events

You can use the same copy methods used for Regions and MIDI events on global events: Drag an event while holding the Option key (watch the help tag) or use the standard menu or key commands for *Copy* and *Paste*. The copied global event will be pasted at the current Song Position Line (SPL) location. If multiple events are copied, the first one will be pasted at the SPL, the others will retain their relative distance to the first copied event.

Deleting Global Events

To delete one or several global events, select the desired event/s and press Backspace or Delete, or just use the Eraser tool.

Tempo Track

The Tempo track displays tempo changes as nodes: dots connected by lines. By default, these dots are followed by horizontal lines that (at the bar position of the next tempo change) form right angles with vertical lines, connected to the node of the ensuing tempo change.

Note: If there is enough space in the Tempo track, the tempo will be indicated numerically (in bpm) alongside each node.

Insertion of Tempo Changes

Tempo events are inserted by a double-click (with the Pointer) or by using the Pencil tool. Watch the help tag and don't release the mouse button until the intended tempo and position are indicated exactly.
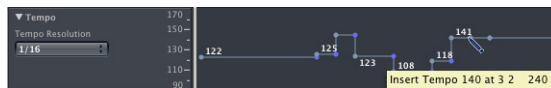
Note: If you hold Control-Option-Command while clicking in the Tempo track, a text field opens. You can type the desired bpm value into this field. Press Return or Enter, and a tempo event (of the typed bpm value) will be created at the clicked position.

Deleting Tempo Changes

To delete a tempo change, select it by either clicking the node itself or the line which leads away from it, then press Backspace or Delete. Alternately, you can double-click on the node or use the Eraser tool.

Continuous Transition Between Different Tempi

To create a continuous transition between two tempi, grab the dot at the tip of the right angle (above or below) the second node, and drag it inside. A curve or diagonal line will be the result. You'll find that this is quite similar to drawing track automation curves with the mouse.

The *Tempo Resolution* menu in the Tempo track defines the number of tempo changes that are actually performed when using curves: When it is set to *1/16*, there will be four tempo changes per quarter note, *1/1* will only generate one tempo change per bar, which will result in a less smooth transition. This setting can be defined differently for each node.

To delete a tempo curve:

- Click the handling node (at the tip of the right angle) with the Eraser tool, or double-click on it.

Moving and Copying Tempo Changes

To move a tempo change, grab its node (or the line leading away from it) and drag it left or right. To copy it, do the same while holding Option. To prevent unintentional changes, moving a node is restricted to either vertical or horizontal movement. Put another way, you can either change the tempo value or its position, but not both at once. To alter the tempo in very small steps, press Shift while dragging the desired node up or down.

Tempo events can also be copied by using the standard *Copy* and *Paste* procedure. The SPL will determine the position for the first pasted event.

It is also possible to copy or move *multiple* tempo events at once: Use Shift-click or the rubberband selection method (while pressing Control) for multiple selection.

More About the Tempo Track

- Shift–double-clicking in the Tempo track will open the *Tempo List*.
- The *display range* for tempo events is adjusted automatically. The upper and lower boundaries of the Tempo track are labeled in the Track List. Dragging a node beyond the current maximum or minimum scale boundaries will result in an automatic adjustment of the range. You can also define the maximum and minimum ranges of the tempo display manually. To do so: Grab the maximum and minimum values in the tempo scale and drag them vertically, or double-click on either (or both) range(s) and type the desired numerical value into the text field(s). These user-defined values are displayed in yellow. If you want to reset to the automatic adjustment values, use the procedure described above, and leave the text fields empty.

Signature Track

The Signature track shows all time and key signatures of a song. These can be created in either the Score Editor or directly in the Signature track: Click at the desired position using the Pencil tool. A dialog window will open, allowing you to set the time or key signature. Insertion of the event occurs after closing the dialog with the *OK* button. If you perform this procedure when the track height is reduced, a time signature change will be created. If the track height is expanded, you will see separate lines for time and key signatures, which can be independently clicked with the Pencil tool to create events.
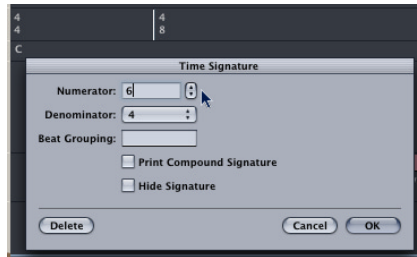
The global playback key for Apple Loops and MIDI Regions is determined by the very first key signature (default: C major).

Apple Loops can contain information about the key they are in, and can be transposed automatically. They will be played back in the song key by default, which is defined by the first key signature event. No distinction is made between major and minor keys for these global transposition functions; in fact, only the root of the initial key signature is relevant for playback of Apple Loops and MIDI Regions.

Note: If a *GarageBand* song file is imported into Logic, the initial key signature will automatically be set in accordance with the "project key" of the GarageBand song. Any existing Apple Loops will be played back in this key, or rather, with the key's root note.

Key signature changes *after* the initial key signature only affect the *display* of MIDI notes in the Score Editor—they do not have any effect on playback.

Similarly, even time signature changes don't affect playback, but only the display of the Score Editor. You will not hear anything different when you change the time signature or insert a time signature change in this window.

Handling Signature Changes

Events on the Signature track can be selected, moved, deleted, and copied (drag them while pressing Option or use the standard *Copy* and *Paste* commands). Multiple selections are possible, even in conjunction with Regions, which is very useful when complete parts of a song, containing signature changes, are to be copied. In this situation, the *Edit > Select Inside Locators* option can be helpful. Note that the Signature track must be visible and must not be protected, in order to select and copy signatures.

If you double-click a signature in this track, a dialog box opens, allowing you to edit the signature.

Shift–double-clicking in the Signature track opens the *Signature/Key Change List*, where time and key signatures are shown in a list style editor, along with other global Score symbols such as repeat signs, double bar lines and so on.

Cutting Bars

You can use the Scissors tool in the Signature track to cut bars. As an example; to divide one 5/4 measure into a 3/4 and a 2/4 measure by cutting at the fourth beat of the 5/4 bar.

If you make a cut in the middle of a bar in a section where the time signature doesn't change, two corresponding shorter measures will be inserted, with the original time signature resuming after the cut.

Likewise, it is also possible to *merge* two subsequent measures into one longer measure by using the Glue tool in the Signature track.

Transposition Track
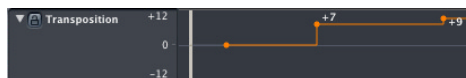
The Transposition track shows global transposition events, which affect the transposition of both Audio and MIDI Regions. In MIDI regions, it changes the actual MIDI events themselves. Despite this data change to events, the Transposition track works "non-destructively", as the global transposition of MIDI Regions can be changed multiple times, without actually altering any information. If the Transposition track is set to zero, Regions (and the events they contain) are played back as originally recorded.

Note: All Apple Loops and MIDI Regions will be pitch-shifted accordingly. MIDI Regions will only be transposed if the No Transpose checkbox is deactivated in their respective Object Parameter boxes. The "zero position" of the Transposition track is determined by the current key signature in the Signature track. If the key signature changes during a song, the "zero position" of the Transposition track changes accordingly. "Regular" Audio Regions (Audio Regions that are not Apple Loops) will not be affected. Nor will Apple Loops that do not have a key definition (drum loops, for example).

Handling Events in the Transposition Track

The Transposition track contains nodes that are connected by vertical and horizontal lines. Each node represents a global transposition event, which determines the global transposition value until the song position reaches the next transposition event during playback.

Handling of transposition events works in a similar fashion to Tempo track events: They are created with the Pencil tool, and can be moved horizontally (along the timeline) or vertically (changing their transposition value) by dragging them with the mouse. Watch the help tag during these procedures to see the exact transposition value and bar position of that particular event.

If you hold Control-Option-Command while clicking in the Transposition track, a text field will open, allowing direct entry of the desired transposition value. After pressing Return, a transposition event of the typed value will be created at the clicked position.

To *delete* a transposition event, select it by clicking on the node itself (or the line to its right) and press Backspace, or use the Eraser tool.

Transposition events can be *copied* using the standard Copy and Paste procedure or by dragging them with the mouse while holding Option.

It is also possible to copy or move multiple transposition events simultaneously, which can be useful for repeated song sections: Use Shift-click or the rubberband selection method (while pressing Control) to make the multiple selection, then drag the first selected event to the desired position (while holding Option for copying), or perform the *Copy* and *Paste* commands. Again, watch the help tag while dragging the events.

The scale range for the display of transposition events is adjusted automatically: The upper and lower boundaries of the Transposition track are labeled in the Track List. Dragging a node or line beyond the current maximum or minimum values will result in an automatic adjustment of the range. You can also define the maximum and minimum of the transposition scale manually: Grab the maximum and minimum values and drag them vertically, or double-click on them and type the desired numerical value into the text field that appears. These user-defined values are displayed in yellow. If you want to reset to the automatic adjustment mode, repeat the procedure and leave the text fields blank.

Video Track

The Video track does not contain any global events, but serves as the "thumbnail track" (an overview containing single frames) for QuickTime video when creating film music.
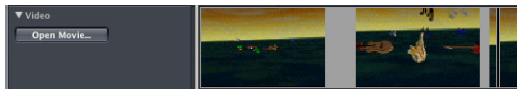
Note: This global Video track replaces the *Video Thumbnail track* of previous Logic versions. If a song file (created with an older Logic version) which contained a Video Thumbnail track in the Arrange window is opened, the Video will be displayed in the original Video Thumbnail track view.

Note: You can easily insert a movie at the current mouse position by clicking in the Video track with the Pencil tool.

The number of frames displayed in the Video track depend on the track height and the zoom level of the window. All frames are aligned left, with only the very last frame aligned to the right. This guarantees that you can always see at least the first and last frames of a video, independent of the current zoom level. Given the left alignment of frames, the left margin of a frame will always be displayed at the exact position of that particular frame (except the very last frame).

Note: Some settings for the thumbnail display can be found in Logic's Video preferences (see "Video Preferences" on page 485).

Audio Window

9

The Audio window provides an overview of all audio files used in the current song. It also offers a number of simple editing and conversion facilities that simplify audio file handling.

While many of the Audio window's tasks can be performed elsewhere in Logic, it offers a number of unique features that are discussed in this chapter.

Audio Window—Introduction
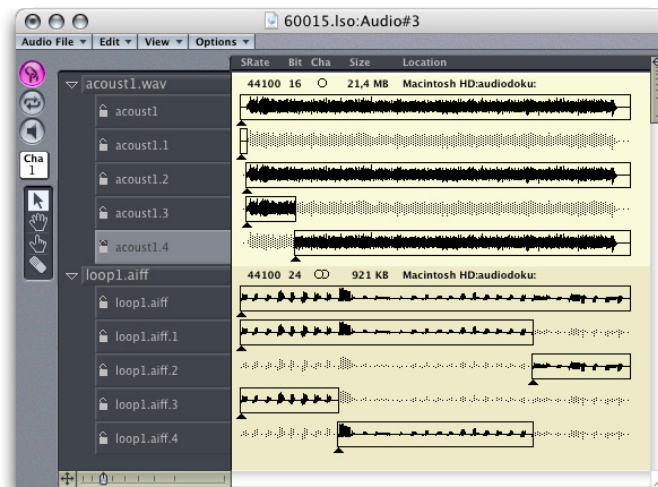
Logic allows you to access any digitally stored audio recordings (audio files) on your hard drives, in the most common Macintosh formats: AIFF (Audio Interchange File Format) and SDII (Sound Designer II format), and also Wave (.WAV) format files. Several other audio file formats are also supported, including; MP3, AAC and ReCycle.

By default, recordings made in Logic are stored in the Sound Designer II format. You can change the recording format to AIFF or WAV via *Audio > Audio Preferences… > Recording File Type*. Sound Designer I files can also be imported, played back and edited destructively in the Sample Editor, but Logic will neither record nor bounce this file type.

Audio files imported into a Logic song can be at any supported bit depth and sample rate. Logic supports bit depths of 16, 20, and 24 bits, and sample rates of 44.1, 48, 88.2, 96, and 192 kHz. Logic performs a real time, native sample rate conversion (see "Further Options" on page 268).

The Audio window is used to organize all audio files that are used in a Logic song. It doesn't matter whether these audio files have just been recorded, or whether they were copied weeks ago from a CD-ROM onto the hard disk. The Audio window gives a Logic song access to any compatible data on the hard disks.

The Audio window contains no positioning information about the files it lists. In fact, files that are not yet in use in the arrangement may be added to the Audio window. Files are assigned to the sequencer's time axis by arranging sections of the audio files, known as "Audio Regions", in the Arrange window, much like MIDI Regions.

The Audio window can be thought of as an audio file catalog for the song. It also provides an overview of Regions that have been defined from each audio file.

You can define new audio files and Regions and edit, delete, or rename existing ones in the Audio window. When edited here, the accuracy is limited to units of 256 sample words. To make more precise edits, use the Sample Edit window.

These audio files and Regions can then be dragged directly into the Arrange window, where they may be arranged as Audio Regions.

The menus of the Audio window contain all operations related to the administration of audio files and Regions.

Opening the Audio Window
Select *Audio > Audio Window* (or Command-9) to open the Audio window. You can open several Audio windows at once (even within one Screenset)—to use different zoom factors, for example.

If you add an audio file to the Audio window, Logic automatically creates a Region that encompasses the entire length of the file.

You can create as many Regions as desired from the same audio file. There are no length limitations to Regions, as long as they don't exceed the length of the source audio file.

Regions can be moved with the mouse into the Arrange window. The portion of the audio file represented by the Region is then played at the desired song position.

Layout
Overview
On the left side of the Audio window, you'll see a thin column. At the top, you'll see the mode buttons (see "The Mode Buttons" on page 251), and at the bottom, the tools.

The column to the right lists the audio files, and their Regions, by name.

Further to the right, Region waveforms are displayed graphically, in the large white area of the window. A Region is shown as a boxed, black, or colored area, while the rest of the audio file is shown in light gray, indicating that this part of the audio file is not used for the Region.

Zoom Functions
The Zoom Bar at the top right can be used to enlarge or reduce the vertical display.

The Zoom Bar at the lower left is for enlarging or reducing the horizontal display size—altering the time display of the Regions.

The Mode Buttons
The mode buttons allow you to select different operating modes. These affect both the display and the playback of Regions in the Audio window.

Link
Link mode in the Audio window means that whenever you select an audio Region in the Arrange window, the same Region is automatically selected and displayed in the Audio window.

You can switch link mode on or off by clicking the button featuring the chain link icon.

Hidden Regions (see "The Audio List" on page 253) cannot be displayed in link mode. If you want to display them, you need to *Show* (see "The Audio List" on page 253) the Regions.

Monitoring
You can play Regions directly in the Audio window. This monitoring is not related to the time axis of the sequencer. There are several ways to play a Region:

Playing From a Specific Position
Click-hold the desired Region in the waveform display with the mouse. Playback starts at the click point. This allows you to play specific sections.

Playback stops as soon as you release the button.

Playing the Whole Region
If you want to play an entire Region, highlight its name in the list. Now click the button featuring the speaker symbol to start playback. Click the button again to stop playback.

You can also start or stop this type of playback with the *Play/Stop Region* key command.

Stereo Playback
If a Region of a stereo file is selected, clicking the speaker icon plays both sides of the stereo file. If you click the icon while holding down Command or Shift, only the selected Region (mono) is played. If you subsequently select a Region from another stereo file, Logic returns to stereo playback.

Region Cycle
Regions may be looped continuously during monitoring. To switch "Region cycle" on or off, click the button featuring the circular arrow symbols. This mode applies to all Regions in the Audio window.

This cycle setting only affects monitoring in the Audio window, and has no effect on song playback. It should not be confused with the Arrange window Cycle function.

You can adjust the start and endpoints of the Region in real time, while the Region is being cycled. This is useful for setting precise Region lengths—when "polishing" drum loops, for example.

Selecting the Audio Output for Monitoring
The actual routing of audio signals to different outputs is done in the Arrange window (using the Audio Object in the track list).

You can, however, choose a specific audio hardware channel—for monitoring duties—in the Audio window. Set the desired output by click-dragging on the *Channel* button, just below the speaker icon.

Display
The Audio List

The list provides an overview of all audio files used in the current song, and the Regions derived from them. This is where audio files can be added, removed, deleted, or renamed. Regions can also be created, deleted, and renamed.

Hiding and Showing Regions

Following the addition of an audio file, you will see the file name in the Audio window, in large print. This takes up minimal screen space, and shows as many currently used files as your zoom setting and monitor size will allow. There is a small triangular arrow directly beside the file name.

Click the small triangle to reveal an audio file's Regions. Much like the list display of folders in the Finder, this shows you the "contents" of the audio files—the Regions derived from the files. The arrow points downwards, showing the Region names in small print. Click the triangle a second time to hide the Regions.

You can also press Command while clicking on any audio file's triangle to quickly Hide/Show all Regions.

Activating the Display of All Regions
Selecting *View* > *Show All Regions* instantly displays all Regions—of all audio files in the Audio window.

Hiding the Display of All Regions
The *View* > *Hide all Regions* option instantly hides the Regions of all audio files. Click the small triangle to the left of the file name to view individual Regions.

Displaying the Lengths of the Regions

The lengths of Regions can be displayed in various units.

Select *View* > *Show Length as;* at the lowest level of this hierarchical menu, you can choose the display units for Region lengths.

Show Length as… > None
No length display.

Show Length as… > Min:Sec:Ms
Absolute time length of the Region in hours, minutes, seconds, and milliseconds.

Show Length as… > Samples
Number of sample words in the Region.

Show Length as… > SMPTE Time
SMPTE length, which unlike absolute time, uses frames and bits in place of milliseconds.

Show Length as… > Bars/Beats…
The Region is displayed in musical units: bars:beats:divisions:ticks.

If the tempo, time signature or division settings are altered, the display is automatically recalculated.

Displaying Information About Audio Files
Information on every currently loaded audio file can be displayed, from left to right, in the Region waveform display, as follows:

Sample rate (Hz), Bit Depth (Bit), Mono, or Stereo status (Cha), file size (kByte) and file path or folder (Location). Mono files are identified by a single circle symbol, and stereo files by a double circle symbol.

You can switch this display on or off by selecting *View > Show File Info*.

Sorting Audio Files and Regions
Sorting Audio Files
Audio files in the list can be sorted according to various criteria by selecting *View > Files sorted by…*:

Files sorted by… > None
The audio files are listed in the order in which they were loaded or recorded.

Files sorted by… > Name
The audio files are listed in alphabetical order.

Files sorted by… > Size
The audio files are listed according to size, in decreasing order.

Files sorted by… > Drive
The audio files are sorted according to the drive on which they are stored (hard disk, removable drive, partition).

Sorting Regions
The display of Regions can be sorted (within an audio file) according to various criteria by choosing *View > Sort Regions by…*

Sort Regions by… > Start
The Regions are sorted according to their time position in the audio file. This is the default setting.

Sort Regions by… > Length
The Regions are sorted according to their lengths.

Sort Regions by… > Name
The Regions are sorted alphabetically.

The Waveform Display Outside the Region
Logic defaults to showing the waveforms outside the defined Region area in light gray.

You can alter the display by Option–click-holding inside the Region. A pull-down menu will appear, containing the following options:

None
No waveform display outside the Regions.

Bright
Waveform display outside the Regions colored light gray.

Middle
Waveform display outside the Regions colored mid gray.

Dark
Waveform display outside the Regions colored dark gray.

Overview Calculation
In addition to the actual audio data, an audio file also contains data required for graphical display of the waveform in the Audio window and Sample Editor ("Overview" data).

Automatic Overview Calculation
If the *Audio > Audio Setting > General > Create Overview after Recording* option is switched on, graphic overviews are automatically calculated immediately after audio recording.

If you switch off this option, overviews are not calculated automatically, but can be started manually.

Starting Overview Calculation Manually
Occasionally, when loading/importing audio files, you may need to perform a manual overview calculation (if the audio files don't contain overview data). You can start the overview calculation of selected files with *Audio File > Refresh Overviews*.

Controlling the Overview Calculation
The calculation of audio file overview data is shown in a float window. This calculation occurs in the background, allowing you to continue working with Logic.
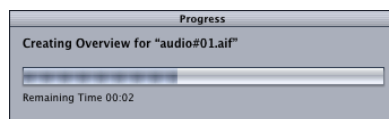
You can position this float window anywhere. The most recently used position is saved in the Preferences.

Double-clicking this window opens a dialog box that offers the following options:
- If you stop the calculation by clicking *Abort*, you can still play the audio file—but it will not be easy to edit without an overview!
- *Continue* performs the overview calculation in the background, as per usual.
- Clicking *Finish* transfers the calculation to the foreground, speeding it up considerably. The disadvantage is that you can't use your Mac for anything else, until the overview calculation is finished.

Operation
Selection Techniques

There are several different ways of selecting audio files and Regions in the Audio window.

To select a single item, either click its name in the list, or on the waveform display.

Shift-clicking allows the selection of several items, even if they aren't adjacent to one another. You can also "rubber band" select multiple adjacent files in the list.

To select all items, use *Edit > Select All* (Command-A).

You can also use the up/down cursor keys to select the upper/lower audio file or group, and the left/right cursor keys to show/hide the waveform display.

Audio Files
Selecting the Next Audio File
The *Select Next Audio File* key command selects the next audio file in the list.

Selecting the Previous Audio File
The *Select Previous Audio File* key command selects the previous audio file in the list.

Audio Files and Regions

Selecting Used Regions
Choosing *Edit > Select used* will select all audio files and Regions used in the song arrangement.

Selecting Unused Regions
Edit > Select unused selects all audio files and Regions that are not used in the current song arrangement. You can use this function at the end of a session or production, to delete any items that are not required (press Backspace to delete).

Edit Commands

All standard edit commands are available in the Audio window. As usual, they only apply to the currently selected items (audio files or Regions).

The *Cut*, *Copy,* and *Paste* commands only apply to the exchange of items between two different songs. An audio file can only appear once in a song's list of audio files, and therefore, cannot be copied within a song.

Cut

The selected audio files or Regions are cut, and moved to the Clipboard. They are removed from the Audio window. (key command: Command-X).

Copy

The selected audio files (and their associated Regions) are copied to the Clipboard. They remain in the Audio window. (key command: Command-C).

Paste

The contents of the Clipboard are added (provided it contains audio files and associated Regions from another song). (key command: Command-V).

Clear

Any selected audio files or Regions are deleted. You can achieve the same effect by pressing Backspace.

Note: The *Cut* or *Clear* functions do not delete audio files from the hard disk, they simply remove them from the Audio window of the current song. If (whole, or portions of) audio files are being used as Audio Regions in the Arrange, they will be deleted from the Arrange window as well.

If you actually want to delete the selected audio files from the hard disk, select *Audio File > Delete File(s)*.

Undo

Reverses the previous command (key command: Command-Z).

Not all actions can be reversed with Undo. Any function that cannot be undone will warn you of this before executing the function.

Regions

Creating a Region

Select the desired audio file, and choose *Audio File > Add Region*. The new Region will appear after the existing Regions in the list.

Copying a Region

If you select an existing Region, and use the *Add Region* function, a cloned Region is created.

Deleting a Region
You can use the Eraser tool to delete one or more Regions. If any of these Regions exist in the Arrange window, they will be removed as well. You should, therefore, be careful when using this tool. The Undo function is always available, however, should you inadvertently remove a required Region.

You can also delete any selected Regions by pressing Backspace.

Altering the Boundaries of a Region
You can directly alter the boundaries of a Region in the graphic display with the Region Edit (finger) tool. You can also use the normal mouse pointer. Just make sure that you grab the lower third of the Region when performing the following actions:

Moving the Start Point
To adjust the start point of a Region, grab the left border. The tool turns into a small hand pointing to the right. You can now adjust the start point.

Moving the End Point of a Region
To adjust the end point of a Region, grab the right border. The tool turns into a small hand pointing to the left. You can now adjust the end point.

Moving the Whole Region
You can also move an entire Region within an audio file, by grabbing it in the middle. The tool turns into two arrows pointing left and right. If the Region is very small, use the zoom function to enlarge the section. Make sure you can see the two arrows before making any alterations.

If you want to adjust the boundaries of the Region without moving the Anchor, hold down Option during the operation. This applies to moving the start or end points, as well as moving the whole Region.

Moving the Anchor
To move the Anchor, grab the small Anchor triangle below the Region. The tool turns into the Region Edit tool. A vertical guide line appears above the Anchor triangle.

Snapping to Zero Crossings
If *Edit > Search Zero Crossings* is switched on, adjustments to the start or end positions of a Region are snapped to the nearest point where the wave form crosses the zero axis. This ensures "glitch-free" playback. When adjusting the startpoint, the area preceding the selected point is searched. When adjusting the end point, the area that follows the Region is searched. This option is useful when defining Regions in the Audio window.

Search Zero Crossings also applies to all operations in the Arrange window.

Making Fine Adjustments

The graphic display in the Audio window is optimized for quick and simple organization of audio files and Regions. This involves displaying as many things as possible simultaneously in the window. Given this, the finest resolution for positioning the start and end pointers, or the Anchor, is limited to units of 256 samples. This is usually adequate, particularly if search zero crossings is switched on.

On occasion, however, you need to make precise adjustments—down to individual sample word level. Drum loops are a good example. The Sample Edit window is better suited to these situations. To open the Sample Edit window for a Region, double-click on it!

Protecting the Region Parameters

Regions can be "locked", to protect against accidental alterations to the start and end points, or the Anchor position. The small lock symbol beside every Region can be opened and closed with a click. If locked, you can play the Region, but can't edit it. This function should not be confused with delete protection: A protected Region can still be deleted.

Renaming Audio Files and Regions

To rename audio files and Regions in the Audio window, just double-click the name in the audio list. A text input box will appear, allowing you to type in a new name.

The following warning appears when renaming files:

Keep in mind other songs may use the same file! Do you still want to rename the file?

You should check if the audio file that you want to rename is used by another song. If it is, don't rename the file, or it won't be found or played by the other song.

Logic helps you in these situations:
• Logic alters the name of an audio file in all currently opened songs that use this file.
• If the file is half of a "split" stereo pair, Logic automatically assigns the new name to the other half of the (SDII) stereo pair.
• Logic also renames any backup files on the same drive.

If you rename a stereo file, Logic automatically assigns the new name to up to five files (both the mono files used in Logic, their backups and the stereo file). In this situation, it's a good idea to store all files in the same location.

You can rename Regions whenever you like.

As long as Regions are named after their "parent" audio files, any renaming of the audio files is automatically carried over to their associated Regions.

File Administration
Record File
Defining the Record Path

Every recording in the Arrange window creates a new audio file. To keep track of your recordings, you should tell Logic where the data is to be written before you start recording.

You can also define a file name for the audio files that are recorded—a kind of working title—which Logic will automatically keep using, by appending a series of numbers to the file name for each subsequent recording.

The path (folder) for audio recordings can be set individually for each song.

Select *Audio > Set Audio Record Path* or open the Record menu (click-hold the Record button) to access these settings.
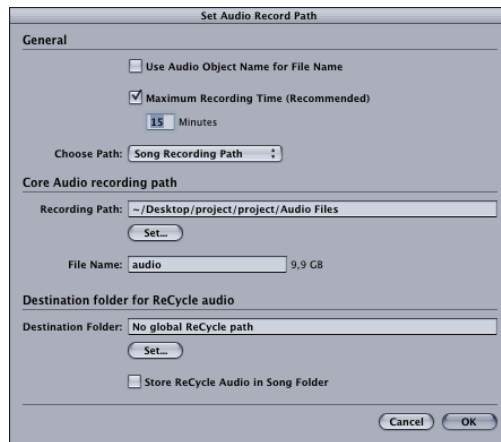
Use Audio Object Name for File Name

If this option selected, the name of the Audio Object is used as the file name for the recording.

Pre-allocate Recording Files

If this option is selected, Logic creates the audio file for the next recording when you record-enable the track. In addition, the audio file (buffer) for the next recording is immediately created at the end of every recording. This allows you to start audio recording more quickly.

Unused recording files are deleted when you quit Logic.

Maximum Recording Time (Recommended): xxx Minutes
This parameter defines the maximum recording time for new audio files, in minutes; this determines the size of the temporary recording file. Before any recording can take place, a file large enough to hold it must be created on the hard disk.

You can switch this option off, which will create a record file with the size of all available free space on the currently selected hard disk.

Disadvantage:
• the audio file may be heavily fragmented, if the actual recorded file is much shorter than the pre-created recording file.

It is strongly recommended that you switch on this option, and set a maximum recording time.

If there's not enough storage space available to accommodate the time you have set, the maximum length of the recording is temporarily reduced. During recording, the Record float window (the one with the red bar) will display the remaining time.

Global Record Path/Song Record Path
The Global Record Path was available in earlier versions. It is stored in Preferences, and applies to all songs. The advantage is that you don't need to define a record path in every new song before you can record, provided that you don't mind recording files for every song into the same folder.

The Song Record Path allows you to organize the audio recordings for each song into its own folder. The advantage is that when you switch from one song to another, any new recordings are automatically stored in the current song's folder, without having to switch the path manually.

Set
This button can be used to define the path and the file name of the recording file. An incremental number is added to the name of every new recording. You can create a new folder (if required) in the dialog box.

To the right, you will see the current volume, and the remaining capacity (if the volume is registered). If you click-hold the volume, the entire path is displayed. This way you can see exactly which folder you are recording into.

You can change the path and name whenever you want, via the Set Record Path function.

When You Choose the Path Remember …
• If the hard disk used by the path leads is not connected or is switched off, the path will be deleted.
• If you rename the volume, Logic will not be able to find it.

When You Enter the Recording Time Remember…
The display of the remaining memory and the maximum recording time depends on the following factors:
• the number of tracks that you want to record simultaneously.
• the sample rate.

If you are starting Logic for the first time, this display refers to recording a single mono track. After every recording, Logic makes any unused memory available for more recording.

It is always advisable to choose a much smaller value than the maximum possible recording time. If you don't, there will not be enough space for further recordings, following the first recording. It's good practice to set this value one minute higher than the longest single take you expect to record.

If you set a long recording time, and then increase the number of tracks, or change the sample rate, and there's insufficient hard disk space, Logic will warn you via an alert.

Adding Audio Files
If you want to use an audio file in the current song, select *Audio File > Add Audio File*. An extended file selector box appears, allowing you to select one or more audio files.

Audio File Selector
Logic's add audio files selector box offers the following features:
• Adding several files at once.
• Adding or removing all files in the folder.
• The cursor stays at the last position after you have added a file—subsequent files can therefore be added by pressing Return.
• Any files that have already been added are filtered from the view.

Auditioning audio files:
• Channel 1 of your audio hardware is used for playback.
• Playback can be stopped at any time.
• Playback is not stopped if you change the folder or volume.
• A short standby pause (a delay before the file can be auditioned) ensures that you can scroll quickly through folders.

Done adds all selected audio files to the song and closes the file selector box.

Drag & Drop Using Audio Files
The Drag and Drop functionality of Mac OS X is supported: you can drag any selection of audio files directly from the Finder into an open Audio window.

The end result is exactly the same as using the *Add Audio File* function. It can save you time, especially with large multiple selections.

You can also drag and drop audio files from the Finder directly into the Arrange. A corresponding entry will automatically appear in the Audio window.

Removing Audio Files
To remove an audio file from the current song, select its name in the Audio window and press Backspace. This does not delete the file from the hard disk.

MP3 Import
MP3 files may be imported into Logic by using the same methods employed when adding AIFF, SDII, or WAV files: namely by Shift-clicking with the pencil tool in the Arrange, using the *Audio > Add Audio File* command, via the Audio File local menu of the Audio window, or by dragging MP3 files from the Finder into the Audio window or Arrange.

When you import an MP3 file, Logic converts it into an AIFF file, and it is the AIFF file that is used in Logic. Logic does this because many functions, such as waveform display, sample accurate editing, and so on, would overtax the CPU if Logic had to constantly decode and re-encode the MP3 files in real time for each change or edit. Logic ensures the most efficient use of resources by converting the MP3s to AIFF on import.

Deleting Audio Files
In theory, audio files are displayed and organized by the operating system in exactly the same way as all other Macintosh files. You can therefore delete or copy them in the Finder. This has the following disadvantages, however:
• If you delete an audio file, you may not know if it is needed in a song.
• If you accidentally delete audio files, Logic warns you of this when you load the song. In addition, there will still be items in the Audio window and Audio Regions in the Arrange window which originally referred to the missing audio file, and have therefore been "orphaned". This detracts from a clear overview of the song.

For this reason, it is safer to delete redundant audio files in the Audio window. First, select the audio files that you want to delete. Be careful, because once files have been deleted, they are gone for good. You cannot use the Undo function to recover deleted audio files.

Select *Audio File > Delete File(s)*. An alert message, informing you of the number of audio files about to be deleted, will appear.

Click *Cancel* to abandon the deletion process, or click *Delete* to permanently delete the files.

You should make sure that the files selected for deletion are not used in other songs.

Further File Functions
Saving a Region as an Individual Audio File
If you want to create one (or more) independent audio files from selected Regions, use the *Audio File > Save Region(s) as* function. Use the file selector to choose the target folder for the new audio files. If you're only editing one Region (or two paired Regions from a stereo recording), you can also enter a name for the new audio file. If you are editing several Regions simultaneously, it's a good idea to name the Regions in advance, as the existing Region names will apply to the audio files derived from them.

A dialog box appears onscreen:

Add Audio Files to List of Audio Window? No/Add

If you want to add the new audio files immediately, confirm with Enter or *Add*. If not, click *No*.

There is a very similar function that allows you to convert selected Regions into individual audio files, accessible directly from the Arrange window.

Making Backups
The *Audio File > Backup File(s)* function stores duplicates of files in the same storage location as the original(s), with the extension "dup".

Don't forget the backup options that are available in the Sample Edit window.

Copying Audio Files
The *Audio File > Copy/Convert File(s)* function copies files to a different location on your hard disk (or other storage medium). When you copy a file, you can enter a new name in the file selector box (similar to the *Save A Copy As* command).

Logic checks if there's enough space to copy the selected file(s) to the target location. If a file of the same name exists at the target, Logic asks whether or not you want to replace it. Logic also provides the opportunity to replace the audio file used in the song with the file that you just copied.

Moving Audio Files
The *Audio File > Move File(s)* function enables you to move audio files on your hard disk. Unlike the copy function, the source file disappears after the operation.

If the source drive/partition is the same as the target drive/partition, the files are simply moved to the other folder. This is a very quick and convenient way of organizing the drive and the song.

Example
Choose "Select Used" from the Edit menu of the Audio window (this refers to the files being used in the Arrange window), and move them to a new folder. This folder will only contain the audio files used by this song.

Be very careful when using this function. A different song may use the same audio files. The next time you start the other song, you will need to locate the files that you have moved.

Logic updates the path information for all open songs that use a given audio file. This makes it easier to move (and reopen) audio files. Following the move of files to the new location, save all open songs to transfer/update all storage reference(s).

File Conversion and Exchange

Audio File Format Conversion

You can define the format of the destination file when you copy files using the *Audio File > Copy/Convert Files(s)* function.

All selected audio files can be copied into any of the following formats:
- …*Original File Type*: The original format is used.
- …*SDII File*: The copies are in the Sound Designer II format.
- …*AIFF File*: The copies are in the Audio Interchange File Format.
- …*Wave File*: The copies are in the ".WAV" format.

Convert to AAC or MP3:

There are also the two separate *Audio File > Convert to MP3* and *Audio File > Convert to AAC* functions, which allow you to convert audio files to the AAC (MPEG Layer 4) or MP3 format. A dialog will launch when either option is selected, allowing you to set the desired preferences. These conversions can be performed on one, or multiple, files.

When activated, a dialog will allow you to save a single file with any name. In cases where multiple files are being converted and saved, the existing file name will be used, with the appropriate file extension added—"partyman.aiff" will be converted to "partyman.mp3".

The default folder location for all saved files is the parent directory—the folder that contains the original files. This can be freely changed in the *Save As* dialog, prior to saving the files.

Exchanging Audio Files Between Mac and PC

When converting audio files to the Wave format on the Macintosh, or when converting AIFF files on the PC, you can use long file names.

Wave files can be directly played on the Macintosh, without problems, in Logic's native Audio Engine. SDII Files can also be played on the PC, as long as the files are recorded at 16 Bit 44.1 kHz. It is generally recommended, when transferring files from Mac to PC, that you convert the files to Wave format (while still on the Mac), as the Resource Fork is lost in SDII files. (The Resource Fork contains detailed information about format, Sample rate and Bit definition).

The use of DOS-formatted hard disks with your Mac OS computer is not recommended, as its audio performance is significantly worse than the performance of an HFS+ drive.

To transfer an entire Logic song from Logic Mac to Logic Windows, open the Audio window and copy all audio files onto the MS-DOS drive (or the PC network drive, if available) as .WAV files. The song file (exported as a Logic 4.8 song) itself can be read directly on both platforms.

Logic Windows will recognize a song created on a Macintosh, and looks for "FileName.WAV" instead of the original files.

Likewise, to transfer from Logic Windows to Logic Mac, you need to export the audio files onto the Mac/HFS+ drive. Logic Mac will first look for "FileName.AIF" files, and then for "FileName.WAV" files, which are used on the PC.

Store the Logic song file in the same folder as the audio files. This will allow Logic to find the audio files immediately after loading.

Split and Interleaved Stereo Formats

The internal structure of multi-track hard disk recording systems is such that each individual audio track can be dealt with independently. Accordingly, a separate audio file is created for each track.

Logic creates single files containing both channels of a stereo recording. This is called the "interleaved stereo format". These are composed of a Region consisting of small alternate data packets from both tracks. Logic can record files directly in the interleaved format, giving stereo files recorded in Logic instant compatibility with other mastering or CD recording applications. Please note that not all hardware and driver models are compatible with this format, so all files recorded on these systems will be in the split stereo format. Please read more about this topic in the Universal Track Mode section.

Special Features of "Split" Stereo Files

There are a few special features for dealing with "split stereo" sound files:
- In the file selector box, "split stereo" audio files are treated as a single file, even though strictly speaking, they are two independent files.
- In the audio list you can see both files. They have the same name—apart from the channel markings (L and R). If you rename one channel of a stereo audio file, the file for the other channel is automatically renamed as well.
- Their Regions can also be renamed.
- If you use the *Add Region* command to create a new Region, Logic does this for both audio files.
- Any alteration made to either Region is automatically transferred to the other Region. This applies to the start point, end point, and position of the Anchor.
- If either of these Regions is moved into the Arrange window, the other Region is also moved.

Converting Different Split Stereo Formats

Logic treats audio files with a name that ends in ".L" or ".R" as stereo files. These "name extensions" are used by ProTools, Session, or SoundDesigner II to identify "split stereo" files. Logic's file management functions, such as *Rename, Create,* or *Revert to Backup* can also identify these name extensions.

Manual Stereo Conversion

Convert to SDII Stereo

This command converts two (split-stereo) audio files into a single stereo file—in the SDII format. This is useful if you want to edit a "split stereo" file using a different program, such as CD mastering software.

Select the audio files and choose *Audio File > Convert to SDII Stereo.* Keep in mind that this only works for split stereo files. You can't use Convert to SDII Stereo to combine two mono files into a stereo file.

Logic automatically stores converted SDII files in the same location as the original split files (provided that there's enough room on the drive).

Convert to AIFF Stereo

Split stereo files can be converted into an interleaved stereo file—in the AIFF format—by using the *File > Convert to AIFF Stereo* command.

Other Functions Involving Audio Files

Reassigning Audio Files (Update File Information)

If Logic cannot find one or more audio files—when opening a song, for example—the Regions are shown as "blank" gray areas in the Audio window.

If the files are available under a different name, or you want to assign a "replacement" file, you can do so as follows:
- Double-click the relevant Region, or select *Audio File > Update File Information*.
- Select *Locate* in the dialog, and a file selector box opens, allowing you to load the desired audio file.

What to Do if Logic Cannot Find an Audio File

Sometimes, Logic can't find a file which was previously used in the song. This could be due to one of the following:
- You have not connected the relevant hard disk, or you have renamed the volume.
- You have stored the files in a different volume, or moved them to another volume.
- You have renamed the files in the Finder, or renamed them in the Audio window of another song.
- You have deleted the files.

In these situations, Logic launches a dialog box. You can respond in any of the following ways:

Search

The current volume is searched for filenames. If the search is unsuccessful, Logic asks you if you want to search other volumes for these files. This enables you to assemble songs, even if you have copied or moved the relevant files onto other media.

Skip

(Don't search for this file). Use this function if you know that this audio file no longer exists, or was renamed. This button changes to "Skip All" if further audio files aren't found.

Skip All (for Several Files)

(Don't search for any more files). Use this function if you know that all audio files in this song no longer exist, or have been renamed.

Manually

You can manually define where to search for the file. A file selector, containing the names of the audio files being searched for, appears onscreen.

If more than one file with a matching name is found, you can select the correct file in a dialog box.

Further Options

Setting the Sample Rate

Logic performs a real time, native sample rate conversion. Any sample rate available in Logic (via *Audio > Sample Rate*) can be used for the conversion—even if your audio hardware does not support the selected sample rate.

The native software sample rate conversion facility matches the sample rate of any audio hardware, thereby allowing the playback of projects on virtually any audio system—even if the hardware is—in sample rate terms—not compatible. Nothing is lost in the process. Any internal processing and bouncing is always performed at the original sample rate, and at the highest quality, even in cases where the hardware does not support a particular sample rate. This facility allows you to work on projects originally created on high-end audio systems, with smaller setups.

Example:

A song was created with an audio hardware/setup at 96 kHz. Moving this project to a laptop, or setup that does not support the original project's sample rate, will commonly result in the wrong playback speed. The native realtime sample rate conversion facility will counteract this effect, allowing correct playback of the project on the laptop, at any sample rate.

High sample rates not only eat drive space, but also result in more CPU load, because everything has to be handled in half the time.

Varipitch/Varispeed Synchronization

The real time sample rate conversion facility allows Logic's audio engine to follow an external MTC signal ("MTC continuous"), while maintaining the correct playback pitch and speed. This even works when recording in MTC-slave mode.

Audio Drivers

10

To use particular audio hardware with Logic, the hardware's driver needs to be activated and configured correctly. This chapter explains how this is done.

Drivers are software programs used to enable various pieces of hardware and software. This allows them to be recognized by other computer programs, and to have the appropriate data routed to and from them, in a format they can understand.

Selecting, activating, and configuring a particular audio driver in Logic is achieved via the Audio > Audio Hardware and Drivers dialogs.

The Audio Hardware and Drivers Dialog

In Mac OS X, all audio devices are accessed via Core Audio, an integral part of the operating system. Core Audio is a flexible, high-performance, low-latency audio system, which allows access to multiple audio hardware devices from several audio applications at the same time. Logic is compatible with any audio hardware which has a Core Audio driver. All information about using Logic with Core Audio hardware can be found in the following section.

Core Audio
Logic automatically recognizes any installed Core Audio hardware, and will use the default settings—defined in Mac OS X's Audio MIDI Setup utility (Applications > Utilities > Audio MIDI Setup). It can, however, be advantageous to optimize the settings for your individual hardware setup, particularly if you use several sound cards or a multi I/O card. This can be done in Logic's Core Audio pane, which offers the following options:

Enable
Click this box to enable the Core Audio driver.

Note: In situations where the preferred hardware is unavailable, such as when opening a song created in the studio on your PowerBook, or your audio interface is not connected or turned off, Logic will automatically select the built-in audio hardware of your Macintosh.

Driver
Allows you to choose between any Core Audio Driver installed in your system, including the internal sound output.

I/O Buffer Size
This parameter determines the size of the buffer used by the audio hardware—for both input and output. Options range from *1024* down to *32* samples. The smaller the buffer size, the less "latency" you will encounter when monitoring while recording, or using software instruments.

Note: There may be a point where the selected *I/O Buffer Size* is too small for your system, and begins to affect playback. This usually takes the form of clicks, pops, and crackles. You should therefore aim for the lowest possible I/O Buffer Size value that doesn't introduce these types of artefacts.

As this parameter value is reduced, it places a higher strain on the CPU(s) of the system. On current model Macs, you should be able to reduce this value down to its minimum value. As a word of advice, if you find a higher (larger) *I/O Buffer Size* setting provides suitably low latency during record monitoring and software instrument playback, you should use it. This will minimize the impact on the CPU(s) of your system.

Recording Delay
This parameter is measured in samples. It allows the recording of Audio Regions to be delayed by a certain fixed value. It helps advanced users to compensate for any incorrect delay information that might be caused by the audio driver. You should not normally need to touch this parameter.

Max. Number of Audiotracks
The Audio Engine requires free system memory, which is not assigned to Logic or any other application. The amount of memory required depends on the maximum number of tracks to be played, and on the number of I/O channels supplied by the driver. This setting allows you to reduce the amount of memory required by the driver, by reducing the number of tracks. This may be useful when you want to run other applications or drivers simultaneously.

Universal Track Mode

Universal Track Mode allows you to play back adjacent stereo and mono Regions on a single track. Even-numbered Audio Objects won't be regarded as the right channels of the odd-numbered stereo Audio Objects to their left, and every Audio Object has its own mono/stereo switch. Dependent on whether a mono or stereo Region is played back, the pan knob will behave as a Balance or Pan control. If you play back a mono Region and the pan is set to the center position, both channels of the Audio Object will output the same signal level. Universal Track mode is not switchable in Logic Express.

Larger Disc Buffer

This option influences the amount of audio data that is read from the disk in advance. This option is switched off by default, matching the demands of fast hard drives and powerful computers. If you encounter frequent error messages while running Logic in this mode, you should switch this setting on. This will allow you to play back more tracks, achieving higher reliability. Please note that RAM requirements are increased if this option is active.

24 Bit Recording

When this setting is active, Logic can record 24 bit files. Please note that this only makes sense if you are actually using a 20 or 24 bit interface. As long as your audio hardware is capable of this bit resolution, you can select this option in the Audio > Audio Hardware & Drivers window. 20 or 24 bit recordings offer a significant improvement in the available dynamic range, but require high quality peripheral components such as microphones, preamps, and high quality AD/DA converters. 24 bit files use one and a half times the disk space of comparable 16 bit files.

Software Monitoring

This option allows you to switch *Software Monitoring* (listening to the actual input signal) on or off. Please note that with *Software Monitoring* active, the audio signal is processed via software—a certain amount of audible delay (commonly referred to as "latency") is inevitable. If you are listening to the recorded signal through your mixing desk, or your audio hardware supports hardware monitoring, you should switch this option off.

Process Buffer Range

This parameter determines the size of the native buffer used to compute mixes and effects. Choose between Small, Medium, and Large buffer sizes.

Note: Larger buffer sizes will increase latency. Dependent on CPU speed, buffer sizes that are too small might compromise real time audio processing.

ReWire Behavior

When sending MIDI data to a ReWire compatible software instrument, you can choose between four modes:

- *Playback mode*: use when playing back MIDI tracks via ReWire. This setting requires less CPU power.
- *Live mode*: use when playing a ReWire instrument live. This settings requires more CPU power.

Audio Engine

The Audio Engine is the part of Logic that processes and controls all audio data for playback, recording, mixing, and effects.

All descriptions of the audio functionality in this manual are based on the Native Audio Engine. Settings for different Audio Driver Models are nearly identical. This engine performs a realtime, native Sample Rate Conversion.

Realtime Sample Rate Conversion

Any Sample Rate (*Audio > Sample Rate*) available in Logic can be used in the Native Audio Engine—even if your audio hardware does not support the selected sample rate. Nothing is lost in the process. All internal processing in Logic, including bouncing, is performed at the original song sample rate (Audio > Sample Rate), and will be performed independently of the sample rates supported by the audio hardware. Logic automatically uses the best matching sample rate supported by your hardware for playback.

This facility allows you to work on projects originally created on high-end audio systems, with smaller setups.

Example:

A song was created on an audio hardware/setup at 96 kHz. Moving this project to a laptop, or setup that does not support the original project's sample rate, will commonly result in the wrong playback speed of the audio files. The real time software sample rate conversion facility will counteract this effect, allowing correct playback of the project on the laptop, at any sample rate. You can start a Logic project in the studio, continue on your laptop, and return to the studio with the new material.

Note: The set sample rate also applies for recording. As an example, if your audio hardware supports sample rates up to 48 kHz, but the song is set to 96 kHz, Logic will generate audio files at 96 kHz. You should be aware that the audio quality is not improved in the process. The quality of audio is still at 48 kHz, as determined by the recording hardware, despite the fact that the information is stored in a large 96 kHz file.

Important: Using higher audio sample rates often increases CPU load significantly.

Sample Editor

11

The Sample Editor is used to perform extremely precise destructive edits on audio files.

The Sample Editor features a number of useful processing tools—collectively known as the Digital Factory. These allow you to time stretch and pitch shift audio and change sample rates.

Sample Editor—Introduction
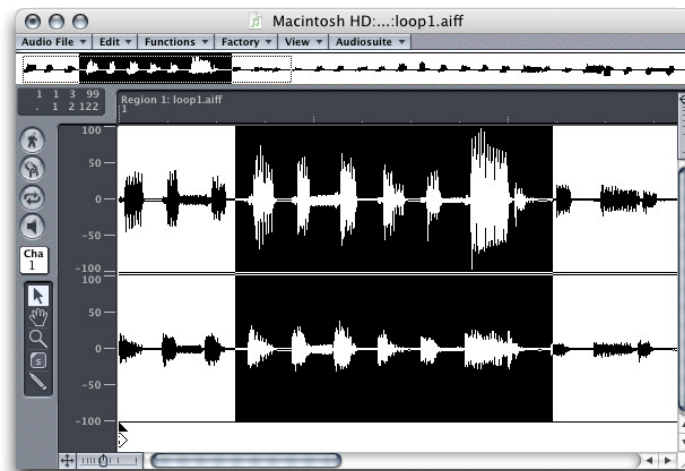
The Sample Edit window offers an enormous number of data-editing functions, which are used to process individual audio files. You can edit mono, as well as stereo files.

You can set the lengths of Audio Regions with extreme precision (down to single-sample resolution), by making use of the window's adjustable zoom resolution. The Anchor points can also be positioned here, with the same degree of accuracy.

Opening the Sample Edit Window

There are various ways of opening a Sample Edit window:

- Select *Audio > Sample Editor*.
- Press Command-0.
- Double-click on any audio Region in the Arrange window; this opens the selected Region in the Sample Editor.
- Double-click on any Region in the Audio window.

If no Region is selected, Logic will ask if you'd like to load a new file into the Sample Edit window.

If you're dealing with an interleaved, or half of a "split stereo" file or Audio Region, both channels/audio files will be displayed in the Sample Edit window, with the left side on top, and the right side below.

If you open the Sample Edit window from the Arrange window, as opposed to the Audio window, the Bar Ruler is able to reference the Region's position in the song. You can tell all of this from the position marker lines in the Bar Ruler. A dotted line indicates no time connection (Audio window), while a broken line indicates a time connection for the Region being used in the Arrange window.

Elements of the Sample Edit Window

- The small waveform display at the top is the overview; the entire audio file is depicted here.
- The dotted frame in the overview shows the extent of the section visible in the display area.
- The Parameter box in the upper left corner below the overview shows the start point and length of the selected area.
- When the *Catch* ("walking man" symbol) button is activated, it ensures that the playback position is always visible in the window. The other controls operate as in the Audio window.
- In the center, you'll see the main contents of the Sample Edit window: the detailed waveform display.
- Left of the detailed waveform display is the Amplitude Scale (as a percentage, or 16-bit decimal values).
- The dotted line in the waveform and overview display is the Playback position line.
- The zoom bars are used to set the magnification of the detailed waveform display.
- The horizontal time ruler above the detailed waveform shows the name of the edited Region at the top left.
- Beneath that is the time position of the Region in the audio file, in various formats.

Display
Waveform Overview

Between the Sample Edit window's title strip and Bar Ruler, you'll see the *overview*. This display always shows the full length of the currently selected audio file, regardless of the zoom resolution. Please note that the overview is not scaled; a kick drum sample lasting 0.3 seconds could take up the same space as a choral passage lasting 15 minutes.

During playback, the current position is indicated by a vertical line that moves in real time. This is visible in both the overview and the detailed waveform display.

The current selection is also displayed in the overview.

The section visible in the detailed waveform display is shown as a dotted rectangle in the overview.

Functions in the Overview
- A short mouse click on the overview displays the clicked area in the detailed waveform display.
- A long click resumes playback from this position. Releasing the mouse button stops playback.
- Double-clicking lets you listen to the sample from the clicked position.

Window Functions
The Catch and Link functions work in pretty much the same way as in the other edit windows.

Catch Mode
Catch mode ensures that the Sample Edit window always displays the area around the current playback position (whether you are playing the song, or monitoring the sample). Catch is turned on and off by either clicking the "walking man" button, or with a key command.

Link Mode

Link mode ensures that any Audio Regions selected in the Arrange window are displayed in the Sample Edit window. Link mode is turned off and on by clicking the "linked chain" switch, or the corresponding key command.

If you often work in Link mode, give this a try: open a Sample Edit window and switch on Link mode. Now close the window, and Logic will retain this status.

Double-click on the Region you wish to view, and you'll see that the display in both windows is linked.

The Detailed Waveform Display
Display Scale
Zoom Bars

The Zoom Bars work as they do in all other windows.

The Zoom Tool

Just as in the other windows, there is a zoom tool in the Sample Edit window's Toolbox (the magnifying glass). If you use this tool to draw a rectangle, the selected area of the window will be magnified so that it fills the whole display area. Clicking once (with the tool) returns you to the previous zoom resolution.

If you hold down Command as you click the Bar symbols with the mouse, you can alter the vertical and horizontal zoom simultaneously.

X and Y Axis Scales

The Y axis vertical scale shows the waveform amplitude in percentage units (*View > Amplitude Percentage*). If you select *View > Amplitude Sample Value*, the scale will be displayed in sample units.

The X axis (the time ruler) shows the course of the audio file over time. You can select various scaling units in the *View* menu.

Don't forget that this display format also affects the figures shown in the help tag, and the selection parameter field:

View > Samples

Displays the sample word number from the beginning of the song or audio file.

View > Min:Sec:Ms

Shows the scale in Hours:Minutes:Seconds:Milliseconds, from the beginning of the song or audio file.

View > SMPTE Time
Shows the scale in SMPTE time (in Hours:Minutes:Seconds: Frames). The time scale begins at the song start point (with the SMPTE offset, if applicable). When you use this scale, the absolute SMPTE value of the source clock is shown on the X axis.

View > Bars/Beats…
Shows the scale in Bars, Beats, Divisions, and Ticks, just like the Bar Ruler in the other time-related windows. The "zero point" is represented by "1 1 1 1", but lengths are measured from "0 0 0 0".

Absolute and Relative Time
The different axis scales in the Sample Edit window can be displayed relative to two different reference values:
• by reference to the time axis of the song (absolute position)
• by reference to the beginning of the audio file (relative position).

Relative Position
The units in the time axis (between the overview and the waveform display) are displayed with dotted lines when viewing the relative position. You will be in this mode if you open the Sample Editor from the Audio window, or if the Sample Editor is in Link mode, and you select a Region in the Audio window.

The beginning the section is automatically assigned the to the zero value, or in Bar/Beat terms, "1 1 1 1".

This does not necessarily match the actual song position. The calculation of all remaining musical sections uses the current song tempo.

Absolute Position
You can recognize this format by the broken line below the units in the time axis. You will be in this mode if you open the Sample Editor from the Arrange window, or if the Sample Editor is in Link mode, and you select a Region in the Arrange window.

Time is measured from the start of the song, which is assigned a value of zero (or 1 1 1 1 in Bar/Beat terms). In this instance, the time axis shows the absolute (song) time, and the figures do not refer to the audio file.

Display Waveform as Sample Bits

You can switch from the usual representation of the waveform, to one that shows the structure of the recorded digital data, at high magnification levels on the detailed waveform display. You do this by selecting *View > Show as Sample & Hold*. This can be useful when eliminating clicks and pops from your recordings, for example.
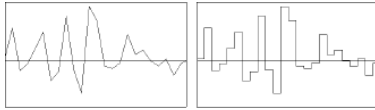
Thanks to the clever use of oversampling techniques and lowpass filters at the D/A conversion stage, the stored sample bits (on the right) are ultimately converted into a signal waveform, more like the one shown to the left.

The Sample Edit Window in Use
Monitoring Sample Playback
Monitoring Sample Playback

There are various ways to play back the audio sections visible in the Sample Edit window, allowing you to hear audio during edits. Playback occurs independently of the song position. If you'd like to hear the selected audio passage in the context of the song, just use the Transport controls, as usual.

Selecting the Audio Output

The small boxes below the loudspeaker symbol allow you to select the output channel that you want to use for monitoring.

Set the number of the desired output in the *Channel* box under the loudspeaker symbol.

Playback From the Overview

Monitoring playback from the overview display is performed in exactly the same way as Regions in the Audio window. Simply click-hold at the point you want playback to begin. Releasing the mouse causes playback to stop. You can also start monitoring from any position by double-clicking on the overview.

Playing the Current Selection

To play back the current selection, click on the loudspeaker switch. You can also perform this function with the *Play/Stop Selection* key command.

Playback From a Certain Position

If you double-click at any position on the time axis, the audio file will play back from this point, to the end of the current selection. If you double-click on a point beyond the selected area, the audio file will play until its endpoint is reached.

Checking the Position of the Anchor

The *Play/Stop Region to Anchor* and *Play/Stop Region from Anchor* key commands allow you to check the Region Anchor position, by listening to the parts just before and after the Anchor.

Cycle Playback Mode

You'll find the Cycle button on the left-hand side of the Sample Edit window, just above the Loudspeaker button. If you turn this on, the currently selected audio section will cycle continually when playback is engaged.

You can change the start and end points of the selected area while monitoring it in cycle playback mode. This makes it easy to edit the start and end points of (say) a drum loop, until it loops perfectly. When you're satisfied, you can turn the selection into a new Region with the *Edit > Selection > Region* function.

Playing Regions

In general, you can only play currently selected parts of files from within the Sample Edit window. There is, however, a key command that toggles between playback of the whole Region and stop—regardless of the selection. This key command is called *Start/ Stop Region*.

When you open the Sample Editor by double-clicking on a Region, it will automatically be selected in the Sample Editor. The same thing happens when you click on a Region, while the Sample Editor is in Link mode.

GoTo Commands

The scroll bars along the bottom and right edges of the Sample Edit window scroll through the detailed waveform display in the usual way.

If you're trying to reach a specific point in the audio file, some of the keyboard short-cuts listed below may be of use to you. You can define your own keystrokes for these commands in the Key Commands window (see "Key Commands" on page 36).

These commands move the corresponding point to the center of the waveform display.
- *Goto Selection Start*
- *Goto Selection End*
- *Goto Region Start*
- *Goto Region End*
- *Goto Region Anchor*

Making Selections

Selecting the Whole Audio File

You can select the entire audio file with the *Edit > Select All* function, or Command-A.

Manual Selection

To select a particular section of an audio file, click-hold on the start or end of the area you want to select, and move the mouse to the right or left.

To Change the Boundaries of a Selection

Shift-clicking on a selection changes its existing start and end points. The proximity of your click to the beginning/end of the selection determines whether you change the start point or end point boundary. The closest one wins…

Changing the Farthest Selection Limit

If you hold down Option-Shift, the more distant selection boundary is changed (rather than the nearer).

Moving a Selection

Option-click, and dragging shifts the whole selection, without changing its length.

The Selection Parameter Box

The start point and length of the current selection are shown in the Selection Parameter box. The format depends on the display setting in the *View* menu.
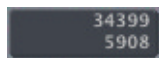
The start point and length are displayed in a separate help tag while making a selection. The format is sample words.

Selection from Sample: 34400 to
Sample: 40288 Count: 5888
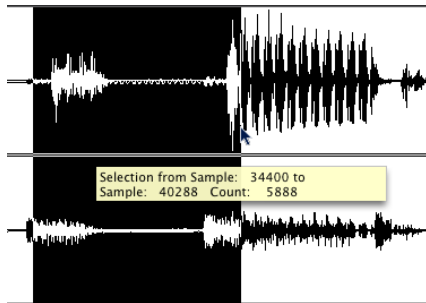
The Relationship Between Selections and Regions

When you open the Sample Edit window by double-clicking on a Region, the Sample Edit waveform display will open with the entire Region selected. Changing the selection has no direct effect on the borders of the actual audio Region. The playback monitor only plays back the current selection.

Logic offers two functions that govern the interaction between selections and audio Regions. These will allow you to create and edit Regions with the minimum of fuss.

Selecting the Region

The *Edit > Region→ Selection* function selects the entire Region, currently shown in the Sample Edit window. The current Region is the one selected in the Audio window (or the Audio Region selected in the Arrange window).

This function is useful if you want to reselect the entire Region for cycled playback, after performing a number of edits, for example.

Turning a Selection Into a Region

If you want to turn your current selection into an audio Region, use *Edit > Selection → Region*. This enables you to define an audio passage as a selection, and then convert it to a Region, in place of the originally selected Region.

Creating New Regions

To define a new Region from an area you've just selected, select *Edit > Create New Region*. You can define this function as a key command.

Editing Regions in the Sample Editor

If accuracy is what you need, you should edit the start and end points of Regions in the Sample Edit window, not the Audio window.

The same goes for any adjustments you make to the Anchor, which in many cases should really be placed on the amplitude peaks, rather than at the start of the attack phase of the sound. A good example would be recordings of brass instruments, which may take some time to build to a peak. Moving the Anchor to these peaks forces the Region to snap to the grid of your arrangement, using the Anchor as the pivot point. The flexible zoom settings allow you to be as precise as you like, going right down to the level of single bits, at the highest magnification factor.

Important: Be careful! Any changes to the Anchor point will change the relative position of the audio Region in the song. Given that the front of a Region is the default position for the Anchor, you must also take care when changing a Region's start point.

The small markers on the lower edge of the waveform display provide direct access to the boundaries of the Region and the Anchor. As usual, you can just grab them, and pull.

- S = Region Start
- E = Region End
- Triangle = Anchor

Protecting the Anchor Point

If you move the start or end points of a Region past the Anchor point, the Anchor point will also move. This is often not what you want to happen.

Hold down Option while moving the start or end markers to prevent the Anchor from moving. Keep in mind though, that the Anchor can never be to the left of the Region start point, so it will move if you drag the start of the Region past the Anchor (to the right), even with Option pressed.

Search Zero Crossings

If this editing option is switched on, Logic will search for the nearest point where the waveform crosses the zero amplitude axis whenever the start or end points of a selection are changed. This avoids glitches in playback. The program looks for zero crossing points just before the start point, and beyond the end point.

Editing Commands

The Sample Edit window features the usual *Cut*, *Copy*, *Paste*, *Clear*, and *Undo* commands in the *Edit* menu (or from the keyboard).

All of these commands (except *Copy*) actually change the data of the audio file itself; in other words, they behave destructively.

Cut
Cuts a selected passage out of an audio file, and copies it to the Clipboard. All following audio sections move forward to fill the gap.

Copy
Copies a selected passage to the Clipboard, leaving the selected area in its original location.

Paste
Inserts the contents of the Clipboard at the cursor position, or start point of the selection. If there is no selection available, the cursor acts as the paste point (it is shown as a thin dotted line). If audio data is present behind the paste point, it is moved back to make room for the Clipboard contents. If anything is selected at the time of the paste, it is deleted and replaced by the Clipboard contents.

Clear
Erases the selection, without placing it in the Clipboard. All data beyond the deleted passage is pulled forward to fill the gap.

Undo
Cancels any edit commands used, and reverses its effect. This also works with the destructive editing commands (see "Functions" on page 288).

The *Undo* function in the Sample Editor operates separately from the rest of the program (see next section). This allows you to try out the edit in the Arrangement. If you don't like it, you can return to the Sample Editor, and reverse the edit with the Undo function.

Space is reserved on the hard disk for armed tracks, which is not available for undo files. Logic therefore automatically switches off record-ready status for audio tracks if the disk is nearly full, thereby making edits possible in the Sample Editor.

Sample Editor Undo Preferences

Several options that accompany the Sample Editor's multiple undo functionality can be found in the Audio preferences:
• *Record "Normalize" in Undo History*—disable this parameter if you don' want to create any undo files once the *Normalize* function is invoked.

Note: As normalization is generally the last step in sample editing, this parameter (if active) can destroy the undo history. As a safety feature, a warning pops up if an undo history exists (and the switch is on), providing you with the opportunity to create an undo file.

- *Number of Undo Steps*—limits the maximum number of recorded undo steps. Use the mouse as a slider to adjust the step value.
- *Store undo files in Song Folder*—switch this parameter on if you would like the undo history to be stored in a sub-folder alongside the song.

Note: This is switched on by default if the song is part of a project (see "Projects" on page 51).

- *Global undo file path*—all undo history files are saved into a "global" location (a user-defined folder) if the *Store undo files in Song Folder* option is not switched on.

Backup Copies
Automatic Backups
Logic will ask you if you wish to make a backup copy of the file you're working on (unless one already exists), before you perform a destructive edit in the Sample Editor.

Activate the *No Dialog* button to avoid this question being asked again, while editing in the current window.

You can even turn off the dialog altogether in the *Audio > Audio Preferences*. In this situation, you'll only be asked when the program is first loaded, and when you make your first edit. You can reply as follows:

Process
No backup is made and the edit is performed. You won't be asked the question until the next program launch.

Cancel
Stops the edit.

Preferences
Opens the Audio Preferences window, allowing you to reactivate the Backup dialog box, so that it appears every time you attempt a destructive edit.

Manual Backups
You can make manual backups of the file you're editing, or replace it with a backup version at any time—using a variety of functions:

Audio File > Create Backup
Creates a duplicate of the audio file you're working on (with the extension ".dup"), and places it on the same level, in the same folder.

Audio File > Revert to Backup
This function completely replaces the current audio file with the backup (provided one exists, of course). A warning message informs you of the creation date of the backup file, before the current file is replaced.

You cannot reverse this function with Undo.

Audio File > Save A Copy As
Copies the current audio file to the location of your choice.

Audio File > Save Selection As
Saves the current selection as an independent audio file. You can choose whether you wish to bring the file into the Audio window, following the save.

An interleaved stereo file is created when the source file is an interleaved stereo file.

Update Arrange Position

Edit > Update Arrange Position, when engaged, means that altering the Region start point (or, more specifically, the Anchor position) in the Sample Editor also affects the position of the Region in the Arrange window. This ensures that the position of a given audio Region stays at the same place in the arrangement. When moving the Region start point back, the remaining portion of the Region will start playback at a later position.

Such edits have always been possible with Logic—but you needed to alter the start point of the Region in the Arrange window. The *Update Arrange Position* option allows you to make these edits more precisely in the Sample Editor, without changing the position of audio in the Arrange. This is dependent on the Region start and Anchor points being set to the beginning of the audio file (so that dragging the Region startpoint also drags the Anchor).

This is the most common scenario: Anchor and Region start are always at the beginning of the audio file, whenever you record audio or add an audio file. Moving the Region start also moves the Anchor, as the Anchor can not precede the Region's start position.
- If *Update Arrange Position* is engaged, moving the Anchor won't change the audible result. The movement of the Anchor in the Sample Editor and the new position in the Arrange are automatically compensated for. Moving the Region start in the Sample Editor will lead to the same result as dragging the Region startpoint in the Arrange window. This is the default setting.
- If *Update Arrange Position* is disabled, moving the Anchor changes the position of audio Regions in the Arrange window.

Functions

This section describes various Sample Edit window functions that are ideal for polishing audio recordings. You can use these to add the finishing touches to your work.

Each of the commands only affects the currently selected portion of audio. If you want to use them to alter the whole audio file, use the *Select All* function beforehand.

All of the functions described in this section are destructive, and change the files stored on your hard drive. You can, of course, use the Undo function.

As the Undo function in the Sample Editor works independently of the rest of the program, you can try out an edit in the Arrangement and make changes there. As soon as you open the Sample Editor again (or bring it into the foreground), the Undo function is available for the last destructive sample edit.

You are asked to confirm these functions as a safety measure. This confirmation dialog box can be turned off by selecting *Audio > Audio Preferences > Warning before process Function in Sample Edit (Menu)*.

Data altering processes can be cancelled while underway by pressing Command-period. The audio file will be retained in its original state, even if it appears that a portion of the editing function has occurred.

Normalize

Normalization is a process that raises the maximum level of a digital signal to a certain amount—typically to its highest possible level, without introducing distortion. Normalizing is activated by selecting *Functions > Normalize*.

This is done in the following way; Logic finds the point with the highest volume (–x dB) in the currently selected audio, and determines how far this is from the maximum possible level. The level of the whole selection is then raised by this amount. The dynamic balance of the audio passage remains unaltered—it merely gets louder.

The start and end points for the section being normalized should generally not fall within a continuous section of audio, as this will result in abrupt increases in volume after normalization. The start and end points should therefore be located in sections that also contain pauses. Occasionally, you should remove any unwanted, audible noises that fall in musical gaps with the aid of the "Silence" function.

Change Gain

You can use *Functions > Change Gain* to raise or lower the level of an audio passage by a specific amount.

A dialog box appears onscreen, allowing you to set the required level change in percent (*Change relative:*) or decibels.

If you click on *Search Maximum*, the highest peak level is determined, and a value is then calculated for use when normalizing the audio file.

results in absolute: displays the maximum level that will be achieved by changing the gain (by the amount shown in the *Change relative:* box).

You should never make a gain change that results in a value over 100%, as this will result in digital clipping.

Click *Change* (or press Return) to perform the gain change.

Fade In/Out
Fade In
Functions > Fade In creates a fade in. You can set up the fade-in time period directly in the currently selected audio. Volume is set to zero at the left start point of the selection, and the fade-in occurs over the length of the selection.

Fade Out
Functions > Fade Out works in the same way as fade in, except that the fade works in the opposite direction. This lets you fade passages out automatically. This function is destructive.

If you use the Silence (see "Silence" on page 289) function to remove unwanted background noise from silent passages, small jumps in volume can sometimes appear at the start and end points of selections, as well as on the edges of the audio signal. In this situation, zoom in, and select a small area surrounding (just before and after) the startpoint of the signal, then use the fade-in function.

Silence
You can use *Functions > Silence* to remove all data from a selected area. The waveform material contained in the selected audio passage and the corresponding amplitude values are all set to zero. You can use this function to silence unwanted background noise in quiet passages.

Invert/Reverse
Invert
Functions > Invert completely reverses the phase of all currently-selected audio material. All negative amplitude values become positive, and vice versa. While this doesn't audibly change the file, if heard in isolation, you can use Invert to correct phase cancellation errors, particularly if you're mixing down to mono. This is extremely useful when several out of tune signals (or several signals processed through chorus effects), are to be mixed down to mono. The process depends heavily on the audio material.

You can also use the Invert function to decode MS recordings, but it's far easier to use the DirMixer plug-in for this task.

Reverse
Functions > Reverse reverses the selected audio passage.

Trim
Functions > Trim erases all Regions that aren't selected. Use it to remove unimportant passages from the start and end of your audio files.

Make sure that the areas you are about to delete do not contain any Regions that you may need. Regions outside the selection will be lost, and Regions that fall partly outside will be shortened. If any such Regions are being used in the Arrange, an alert box appears, giving you the option to cancel the trim function.

Remove DC Offset
Poorly constructed audio hardware can result in direct current (DC) being layered over the audio signal. This results in a vertical shift in the waveform position, which can be clearly seen in the Sample Editor.

During playback, this can cause crackling sounds at the start and end of the audio Region.

Functions > Remove DC Offset centers the waveform around the zero amplitude line, to avoid crackling at cut points.

Search Peak/Silence
Search Peak
Functions > Search Peak scans the currently selected Region for the sample bit with the greatest amplitude value. The cursor in the waveform display is then placed on this bit.

Search Silence
Functions > Search Silence scans the selected audio for sections containing silence ("digital zero"). The cursor is then placed at the start of the first section found, that fits this description.

Adjust Tempo…
Just like Automatic Tempo Matching in the Arrange, the *Adjust Tempo by Selection & Locators* function adjusts the song tempo, according to the current locator positions and Sample Edit window selection.

The operation is similar to the Arrange function; it only refers to the selection in the Sample Edit window, rather than the overall Region length.

Digital Factory

Operation

The Digital Factory functions are accessed via the Sample Edit window's *Factory* menu.

- Open the Sample Editor by double-clicking a Region in the Arrange, or the Audio window.

This selects the whole Region.

- Or: select the area to be edited.
- Or: press Command-A, to edit the whole audio file.

The Digital Factory functions always affect the selected area.

- Select *Factory* > …
- Make the desired settings in the float window that appears.
- You can start playback if you wish. Even though the functions alter the data in the audio file, they can still be performed while the file is playing.
- Click the edit button at the bottom (*Process & Paste*). The label on the edit button varies, depending on the function.

The top line of the Sample Edit window keeps you informed about the function's progress.

The selected area of the audio file is replaced by the edited audio material.

Options

- Selecting *Edit* > *Undo* (or Command-Z) allows you to compare the edit with the original, at any time. You can continue to work in the Arrange window, as the Undo function of the Sample Edit window operates independently of the rest of the program.
- You can repeat the edit with other Regions or audio files, without needing to close and reopen the chosen Factory window. The function is only performed on the selected material.
- You can also use the pull-down menu at the top edge of the window to switch directly between the individual functions of every Digital Factory process. The two sides of the *Factory* menu (separated by a horizontal line) divide the Digital Factory into "Machines" (large float window) and "Functions" (small float window).

If you are playing your song (containing MIDI and audio data) while editing audio material, owners of slower computers may experience slightly "jerky" playback of the audio material. MIDI playback will continue to function correctly. The editing time also increases slightly while the song is playing.

Time and Pitch Machine

The Time Machine allows you to radically alter the time structure of audio files, including time compression/expansion, and pitch transposition. When changing the pitch, you can also correct any alteration of the formants. Pitch shifting without formant correction causes a phenomenon commonly known as the "Mickey Mouse" effect.
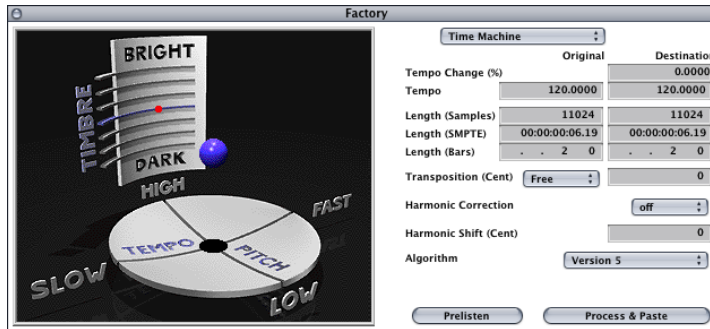
Overview of the Time and Pitch Machine features:
- Time compression or expansion without transposition,
- Pitch transposition with or without altering the length and tempo,
- Correction or alteration of the timbre (sonic character),
- any combination of these functions.
- Consider the Time Machine to be a universal tool for control of the pitch, tempo, and sonic character of digital recordings. Each of these parameters can be addressed independently. The current settings are visually represented by the position of a ball in a 3-dimensional graphic display, where the axes are time, pitch, and timbre (sonic character).

Opening the Time and Pitch Machine

To open the Time Machine, select *Factory > Time and Pitch Machine*.

Parameters

Most of the parameters are mutually dependent; you don't need to enter them all to get a good result. We suggest that you don't adjust a parameter unless you know what the value should be.

The left "column" (*Original)* displays the present value, and the right column (*Destination)* is used for entry of the desired target value for the edit.

Tempo Change (%)
Tempo alteration in percent. (There is no original value shown).

Tempo
Tempo in bpm (beats per minute). Make sure you set the right length in bars, or the correct original tempo will not be shown on the left!

Length (Samples)
Length in samples.

Length (SMPTE)
Length in SMPTE time.

Length (Bars)
Length in bars. If you have already adjusted the song tempo to the Region that you're about to edit, the original value will automatically be set correctly. If not, you need to manually enter the original length here.

Transpose (Cent)
Transposition of the sound material in 1/100 semitone units (cents).

Free Transposition
You will see the *Free* pull-down menu next to the *Transposition* parameter.

This is the most common setting when using the Time Machine. It means that the program performs "free" compression/expansion or transposition. In this situation, the pitch and tempo of the audio material are completely independent of one another.

Classic (Correlated) Transposition
Switch the pull-down menu from *Free* to *Classic*. The Classic mode is for situations where you want to transpose a selected Region, and also affect its tempo. This produces an effect that you're probably familiar with, as it simulates the sound of changing tape speed. In this scenario, the pitch, sonic character, and playback speed all change.

Audio Algorithms
Version 5 algorithm
This is the well-known algorithm of Logic 5 and earlier versions.

Any material
This is the most universal algorithm, which should be able to handle any kind of material—it is the new default setting when using the Time Machine.

Using the Graphic Display
To the left of the Time Machine window, you can see a graphic representation of the current settings. You can grab the ball within the graphic, and freely move it to adjust the compression/expansion, and pitch shift. The further the ball deviates from the center position, the harder the algorithm has to work, and the lower the expected sound quality will be.

Also remember that the quality of the result depends greatly on the source material.

Don't let this keep you from experimenting. Feel free to try extreme settings for compression/expansion or transposition. In such cases, the result may not always be what you expect, but it might be just the "effect" you're looking for.

You can move the ball in the 3-dimensional display with the mouse. Naturally, only two dimensions can be accessed at once; use Shift to switch between two different 2-dimensional planes (enabling you to reach every point of the 3D graph). Holding Control, Option, or Command limits ball movement to one axis, allowing independent timbre, transposition, or length changes.

You can also grab and move the shadows of the ball. These are its projections on the timbre axis, and the transposition/time plane, respectively

The position of the ball directly effects the numerical values, and vice versa.

You can reset the ball and all numerical values to centered (neutral) positions by simply double-clicking in the graphic display.

Time Machine—Technical Background
The Technology of the Time Machine
The Time Machine analyzes the spectral components and dynamics of the digital audio material, and processes the result. The high-grade algorithm endeavors to retain as much spectral and dynamic information as possible, and minimizes phase variations. In stereo files, the phase relationship between the left and right channels is fixed, and not altered. Doubled sound events are kept to a minimum. This approach produces a high quality result, which is smoother than what you're probably used to hearing from other products, despite the speed of the process.

You should, however, bear in mind that apart from resampling (transposition), the Time Machine has to achieve the "physically impossible": when a sample is lengthened, information needs to be "invented." This should be as realistic as possible. Conversely, when a sample is shortened, information has to be cut out. This cut information should be as unimportant to the overall character of the sound as possible. Lengthening is more difficult than shortening, and if you have a choice, it's better to speed up a drum loop than it is to slow it down.

There's always a small deviation between the set stretch or compression factor, and the actual result. This is because the algorithm needs some freedom to optimize the spectral and dynamic integrity (the sound quality). The deviation from the set value is only a few milliseconds (or fractions of a bpm). This shouldn't present a problem, as the absolute deviation is independent of the length of the processed section. Put another way, this means the deviation is no greater in longer files.

Audio Energizer
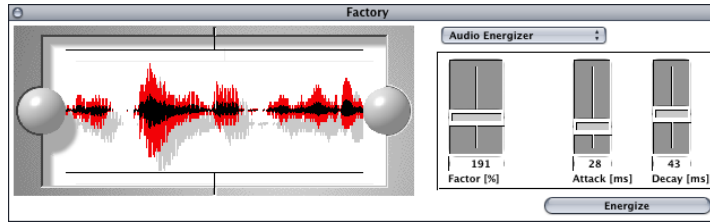
The purpose of the *Audio Energizer* is to increase the perceived volume of audio material, while altering the sound as little as possible, and without causing clipping. Digital distortion (which would be the inevitable result of simply increasing the level, and which sounds very unpleasant) is avoided by using this algorithm.

You could compare the effect to that of an analog tape which is saturated by a high recording level. The distortion factor and effect on the audio material is much lower, however.

Here's an example of the effect. If a normalized audio file (audio data which is already at the maximum dynamic range) is edited, the effect is as follows: a VU meter will show a higher level, indicating increased average energy in the signal. A peak display will show the same level as before, as the maximum signal level has not been exceeded.

Opening the Audio Energizer
Select *Factory > Audio Energizer* in the Sample Editor. The function is executed by clicking the *Energize* button.

Parameters
The main parameter is *Factor*. This is where you select the amount of average level boost. 0% means no alteration, while higher values produce an increase in energy. The setting you make here will depend on the audio material, situation, and personal taste. Begin by trying values in the 40 to 100% range. Values below 10% will have little effect, values over 100% can lead to undesirable alterations in the sound, depending on the material. Values over 200% are not recommended with normalized files, because they will have detrimental effects on the sound and it's dynamics. They can also greatly increase the required computation time. On non-normalized audio data, even high values can be effective because the overall level is initially increased to it's maximum, without affecting the dynamic range.

The *Attack* and *Release* parameters control the steepness of the algorithm's filter. You can try increasing these values to double or four times the default, if the result sounds too "digital" or "raw". This can happen if small elements among the main events in the original signal are boosted. As an example, the reverb portion of a sound can become louder.

The perceived loudness of the overall audio material is increased. If the material contains anomalies such as noise, these will also be increased, and sometimes become audible. If necessary, you can edit the result with the noise reduction function (Silencer) on a low setting, or make use of Logic's effect processing capabilities.

Sample Rate Converter

The Sample Rate Converter is used for sample frequency conversions.

Opening the Sample Rate Converter

Normally, you'll want to convert the sample rate of an entire audio file. To do this, select the whole audio file in the Sample Editor (Command-A).

Select *Factory > Sample Rate Convert,* and click the *Convert* button.

Parameters

Source (Hz)

This shows the previous sample rate of the audio file. To enable changes to incorrectly stored sample rate formats (after editing in other programs, for example)—or for effects—you can enter any value you like here. You should only change this parameter if you know what you're doing.

Destination (Hz)

Enter the desired sample rate that you want the selected area converted to.

Event List

12

The Event List displays MIDI data in the form of an alphanumerical "list", combining all of the data editing functions of the other editors.

The Event List, while not as "pretty" as other Logic editing windows, is extremely powerful. This chapter discusses the many specific uses where the Event List is your best choice for data handling and editing.

Using the Event List

The Event List is used whenever you need to make precise alterations to recorded data, and where the graphic display of the other editors is not as well suited to the task. It is the only editor that provides access to all recorded event data. You can also restrict what you see, allowing you to only edit specific event types.

Opening the Event List

To open the Event List and view the contents of the selected Region, select *Windows > Event List*, or use a user-defined key command for *Open Event Editor*.

You can also open it by double-clicking on a Region if you have selected *Double-clicking a MIDI Region opens Event List* in *Preferences > Global > Editing*.

Structure

The standard buttons are supplemented by two scroll arrows, that help you move through the list.

The event type buttons allow you to filter specific event types from the display, and access or add them (by Command-clicking on them).

Beneath the Toolbox is the quantization grid selection field for the event quantize function. There is also a field for defining the Division value, which corresponds to the Division value as set in the Transport window.

If the Catch function is switched on, the arrow-shaped position marker always points to the current event.

The main area shows the actual list of events or Regions.

Display

The event type buttons allow you to "filter" the display, removing individual event types from the Event List, limiting the view to the specific types of events you're interested in. Click the desired button with any tool (except the pencil).

If a button is grayed out, that event type will not be displayed.

All functions only affect the displayed events, thus protecting any non-displayed events from any alterations you may make.

Here is a short overview of the filter buttons.

The note symbol denotes *note events*. The symbol with the dual-digit, seven-segment display denotes *program change events*.

The hand wheel symbol with a marker in the middle (pitch bend wheel) denotes *pitch bend events*. The hand wheel symbol with a marker at the bottom (modulation wheel) denotes *control change events*.

The single weight symbol denotes *aftertouch events* (channel pressure). The multiple weights symbol denotes *polyphonic key pressure events* (polyphonic aftertouch).

The SysEx symbol denotes *SysEx events*. The symbol with a row of zeros and ones is called the f*ull message* button. This does not filter out any type of event, but affects the amount of detail displayed for all event types.

The Event List display is normally restricted to one line per event. When the full message display is active, all information stored along with the event is also shown. This is particularly important for editing SysEx messages. When examining note events in the Event List, you will also notice Logic's internal score layout information included in the list. You can edit this in the Event List if you wish, but it serves little purpose.

Operation
Scrolling

Clicking either of the scroll arrows moves the display up or down by one event. The event at the position marker is always selected (the existing selection changes as you scroll). The scrolling speed can be varied by vertically moving the mouse. The *Scroll to Next/Previous Event* key command is also available from the Event window, and has the same end result.

If the MIDI Out button is switched on, every newly selected event will be played. This allows you to scroll through the list and audibly monitor the events as you go.

If you want to keep the selected event where it is, use the usual scroll bar functions.

Selection
Selection Techniques

When selecting events with the mouse, you should click near the status column, to avoid any unintentional parameter alterations.

You can use any of the standard selection techniques here: individual selection by clicking on objects, multiple selection using the rubber band, or both of these (without altering the previous selection), in conjunction with Shift. Don't forget you can also make *selections* according to specific criteria with the *Edit* menu.

Any events hidden from the display by clicking on the event type buttons, are immediately deselected. This ensures that all functions only affect the displayed (and selected) events.

Special Selection Functions

Some selection commands (which can be accessed from the Edit menus of all Editor windows) can also be utilized by selecting an item with the mouse, while holding down additional modifier keys.
• If you click on an event while holding down Option, you select all events between the last event that was selected, and the current one.
• If you hold down Control and select an event, all similar events will also be selected.
• If you select an event while holding down Control-Option, all identical events will be selected.

Event Editing

Adding Events

To add an event, click on the desired event type button with the pencil (or any other tool, while holding down Command). The event is then added at the current song position, and is automatically selected.

Duplicating Events

To duplicate an existing event (to alter the parameter value of the copy, for example) click on the original event with the pencil. An input box appears—use it to enter the position for the newly-duplicated event. If you press Return, the duplicate will appear at the same position as the original.

Pasting from the Clipboard

When adding events using the Clipboard's *Paste* function, a position input box will appear, allowing you to type in the position of the first event. Once again, if you confirm by pressing Return, the original position of the event is retained. The relative positions of other copied events are also always maintained.

This means that the events are not added at the song position, as in the graphical editors.

Moving Events

To move an event in time, alter its position indicator. As soon as you alter its position, the list is automatically sorted, even though the currently selected event remains the same.

Altering Values

Event positions or parameter values can be altered in the usual way by using the mouse as a slider (grabbing and dragging), or with text input (double-click on the parameter value and type in a new value).

You cannot alter the type of events using this method, however. To alter the event type, you must either; open a Transform window, or add an event of the desired type and then delete the original event.

Altering the Values of Several Events

If a parameter of a selected event is altered, it will affect the same parameter in all selected events.

Relative Value Alteration

When you alter parameter values in a group of selected events, the relative differences between parameter values remain unchanged. This means that parameter values can only be altered until the (same) parameter value of one of the selected events has reached its maximum or minimum value.

Flexible Relative Value Alteration
If you want to continue altering a parameter value in a multiple selection (even if one of the values in the selection has reached its maximum or minimum value), hold down Option while moving the mouse, or press Return to confirm a numerical input.

Absolute Value Alteration
If you want to set a parameter to the same value for all selected events, hold down Shift-Option, while using the mouse as a slider, or press Return to confirm a numerical input.

Numerical Value Input
If you want to directly input a number, double-click the relevant parameter.

There are a few special points concerning numerical editing of events in the Event List:
• When entering event time positions and lengths, press Tab to jump from part to part within the value you're entering.
• New events can be created by using the ASCII keyboard. When you're numerically editing events, you can duplicate them by simply pressing Esc.
• The *Duplicate Event and Numerical Edit* key command also allows you to create new events.

Event List Structure
… on the Event Level

Position	Status	Cha	Num	Val	Length/Info

The individual columns in the list have the following meanings:

Position
The position of events in the song; for note events this means the beginning of the note. The units represent bars, beats, divisions, and ticks (see "Position Display" on page 76).

Counting begins at 1 for each unit (first bar, first beat, first division, first tick: 1 1 1 1), and continues until it is carried over to the next largest unit.

Numerical input starts from the left (which means you can simply enter the bar number if you want). The units can be separated by either spaces, dots, or commas.

Position Within the MIDI Region
If you select *View > Local Position*, the event positions don't refer to their absolute location within the song, but to their relative positions within the MIDI Region.

Status

This is where you can see the event type, as specified by the status byte of a MIDI message. You cannot directly edit this parameter.

Cha

The MIDI channel used to record an event.

Remember that this MIDI channel will be replaced by the *Channel* parameter of the playback instrument, during playback. The event is only output to the recorded MIDI channel when the *Channel* parameter is set to *All*.

You should also note that the recorded MIDI channel is used to assign a polyphonic voice to the note in Score Styles.

Num, Val

These columns contain event data bytes. Their meaning depends on the event type:

Status	Num	Val
Note	Pitch	Velocity
Control	Controller number	Value
Pitch	LSB	MSB
C-Press	(not used)	Value
P-Press	Pitch	Value
Program	Bank Select	Program number

Length/Info

With controller events, this column shows the controller name.

With SysEx events, the manufacturer's name.

With pitch bend events, a 14-bit value is displayed here; comprised of the first (Num) and second (Val) Data bytes, combined. This value can be edited directly here.

With notes or Regions, the length is displayed here.

Here too, the units are bars, beats, divisions, and ticks. For the sake of clarity, when the length begins with one or more zeros, the "_" symbol is used. The minimum length is 1 tick (_ _ _ 1) not 0 ticks, as simultaneously switching a note on and off wouldn't make sense!

Numerical input starts on the right, working to the left—you can enter ticks if desired. The units can be separated by either spaces, dots, or commas.

End Instead of Length

If you select *View > Length as absolute Position*, you can make the length display show the absolute position of the note off event, rather than it's length from the note on.

… on Arrange Level

When you click on the UDL button, or double-click the background area above or below the list entries (if visible), you move up one level in the Folder/Region hierarchy.
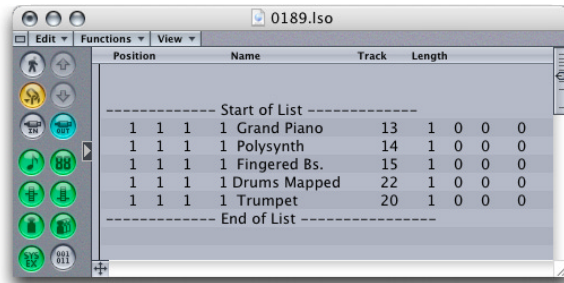
This allows you to see all Regions in the current song (or folder). On the Arrange level, the list has the following columns:

Position
The start of the Region.

Name
Name of the Region. Double-clicking on the Folder name switches you to the display of its contents. Double-clicking on an audio Region opens the Region in the Sample Editor. A click on a MIDI Region returns you to event-level editing.

You can edit the name with the Text tool.

Track
Displays the track number. You cannot edit this value here (you could totally destroy your arrangement if you did). If you want to move Regions to other tracks, do it graphically in the Arrange window.

Length
The length of the Region.

Event Type Structure
Note Events

Position			Status		Cha	Num	Val	Length/Info	
------------ Start of List ------------									
2	1	1	1	Note	1	C3	80	. . 1	0
------------ End of List ----------------									

Num

MIDI note number (note #). The range is from C-2 (note #: 0) to G8 (note #: 127). Middle C is note # 60. It's known as C3 in MIDI terminology.

On some keyboards/synth modules (notably those made by Korg and Roland), the note range is C-1 (#0) to G9 (#127). In these cases middle C is called C4.

In the *Preferences > Display Preferences* page, you can reference the display to the description that is most frequently used by your devices (*Display middle C as…*).

Val

Velocity of a note from 1 to 127. The zero value (0) carries the note off message, and cannot be used here.

Length/Info

Length of the note. Although MIDI can only transfer *note on* or *note off* messages, Logic actually stores the position and length of all notes, which makes them easier to access musically. The *note off* message is generated automatically during playback.

Mapped Instrument Notes

If the edited MIDI Region is played through a mapped instrument, the defined names of the individual notes appear in the Status line. For the sake of clarity, there is a small note symbol to the left of each name.

Position			Status		Cha	Num	Val	Length/Info	
------------ Start of List ------------									
1	1	1	1	♪Open HH			80	. . 1	0
1	1	1	1	♪KICK 1			80	. . 1	0
1	1	3	1	♪SD 1			80	. . 1	0
1	1	3	1	♪Closed HH			80	. . 1	0
1	2	1	1	♪KICK 1			80	. . 1	0
1	2	1	1	♪Closed HH			80	. . 1	0
1	2	3	1	♪SD 1			80	. . 1	0
1	2	3	1	♪Closed HH			80	. . 1	0
------------ End of List ----------------									

Program Change Events

Position	Status	Cha	Num	Val	Length/Info
-------------- Start of List --------------					
2 1 1	1 Program	1	-	0	Grand Piano
-------------- End of List -----------------					

Program change events can be transmitted to connected MIDI devices for patch selection. These may be sounds in a synthesizer, programs in an effects unit, or snapshots in an automated mixing desk.

Val
A program number between 0 and 127.

Some manufacturers (such as Yamaha) number the programs in their devices from 1 to 128, not 0 to 127. In this situation, you need to subtract 1 from the program number shown on the device itself.

Other manufacturers use various methods of dividing internal memory locations into groups (or banks) and sounds. The most common is divisions into 8 groups of 8 sounds, each numbered 1 to 8. These devices respond to program numbers 0 to 63 by addressing storage locations 11 to 88. The instruction manuals for these devices should contain conversion tables to assist you.

Num
Bank select. Normally you will see this symbol (–), which means no bank select will be sent. If you assign a number between 0 and 126, a bank select event is sent before the program change event. This allows you to address different sound banks (preset, internal, card, and so on) inside your synthesizer. The synthesizer must be able to recognize controller 32 as bank select, but unfortunately this standard is not used by all manufacturers. If you have any problems with bank select, check your synthesizer's manual to see whether, and how, it responds to bank select commands. You can change the type of bank select message Logic sends for each Multi Instrument in your setup (see "Defining Custom Bank Selects" on page 169).

Pitchbend Events

Position	Status	Cha	Num	Val	Length/Info
------------- Start of List -------------					
2 1 1	1 PitchBd	1	0	64	= 0
------------- End of List ----------------					

Pitch bend events are used to continuously vary the pitch. They are usually generated by a centered pitchbend wheel or joystick on your keyboard.

Num

Fine pitch bend division (LSB). Many keyboards transmit a value of 0. If the pitch bend wheel has an 8-bit resolution, you will see values of 0 or 64 here.

Val

The effective pitch value (MSB) of 0 to 127. A value of 64 corresponds to the mid-way setting of the wheel.

Length/Info

The 14-bit value is displayed in this column as a decimal figure ranging from −8192 to 8191. The value in this column may be edited in the usual way.

Control Change Events

Position	Status	Cha	Num	Val	Length/Info
------------- Start of List -------------					
2 1 1	1 Control	1	71	127	Resonance
2 1 1	1 Control	1	64	127	Sustain
2 1 1	1 Control	1	1	21	Modulation
2 1 1	1 Control	1	7	89	Volume
2 1 1	1 Control	1	10	64	Pan
------------- End of List ----------------					

These event types are used to transfer MIDI controllers (modulation, sustain, volume, and pan, as examples).

Num

The number of the controller. All of the various MIDI controllers (such as the modulation wheel or sustain pedal) are assigned their own numbers (#1 or #64 respectively). Some other controllers are also defined, such as volume (#7) or pan (#10).

Controllers that are defined in the MIDI Standard are described in the *Length/Info* field.

Val

Value of the controller. Continuous controllers have a range of 0 to 127. Switch controllers (#64—#90), transfer only two states; *off* (val=0) and *on* (val anything between 1 and 127).

Aftertouch Events

Position	Status	Cha	Num	Val	Length/Info
------------- Start of List -------------					
2 1 1	1 C-Press	1		0	
------------- End of List ----------------					

Aftertouch (or channel pressure) events are generated by a mechanical pressure sensor beneath the keyboard. The resulting sound modulation affects all notes on that particular MIDI channel.

Num

This column is empty for aftertouch events, as they only have one data byte.

Val

Strength of the pressure on the keyboard (0 to 127).

Poly Pressure Events

Position	Status	Cha	Num	Val	Length/Info
------------- Start of List -------------					
2 1 1	1 P-Press	1	E3	0	
------------- End of List ----------------					

Poly pressure events are generated by mechanical pressure sensors beneath each individual key. The resulting sound modulation only affects that particular note. Only a few keyboards offer this capability.

Num

MIDI note.

Val

Strength of the pressure on the key.

SysEx Events

Position	Status	Cha	Num	Val	Length/Info
------------- Start of List -------------					
2 1 1	1 SysEx		4	0	Moog
------------- End of List -----------------					

System Exclusive Data (SysEx) is exclusive to individual MIDI devices. You can record these events using the dump utilities of your synthesizers, allowing you to save patch information outside the MIDI device. The arrows in front and behind the word *EOX* are used to add or remove bytes.

Editing SysEx Events requires a thorough understanding of the data format used by the MIDI device in question. Incorrect edits can lead to the corruption or loss of sound data.

SysEx Data in Hex Format
You can select whether SysEx data is displayed in hexadecimal or decimal, in the Event List or the SysEx fader editors, with the *View > SysEx in Hex Format* command.

Hexadecimal digits are preceded by a *$* symbol in Logic.

Tips for Numerical Input
Numerical input (by double-clicking) is always independent of the current display mode or event type, and can be used in many other areas of the program. Here are some of the possible methods. You can type in:
- *Decimals*: 1, 01, 2, 3, 4, 127, …
- *Hexadecimals*: $1, $01, $2, $3, $A, $0A, $7F
- *Notes*: "C3", "C#3", "Cb3", "C##2" (equivalent to D2), "Dbb2" (equivalent to C2)

If you double-click on the note "E3", you can enter a decimal value such as "64" or a hex value of "$40" instead of the note itself.

In many parts of Logic, mathematical operations can also be used to change values. As examples:
- adding two existing values: "+5", "+$10"
- subtracting from the existing value: "−5"
- summing two values: "38+17"
- subtracting two values: "38−17"
- multiplying two values: "7∗8"
- dividing two values: "80/5"

Event Float Window

The event float window can be accessed from most other windows.

Select *Options > Event Float* (or the *Open Event Float* key command) to open an Event Float window. This provides information on the currently-selected object, and can be compared to a single line of the Event List. You can edit all parameters in this window.

The following parameters are displayed:
- the start point of the selected object in bars, beats, divisions, and ticks,
- the type or name of the selected object,
- the recorded MIDI channel and first data byte (if the selected object is an event), the name of notes, and the second data byte (if it exists);
- length of the selected object in bars, beats, divisions, and ticks.

Hyper Editor

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The Hyper Editor is a graphical editor that can be used to create or edit MIDI note and controller data.

This editor is unique in that it makes some editing tasks—such as data scaling—much faster. The Hyper Editor is also ideal for "drawing" in drum and other parts.

Hyper Editor—Introduction
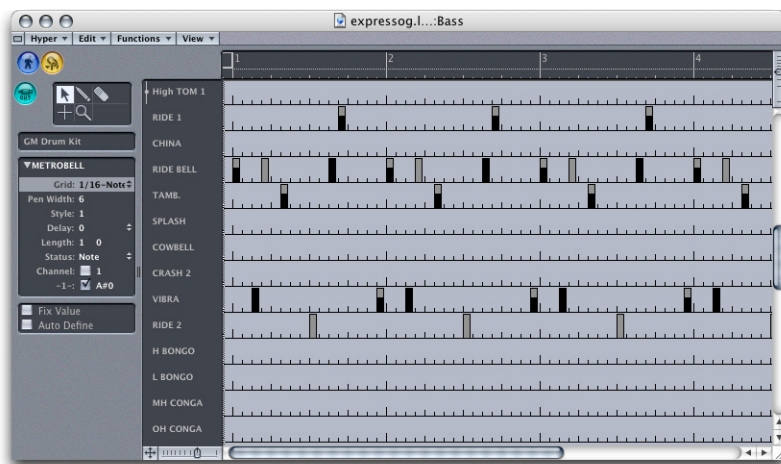
Usage
The Hyper Editor has many uses. The main ones are creating and editing drum MIDI Regions, and graphically editing controller data. Despite some similarities, don't confuse the Hyper Editor with the *Hyper Draw* function.

Opening the Hyper Editor
To open a Hyper Editor window, select *Windows > Hyper Edit* (default Command-5). You will then be able to see the contents of the MIDI Region selected in the Arrange window.

Structure

The structure of the Hyper Editor window resembles that of the Arrange window: there is the horizontal Bar Ruler at the top, and the optional transport panel in the top left corner. On the left is the optional parameter area and the event name column, and to the right of that, the editing area, which can be likened to the arrangement area of the Arrange window.

The individual lines in the Hyper Editor are functionally similar to tracks in the Arrange window, in that each line has an event definition, which determines the event type displayed in this line (much as tracks in the Arrange window contain an instrument). When you select a line in the name column, its event definition is shown in the Parameter box.

The display of events takes the form of a horizontal row of vertical beams. The height of the beams indicates the value of the event. You can directly alter the value by grabbing the beam and moving the mouse up and down. It is possible to store a combination of simultaneously displayed event definitions as a hyper set.

Hyper Sets

A hyper set is a way of saving a combination of event definitions. When a hyper set is saved, the vertical zoom setting of the Hyper Editor is stored (this determines the number of event definitions that can be displayed simultaneously). You can save as many hyper sets as you need in each song.

Selecting a Hyper Set

Directly above the event definition parameter field is the hyper set selection field. Grabbing it opens a pull-down menu, which allows you to select from among the available hyper sets.

Creating a Hyper Set

To create a new hyper set, select *Hyper > Create Hyper Set*. The preset event definition in the new hyper set is the volume controller (#7). Any alterations that you make, such as adding or redefining event definitions, or adjusting the vertical zoom setting, are automatically stored in the current hyper set (as with screen sets).

Hyper > Create Hyper Set For Current Events creates a new hyper set, consisting of the the currently selected event types. This is especially nice if you want to create a hyper set for all event types that you have created in a conventional Region Hyper Draw. You can open the Event Editor, select everything, deselect the note events, open the Hyper Editor and use *Hyper > Create Hyper Set For Current Events*. All used event types can then be edited in the Hyper Editor.

Create GM Drum Set

General MIDI has an established keyboard assignment pattern for drum and percussion sounds. This is often even the case with sound modules, samplers, and professional synthesizers that don't carry a GM, GS, or XG emblem. As the Hyper Editor is ideally suited for drum track editing, you may wish to create a hyper set that is specifically tailored for GM Drum Sets, including the correct names and hi hat modes. Select *Hyper > Create GM Drum Set* to do so.

Naming the Hyper Set

To name the current hyper set, double-click on the hyper set selection button.

Clearing a Hyper Set

To clear the current hyper set (to delete its contents), select *Hyper > Clear Hyper Set*.

Event Definitions

The event definition of a hyper edit line determines the events it displays. This selection usually affects the status byte and the first data byte of the event. The second data byte then contains the adjustable value, which is represented by the height of the beam. As an example, the value of a controller or the velocity value of a note is shown as a beam in an event definition line. Don't worry if this seems a bit confusing at first: when setting up the hyper definition parameters, Logic helps you by providing pull-down menus containing written definitions of the status byte and (as far as possible) the first data byte. There is an even simpler way to set up hyper definitions: you can automatically create event definitions for selected events—see below.

There are many ways of altering the way the beams are displayed, and adjusting them to the particular event types. You can also use a grid to align the display of existing events, and add new events. This grid can be set separately for each event definition in a hyper set. The height of the lines in the hyper set is adjusted with the Hyper Edit window's vertical zoom function.

Selecting the Event Definition

As with tracks in the Arrange window, you can select an event definition by clicking on the name column. This allows you to view its parameters in the Event Definition Parameter box. You can also make multiple selections.

Creating Event Definitions

Creating an Event Definition

When you select *Hyper > Create Event Definition*, a new event definition is added, at the position of the currently selected event definition. Initially, it has the same parameters as the original. The event definitions beneath it are moved downwards.

Automatically Creating Event Definitions

If you select an event in another opened editor window, you can automatically create an equivalent event definition by checking the *Auto Define* checkbox.

If the current hyper set already contains an event definition that corresponds to the type of the selected event, Logic does not create a superfluous double definition. The existing event definition is moved into the visible area in this situation.

Don't forget to switch off Auto Define immediately after completing your input.

Creating Several Event Definitions Automatically

You can also automatically create several event definitions. Just select the events that you want to base the event definitions on. You can use the same function to create event definitions for all event types in the selected MIDI Region.

It's a good idea to create a new hyper set before creating a group of new definitions.

*Hyper > Create Hyper Set For Current Event*s creates a new hyper set with event types that match those of the selected events. This is especially nice if you want to quickly create a hyper set for all event types created in the conventional Region Hyper Draw. You can open the Event Editor, select all, deselect the note events, open the Hyper Editor and use *Hyper > Create Hyper Set For Current Events*. All used event types can then be edited in the Hyper Editor.

If you select *Hyper > Multi Create Event Definition* a dialog box asks whether you want to create event definitions for all event types (select *All* or press Return), or just the selected events (*Selected*). Press *Cancel* to abort.

Deleting an Event Definition

Select *Hyper > Delete Event Definition* to remove the selected event definition.

Sorting Event Definitions

To change the vertical order of the various event definitions, just grab the event definition you want to move by its name column, and drag it to the desired position.

Copy/Convert Event Definitions

Hyper Sets: Copying Event Definitions

Select the event definition that you want to copy, and select *Hyper > Copy Event Definition*. Switch to the destination hyper set, and select *Hyper > Paste Event Definition*.

Converting Event Definitions

You can redefine an event definition (along with all events). The values of the events are retained, but the event type is changed to the new event definition. Select *Hyper > Convert Event Definition*, or double-click on the name column of the event definition that you want to convert.

The box shown below appears. On the left (convert), you can see the parameters of the selected event definition, and on the right you can define the parameters of the destination event type. The current settings are used as default values.
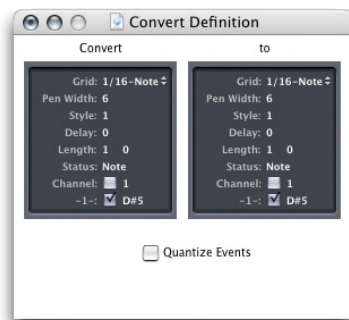
If you place an "x" in the *Quantize Events* checkbox, the event positions are quantized according to the *Grid* setting shown in the right-hand parameter field. If you make no further alterations, this allows you to quantize the positions of the events. If any *Delay* value is shown on the right, this is taken into account by the quantization.

Event Definition Parameter Box

The Event Definition Parameter box is where you make the settings for the currently selected event definition line. The most important parameters are *Status* and *-1-*.

```
        Grid: 1/16–Note ⇕
   Pen Width: 6
       Style: 1
       Delay: 0
      Length: 1   0
      Status: Note
     Channel: ■ 1
         –1–: ☑ F#1
```
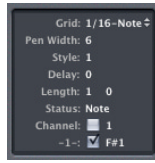
Opening the Event Definition Parameter Box

You can show (or hide) the entire left parameter area by checking (or unchecking) *View > Parameters*. You can close or open the Parameter box by clicking the triangle in the top left corner.

Name of the Event Definition

Clicking the name next to the triangle determines what appears in the name column. If you define a named MIDI controller, or a note from a mapped instrument in the *Status* and *-1-* parameters, the relevant name will be offered as a preset. Altering a note name in the event definition also alters the corresponding note name in the mapped instrument.

You can also display, add, and edit Meta Events in the Hyper Editor's event definition.

Display and Editing Grid

The *Grid* parameter is set with the typical pull-down quantization menu. New events can then be added at the set grid positions. The positions of existing events are not affected.

If you want to quantize the positions of existing events, you can do so using event quantization, or more simply with event definition conversion.

The same quantization templates available for playback parameters, including Groove Templates you have defined, are accessible.

When editing complex drum rhythms, it can be useful to create several hyper definitions for one drum note, each with a different quantization grid. As an example, if there are two lines for a snare drum, one with a 1/16 and the other with a 1/96 grid, you can use the pencil to add individual hits in the coarser grid, and rolls in the finer grid.

Beam Width

You can set the width of the event beams from 1 to 16, using the *Pen-width* parameter. Regardless of the beam width, the exact event position is always marked by the left edge of the beam.

When set to the maximum value (Penwidth = 16), note events are displayed with their actual length.

Beam Display

The *Style* parameter allows you to select from four different color display variations, for the beams. Styles 5 to 8 are the same as 1 to 4, but the selected events flash when you highlight them.

Delay

The *Delay* parameter can be used to delay (with positive values), or advance (negative values) all of the events in an event definition line by an adjustable number of ticks. The change in position is visible immediately. Even new events are offset from the grid positions by the *Delay* value. If you click between the word *Delay* and the parameter value, you can use a pull-down menu to enter note values (1/16 and so on) directly.

Unlike the Region playback parameters' *Delay* option, this only affects individual event types or note numbers, which is very useful for drum programming (flams, for example).

In general, it is useful to transmit controller data slightly before or after the exact grid positions, to improve the timing of the notes lying on the grid positions.

Length of Notes to Be Added

You can use the *Length* parameter to set the length of notes to be added, measured in divisions (the left number), and ticks (the right number).

To guarantee optimum timing when drum programming, you should ensure that note off events are never transmitted at the same time as note on events. Use note lengths that aren't close to straight note values, such as 100 ticks (1/48 note = 80 ticks, 1/32 note = 120 ticks). Very small tick values are also unsuitable, because note off events may sometimes be transmitted at the same time as note on events, at the same position.

Event Status

If you grab the right side of the *Status* line, a pull-down menu opens, enabling you to set the status for this event definition line.

MIDI Channel

Next to *Cha*, you'll see a checkbox, and to the right of this you can set a MIDI channel number. If you check this box, the display is restricted to events on the set channel. If the box is unchecked, the channel parameter is ignored, and matching events on all channels are displayed.

First Data Byte

The bottom line shows the *-1-* parameter, where you can determine the first data byte of the displayed event.

As an example, if *Note* is set as the event status, you can determine the pitch (note #) that should be displayed in this event definition line. If the edited MIDI Region is played by a mapped instrument, a pull-down menu that features the names of the input notes (drum sound names) appears here.

As with the MIDI channel, the checkbox determines whether (if checked) only events with the defined first data byte should be displayed, or whether (if unchecked) the setting should be ignored. In the case of note events, the velocity values of all notes (regardless of pitch) would be displayed in the relevant event definition line.

If *Control* is set as the event status, you can use a pull-down menu to determine the controller type (controller #).

With channel aftertouch (status *C-Press*), or program change events (status *Program*) the setting of the -1- parameter is always ignored, and the first data byte is displayed as a beam height. With pitch bend data (status *PitchBd*), the setting is also ignored, because both data bytes are used to display the beam height.

Making Different Definitions Simultaneously

Just as you can adjust the parameters for several MIDI Regions at once, you can set the parameters of several event definitions simultaneously. Select several event definitions in the name column, by holding down Shift and clicking on them. You can also use *Hyper > Select All Event Definitions* to select all event definitions, and then deselect some of them by Shift-clicking on them.

Any alterations made in the Event Definition Parameter box affect all selected event definitions.

Hi Hat Mode

In hi hat mode, event definitions can be grouped together. Only one event from each group can be played at any time position. A typical use is for preventing different hi hat notes (open, closed, pedal) from being inserted at the same position.
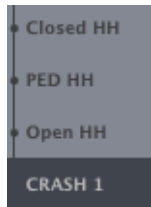
To define a hi hat group, click in any of the lines at the left edge of the name column. Click here once again to switch hi hat mode off for the line. All lines in a hi hat group must be vertically adjacent to each other.

If you add an event within a hi hat group, all existing events at this time position are deleted.

You can create as many hi hat groups as you want in a hyper set, but they must all be separated by at least one line in which hi hat mode is switched off.

Operation
Grid

The grid defined by the *Grid* parameter in the Event Definition Parameter box is very important:
* During selection, all events within a grid section are selected
* When you change the values of existing events, all events within a grid section are altered, and
* New events are added at the grid positions, in accordance with the value set as the *Delay* parameter.

Selection Techniques

You can use any of the usual selection techniques (see "Selection Techniques" on page 33), with the following differences:
* To select individual events, hold down Shift, as you would when selecting several events that are scattered across the screen, and;
* When making a rubber band selection, hold down Shift (be careful not to click on any events).

Moving and Copying Events

When moving selected events, you also need to hold down Shift.

To copy events, use Option as per usual.

Both operations allow you to move events to other event definition lines. The events will be converted automatically.

Altering Event Values

You can alter individual values by grabbing the event beam (with the pointer or pencil). As you change the event value, the current value is shown in a help tag.

Altering Several Events

If several events are selected, you can alter all of their values relatively, by grabbing one of the event beams. The absolute differences between the event values remain constant. If one of the beams reaches the top or bottom value, you will not be able to go any further in that direction.

If you hold down Option while doing so, you can keep raising or lowering the values of the selected event group, until the grabbed event beam reaches the top or bottom.

Setting Up a Manual Series

Existing Events

Draw the events with the mouse pointer, while holding down the mouse button.

Creating New Events

Draw the events with the pencil, while holding down the mouse button. The pencil is preset as the second tool (Command key).

Setting Up a Linear Series

- Select the crosshair tool.
- Click anywhere in the beam display area, and hold down the mouse button.
- Keep an eye on the help tag (showing the exact position and event value in the top line). Move the mouse to the start point of the line you want.
- Release the mouse button.
- Move the mouse to the desired end point of the line (to the right or left). You can also keep an eye on the position and event value in the help tag.
- Click at the desired end point to align the event beams along the line.

If events existed in the area between the start and end points, they are aligned along the line.

If there were no events in the region, new events are created at the grid positions (in accordance with the Grid parameter), aligned along the line.

If you definitely want to create new events, hold down Option when you click for the last time.

This creates one event at every grid value. With very flat slopes, or very fine grids, the individual grid positions remain unoccupied if the value to be added is the same as the value of the previous event. This reduces the data-flow along the MIDI bus, without reducing the resolution of the controller.

When defining the *Grid* parameter to add a succession of controllers use the motto, "as coarse as possible and as fine as necessary" to minimize data output. Logic can deal with very large amounts of data, but unfortunately the same cannot be said of MIDI itself.

Linear Series in Sections
If you also hold down Shift, you can immediately draw another line from the end point of the original line.

Adding Individual Events
Use the pencil to add individual events. You can alter the value before you release the mouse button. The pencil is preset as the second tool (Command key).

Fix Value
If you place a check in the *Fix Value* checkbox, you can prevent the height of any event beam being altered with the mouse pointer or pencil.

When adding events with the pencil, all added events are assigned the value of the previously-selected event. This allows you to draw a succession of events with the same value.

You can adopt the value of an event (with a fixed value) as a preset, by selecting it with the pencil. In fix value mode, it is impossible to alter the value by clicking on it.

When adding events with the crosshair tool, the preset value is always used as the start point of the line.

Matrix Editor

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

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</div>

The Matrix Editor allows MIDI note events to be handled in much the same fashion as Regions in the Arrange window.

This editor is often called the "piano roll" editor as it represents note events as beams that resemble the holes cut in the paper of pianola piano rolls. It is an exceptionally easy to use tool for the creation and editing of MIDI note data.

Matrix Editor—Introduction
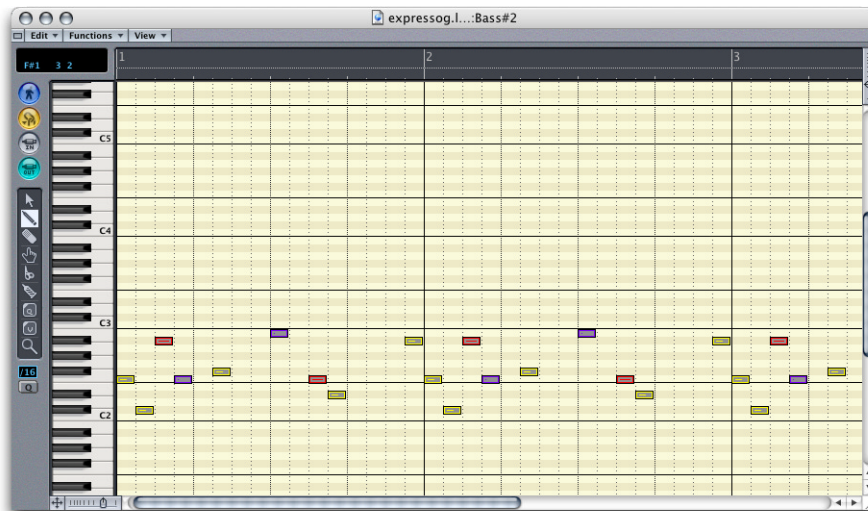
The Matrix Editor is used to graphically edit note events. Its advantage over the other editors is its ability to provide a more precise display of the length, position, and velocity of the notes. The Matrix Editor is designed for fine-tuning the positions and lengths of notes.

Opening the Matrix Editor

To open a Matrix Editor window that shows the contents of the selected MIDI Region, select *Windows > Open Matrix Edit* (Command-6) or a user-defined key command (*Open Matrix Editor*).

The optional parameter field to the left contains the standard buttons and the Toolbox. A Bar Ruler is shown at the top edge, much like the Arrange window (and the Hyper and Score Editors). Below the Toolbox, you'll find a field that allows you to define the sub-division of the grid. The vertical screen keyboard indicates the pitch of notes, which are displayed as horizontal beams. In the upper left corner, a display panel shows various types of information, depending on the situation.

Display

Notes are the only events shown in the Matrix Editor. The beams (and the way they can be edited) are very similar to the MIDI Regions in the Arrange window.

Pitch/Note Names

The pitch is indicated by the vertical keyboard on the left side. To help you with positioning, there are horizontal lines running across the screen between notes B and C, and notes E and F.

If a mapped instrument MIDI Region is being displayed, the names of the notes being played will appear on the vertical keyboard, in place of notes "C" and "F".

When a mapped instrument note is being moved, its name is displayed in the help tag.

Position

You can read the position of a note in the Bar Ruler. The background is marked by vertical lines to assist with positioning—the default values are:
- A black line at every bar,
- A lighter gray line at every beat, and
- A very light gray line at every division (you can alter the division value in the Transport window, or in the parameter area).

Velocity

The velocity of a note is portrayed by a horizontal line in the note. The length of the line in relation to the total length of the note corresponds to the velocity value of the note (in relation to the maximum value of 127).

The Matrix Editor displays the velocity of note events by color, too.

This makes it very easy to see at a glance what range of velocities are contained in a MIDI Region.

If you change the velocity of MIDI notes with the V tool, you will notice that the color of selected notes changes in real time.

Chord Recognition
When selecting multiple overlapping notes in the Matrix editor, the information section in the upper left corner displays the chord name.

Editing Notes
You can use the same intuitive editing functions available for Regions in the Arrange window.

There are also some editing options (see "Edit Operations" on page 32) that are available in all editor windows.

Selection Techniques
In addition to the usual selection options, you can select all notes of the same pitch in the MIDI Region by clicking the corresponding onscreen keyboard key.

You can also rubber band select a pitch range of the onscreen keyboard, and select all notes within it.

Quick Opening of Event or Score Editor
A double-click on any event (without any modifier) opens the Event editor. An Option–double-click opens the Score editor.

Creating Notes
To create a note, click at the desired point on the background with the pencil tool.

Duplicating Notes
To copy an existing note to another position or pitch, first click the original note with the pencil (near the middle).

Any notes now created by clicking the background will have exactly the same length and velocity as the original note.

Deleting Notes
You can delete selected notes by pressing Backspace, or clicking on them with the eraser.

Moving Notes

You can move selected notes by grabbing them (near the middle) and dragging them. If you move notes vertically, they will be transposed, and if you move them horizontally, they will be moved in time. The target position and pitch are shown in the help tag while the mouse button is held down.

When you move notes horizontally, they snap to the resolution of the Bar Ruler, and the setting of the zoom function.

You can limit movement to one direction, to avoid accidentally transposing notes when moving them vertically (and vice versa). (*Options > Settings > Global Preferences: Limit Dragging to one direction in Matrix and Score*).

Setting a Finer Grid

When moving notes in the Matrix window, you can make fine adjustments at a high resolution, by holding down Control as you drag. The exact resolution will depend on the current resolution of the Bar Ruler, and the setting of the zoom function.

If you hold down Control-Shift, you can move the notes in tick steps, completely independently of the resolution of the Bar Ruler, and the setting of the zoom function.

Copying Notes

Hold down Option as you move the notes.

This allows you to copy or move notes between two Matrix Editor windows.

You can, of course, also copy (*Edit > Copy* or Command-C) or move (*Edit > Cut* or Command-X) the notes onto the Clipboard, and then paste them at the current song position, at their original pitch (choose *Edit > Paste* or Command-V).

Altering Length

To alter the length of a note, grab it by its bottom right-hand corner, and drag it to the required length. While you are altering the length, the help tag will keep you informed about the precise length of the note.

Note Start Edit

The head of a note (startpoint) can be changed, while retaining the original endpoint. This is done by grabbing and dragging a note at the bottom left corner. This function is similar to adjusting the startpoint of a MIDI Region in the Arrange Window.

Altering the Lengths of Several Notes Simultaneously

You can adjust the lengths of several selected notes at once (a chord, for example), by simply altering the length of one of them. The relative differences between the (selected) note lengths will be maintained.

Making Notes the Same Length
If you want to make several selected notes the same length, hold down Option-Shift (as in the Event List, when making several parameters the same value).

What Tools to Use
You can use either the mouse pointer or the pencil when altering note lengths. It's advisable to use the pointer, as this avoids the accidental creation of new notes, possible with the pencil.

It can sometimes be difficult to grab the bottom right corner of very short notes. In this situation, you should use the index finger tool, which allows you to grab notes anywhere, in order to alter their length.

Altering Velocity
To alter the velocity value, click-hold, and vertically drag on the note with the V tool. The help tag will indicate the velocity value of the note you have clicked on.

If the MIDI Out function is switched on, the note will be output when you alter the velocity.

Altering the Velocity of Several Notes
All selected notes can be altered simultaneously; the differences in their respective velocity values will be retained. If the velocity value of one of the selected notes reaches an extreme value (0 or 127), none of the selected notes can be adjusted further.

You can override this behavior by holding Option while doing so. This allows you to continue altering the velocity values until the selected (clicked) note reaches an extreme value.

Hold down Option-Shift while dragging, to assign the same velocity value to all notes.

Hyper Draw in the Matrix Window
In both the Matrix and Score Editors you can use the *View > Hyper Draw* command to open a Hyper Draw (see "Hyper Draw" on page 233) display. This allows quick and easy editing of controller data while viewing note data.

Once you have opened the Hyper Draw display, you can select the type of event you want to view by using the arrow menu to the left.

You can adjust the size of the Hyper Draw display by grabbing, and vertically moving the dividing line that separates it from the main Matrix editing window.

Score Editor

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The Score Editor offers extensive score layout and printing facilities, allowing the transcription of everything from simple melody lines to full symphonic scores.

This chapter outlines all of the tools and features available for Score and Lyric entry, editing, layout, and printing.

Score Editor—Introduction
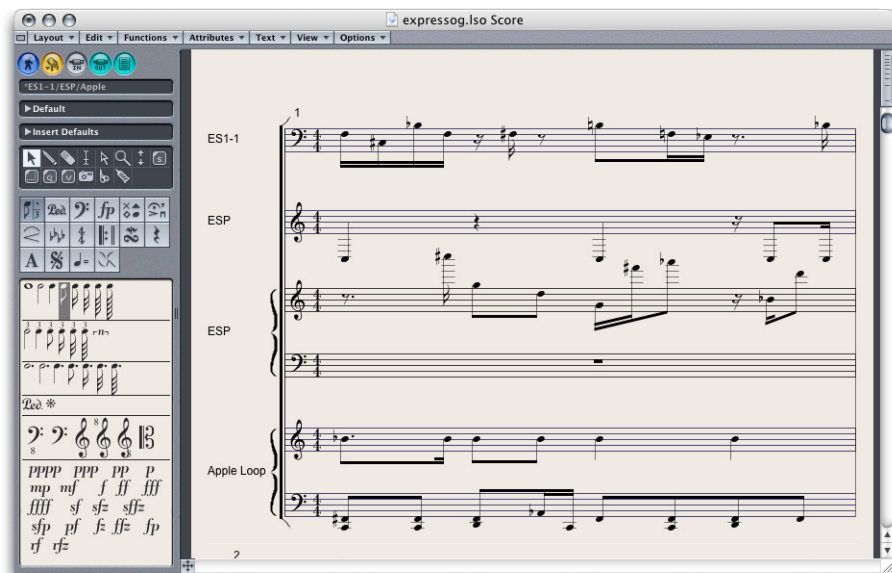
Logic's Score Edit window basically serves two purposes:

- As a MIDI editor for users who prefer to use traditional music notation as an interface for MIDI sequencing. Input, editing, copying, or deleting of MIDI events and changing their musical position can be done directly in the Score window. You can also change between different display levels (view single or multiple parts at once).
- To prepare and produce printed music. The number of staves in a score is only limited by the paper size. Each staff can contain up to 16 independent ("polyphonic") voices.

In addition to notes (which always represent MIDI events), numerous musical symbols can be inserted. Text (or any symbol which is part of a text font) can also be integrated into the music.

Single pages, or parts of them, can be exported to graphic or text based programs with the camera tool. The selected area can be saved as a graphic file, or copied to the Clipboard, and then imported or pasted as a picture in another program. This is especially useful when preparing teaching material.

MIDI sequencing and notation layout for printing are closely related in Logic. Recorded MIDI notes are immediately displayed in the score. On the flipside, notes inserted with the mouse onscreen, or changes to existing notes, are immediately reflected in the MIDI playback.

Opening the Score Edit Window
There are several ways to open the Score window:
- Main *Windows > Open Score* menu option.
- The *Open Score Window* key command (Default: Command-3).
- Double-click on a MIDI Region in the Arrange window, if *Double-clicking a MIDI Region Opens Score Editor* is selected in *Logic > Preferences > Global > Editing*.
- To recall an open window (which is hidden by other windows), select the window's name in the main *Windows* menu, where all currently opened windows are listed.

Several Score windows can be open at once. This allows the display of different groups of instruments, by using different Instrument Sets, for example.

Elements of the Score Edit Window

Here's an overview of the Score Edit window's elements.

Along the Left-Hand Side:

Buttons for Catch, Link, MIDI In, MIDI Out, and Page Edit view

Instrument Set Box

Display Parameter box

Event Parameter box

Toolbox

Part box (groups and individual)
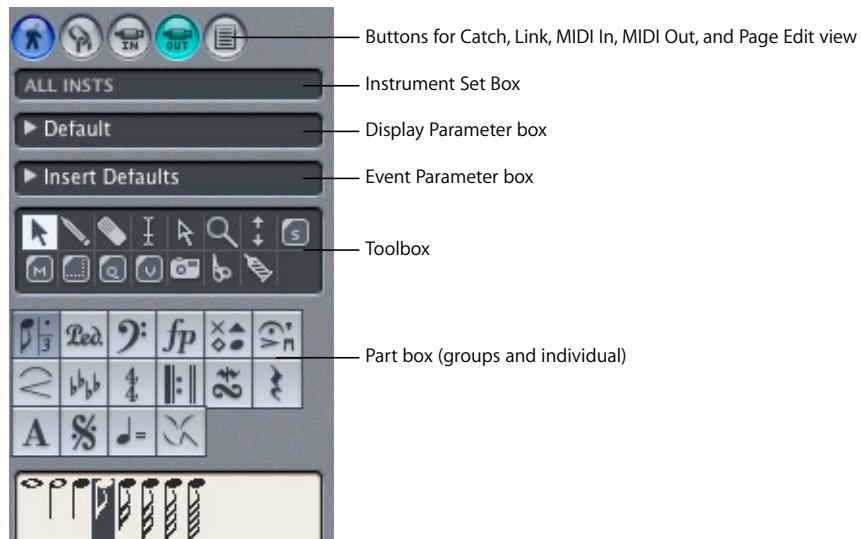
Along the Top Margin:
- Bar Ruler (linear view only)
- Zoom symbols
- Menus

The Main Working Area:
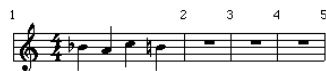
Optionally shows:
- Instrument name display column on the left side.
- Hyper Draw area at the bottom (only possible in single MIDI Region view and with linear display).
- Page Rulers (only in page view).

The various options for changing the display of these elements are described in the General Appearance of the Score Edit window section (see "View Menu" on page 336).

Positioning the SPL Directly in the Score

The Song Position Line can be set directly in the Score window by Option-clicking a staff at the desired position. This function is only available when the sequencer is stopped. It is especially helpful in Page view, where no Bar Ruler is displayed. The selected position is displayed in the Help Tag while the mouse button is pressed.

Notation Concept

MIDI sequencing and score display are closely related in Logic. Every note in the score represents a MIDI note event. MIDI Regions are interpreted for display by Logic, using methods that can be influenced by the user to a great extent. The goal is to retain the feel of real time recordings, while still rendering a readable score.

If notes are entered into the score with the mouse or step input, they are also played back via MIDI, as they represent MIDI events.

Basics

Recorded MIDI Regions are automatically displayed in the Score window. If you like the sound of playback, but not the score display, you can usually obtain the desired results by changing settings in; the *Display Parameter box*, the various *Song Settings* dialog windows, or the *Note Attributes*. You can further control the display by selecting or creating *Score Styles*, *Instrument Sets*, and *Text Styles* that best fit your music.

If you generally prefer mouse input, you first need to create one or more empty MIDI Regions in the Arrange window with the pencil tool. These will be displayed as empty staves in the Score window. Rests are usually displayed automatically in Logic, and don't need to be manually inserted.

If you want to use the mouse to insert new notes into a previously recorded MIDI Region, you can select a rhythmic note value from the Part box, and drag it to the desired bar and pitch position, in any of the visible staves.

No matter which input method you decide to use, the selected display settings always apply to the inserted MIDI events. This means that a thirty-second note can only be displayed if the *Qua* parameter in the *Display Parameter box* of the corresponding MIDI Region is set to 1/32, or shorter. If the value is set to 1/8, an inserted 32nd note will be displayed as an eighth note (but will still play back as a 32nd). The display is also affected by the *Interpretation* setting in the MIDI Region's Display Parameter box. These settings can be different for each MIDI Region—even for MIDI Regions on the same track! Simply cut the MIDI Region with the scissors tool to use different display parameter settings in the same staff. Once cut, you can assign different display settings to the resulting shorter MIDI Regions, although they will still be displayed as one, uninterrupted staff. MIDI playback is not affected by this procedure.

The *Part Box* contains a number of symbols that can be inserted into the score by dragging them into position with the mouse.

The printed result always corresponds to what you see in the selected Score window (Page Edit view must be activated). Layout work should be done in page and print view, after all of the notes (and most of the symbols) have been recorded or inserted.

Staff Display…

…in Relation to the Position and Length of MIDI Regions in the Arrange Window

MIDI Regions in the Arrange (see "MIDI Regions" on page 107) window represent parts played by certain instruments (on tracks), and are displayed as staves in the Score window. Depending on the selected *Score Style* (see "Basics" on page 380), an instrument's notation can be displayed in a staff system containing two or more staves (such as a two staff system for a piano part).

Each of these staves or (Arrange window) tracks, can contain an (almost) unlimited number of MIDI Regions. If the MIDI Regions on one track directly follow one another in the Arrange window (with no gaps between them), they are displayed as one continuous staff in the score, unless you have limited the view to a single MIDI Region, by engaging *content linked mode*. In linear view, you will still see clefs, time and key signatures at the beginning of each MIDI Region, but these disappear as soon as you change to Page Edit view.

The *Display Parameters* (see "The Display Parameter Box" on page 374) for each of these MIDI Regions can be set independently. This allows you to influence the visual display of (the notation contained in) MIDI Regions very flexibly—especially the display of rhythmic values. If necessary, MIDI Regions can be divided into several smaller Regions with the scissors tool (available directly in the Score window), allowing you to assign different display parameters to each resulting part.

Selected MIDI Regions are displayed with blue stave lines (unless this option is deactivated in the Score Preferences (see "Score Preferences" on page 423), making it very easy to identify the currently selected part.

Aliases in the Score Display

Alias (see "Aliases" on page 124) is a term used for MIDI Regions and Folders in the Arrange window that are not independent. Alias objects "mirror" other MIDI Regions and Folders at different positions and/or tracks. Wherever an alias exists, its parent (original) MIDI Region or Folder is played back.

Aliases are also displayed in the Score Edit Window, and can be printed. The display of Alias objects can be switched on or off via *Layout > Global Format > Show Alias*.

An alias can be assigned a different Score Style than its parent Region. As an example, a melody played in unison by several instruments can be handled as a regular MIDI Region, and several aliases. Different Score Styles can be used for the different instruments, including transposing Score Styles. If you decide to change something in the melody, you don't need to edit all copies of it. Just make the change in the parent MIDI Region, which will automatically be reflected in all of it's aliases.

Alias Editing

You can directly edit the notes and symbols in the displayed alias if *Layout > Global Format > Allow Alias Editing* is switched on. Please be aware that this alters the data of the original MIDI Region and all aliases created from it, because only the original MIDI Region can actually contain MIDI data.

If *Allow Alias Editing* is switched off and you try to edit an alias, a dialog that will offer the following options:
• *Cancel*: the aliases and the original MIDI Region remain untouched.
• *Enable Alias Editing*: Alias Editing is enabled; remember that this actually edits the original MIDI Region.
• *Copy Region*: A copy of the original MIDI Region is created. You can now edit the notes independently of the original MIDI Region, as the alias is also a real Region.

Basic Elements for Score Display

The following elements and parameters form the basis of Logic's score display.

Instrument Sets

Instrument Sets (see "Instrument Sets and Score Display Levels" on page 401) allow you to control which instruments are displayed (and printed) in a score. You can include as many (or few) of the existing track instruments into a score as you wish. The order of the instruments can be arranged independently of their order in the Arrange window. You can assign names and abbreviated names to each track instrument, independent of the actual track instrument names in the Arrange window. These names are displayed in the score. You can also define which staves are connected with brackets and bar lines, to form groups of instruments in the score.

Any single instrument can be quickly extracted from the score, by selecting it from the pull-down menu that appears when you Option-click on the Instrument Set Box. This way, you don't need to create an Instrument Set for every instrument, in order to produce parts. The automatic line breaks and individual stave margins can be independently changed for each Instrument Set. Please see the Instrument Sets section for details.

When you open a new Score window with several MIDI Regions selected in the Arrange window, an Instrument Set will automatically be created and displayed in the Score window. This Instrument Set only contains the instruments of the selected MIDI Regions.

Score Styles
Each Score Style (see "Basics" on page 380) contains a collection of score settings. Their function could be compared to that of text formats in word processors and layout programs. In place of text settings, Score Styles contain the staff size, display transposition, stave distance, number of independent voices and so on. Obviously, defining all of these settings each time a new MIDI Region is created or recorded would be painful. Fortunately, you can assign any desired Score Style to any MIDI Region. In fact, any number of Score Styles may be created and assigned to individual MIDI Regions. There are a number of Score Styles included in the template files that come with Logic, and in Logic's default song. Please see the Score Styles section for details.

Text Styles
These are user-definable text formats for all types of displayed text.

Display Parameter box
The parameters of the Display Parameter box (see "The Display Parameter Box" on page 374) mainly affect the rhythmic display of selected MIDI Regions. They can be different for each Region. Some of these parameters can be overridden for individual notes, by using Note Attributes.
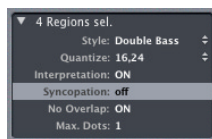
Song Settings
You can set general display options that affect the whole song in the Song Settings (see "Song Settings for Score Display" on page 410) window. These include; spacing between notes, page margins, line thickness, display of instrument names, bar and page numbers, and a lot more.

Note Attributes
The Note Attributes (see "Note Attributes" on page 398) affect single notes or—when assigning them to a group of notes—all selected notes. The following parameters can be defined individually for each note:
• Enharmonic changes.
• Settings for Interpretation and Syncopation, independent of the settings in the Display Parameter box.

- Stem direction, tie direction, and beaming, independent of the settings in the Score Style being used.
- Display as an *Independent Note*, which excludes the note from the measure's overall rhythmic calculation.
- Horizontal graphic offset from the default position.
- Change of accidental distance.
- Change of note size, and form of the note head.

General Appearance
View Menu
You can activate and deactivate the following display options by selecting the corresponding menu entries. Activation is indicated by a check mark:

Colors
The entries in this menu set the color mode for the active score window. These settings have priority over all other color settings.
- *Normal* or *Individual* means that colors are assigned according to the color settings in Score Styles and Note Attributes. As long as these settings haven't been changed in new songs, this will result in a regular black and white printout—and black notes on a yellow background onscreen.
- *Show Pitch* applies colors in accordance with note pitches. The colors of notes can be edited in the *Layout > Colors* window. You can also determine whether notes with accidentals have the same color as those without accidentals, or if each note in the chromatic scale will have its own color, in this window.
- *Show Velocity* applies eight different colors in accordance with MIDI velocity. These colors can also be edited in *Layout > Colors*.
- *Show Voice Assignment* assigns different colors to different Voices. This only makes sense in Score Styles that contain more than one Voice. This mode employs the colors of the user palette, which can also be found and edited in *Layout > Colors*.
- *Force Black & White* does exactly that. This mode is useful when color options have been used in Score Styles or have been assigned to notes using Note Attributes, but you want to print a regular black and white score, and return to the colored display.

Page Edit
Note: A quicker way of changing between Linear and Page Edit view is to click on the button in the upper left corner, or use the corresponding key command.

You should use linear view for editing, as screen redraws are much faster, especially on slower computers. Page view should only be used for layout work, in preparation for printout.

You can jump directly to any page, using the *Go to Page* key command, when working in Page view mode. The Song Position Line is automatically set to the beginning of the selected page, unless the sequencer is running when you execute the command. In this situation, *Catch* mode will be turned off.

In Page View mode, Logic will automatically display as many pages next to each other as possible, according to the size of the Score Edit window and current zoom level.

Print View
Print view will also show the page margins onscreen (if Page view is activated).
Note: the yellow area on the screen represents the printable area (which also depends on the printer being used), not the actual sheet of paper.

Explode Folders
Displays the contents (MIDI Regions) of all lower display levels (folders), along with the MIDI Regions of the current level.

If this option is not activated, folders are displayed as gray beams in linear view. In Page view, they are not visible at all. As with the other windows, the contents of a folder will appear when you double-click the gray beam that represents it.

Explode Polyphony
Displays every voice of a polyphonic Score Style on a separate staff. In general, this is not intended for printout, but for convenient editing of polyphonic voices.

Scroll in Play
Changes Logic's scrolling behavior when *Catch* is activated: the current song position is always shown in the middle of the window, making the score display itself move around the SPL, which stays in the center of the screen.

Part Box
- *Show All Groups*: If deactivated, only the Part box Group that is currently selected in the top section of the Part box, appears below it.
- *Lock Group Positions*: This allows you to lock the order of Part box Groups. If unlocked, the group of the most recently selected object is always moved up to the top (of the lower section) of the Part box.

Toolbox
Hides/Shows the Toolbox on the left side of the Score window. As in all Logic windows, the Toolbox is displayed at the current cursor position when you use the Esc key command. Select a tool, or press Esc again to close the Toolbox.

SMPTE Time Ruler
Displays SMPTE timecode positions in the Bar Ruler (only in linear view). If there's enough vertical space, it will show both bar and timecode positions.

Parameters

Hides/Shows the left column of the Score window (Display Parameter box, Event Parameter box, Part box, and so on).

Instrument Names

Hides/Shows the names of (used) track instruments, to the left of the score display.

Page Rulers

Hides/Shows rulers in Page Edit view. Measurement units can be centimeters or inches.

White Background

Switches between a white and colored background.

Hyper Draw

If you activate one of these options, a Hyper Draw area appears at the bottom of the main working area, allowing you to easily insert control data. You can change the area height, by dragging the borderline vertically with the mouse. Note that Score Hyper Draw is only available when single MIDI Regions are displayed in linear view.

Other Options

Adjusting the Borders Between the Different Areas

You can move the left and upper borders of the main working area by positioning the cursor on one of the border lines, and click-dragging it. During these operations, the cursor features two or four arrows. There are three possibilities:

• On the left side, you can alter the width of the columns containing the parameters, (mainly changing the appearance of the Part box Groups), and the instrument names.

• Along the upper border, you can create vertical headroom. This is useful for working on parts containing very high notes, or symbols above high notes (such as slurs), which might not be otherwise visible, and therefore can't be edited.

• In the upper left corner of the main working area, you can change the width of the parameter column, and the height of the bar or page ruler. If *View > Instrument Names* is activated, the width of the instrument name column can also be changed.

Parameter Boxes

Both the Display and Event Parameter boxes can be reduced/restored, by clicking on the triangle in the upper left corner of each parameter box.

The Main Working Area

The appearance of the score display depends on:

• The settings of the Link and Catch buttons (see "Display Levels" on page 401)
• The selected Instrument Set (see "Instrument Sets and Score Display Levels" on page 401)
• Page or Linear view (View menu, and/or button to the right of the MIDI Out button)
• Zoom level

- Explode Folders (see "View Menu" on page 336) on or off
- Explode Polyphony (see "View Menu" on page 336) on or off
- Hyper Draw (see "Hyper Draw in the Score Edit Window" on page 347) on or off

Input Methods in the Score Window

There are several ways to input notes and symbols in the Score window:

- Real time MIDI recording (notes and sustain pedal markings only)
- MIDI step input (notes only)
- Mouse input from the Part box (notes, text, and all symbols)
- Insertion of copied events (all, except global events)
- Fast input of symbols by assignment to selected notes with key commands. These are available for some symbols which are attached to notes (accents, Jazz symbols, and so on) and slurs or crescendi.
- Hyper Draw (see "Hyper Draw in the Score Edit Window" on page 347) allows you to insert and edit MIDI events that aren't normally displayed in the Score window, such as continuous controller data (volume, pitchbend, and so on).

The various input and insertion methods can be combined. With all input methods, however, you should always remember that MIDI playback is also influenced by the settings in the Region Parameter box (see "MIDI Region Playback Parameters" on page 116) and Instrument Parameter box (see "The Instrument Parameters" on page 102) in the Arrange window. Settings in the Environment may also affect MIDI playback, if configured to do so.

Score Display Options—a Survey

With a few exceptions, a printed score (see "Printout" on page 341) is always identical to the Page Edit view display in the currently active Score window.

The display depends not only on what was recorded or inserted, but also on the chosen display settings. As there are a quite a few, each affecting certain aspects of a song's display, here is an overview of the various settings. These are organized into groups, ordered in accordance with their influence on the overall display. Detailed explanations of the following terms are provided on the indicated pages.

Settings that affect all song files:
- The Score Preferences (see "Score Preferences" on page 423)

Settings that affect the score display of one song file:
- Page format, and printer driver

Song Settings (see "Song Settings for Score Display" on page 410) (menu Layout):
- Global Format
- Clefs & Signatures

- Extended Layout Parameters
- Numbers & Names
- Guitar Tablature…
- Text Styles…
- Score Styles… (see "Basics" on page 380)

Settings that can be assigned differently for each Score window, allowing different score displays within the same song file:
- Display levels: Content Linked, Linked, or Not Linked
- Explode Folders
- Instrument Set (see "Instrument Sets and Score Display Levels" on page 401): selection and order of the displayed instruments
- Explode Polyphony
- Linear view or Page Edit view (printout can only be started from Page Edit view)
- Zoom levels (does not affect the printout)

Settings that affect the score display of a particular MIDI Region:
The parameters in the Display Parameter box:
- Score Styles…
- Display quantization ("Qua")
- Interpretation
- Syncopation
- No Overlap
- Max. Dots

Special case:
- *Score Off* in the Extended Region Parameters

Settings that can be changed for each note individually, regardless of the default settings:
- Accidentals: Enharmonic Shift
- Accidental Position (distance to note)
- Beaming of notes
- Stem Direction
- Interpretation
- Syncopation
- Tie Direction
- Note head appearance (Head)
- Treating a note as Independent Note or Independent Grace Note
- Note size (Size)
- Horizontal Position: Graphic positioning
- N-Tuplet settings (Tuplets)

Printout

It is important that you first choose the appropriate paper size and format in the *File >
Page Setup* menu. The Score window (containing the intended print view) must be the
active window. Start printing by selecting *File > Print*, or use the corresponding key
command (default: Command-P). A dialog box, which will vary slightly from printer to
printer, is shown. Depending on the printer, there may be some additional options,
such as which page numbers you would like to print, or the number of copies. Make
your selections, and click the Print or OK button.

The printout is always identical to the Page Edit view display in the Score window. The
following items are not printed, however, but are visible on the screen:

- The dashed lines that represent page and header margins, and borders between staff
  systems
- Cursor, Song Position Line
- Colors (page margins, stave lines of selected MIDI Regions)
- Hidden time signature changes
- Hidden note heads (displayed in gray onscreen), and their ties
- Hidden bar lines (displayed as dashed lines on the screen)
- Hidden N-Tuplet numbers

Printers work at higher resolutions than monitors. As such, you should work at high
zoom levels when doing layout work that requires precision, such as positioning
symbols and text elements.

It's very easy to switch back and forth between a normal and enlarged view of the
display, by using the magnifying glass tool (shortcut: rubber band selection while
holding down Control, to enlarge the selected area).

Using External Symbol Fonts for Display and Printout of Notes and Symbols

You can use the Sonata font from Adobe™, the Jazzfont (http://www.jazzfont.com/)
and the Swingfont (not included with Logic), instead of Logic's internal score font, for
display and printout of notes and symbols. The external font must be properly installed
on your system. Activate *Options > Score Preferences > Use external Symbol Font (if
available)* and choose the font you wish to use in the corresponding pull-down menu.

The onscreen display of some of these fonts can be hard to read (especially at smaller
zoom levels), so there's also an option to only use the external font for the printout.
Select *only for Printout* is the Score Preferences option.

Graphic Export

There are two ways to export Logic's notation into other programs, as graphic images:

PICT Export Using the Camera Tool

You can save a part of a Logic score page (or a whole page) as an image (PICT format), and paste it into documents created with other programs (word processing and DTP software). Use the *Camera tool* to select the desired score section, using the "rubber band" selection technique. As soon as you release the mouse button, Logic creates a PICT file (or copies the selection to the Clipboard—see option below), encompassing the area you dragged the *Camera tool* over. This function is only available in Page Edit view.

There are some related settings in *Logic > Preferences > Score Preferences*:

Graphic Export Resolution
Determines the resolution of the exported image file. This can be set between 72 and 600 dpi.
• If the image is only intended for use on a computer screen, use low resolution (72 dpi).
• If the image is intended for a document that will be printed, select your printer's resolution.

Graphic Export to (pull-down menu)…
• *Clipboard*: The image is copied to the Clipboard and can be pasted directly into other documents, without saving it as a separate file.
• *PICT File*: The image will be saved as a PICT file. A file selector box allows you to assign a file name and path.

PICT File Creator ID
This allows you to determine which program will be used to open the file when you double-click it in the Finder. The default setting is ttxt. This setting, however, has no influence on the file format itself.

Realtime MIDI Recording

Although real time MIDI recording is usually done in the Arrange window, you can also start recording directly from the Score window. You must first select the destination track in the Arrange window's track column. This can be done directly from the Score window, by clicking on a staff that belongs to the desired track. If no MIDI Regions exist on the track, you will need to switch to the Arrange window for recording, because the track won't be displayed in the Score (the Score window only shows Regions and folders).

If you want your recording to become part of an existing MIDI Region (because you use score template files), select the global *Song Settings > Recording Options* menu item, and activate *Merge New Recording With Selected Regions*, before starting to record. Also make sure that the destination MIDI Region is selected, or Logic will create a new MIDI Region on the same track, which will probably overlap the existing one.

The display of recorded notes depends on:
- The score display settings, especially those in the Display Parameter box (see "The Display Parameter Box" on page 374) and the Note Attributes (see "Note Attributes" on page 398). Please read the corresponding sections in this chapter.
- The *Quantize* and *Transpose* settings in the Arrange window's Region Parameter box (see "MIDI Region Playback Parameters" on page 116):

Logic creates a score display based on the MIDI data, including any changes caused by these two playback parameters.

An example: if *Transpose* is set to +2 in the Region Parameter box, a note that was initially a C (when recorded) will be played back and displayed as a D. The same applies to playback quantization, with the exception of notes that were "unquantized" with the Quantize tool, or the corresponding key command.

Step Input

Step input (see "Step Input" on page 44) in the Score window works in the same way as other editor windows.

The Score Edit window, however, is the only editor (apart from the Matrix editor) where the content of several Regions can be displayed and edited at once. This ability results in some differences relating to step input in the Score window:
- The MIDI Region that you want to insert notes into must be selected (click on the staff). If no staff is visible, you must first create an empty MIDI Region in the Arrange window.

- Simultaneous step input into several Regions is not possible. If more than one MIDI Region is selected, the notes will be inserted into only one of them.
- If several Regions follow one another on the same Arrange track (even those with gaps in-between them), you can step input notes from one MIDI Region to the next. As soon as the SPL reaches the beginning of the next MIDI Region, Logic will automatically insert the notes into it.

Mouse Input

A staff must exist before notes, symbols, and text elements (called *objects* in the following sections) can be inserted. Each staff (even an empty one) is the direct representation of one or more Regions. Empty Regions can be created with the pencil tool in the Arrange window, where their length and position can also be changed.

These empty Regions are displayed in the Score window as empty staves. Rests are automatically displayed (unless the automatic rest display is deactivated in the assigned Score Style).

Input

Prior to any mouse input, you first need to select an object in the Part box, and drag it to the desired position in the main working area. As a positioning aid, you will see a Help Tag while you're "holding" the object with the mouse. Drag the mouse until the desired position is shown in the Help Tag, and release the mouse button. The Help Tag is especially important for positioning when working at smaller zoom levels.

When working in full score view, and inserting objects between the staves (such as dynamic symbols), you should make sure that these symbols have been inserted into the desired MIDI Region/staff. Immediately after inserting an object, the target MIDI Region will be selected, and displayed with blue stave lines. You can also see its name in the top line of the Display Parameter box.

It's generally better to change to single staff display (double-click on the staff) when inserting objects that are positioned between staves (especially lyrics). Although it doesn't matter which MIDI Region an object belongs to in full score mode (as they stay where they are placed), such objects can be displayed with the wrong instrument, when single instrument parts are later displayed and printed.

All Part box objects and features are described in detail in the Part box section (see "The Part Box" on page 348).

In the Event List, notes and sustain pedal markings are listed as MIDI events, and most other symbols and text objects as Meta events. Global symbols, global text elements, time, and key signature changes are not listed in the Event List. Symbols attached to notes (accents, note heads, and so on), are not listed as events in the Event List, but are saved with their "parent" notes (the notes they belong to/are associated with).

MIDI Channel and Velocity of Inserted Objects

The MIDI channel and velocity of objects inserted with the mouse are determined by the *Insert Defaults* settings in the Event Parameter box. These are visible (and can be edited), when no object is selected. Click anywhere in the background of the working area to display the *Insert Defaults* settings.
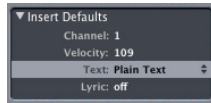
Ensure that "Insert Defaults" is displayed in the top line of the Event Parameter box.

When inserting events into a staff which uses a Polyphonic Score Style (see "Editing Single-Staff Polyphonic Styles" on page 392), only MIDI channels that correspond to those of the voices can be used.

Many symbols, apart from notes (all Meta Events), display a MIDI channel in the Event List. Some of them even have a velocity parameter. These parameters vary in the Event Parameter box: for most objects, the MIDI channel indicates a Staff parameter, which determines the staff (theoretically, up to 16) that the symbol belongs to, in Polyphonic Score Styles. BE CAREFUL: if this parameter is set to a value that exceeds the number of staves in the Score Style, the symbol will disappear.

Insert Quantization

To make positioning of notes and symbols easier, objects can only be inserted at certain bar positions:

- There is an invisible note positioning grid. You can imagine its resolution as if the whole bar—beginning at beat one—were filled with notes of the chosen value. An example: in an empty 4/4 measure, half notes can only be inserted on beats one and three, eighth note triplets only on the first, second, or third eighth note triplet of every beat.
- All binary and dotted values can be inserted at any position of an automatically displayed rest. This means that if there is an eighth note on one, you can insert a quarter or a dotted quarter note at the second eighth's position. (In this situation, *Interpretation* must be turned off in the Display Parameter box, to allow the display of the eighth note rest on the "and" of beat one). The *Syncopation* setting determines how the inserted note is displayed, in this example.
- Symbols (except those directly attached to notes) can be inserted at any position that corresponds to the grid defined by the *Qua* parameter. For hybrid quantizations (such as 8,12), the insert quantization is determined by the binary value (1/8 in this example).

You can move any note, and most symbols, to any desired position, by editing its numeric bar position in the Event List, or the Event Float Window (see "Event Float Window" on page 310). As an example, if you want to insert a half note on "two" in 4/4 time, place it on "one" or "three", and change the position to "two" in the Event Float.

Simultaneous Input of Objects Into Several Regions

If you hold down Shift while inserting an object from the Part box, the object is inserted at the same position into all currently selected Regions. The help tag will display *Insert Multi* during this process. This technique allows you to insert notes, symbols, and even text elements into several Regions at once. (Text elements will not appear until you have finished the text input procedure).

You may make the multiple MIDI Region selection in either the Arrange or the Score window. Shift-click all desired Regions/staves, or use the rubber band selection method. You don't need to select events in the Score window—just drag the cursor vertically across the staves that you want to select.
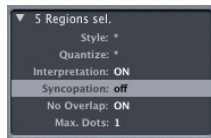
Following selection, the top line of the Display Parameter box will indicate the number of staves (Regions) that have been chosen.

Key changes, signature changes, and global signs are automatically inserted into all staves of a song, and cannot be inserted into individual, selected staves.

Exact Graphic Position of Symbols

When inserting a symbol that isn't automatically attached to a note, you should pay attention to the following details:

All symbols are inserted at the bar position indicated in the Help Tag, when you release the mouse button. This position corresponds to the symbol's Event List line. Apart from the bar position, further parameters that affect the graphic offset (from the inserted bar position) are available.
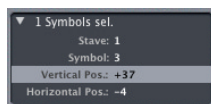
These are shown, and can be edited, in the Event Parameter box *(vert. pos, hor. pos)*. The measurement unit of these two parameters is one sixteenth of the distance between two lines in a staff. These distances are scaled accordingly when the *Size* of the staff (defined in the selected Score Style) is changed.

Make sure that the bar position really is identical to the graphic display position when inserting symbols. As an example: If you work with small *Spacing* parameters (in *Layout > Global Format*), a "Forte" symbol placed under a note on one may be interpreted as being on two, with a negative *hor. pos* value because you placed it a little bit too far to the right. This won't make any difference as long as you stay on that particular display level.

If you switch to a different display level (to extract the parts of single instruments), this can result in an undesired display, as these graphic position values represent an absolute distance (defined by the vertical staff size). If you later change the Score Style, the line breaks or some other layout parameter, a different number of bars may be displayed in one line. Given that the horizontal offset (*hor.pos*) is calculated as an absolute distance from the new (relative) graphic display of the bar position, the Forte symbol may then be displayed at a position closer to the second beat than to the first.

The following key commands move any score symbol that can be positioned independently of notes or staves. They also apply to text events and chord symbols:
• *Nudge Position Up*
• *Nudge Position Down*
• *Nudge Position Left*
• *Nudge Position Right*

These functions alter the *hor.pos.* and *vert.pos.* parameters by ±1, rather than the bar position of the affected symbols and text events.

Hyper Draw in the Score Edit Window
If you activate *View > Hyper Draw*, you can insert and edit MIDI events which aren't normally displayed in the Score window (volume, pitchbend, and so on). The type and channel of the MIDI data displayed in the Hyper Draw area can be selected and changed from the *View* menu.
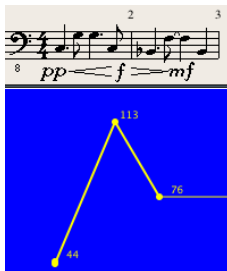
Hyper Draw (see "Hyper Draw" on page 233) in the Score window operates in the same way as in the Arrange window.

Hyper Draw can only be activated in Linear view, and when a single MIDI Region is displayed. If you switch to another mode (Page Edit view, or full score), the Hyper Draw area disappears. The view settings are stored, however, so when you return to single MIDI Region and Linear view, the previous Hyper Draw setting is recalled.

The Hyper Draw display is horizontally scaled, in relation to the score display above it. Its height can be changed, by dragging the horizontal borderline with the mouse. A corresponding value scale is displayed in the instrument name column if *View > Instrument Names* is activated. As in the Arrange window, you may select and/or change the event type and MIDI channel displayed in the Hyper Draw area, via the *View > Hyper Draw* menu option.

Hint: Set Hyper Draw to Note Velocity to graphically display and edit velocities.

The Part Box

The objects available in the Part box (notes, symbols, text objects) are organized in groups. The top section contains small squares, with each representing a group. All groups (with all available symbols) are shown in a panel below. The arrangement of groups can change. If you click on one of the squares in the top section, the corresponding group moves to the top of the panel below, for easy access to its symbols.

Any symbol can be selected and inserted, directly from the group panel, at any time. The function described above makes it easier to work with the Part box, especially on smaller screens, or when using small Score windows.

Selecting and Inserting Part Box Objects

There are various ways to select and insert objects:

- Selecting an object with the mouse from one of the object groups, and dragging it to the desired position in the Score display. If a particular object group isn't visible, click on its symbol in the top section of the Part box. This places the selected object group at the top of the group panel.

Note: To select an object, you can also click-hold on one of the squares that represent the Part box groups: a pull-down menu containing all of that group's symbols will appear.

▪ Direct Insertion of a selected symbol: if the desired symbol is already selected (indicated by its inverted display in the Part box), click the desired position in the staff with the pencil tool. If you click-hold the mouse button, you will be holding the previously selected symbol. Drag it to the destination position, while keeping an eye on the Help Tag for positioning information.

Using Floating Palettes
A double-click on one of the squares in the top section of the Part box opens a small floating window, containing all objects of the corresponding group. This palette can be moved to any onscreen position. Objects can be dragged directly from these palettes into any position in the Score.

Note: Unlike the regular Part box, the object selection is not visible in the palettes.

The palettes can have different shapes, depending on the modifier pressed while opening a floating palette with a double-click:
• Normal (Control)
• Vertical (Option)
• Horizontal (Command)

If you don't wish to use a modifier key when you open a palette, the shape can be predefined in the *Score Preferences > Open Floating Palettes* pull-down menu.

As many palettes as required can be simultaneously opened, and positioned around the screen.

Object Selection by Key Commands
The following (user definable) key commands (see "Key Commands" on page 36) selects the corresponding note values in the Part box. These can then be quickly inserted with the pencil tool:
• *Part box 1/1 Note*
• *Part box 1/2 Note*
• *Part box 1/4 Note*

- *Part box 1/8 Note*
- *Part box 1/16 Note*
- *Part box 1/32 Note*

If you execute any of these twice in succession, the corresponding triplet value is selected, three times selects the dotted value, and four times returns to the original value.

Further key commands can also change the selection inside the Part box:

- *Next Part box Symbol*
- *Previous Part box Symbol*

Next moves the selection (similar to a text cursor) to the right, *Previous* to the left. After reaching a group's last object, the selection cycles back to the beginning of the group.

- *Next Part box Group*
- *Previous Part box Group*

Next moves the selection to the object group below the current (selected) one. *Previous* moves one group up, as determined by the current order of the groups. When changing between groups, the most recently selected object within each group is retained.

Display Size of Inserted Objects
The size of inserted objects (except text and chord symbols) always corresponds to the size of the staff they are inserted into, and changes if the staff is resized via the Score Style (see "Basics" on page 380).

Most objects can be made larger or smaller after insertion with the Sizing tool (as can text elements, except chord symbols). Just grab the object with the tool and move the mouse up or down. Changes are immediately visible.

Notes

The square that represents notes, in the top section of the Part box, is divided into three parts. This is because note values are organized into three sub-groups. Each can be brought to the top of the group panel by clicking on the corresponding symbol within the note square (note, dot, or 3).

Inserting any of these symbols creates a MIDI note event, of the exact note length value. For display purposes, however, all of these MIDI notes are interpreted by Logic as if they were recorded in real time. Therefore, the Display Parameter box settings need to be set in a way that allows inserted notes to be displayed correctly.

If you only want to enter notes with the mouse, without using real time recording at all, switch off Interpretation (see "Interpretation" on page 378) and No Overlap (see "No Overlap" on page 379) in the Display Parameter box, and choose a very high *Qua* value (128, 384). Syncopation (see "Syncopation" on page 379) can be set according to style, and personal preference.

Allowing Diatonic Input Only

Select *Options > Diatonic Insert* to limit input to notes that are diatonically correct for the current key. Notes can be altered chromatically, once they have been inserted.

Note: If you protect (lock) your screensets (see "Screensets" on page 30), this function's setting will also be "locked".

Ties

Notes which are displayed as several graphical notes, connected with ties, only represent one MIDI note. To create such notes, you first insert a shorter note value, then change its length in the Event Parameter box (see "Other Options" on page 338), the Event List (see "Using the Event List" on page 297), or the Event Float (see "Event Float Window" on page 310) window.

Ties cannot be inserted directly into Logic, but are created and displayed automatically, according to the length of the MIDI note. The up/down direction of each tie can be set with *Attributes > Ties*.

Changing the Way Notes With Ties Are Displayed

If you don't like the way particular tied notes are displayed, you can change the display by inserting a user rest at the position you want to see a graphic note. The rest's length is not important, but you should preferably use a shorter one (an eighth note rest). Watch the Help Tag, for exact positioning. As soon as the rest is inserted, it will no longer be visible in the score display, but the note display will change accordingly. If you want to change the position of a rest, or delete it, you may do so in the Event List.

N-Tuplets

The symbol for N-tuplets is found in the triplet group.

Depending on the selected display quantization, and the particular situation, Logic usually recognizes and notates regular triplets correctly. This requires a corresponding Qua (see "Qua—Display Quantization" on page 377) value in the Display Parameter box). You need to use the N-tuplet object for the display of other N-tuplets.

Definition of Previously Recorded Notes As N-Tuplets

For notes that already exist (as part of a MIDI recording), but are not displayed correctly, the N-tuplet symbol needs to be dragged on top of the first note. This note must be indicated in the Help Tag, before you release the mouse button. A dialog box will open, allowing you to define the N-tuplet's attributes:
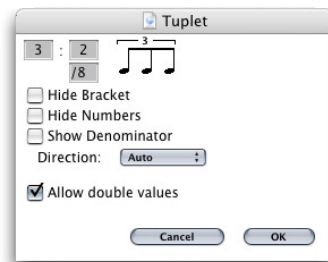
In the score, the above would correspond to:

The dialog box is best explained with the example above: five tuplet eighth notes should be displayed, in place of four regular eighth notes. The following options are also available:

Hide Bracket: the bracket is not displayed.

Hide Numbers: the N-tuplet's number will not be printed. It will be displayed in parentheses onscreen. This is necessary for further edits to the N-tuplet.

Show Denominator: the N-tuplet display also contains the denominator (the second number in the dialog box). This would be 5:4 in the example above.

Direction: the direction of bracket and number. *Auto* refers to the setting in the Score Style being used.

Allow Double Values: if this option is activated (which is the default setting), N-tuplets can contain note values that are twice as long as the "regular" tuplet value.

N-Tuplet Input With the Mouse

If you want to insert a tuplet, including all of its notes, with the mouse, insert the first note at the desired position, then drag the N-tuplet symbol on top of it. Define the required settings in the dialog box that automatically opens.

The display will initially display a series of rests, the number of which corresponds to the N-tuplet value. You can insert other notes at these rest positions. Select a note value which approximately matches the length of the desired N-tuplet notes. In this example, this would be dotted sixteenth notes.

If you want to hear these notes played back with legato phrasing, and the notes are still too long or too short, you will need to change their (MIDI) lengths. The fastest way to do this is to select all notes, and then use *Functions > Note Events > Note Force Legato (Selected/Any)*, or the corresponding key command.

The method described above also allows you to create N-tuplets which contain rests or syncopated note values (double length).

If you want an N-tuplet to begin with a rest, you first need to insert a user rest from the Part box, then drag the N-tuplet symbol on top of the rest. Automatically displayed rests cannot function as starting points for N-tuplets.

Changing or Deleting Existing Tuplets

A double-click on the N-tuplet number opens its configuration box, allowing you to make changes, or use the *Delete* button to erase the tuplet. N-tuplets also can be deleted by clicking on the tuplet number with the eraser tool.

Fast Input of Several Identical N-Tuplets

If you hold down Option as you insert the N-tuplet symbol, the most-recently inserted N-tuplet's settings will be used, without the dialog.

Editing Automatically Displayed Triplets

Triplets are usually displayed automatically (depending on the *Qua* parameter in the Display Parameter box). If you want to change the way triplets are displayed, you can simply double-click the "3", which opens the N-tuplet dialog box (allowing you to change the settings), and converts the automatic triplet to an N-tuplet. This also useful for hiding the numbers and brackets of "normal" triplets.

"Artificial" N-Tuplets to Bypass Display Quantization

You can bypass the display quantization value (Qua) by using hidden, "artificial" N-tuplets. As an example, if there is a single 32nd note run in a MIDI Region that otherwise only contains eighth notes or longer values, you can set *Qua* to 1/8, and drag the N-tuplet symbol onto the first note of the 32nd figure. In the resulting dialog box, use the 8:8/32 setting, with *Hide Brackets* and *Hide Numbers checked*. The number (8) will be visible on screen, but not in the printout.

Although this is not the way that tuplets are normally used, it can be a handy tool for forcing the display of runs of shorter notes in a MIDI Region (1/32nd notes in this case), with a display quantize value set for longer note values (1/8 notes, in this example).

Grace Notes, Independent Notes

Independent Notes are notes that aren't included in the automatic rhythmic and graphic display calculation of a measure, but are still played back via MIDI at their insert position. There are two types:

- *Independent*: these are displayed at their original length, as long as they are binary or dotted note values which can be displayed as a single (not tied) note. After insertion, you can change the stem direction, enharmonic interpretation, accidental distance, and note head, using the Note Attributes (see "Note Attributes" on page 398) functions.
- *Independent Grace*: these are always displayed as miniature eighth notes, with a slash across the stem, and a tie. The tie direction, stem direction, enharmonic interpretation, accidental distance, and note head can be changed.

Both types of Independent Notes can only appear as single notes, without beams to other notes.

Creating Independent Notes:

- Existing regular notes can be converted to Independent Notes via *Attributes > Independent > Independent or Independent Grace,* or corresponding key commands. *Attributes > Independent > Not Independent* converts notes back into regular notes.

- If you want to insert an *Independent Note* directly, Option-select a note with the mouse from the Part box, and drag it to the desired position. *Independent Grace Notes* cannot be inserted directly. They need to be created by converting regular or Independent notes.

In most situations, you will need to create additional graphic distance between the Grace Note and the note it is associated with. The best way is by using the Layout tool (see "Editing With Tools" on page 371) to move the main note away from the grace note.

Hint: if you want to create beamed grace notes, try using a polyphonic Score Style (see "Editing Single-Staff Polyphonic Styles" on page 392) with no rests displayed for the second voice. Assign the desired grace notes to the second voice, and resize them with the Sizing tool.

Sustain Pedal Symbols

These two symbols are the only score symbols—excepting the notes themselves—that directly represent MIDI events (MIDI controller #64, sustain pedal on and off), and thus affect MIDI playback. Logic intelligently inserts the On or Off version of the symbol, depending on the status of the type that preceded it (a Sustain Off always follows a Sustain On and vice versa).

Clefs

The clefs in the Part box are generally intended for clef changes in the middle of a part, for a short section of the music. An example would be cello or bassoon parts, when the part changes to a higher register. Inserted clefs change the score display, starting at the precise insert position (which can even be in the middle of a bar).

You shouldn't use the Part box clefs to change the clef of a whole MIDI Region. In this situation, choose an appropriate Score Style (see "Basics" on page 380) for the Region.

When you insert a "C-clef", please watch the Help Tag carefully, as this clef can be positioned at five different heights, depending on the register (alto, tenor clef, and so on).

If you want to change an existing clef, double-click on it. This opens the following selection box. (The same applies to the "basic" clef of a MIDI Region, but changing this clef affects the Score Style itself, as well as all Regions that use the same Score Style).
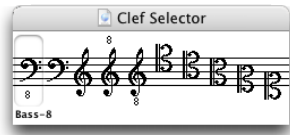
The *Smaller Clef Changes* in *Layout > Clefs & Signatures* option also affects clef changes. All clefs, except the first one in every staff, will be reduced in size, depending on the value set here. This will happen, whether the clef changes are the result of a different Score Style in the same staff, or clefs have been inserted from the Part box.

Octave Settings

The four symbols on the right hand side do exactly what you expect them to: they mark a section to be played either one or two octaves higher (or lower). The length of the section can be edited after insertion, by grabbing the end of the line and moving it horizontally.

Dynamic Symbols
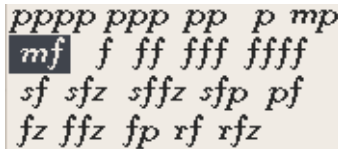
These symbols can be inserted at any position in the score. They are graphic symbols only, and have no effect on the playback of Regions they are placed in.

Note Heads

If you drag one of these symbols onto a note (watch the Help Tag: the destination note must be indicated), the note head changes to that of the selected symbol. If multiple notes are selected, dragging the note head onto any one of the notes will attach it to all notes in the selection. Altered note heads do not affect MIDI playback.

If you want to return an altered note head to a standard display, use the same method, with the black, round note head selected.

Invisible Note Heads

Use of the gray note head will make a note's head and associated ties invisible. This note is displayed with a gray notehead onscreen, allowing further edits. Nothing but the stem will be visible in the printout.

If you combine this feature with *Attributes > Stem > Hide*, you can completely hide notes in the printout.

Symbols Attached to Notes

(Fermatas, accents, phrasing symbols, mute, and bow markings, and so on)

This group contains symbols which usually only refer to one note at a time (Trills, however, are in a separate group). These symbols are positioned automatically, as soon as they are assigned to a note. You do this by dragging the symbol onto the note head (watch the Help Tag to ensure accurate placement). These symbols always move with their parent notes, whether they are transposed or otherwise graphically altered.

MIDI Meaning

The symbols in this Part box group can affect the MIDI playback of notes they are assigned to. The effect can be on velocity and playback length. If you want these symbols to affect playback, you need to define the effect of each symbol, separately, in the MIDI Meaning dialog. This can be opened via *Layout > MIDI Meaning* (see "MIDI Meaning" on page 422).

Quick Assignment With Key Commands

Some symbols feature user-definable key commands (see "Key Commands" on page 36), which automatically assign the corresponding symbol to all currently selected notes:

Hint: working with these key commands can be even faster when you also use the *Select Next Event/Select Previous Event*, and *Toggle next/previous Object (Event)* key commands. The two latter commands include the following or previous event in the current selection, or reverse that inclusion.

Inserting Independent Symbols

If you want to insert a symbol that remains independent of any note, you can do so by holding Option during insertion. This allows you to place a fermata above an automatically created rest, for example.

Jazz Symbols

Jazz Symbol input is similar to the input of accents and so on: if you drag a Jazz Symbol onto a note head, it will be assigned to the note, and positioned accordingly. Additional space will be created automatically, to avoid overlaps with other notes or symbols. These symbols always move with their parent notes, whether they are transposed or otherwise graphically altered.

Jazz Symbols can also be inserted with the *Attach Symbol: Jazz 1–6* key commands. The numbers 1 to 6 indicate the positions of the symbols in the Part box. Black dots are used to indicate the position of each symbol, in relation to the note head (compare the two illustrations above).

Jazz symbols may also be inserted independently from notes—as graphic objects—by inserting them while holding Option. These unattached symbols can be moved freely; and unlike normally inserted Jazz Symbols, do not affect the spacing of notes.

Slurs, Crescendi

Input

Insert these objects at the intended (left) starting point. They can then be edited to their desired shape. After insertion, the object remains selected, and small black square "handles" are visible at its end points (or along its length, in the case of slurs). You can drag these "handles" with the mouse, to change the object's shape.

Fast Slur and Crescendo Input With Key Commands

User definable key commands (see "Key Commands" on page 36) allow the fast input of slurs, crescendo, and decrescendo symbols:

• *Insert Slur Up*
• *Insert Slur Down*
• *Insert Crescendo*
• *Insert Decrescendo*

These commands place the corresponding object below or above (*Slur Up*) the currently selected note(s). The start point is determined by the first selected note, and the length of the object by the most recently selected note. The shape and vertical position of each object is determined by the settings of the last edited object of the same type.

Altering the Shape

To edit the shape of these symbols, grab and drag the black square handles—even if they're not visible. To make them visible, select the object by clicking on one of its ends, or by rubber band selection.

Changing the Position

All but the last six objects can be moved by simply click-dragging the mouse from the object's left hand starting point. The last six objects in the group are moved by click-dragging each of their corners (handles) separately.

Change of Length

All of these symbols can be as long as desired, and can be displayed across line and page breaks, in several parts.

- As an example; if you want to extend a slur to a position which is not visible in the Score window (in Linear view), you can grab its right end, and pull the cursor to the right border of the Score window: the score will automatically scroll. As soon as the desired end position for the slur appears in the window, move the mouse a little to the left, to stop the scrolling. Now position the end of the slur. It is important that you do not release the mouse button during the entire process.
- In Page Edit view, you can simply drag the right end to its destination in one of the lower staves. The slur will be displayed in several sections. The same principle applies to the other symbols in this group.
- The length of these objects can also be changed in the Event List or Event Float, by changing the numerical length parameter. The end point is moved horizontally by this procedure. Slanted objects, such as arrows, will be displayed at a correspondingly varied angle.
- The length can exceed the end of the MIDI Region—it's possible to drag the right end of a crescendo to a position in the next MIDI Region on the same track.

Particular Attributes of Certain Symbols

Crescendo: the tip determines the general position. At the upper right end, length and opening angle can be adjusted. At the lower right, length and overall angle can be altered.

Decrescendo: at the upper left end you can alter the bar position, and opening angle. At the lower left end, bar position, and overall angle can be set. At the tip (right end), vertical position and length are adjusted.

Lines and arrows can be moved (in their entirety) by dragging their starting point. At the other end, length and overall angle can be altered. The slanted line symbol denotes a line that can be altered freely. The other two line objects (vertical and horizontal) can only be extended in the corresponding direction.

Slurs: slurs have five editing points (the black square handles are visible when the object is selected) for changing their shape. The last two slur symbols in the slur group are mainly intended for slurs across staves (in piano parts).

Reminder: these are Slurs, not Ties (see "Ties" on page 351). Ties cannot be inserted manually, but are displayed automatically if a MIDI note's length requires it.

These symbols are graphic only, and have no impact on MIDI playback.

Precise Positioning

It's advisable to work at high zoom levels when positioning slurs. You can quickly switch to an extremely zoomed display by holding down Control while rubber band selecting an area of the score. This activates the magnifying glass tool, and the selected area is displayed at maximum zoom level. Do all your positioning and layout work at this zoom level, and return to the regular view by Control-clicking on any free spot.

Key Signatures
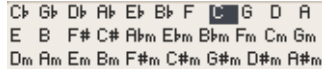
Key signature changes can be inserted at any point in a song, by dragging one of the key symbols from the Part box, as shown above, onto any staff. Watch the Help Tag, to ensure accurate placement. Remember that key signatures and key signature changes are effective globally, for all instruments, on all display levels.

Natural symbols are automatically displayed with a new key signature, when necessary (when changing from A flat major to F major or A major, for example).

Display transposition of the key signature (for notation of non C instrument parts) is achieved by selecting an appropriate Score Style (see "Basics" on page 380). For atonal music, there is the option to deactivate Automatic Key Transposition for transposing Score Styles, in *Layout > Clefs & Signatures* (see "Clefs & Signatures" on page 416). This is effective for the whole song. If it is deactivated, all sharps and flats are displayed directly with their notes. There is a similar option in the Score Style window (*Key*) which allows you to switch off the key signature for a particular Score Style, or even for individual staves in multi-staff Score Styles.

The basic key signature of a piece should, however, be set by double-clicking on the first staff, between the clef and time signature. This opens a dialog box that allows you to set any major or minor key. This window also lets you disable the use of double flats and sharps.

This method applies not only to the first staff, but for all staves. If the piece already contains other key signature changes, however, any newly inserted key signature only changes the key from the insertion point until the next key signature change. As with the starting key signature, inserted key signatures affect all Regions, on all levels.

Deleting a Key Signature Change
This is done by either clicking directly on the key signature change with the eraser tool, or by selecting it and pressing Backspace.

Moving and Copying Key Signature Changes
As key signatures are global symbols, they cannot be moved or copied as easily as other objects.

Further editing of time signatures is possible with the help of the Time/Key Change List Editor (see "Time and Key Signature Editor" on page 127).

It is also possible to copy all time and key signatures from one song to another. This is described in the Copying Time Signatures between Songs section (see "Time Signature and Division" on page 77).

The display of key signatures and key signature changes also depends on the settings in *Layout* > Clefs & Signatures (see "Clefs & Signatures" on page 416), and on the *Key* parameter in the Score Style window (for each Score Style).

Time Signatures
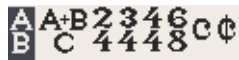
Time signature changes can be inserted at the beginning of any bar, either by inserting signatures from the Part box, or by changing the time signature setting in the Transport window. In the latter case, the signature change will be inserted at the beginning of the measure containing the current song position.

Time signatures and time signature changes are effective globally for all instruments, on all display levels. It is not possible to insert different time signatures for different instruments, or tracks. Time signature changes only affect the display, not playback. The tempo indicator in the Transport window always relates to quarter notes, even if eighth notes are chosen as the denominator for the time signature. You can find more information about this in the Time Signature and Division section (see "Time Signature and Division" on page 77).

Compound Time Signatures
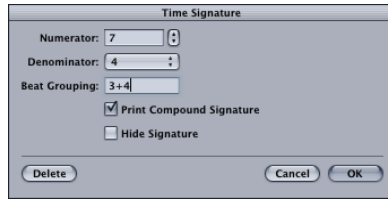
Apart from 2/4, 3/4, 4/4, 6/8 and the alternative display options for 4/4 and 2/2, there are also Part box objects for freely definable time signatures (A/B), and compound time signatures (A+B/C). When you insert one of these, a dialog box opens:
- The *Nominator* can be anything between 1 and 32, the *Denominator* can be 1, 2, 4, 8, 16, or 32.
- The *Beat Grouping* entry field will open when you select A+B/C, allowing you to determine the grouping of beats in compound time signatures. It is sufficient to just enter the numbers—223, for example. As soon as the entry field is closed, this becomes "2+2+3" automatically. The total number of beats in the bar is calculated automatically by the sum in this field.
- *Print Compound Signature* actually displays the defined grouping as the nominator. If this is not activated, only the total sum will be displayed as the nominator. Beat Grouping, however, affects the way the notes are beamed together—in both cases.

You can also change the automatic beaming in "normal" time signatures. In 4/4-time "1+1+1+1" produces four beamed groups (one for every beat), instead of the two groups displayed as a default.

Invisible Time Signatures
Hide Signature hides the corresponding time signature change in the printout. The signature will still be displayed onscreen, but it will be "crossed out", and won't be included in the calculation of the spacing between notes and symbols. As a result, signatures may overlap notes on the screen, but not in the printout.

This function can be used for notating cadenza-like passages, that contain more notes than would normally fit the time signature.

Editing Time Signatures
All time signatures can be edited by double-clicking on them. The dialog box mentioned above opens, allowing you to insert the desired changes. There is also a Delete option that erases the corresponding time signature change. Alternately, you can use the eraser tool, or select them, and press Backspace.

Further editing of time signatures is possible in the Time/Key Change List Editor (see "Time and Key Signature Editor" on page 127).

The display of time signatures and time signature changes is also dependent on the *Layout > Clefs & Signatures* settings *(see "Clefs & Signatures" on page 416)*.

All time and key signatures of a song can be copied into another song (see "Time Signature and Division" on page 77).

Repeat Signs and Bar Lines

These objects can be inserted at any "visible" bar position (at the position of any graphically displayed note or rest). Usually, however, these objects are used at the beginning or end of bars. In this situation, they replace the regular bar line (except first and second ending symbols). They are global symbols, and are always displayed in all staves, on all display levels.

Moving, Deleting
Repeat signs and bar lines cannot be moved with the mouse. You need to use the eraser tool to delete them. These symbols can be moved, along with time and key signatures to a certain extent, in the Arrange window (see the two preceding sections).

The "double repeat sign" is automatically displayed as two "back to back" repeat signs, if it is positioned at a line break.

Invisible Bar Lines
The dotted bar line is invisible in the printout. In conjunction with hidden time signature changes, this enables you to create bars and musical passages which don't seem to have a fixed meter. Another use for the invisible bar line is to force a graphic split of a note into two notes connected with ties—in all staves of a score simultaneously—if it is inserted in the middle of a bar.

To hide all automatically displayed barlines, use the *Hide All Barlines* in *Layout > Clefs & Signatures* option. Note that manually inserted barlines, double barlines, and so on will still be displayed and printed.

1st and 2nd Endings

Following the insertion of one of the repeat endings, text entry mode is automatically activated. The default text is "1." and "2." If suitable, confirm with Return. If unsuitable, you can freely enter any text into these brackets. The bracket which defaults to "2." is open—without a vertical end line, like the "1." ending. As the text can be changed, you also can create a 2nd ending with a vertical line, for example. The font, text size and style of these numbers or text elements is set in the Text Style window (see "Text Styles" on page 425) (Text Style *Repeat Endings*). To edit the text, double-click directly on it, which activates text entry mode, indicated by a flashing text cursor.

A 1st or 2nd ending can be moved by dragging its upper left corner. The length can be changed by dragging the right end. If a repeat ending is selected, it can be deleted with Backspace.

Between the staves in scores, or multi-staff Score Styles—repeat signs and the various special bar lines are connected across the staves in accordance with the Instrument Set and/or Score Style window settings. First and second endings are only displayed on staves with bar lines that aren't connected to the staff above.

The *Alternate Repeat Symbols* (for the whole song) option in *Layout > Global Settings* activates a "Real Book" style display of repeat signs.

Note: These symbols have no impact on MIDI playback.

Trills, Tremolo, and so on

The symbols in this group can be positioned anywhere, and are not attached to notes. The trill line and arpeggio lines can be set to any length, by dragging their end points. The trill line can also span line breaks. The accidental symbols in this Part box group are purely graphic, and do not affect the MIDI playback of notes. They are mainly intended as a supplement to trill symbols.

Rests, Bar Repeat Signs
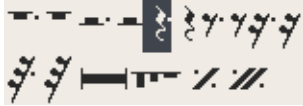
Automatic Rest Display

Rests are displayed automatically in Logic. This is done in a way whereby existing notes and automatic rests always add up to complete bars, that match the given time signature. The only exception to this is when a Score Style with a deactivated rest display (*hide Rest*) or with Beat Slashes (instead of rests) is used.

Manually Inserted Rests

In certain situations, you might want to insert rests manually. These replace automatic rests, but unlike automatic rests, are listed as events in the Event List. These events have a MIDI channel and a velocity value.

The velocity value determines their vertical position in the staff (normal middle position is 64).

Manually inserted rests, unlike automatic rests, can be moved higher or lower. Their size can also be changed with the Sizing tool.

You can use manually inserted rests (also called "User Rests") if you don't like the way a particular "automatic" rest is displayed. As examples; to avoid dotted rests, or for the syncopated display of rests, despite a Syncopation off (see "Syncopation" on page 379) setting. In rhythmic display terms, user rests behave like notes, with Syncopation On and Interpretation off (see "Interpretation" on page 378) settings. User rests are interpreted in accordance with the display quantize setting (see "Qua—Display Quantization" on page 377), just as notes are.

Multi Bar Rests

Rests with a duration of several bars can be indicated by these two symbols. These are most suitable for single instrument parts. In the full score, they are only visible when all staves contain multi bar rests at the same position.

"Church rests" (the older form of display) default to a length value of 2 bars. The default length of "normal" multi bar rests is *Auto* (a value of 0 in the Event List). This means that the rest's duration is calculated automatically, according to the position of the next note, user rest, or global symbol (repeat signs, double bar lines and so on).

Changes can be made in the dialog box, which opens when you double-click on the symbol: you can select the shape (modern or church), activate or deactivate the automatic length function, and determine the length, if *Auto length* is switched off.

Note: Church rests cannot be longer than nine bars. If this length is exceeded, the modern symbol is used automatically.

Moving Multi Bar Rests
These rests cannot be moved with the mouse. You can, however, change their bar position in the Event List or Event Float window. You can also alter the length of the rest (*VAL*) in this manner.

Bar Repeat Signs
The symbols for one or two bar repeats replace all notes and rests in the corresponding measures. All other symbols remain visible. This does not affect MIDI playback, so hidden notes can still be heard. These signs can only be moved in the Event List or Event Float window.

Text Objects, Chord Symbols

You will find descriptions of the extensive range of text objects and chord symbols in the Text: Input and Display (see "Text Input" on page 427) and Chord Symbols (see "Inserting Chord Symbols" on page 432) sections.

D.S., D.C., Segno, Coda Signs

These symbols can be inserted at any position in the score. They are graphic symbols, and do not affect MIDI playback. Their size can be changed with the Sizing tool.

Tempo and Swing Symbols

These symbols can be inserted at any position. The font, size, and style of the tempo indicator itself is determined in the Text Style (see "Text Styles" on page 425) window (Text Style *Tempo Symbols*). The tempo indicator is derived automatically from the playback tempo at the corresponding bar position. Note that the tempo indicators in the Transport window (see "The Transport Window" on page 73) and the Tempo List (see "Tempo List Editor" on page 448) always refer to quarter notes, even if a time signature with another denominator is used. As such, the displayed tempo differs, depending on the symbol being used.

Move, Copy, and Paste

Moving or copying of complete Regions (or major parts of a MIDI Region) should generally be done in the Arrange window.

Despite this advice, most of the following Score window functions work similarly to Logic's other editors. It is not possible to copy, or move the following symbols:

• Global symbols, such as repeat signs, time, and key signature changes—except in the Arrange window (see "Key Signatures" on page 361)—and global text elements (headers and so on)
• Symbols directly attached to notes, such as accents, fermatas, note heads, and so on

Moving/Copying With the Mouse

You can move/copy by dragging the selected objects (hold Option to copy). This allows you to move or copy any number of notes and symbols to other bar positions and/or pitches. If you want to restrict the movement to one direction (vertical or horizontal), hold down Shift during this process. There is also a general preference for this: *Preferences > Global > Limit Dragging to one direction in Matrix and Score.*

It is important to watch the Help Tag during this process. It shows the status (Drag or Copy), the current difference from the original position (Transpose and Time Shift), and the current cursor position (bar position and—for notes—pitch).

Positioning Grid

Movement along the time axis occurs along a quantization grid that corresponds to the MIDI Region's display quantization (*Qua*) setting. If a hybrid quantize value is selected (16,24 for example), the grid corresponds to the binary value (16, in this example). If note positions are not aligned with this time grid (because they were recorded in real time), their relative offset is retained when they are moved or copied. This allows you to move or copy unquantized passages within the Score Editor, without losing the original feel of the performance.

Please note: copying and moving notes (with the mouse) is only possible within the same MIDI Region.

Moving and Copying Several Objects at Once

To move or copy (hold Option) several objects at once (notes and symbols), just select all desired objects and drag one of them (preferably the first one, or one positioned at the exact start point of a measure) to its destination position. Again, watch the Help Tag for exact positioning information. All selected objects will be moved or copied, while retaining their positional relationship to the first object.

It's also possible to simultaneously move or copy objects which are in different Regions/staves. Each event will be moved/copied to its new position, within its original MIDI Region.

Via the Clipboard

These functions work the same way as in many other software programs, and in other Logic windows.

Paste inserts the Clipboard's contents (a note) into the selected MIDI Region at the current song position, as indicated in the Transport Window (see "The Transport Window" on page 73). You need to set the Song Position Line to the desired destination position before pasting.

When you simultaneously copy and paste several objects, the first object is pasted at the indicated bar position, and the others, in relation to it.

Note: If you copy the contents of a whole bar which starts with a rest on the first beat, the first object is not on one (because automatically displayed rests are not objects), and therefore cannot be copied. In this situation, you need to set the paste position accordingly. (The exception is when an object, such as a dynamic symbol, is at the beginning of the selection, say at beat one, which is also copied).

Paste Multiple

The Clipboard's contents can be pasted into several Regions at once, at the original position. Select all desired Regions, and use either *Edit > Paste Multiple*, or the *Paste Multiple* key command.

The multiple selection of Regions can be done either in the Arrange, or directly in the Score window: Shift-click all desired staves, or "rubber band" the adjacent Regions.

Note: The Display Parameter box (see "The Display Parameter Box" on page 374) title line always indicates the number of Regions that are currently selected.

Automatic Insert Quantization

When you *Paste* (or *Paste Multiple*) objects from the Clipboard, the position of the first inserted event is automatically quantized, in accordance with the current global display format (in the Transport window). As an example, if the current bar position is 4.1.1.37, and the global display format is set to 1/16, the pasted object will be inserted at position 4.1.1.1, whether it's a note or a symbol. When the Clipboard contains more than one object, the other objects' positions are not quantized. Rather, their exact relative positions from the first object are retained.

If you don't want this behavior (because you want to preserve the unquantized timing of the original), you are better served by other copy methods.

Paste at Original Position/Paste Multiple at Original Position

These two commands (Edit menu, or key commands (see "Key Commands" on page 36)) allow you to quickly copy passages from one MIDI Region to another, at the same time position. No insert position is required, and no automatic insert quantization takes place.

This is the ideal method for copying an entire musical phrase, including all symbols, to the staves of other instruments. All destination staves need to be selected for *Paste Multiple* to work.

These commands can be very useful when used in combination with *Select Similar*, while copying all dynamic symbols from one staff into other staves/instruments, for example.

Repeat Objects

This dialog box (see "Copying Regions" on page 109) can be opened from the local *Edit* menu, or with a key command. It is especially useful for copying complete bars (or multiple copies), without setting any bar positions. As an example, in a bar that begins with a rest on one, select all notes and symbols (rubber band selection), open *Repeat Objects*, insert the number of desired copies, set *Adjustment* to *Bar*, and press Enter.

Editing or Deleting Notes and Symbols
Editing With Tools
Velocity Tool

If you grab one or several notes with the Velocity tool, and move the mouse up or down, you change the notes' velocity values.

The value change can be seen in the Help Tag, and can also be heard if the MIDI Out button is activated.

Grabbing a note while holding down Option-Control, activates the Velocity tool, saving you a trip to the Toolbox. Once you release these modifier keys, the cursor returns to its previous shape and function.

Quantize Tool

Used for quantizing and de-quantizing (see "Event and Note Quantization" on page 35) the MIDI playback of selected notes.

Layout Tool

The Layout tool changes the horizontal graphic position of a note, in relation to its bar position.

Pulling the note to the right or left changes the displayed distance from the adjacent notes or rests. The bar position (and playback) are unaltered. This is used to create space for a grace note, or for an arpeggio line, as examples. Symbols, when moved with the Layout tool, retain their bar position, but the hor.pos and vert.pos parameters are changed, as indicated in the Help Tag during the process.

There is a shortcut for this tool: press Control while grabbing the note to activate the Layout tool.

Sizing Tool
The Sizing tool allows you to change the size of any note, and most symbols.

If you want to reset an object to its original size, double-click on it with the Sizing tool. A dialog will ask if you want to reset the size of the object.

Changes in the Event Parameter Box
You can edit the following parameters in the Event Parameter box:

Notes
MIDI channel, pitch, velocity, and note length.

Note: Several key commands are available for pitch, length, and MIDI channel changes of selected notes:

- *Event Transpose +1/–1*: half step up/down
- *Nudge Event length by Format +1/–1*: lengthens/shortens the note by the current global display format value
- *Nudge Event Channel +1/–1*: changes the note's MIDI channel, accordingly

Symbols
Staff:
Staff number: this parameter is only important when you are using a polyphonic Score Style with multiple staves (for Piano). It determines which staff a symbol belongs to. Note: if this value is higher than the number of staves in the Score Style, the symbol disappears!

Symbol
The internal number of a symbol in its Part box Group: once you know these numbers, you can edit the symbol by changing this number, rather than deleting a symbol and inserting a new one. This is especially useful for dynamic symbols: 0 = *ppp*, 1 = *pp*, 2 = *p*, 3 = *mp*, 4 = *mf*, 5 = *f*, 6 = *ff*, 7 = *fff* and so on.

Vert.pos/hor.pos
- *vert.pos* determines the height/vertical position. Zero means a position exactly on the top line of the staff, in most cases. Positive values are above, negative values below it.
- *hor.pos* determines the horizontal graphical offset of the object's bar position. A value of zero corresponds to the left edge of a note, at that particular position.

Additional Parameters for Text Objects
- Text Style (see "Text Styles" on page 425)
- *Size* of the font being used
- *Align*: horizontal alignment

Most parameters in the Event Parameter box can be edited by using the mouse as a fader (hold down the mouse button while moving it up or down). Alternately, you can double-click on a parameter (except Text Styles and alignment), which opens an entry field. Simply insert the desired value as a number, or as a pitch, if dealing with notes (example: "D#4"). You can also insert relative changes, such as +4, into this field, to raise all selected note pitches by 4 half steps, or to increase a numerical value of another parameter by 4.

Changing Several Selected Objects Simultaneously
If several objects are selected, this is indicated in the Event Parameter box' title line by *X Notes/Symbols/Events/Texts/Chords selected*. "X" indicates the number of selected objects. The terms *Notes*, *Texts*, and *Chords* are only used if the current selection is limited to objects of that particular type.

If—as in most cases—parameter fields are visible while multiple events are selected, all corresponding values can be edited simultaneously. "*" as a value means that the selected objects have different values for that particular parameter. There are different options for changing these values:

Relative Change (Preserving Differences)
Grab the "*" with the mouse, and use the mouse as a slider. The value shown during this process belongs to the first of the selected objects. The other objects are altered by the same amount (while retaining their relative values). You can also double-click the value and insert the desired change (a number with a plus or minus in front of it) into the resulting entry field (see above).

Absolute Change (All Values Set Equal)
Press Option during the procedure described above: as soon as you move the mouse, the parameter is set to the same value for all selected objects. This enables you to set all notes of a chord to the same length or velocity, or set all selected objects to the same height (vert.pos).

There are also key commands that set the *vert.pos* and *hor.pos* parameters of all selected objects to the same value:

- *Align Object Positions Vertically*
- *Align Object Positions Horizontally*
- *Align Object Positions* (affects both parameters)

These key commands set all objects to the value of the first selected object.

If only one object is selected when you use one of these key commands, a dialog appears, allowing you to decide if the parameters of all similar objects should be set to the same value. (Note: this affects all displayed Regions and instruments.)

Hint: This is very useful for aligning lyrics and chord symbols.

Deleting Objects in the Score Editor

Here is a short overview of the methods available for object deletion in the Score Editor:

- With the eraser tool (works for all objects)

- With Backspace or *Edit > Clear*, while the corresponding objects are selected (flashing). Exception: repeat signs and special barlines cannot be selected. They can only be deleted with the eraser tool.

You can only delete events that are actually displayed in the Score Editor. As an example, if you erase notes from a real time recording in the Score window, MIDI controller events or pitchbend data that was recorded with these notes will not be deleted.

The Display Parameter Box

The settings in the Display Parameter box (with the exception of Style) form the basis for the rhythmic interpretation and display of notes. These settings can be different for every MIDI Region. The displayed settings always refer to the currently selected MIDI Region(s). These settings only affect the score display, not the MIDI playback of notes.
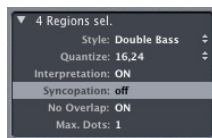
Please keep the following in mind for all settings:

The Display Parameter box settings not only affect the display of notes recorded in real time, but also that of notes inserted with the mouse, or via step input. If you insert a short note, such as a 32nd note, it can only be displayed at its original length if Qua is set to 32 or shorter. If Qua is set to 8, the 32nd note will be displayed as an eighth note (although it will still be played back as a 32nd note). A note inserted with the mouse may also display as a longer value if Interpretation is *on* for that MIDI Region

Settings

Different Settings Within the Same Staff

If you can't seem to find the appropriate display parameters for a particular MIDI Region, remember that you can divide a MIDI Region with the scissors tool (directly in the Score window). This will leave MIDI playback unaltered, but provides the option to assign different display parameters (display quantization) for the resulting shorter Regions. As these divided Regions are still connected to each other, they will be displayed as a continuous staff.

Default Settings for New Sequences

If a new MIDI Region is created with the pencil tool in the Arrange window, or through MIDI recording, Logic always applies the Default parameters (see "MIDI Region Playback Parameters" on page 116) to the MIDI Region. These can be seen and edited in the Display Parameter box, when no MIDI Region is selected (The title line shows *Insert Defaults* to indicate this status). These settings will remain as set, until you quit Logic, but can be changed any time.

Click on any empty spot in the main working area (below or above the score) to display the *Insert Defaults*. Edit any of the parameters as desired. (set *Qua* to the display quantize setting that you will use for most Regions in the song, for example) From this point on, all new Regions will use these settings as soon as they are created. If *Qua* is set to default, the *Qua* setting of newly recorded or created Regions will be dependent on the *Global Format Value* in the Transport window.

The default setting for Score Styles (Style) is not defined here. This is separate for each Track Instrument, and is set in the bottom line of the Arrange window's Instrument Parameter box.

Simultaneously Changing the Settings of Several Sequences

This is possible, if all desired Regions are selected. The top line of the Display Parameter box indicates the number of Regions or objects (if the selection includes folders) currently selected (3 Sequences sel.), instead of the MIDI Region name. If these Regions have differing values for any of the parameters, a "*" will be displayed in the corresponding line. If you change this value, all selected Regions will be set to the same value for that particular parameter.

There are two special functions for the selection of multiple Regions in the Score window:

- Clicking on the title line in the Event Parameter box selects all Regions that are visible in the current display.
- Clicking an instrument name, in the column between the parameters and score, selects all Regions for that particular Track Instrument (even Regions spread across different tracks assigned to the instrument), at the current display level. Remember, the instrument name column is only displayed if *View > Instrument Names* is activated.

Rhythmic Interpretation of Sequences

Traditional music notation is only an approximate description of the musical content in a piece. The actual performance depends heavily on the interpretation of notes by musicians. Quarter notes, for example, are hardly ever held for the exact duration of one beat.

The rhythmic interpretation of MIDI Regions (recorded in real time, to a click) presents a similar problem, especially if one considers that Logic records MIDI events with a resolution of 960 ticks per quarter note. Nobody will play a downbeat at the exact time of the click.

As such, it's important that you have some idea of what your printed music should look like. This will be help you to determine the Display Parameter box settings that will best fit your music. The Display Quantization (see "Qua—Display Quantization" on page 377), Interpretation (see "Interpretation" on page 378), Syncopation (see "Syncopation" on page 379), and No Overlaps (see "No Overlap" on page 379) settings all affect the way that recorded music is displayed.

Name and Style

Title Line: Name of the Sequence

The name displayed here is identical to that of the same MIDI Region in the Arrange window. It can also be edited here. A double-click on the name opens a text entry field. If more than one MIDI Region is selected, this line reads *X Sequences selected* and *Insert Defaults* (the default settings for new Regions), if nothing is selected.

Style

The Score Style (see "Basics" on page 380) used for the score display of the MIDI Region. This is selected from a pull-down menu, which contains all available Score Styles for the current song.

Qua—Display Quantization

This parameter determines the shortest note value that can be displayed in the currently selected MIDI Region (exception: "artificial" N-tuplets, see the "Artificial" N-Tuplets to Bypass Display Quantization section (see "N-Tuplets" on page 352)).

The Qua value is selected from a pull-down menu, which contains all available display quantization options. Among these there are binary quantizations (displayed as one binary value—16 or 128), and hybrid quantizations (two values combined, a binary and a ternary value—16,24 or 32,96).

Binary values always correspond to the note value with the same denominator—32 = thirty-second note, and so on. Ternary values refer to triplets. Here is a list of the ternary values, and their corresponding triplet values:

"Qua" Setting and corresponding Note Length:

3	1/2-note triplets
6	1/4-note triplets
12	1/8-note triplets
24	1/16-note triplets
48	1/32-note triplets
96	1/64-note triplets
192	1/128-note triplets
384	1/256-note triplets

Automatic Display of Triplets

When binary display quantizations are used, automatic triplets are not displayed at all (except for triplets inserted with the mouse, using an N-tuplet object). Therefore, a "hybrid" quantization value must be assigned to the *Qua* parameter, to enable the automatic display of triplets.

Default Setting

The *Qua* parameter cannot be set to it's default in existing Regions, as it could in older versions of Logic. The default option can only be set with the *Insert Defaults*, which determine the default settings for newly recorded or created Regions. If default is chosen, the *Qua* setting of any new MIDI Region will be dependent on the *Global Display Value* in the Transport window. In this situation, the *Qua* value will always be a hybrid value: the global display value currently set in the Transport window plus—in the case of a binary global value—the next highest ternary value, or—in the case of a ternary global value—the binary value which is divisible by that particular ternary value.

A few examples: a global value of 1/8 will result in an 8,12 Qua setting for new Regions, a global value of 1/12 will become Qua = 4,12, a global value of 1/16 will result in Qua = 16,24, 1/24 in 8,24 and so on.

Note, however, if a particular *Qua* value has already been set in the Insert Defaults (shown in the Display Parameter box whenever no MIDI Region is selected), all new Regions will be assigned this value, regardless of the *Global Display Value* in the Transport window. You may, of course, change any of these values at any time.

Swing Notation

For regular swing notation, 8,12 should be used as the display quantize parameter. This enables the display of eighth-note triplets, and also displays two uneven notes on one beat (dotted eighth and sixteenth), as regular eighth notes. For double-time passages containing sixteenth notes, you either need to cut the MIDI Region in the Arrange window, and assign a higher quantize value to the new MIDI Region that contains the double-time figure, or use hidden "artificial" N-tuplets for the sixteenth notes (see the "Artificial" N-Tuplets to Bypass Display Quantization section (see "N-Tuplets" on page 352)).

For swinging sixteenth notes (shuffle funk, hip hop, and so on), the same principle applies. In this case, Qua would be set to 16,24.

Interpretation

If Interpretation is *on*, notes are generally displayed with longer length values than their actual length, in order to avoid short rests. Short notes on a downbeat in 4/4 time, for example, are displayed as quarter notes. The score becomes less precise, but easier to read.

If Interpretation is *off*, note lengths are displayed as close as possible to their "real" values, as determined by the *Qua* value. In the following example, the same MIDI Region is shown twice, the first with Interpretation *off*, the second *on*:
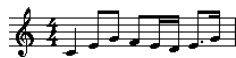
The Interpretation function is intended to produce an easy-to-read score display of real time recordings. You should generally switch it off when using step or mouse input.

Interpretation can actually be switched on and off for every single note, independent from the Display Parameter box setting. This can be done via a menu option, a key command, or by using the Note Attributes (see "Note Attributes" on page 398) box.

Syncopation

If Syncopation is switched *on*, each (MIDI) note will be notated as one graphic note (not displayed as several tied notes), regardless of its position—if this is possible. (This also depends on the *Max. Dots* setting, see below) If this isn't possible, the note is (graphically) divided into the minimum possible number of notes, connected by ties.

This facility is usually used for the display of syncopated notes. The following example shows the same two bars displayed differently, the first with Syncopation off, then on:

Syncopation can also be switched on and off for every single note, independent from the Display Parameter box setting. This can be done with a menu option, key command, or in the Note Attributes box (see "Note Attributes" on page 398).

If an unwanted display of ties and notes results from the Syncopation function, it is possible to change the graphic display of notes connected with ties. Take a User Rest from the Part box (preferably a short one, but the length isn't important), and insert it at the bar position where you want the tie "subdivided". Once the rest is inserted, it will disappear, but the note display will change. The inserted rest can only be seen and edited in the Event List.

This trick works for all notes, not just syncopated ones (see the Changing the Way Notes with Ties Are Displayed section (see "Ties" on page 351)). In polyphonic Score Styles, the MIDI channel of the rest and the corresponding note must be the same.

No Overlap

No Overlap on prevents the overlapped display of notes in melodies that are played with an exaggerated legato. The effect can be seen in the following example, which shows the same MIDI Region, first without, then with Overlap correction:

No Overlap should only be deactivated in rare cases. If, for example, a piano player arpeggiates a chord and holds the notes, the score displays the following result with *No Overlap* on:

Although you can't see that all notes continue to sound here, the result looks like this if *No Overlap* is deactivated:

The solution typically involves switching *No Overlap* on, and using sustain pedal markings. Logic will automatically display pedal markings if notes are recorded in real time with a MIDI keyboard, and sustain pedal.

Max. Dots

This parameter determines the maximum number of dots that Logic will allow for the display of single notes. Unwanted dotted notes or rests can be changed by inserting User Rests (which remain invisible, if notes). See the Changing the Way Notes with Ties Are Displayed section (see "Ties" on page 351).

Score Styles
Basics

The Concept of Score Styles

Score Styles could be compared to text formats in word processing and desktop publishing software. In this case, however, it's score attributes that are stored, not font settings. This makes it very easy to assign multiple attributes; such as clef, staff size, vertical distance between staves, instrument transposition, and so on, to any existing or newly created MIDI Region. A Score Style includes the following parameters:

• Number of staves (for the display of one MIDI Region)

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- For polyphonic, multi-staff Score Styles: configuration of brackets and bar lines that connect the staves.

For every staff:
- Staff size
- Distance to the next (higher and lower) staves
- Number of independent (polyphonic) voices in the staff
- Clef
- Display transposition
- Key signature on/off

For every independent (polyphonic) voice:
- Automatic rest display on/off
- Stem direction of notes
- Tie direction
- Direction of N-tuplet brackets and numbers
- Beaming
- MIDI channel assignment for the voice and/or definition of a split point pitch—for separation of the different voices.
- Note Color

Logic contains a number pre-defined Score Styles.

Score Styles do not affect the rhythmic display, unlike the parameters in the Display Parameter box. Neither do they affect the horizontal distance (spacing) of notes (apart from changes caused by different stave sizes). This is determined in *Layout > Global Format.*

Score Styles are saved with the song file, allowing different Score Styles in different songs. Hint: create some empty template songs with (among other things) the Score Styles, and other score settings, that you would normally use as a basis for your work.

Assigning Score Styles
Each individual MIDI Region can be assigned a different Score Style in the Display Parameter box. This enables you to quickly;
- create parts for transposing instruments.
- display the same MIDI Region at different sizes, for example—for printout of a full score, and individual parts for the different instruments.
- change between different display forms in one staff. This would be done by cutting a MIDI Region, and assigning different Score Styles to the resulting shorter Regions. (This might be used to alternate between passages that are completely written out, and improvised passages using only Beat Slashes and chord symbols, for example).

Predefined Styles

Here is a complete list of Logic's preset Score Styles, and their parameters:

Score Style	Clef Type	Transposition
Bass 1 Stave(s)	Bass Clef	—
Piano 2 Stave(s)	Treble/Bass Clef	—
Treble 1 Stave(s)	Treble Clef	—
Treble +8 1 Stave(s)	Treble (+8) Clef	−1 octave
Treble −8 1 Stave(s)	Treble (−8) Clef	+1 octave
Alto Sax 1 Stave(s)	Treble Clef	Eb (+9)
Guitar Tablature Display		
Guitar Mix Tablature Display and 1 Stave	Treble (−8) Clef	
Baritone Sax 1 Stave(s)	Bass Clef	Eb (+21)
Contrabass 1 Stave(s)	Bass (−8) Clef	+1 octave
Horn in Eb 1 Stave(s)	Treble Clef	Eb (−3)
Horn in F 1 Stave(s)	Treble Clef	F (+7)
Organ 1/1/5 3 Stave(s)	Treble/Bass/Bass Clef	—
Organ 1/3/5 3 Stave(s)	Treble/Bass/Bass Clef	—
Piano 1/3 2 Stave(s)	Treble/Bass Clef	—
Piccolo 1 Stave(s)	Treble Clef	−1 octave
Soprano Sax 1 Stave(s)	Treble Clef	Bb (+2)
Tenor Sax 1 Stave(s)	Treble Clef	Bb (+14)
Trumpet in A 1 Stave(s)	Treble Clef	A (+3)
Trumpet in Bb 1 Stave(s)	Treble Clef	Bb (+2)
Viola 1 Stave(s)	Alto Clef	—
Violoncello 1 Stave(s)	Bass Clef	—
# Drums 1 Stave(s)	Percussion Clef	"mapped"

Working With Score Styles

Assigning Score Styles to Sequences

The default song that appears when you start Logic contains several Score Styles (see "Predefined Styles" on page 382). You can assign a Score Style to a MIDI Region by selecting the MIDI Region, then choosing the desired Score Style from the *Style* parameter pull-down menu in the Display Parameter box.

You can also assign a Score Style to several selected Regions at once—see the section on Changing the Settings of Several Sequences Simultaneously (see "Settings" on page 375).

Score Style assignments can be changed at any time.

Reminder: Regions that directly follow each other (without gaps) on the same Arrange window track, are displayed as one continuous staff in Page Edit view, but can still use different Score Styles.

Automatic Score Style Assignment for New Sequences
When you create a new MIDI Region, either by making a real time recording or with the pencil tool in the Arrange window, the MIDI Region will be assigned the Score Style selected in the bottom line of the Instrument Parameter box of the active track instrument.

When you create template songs, or begin work on a new song, you may wish to change these settings for instruments that are likely to use a specific Score Style. This ensures that these instruments will immediately be displayed with the correct Score Style.

Auto Style
If *Auto Style* is chosen in the bottom line of the Instrument Parameter box, every new MIDI Region will be automatically assigned a Score Style that fits the register of the recorded notes. *Auto Style* can only be chosen in the Instrument Parameter box, and does not appear in the list of Score Styles in the Score window's Display Parameter box.

The Score Style Window
There are several ways to open the Score Style window:
• double-click on the *Style* parameter in the Display Parameter box
• *Layout > Score Styles*
• *Open Score Style Window* key command
• Double-click in the bottom line (*Default Style*) of the Instrument Parameter box in the Arrange or Environment window.

The following elements (also seen in other Logic windows) can be found along the left side of the Score Style window:

Link Button
If the Link button is activated while the Score Style window is open, you will always see the parameters of the currently selected MIDI Region's Score Style. If you switch to a different MIDI Region, the Score Style window will reflect the new selection.

Toolbox
This Toolbox contains the pointer tool (same as the regular mouse cursor), the pencil tool (for creating new staves and Voices) and the eraser tool (for deleting Score Styles, staves, or Voices).

Name Box/Style Selector

The field below the Toolbox shows the name of the currently selected Score Style. Click-hold it to open a pull-down menu that lists all Styles available in the current song. Switch to another Score Style by selecting the desired entry, and releasing the mouse button.

Parameter Groups

The Score Style Parameters are grouped horizontally in three main sections (top line): Staff, Voice, and Assign.

Staff:

The Parameters for staves. Each line below the word Staff represents one staff in the score display.

Voice:

The Parameters for independent Voices. Each line below the word Voice represents one independent voice. The term "Voice" only relates to the simultaneous display of rhythmically independent, polyphonic passages in the music, not the number of notes that can be displayed simultaneously. One Voice can consist of as many simultaneous notes (chords) as desired. Only notes which should be displayed as rhythmically independent from the other notes in the same staff need to be assigned to separate Voices.

Assign:

The parameters for the assignment of notes to the different Voices. For details, see below.

Every Staff can contain several independent Voices (up to 16), but one Voice can not be displayed across different staves. Therefore, a Score Style must contain at least as many Voices as Staves.

List View

The Score Style window features the single Score Style view shown above, and a list view option. The list view is mainly intended for copying Score Styles between songs (see below), or for deleting styles.

Double-click in the empty space below the parameters to switch to the list view. Another double-click on one of the Score Styles in the list switches to the display of that particular Style. Another way to change between single and list views is by clicking on the small button to the left of the menu line.

Handling Score Styles

Copying Score Styles Between Songs

At some point, you'll probably want to use Score Styles that exist in another song. There are two methods for copying Score Styles between songs:

Importing All Score Styles from Another Song

Select *Options > Import Settings* in the Score window. In the resulting dialog box, activate *Score Styles* only, and click on *Import*. This imports all Score Styles from another song into the current one.

If another song file is already open during this procedure, that song's Score Styles will be imported. If no other song is open, a file selector box will appear, allowing you to select the song that contains the desired Score Styles.

Copying Only Particular Score Styles from Other Songs

One or several Score Styles can be selected in the Score Style window's list view, and copied between songs with the usual copy/paste commands (*Edit* menu or key commands). To do this, the Score Style windows of both songs *must* be opened.

Automatic Score Style Copying

If you copy a MIDI Region from one song to another, and the Score Style used by the original MIDI Region doesn't exist in the target song file, it is automatically copied, along with the MIDI Region.

Deleting Score Styles

Score Styles can be deleted in both the single view (*New > Delete Style*), and list view (with Backspace or *Edit > Clear*). In list view, you can also select several Score Styles at once for this purpose. As an example, select *Edit > Select Unused* in list view, and press Backspace to delete all Score Styles that are currently not assigned to any Regions or Track Instruments in the song.

Creating New Score Styles

In single view, you can create new Score Styles by using *New > Single Staff Style* or *New > Dual Stave Style*. The parameters of Styles created this way are very basic, and need to be edited, according to your individual requirements (see below), in most cases.

The default name of Styles created in this fashion is "*New Style". A double-click on the name box opens a text entry field, where any name can be typed in.

Creating New Score Styles Based on Existing Ones

You'll often need a new Score Style that is almost identical to an existing one. In this situation, just make a copy of a Style and edit the copy. Copying can be done:
- in the Score Style window (single view) with *New > Duplicate Style*.
- with the Score Style window's pull-down menu (name box), by selecting the bottom entry ("****DUPLICATE!****") in the list.

- directly in the Score window, by using the *Style* pull-down menu in the Display Parameter box, again selecting "***DUPLICATE!****" at the bottom of the list. This is the fastest method, as the new Score Style is automatically assigned to the currently selected MIDI Region.

Any of these methods will result in a new Style named after the Score Style it is derived from, with "*copied" appended to its name. This text can be edited in the name box of the Score Style window.

If the only difference from the original Style is the staff distance or the Style's clef, creating a variation of the currently assigned Score Style can be done very quickly from inside the Score window: (with the desired MIDI Region selected), select the "****DUPLICATE!****" command in the Score Style pull-down menu. This copies the current Score Style, and assigns the copy to the selected MIDI Region. Now, change the staff distance by dragging the clef with the mouse (as in the illustration), or double-click on the clef to select a different clef from the resulting box.

Editing Single Staff Score Styles

These are the relevant parameters for single Staff Score Styles. The other parameters are only relevant if the Score Style consists of more than one Voice, which does not refer to the display of chords and so on, but to rhythmically independent, polyphonic voices.

Name

The Name of a Score Style can be edited by double-clicking on the name box, which opens an entry field.

Space

These values determine the distance to the next (higher and lower) staves, or the page margins, for the top and bottom staves of a full score.

This also creates additional space (that belongs to the staff) above and below the actual staff. If, for example, symbols are inserted between staves in full score mode, it is important which staff an inserted symbol is assigned to. When parts are extracted from the full score, symbols will follow the staff they were inserted in.

The vertical distance above the staff can also be changed directly in the score, by dragging the staff up or down (at the clef).

The distance below the staff can also be edited in the score, but only for the bottom staff in the score display, or if only one staff is displayed. The bottom line of the score display area is dragged with the mouse, as shown in the illustration.

These editing procedures change the settings of the corresponding Score Style. This means that all Regions which use the same Score Style will be affected, which is not always what you might want. To prevent this, use the fast creation method for new Styles, based on existing ones.

Size

The size of the staff, and the notes and symbols it contains. There are 16 sizes available (0–15). Here are some size recommendations: for regular instrument parts and lead sheets, use size 7 or 8. The staff size you should use in full scores depends on the number of staves in the score, and the size and format of the paper being used. When using A4 or US letter paper: full orchestra: 2, big band: 3, wind quintet: 4.

You should note that the size of all staves in an Instrument Set can also be affected by the Scale parameter (see "Full Score and Part Layout" on page 407) in the Instrument Set window. This makes it possible to use the same sizes for both the whole score and parts of a piece.

Clef

You can select the clef to be used in the Score Style from a pull-down menu. This menu offers some special options, in addition to the usual clefs:

- *Drum.0* to *Drum.8*: staves with 0 to 8 lines and a "neutral" percussion clef. The relationship of MIDI note pitches to the top line of all staves, corresponds to the top line in a regular bass clef (A2). No accidentals will be displayed in these drum staffs. *Drum.0* also omits any ledger lines. These clefs are often used in Mapped Drum Styles (see "Drum Notation With Mapped Score Styles" on page 396), where the height of a note does not correspond to pitch, but is determined by different Drum Map parameters.
- *no clef.0* to *no clef.8*: is like the *Drum.0–8* staves, but without a clef.
- *TAB Guitar…* and *TAB Bass…*: 12 different options for displaying notes as guitar or bass tablature. Tablature Tuning Sets are defined and edited in the Tablature window (*Layout > Guitar Tablature…*).

Trans

The display transposition, measured in half steps up or down. This parameter does not affect MIDI playback. If a staff contains chord symbols, these will also be transposed accordingly. If *Automatic Key Transposition* in *Layout > Clefs & Signatures* is activated (which is the default setting), key signatures will also be transposed (with one exception see next paragraph).

Key

If this parameter is set to Hide, the corresponding staff is displayed without a key signature. Instead, all sharps and flats are indicated directly beside the notes. This parameter will usually be set to Show the key signature. Hide is an option mainly used for transposed french horn parts, which are sometimes written without a key signature.

Note: The abovementioned *Automatic Key Transposition* option has a similar effect on the whole song. At a song level, however, the non-transposed basic key signature is still indicated, and Hide Key suppresses any key signature display.

Rest
The automatic rest display can be switched off (*HIDE*), or set to display *Beat Slashes* instead of rests. This is useful for rhythm section parts, and improvised solos. In this situation, the number of slashes per bar are determined by the nominator in the time signature (4 slashes in 4/4-time, 6 slashes in 6/8-time and so on). Inserted notes and symbols are still displayed, but automatic rests are only shown if shorter than one beat. You can insert User Rests manually, to replace individual Beat Slashes.

Stem
This controls the direction of stems. The default setting is *Auto*. *Up* or *Down* forces all stems, regardless of pitch, in the corresponding direction. *Hide* makes all stems (and beams and flags) invisible.

Tie
The vertical direction of automatically displayed ties. The default setting is *Auto*. *Up* or *Down* forces all ties in the corresponding direction.

Tupl
Controls the direction of N-tuplet brackets and numbers. The default setting is *Auto*. *Up* or *Down* forces all N-tuplet brackets and numbers in the corresponding direction. *Hide* prevents the automatic display of triplet brackets and numbers. In this situation, the numbers are still displayed in brackets on the screen, to allow edits to these triplets. These bracketed numbers will not appear, however, on the printout.

If you set this parameter to *Hide*, you can still make particular triplets visible: double-click on the bracketed number (3) to open a tuplet dialog box. If you close this box with OK, you will convert the automatically displayed triplet into a "forced" triplet, which will be displayed in accordance with the parameters set in the dialog box.

Beam
Controls the appearance of beams. The default *Slant* setting allows slanted beams. *Horiz* only allows horizontal beams. *Vocal* prevents the display of beams, as is typical in "classical" vocal parts, where notes are only displayed with flags.

Color
Sets the color of the voice's notes. The color options are: Black ("---"), Pitch, Velocity, and the 16 colors of the user palette (see "Color" on page 423).

These settings only affect Regions that use an appropriate Score Style. In addition, the active color mode in the Score Edit Window must be set to Normal (Individual), which is the default setting.

Editing Two-Stave Score Styles

(2 staves, with one Voice in each)

The most obvious example of a multi-staff Score Style is a two-staff piano system.

When working with multiple staves and/or Voices in a Score Style, the following parameters also become relevant:

Number of Staves

Each staff is represented by a number in the first column. These numbers are assigned automatically, and cannot be changed. An additional staff can be created in two ways:

- *New > Insert Staff*. The new line is inserted at the insert mark (>) position, which can be determined with a click in the narrow column to the left of the staff numbers.
- Click on the lower left portion of the empty space below the parameters (under the Staff parameters) with the pencil tool.

Brackets and Bar Line Connections

In the second to fifth columns of the Score Style window, you can determine which staves are bracketed (two bracket types available) and/or connected by bar lines (only at the beginning of each staff line, or at every bar line). Simply click-drag in the corresponding column until you see the appropriate display, for any of these connections. If a Score Style consists of more than two staves, the brackets and bar lines can be set to only connect certain parts of the whole system—they can be interrupted in-between staves. If you want to delete any connections, grab the symbol at its end, and drag it up to the beginning, until it disappears.

Bar line connections can also be edited directly in the score. Just click on the upper end of a bar line to connect it to the next (higher) staff. To disconnect bar lines, simply click on the same spot again.

The *Voice* parameters in the middle of the window (Space, Size, Clef, Rest, Stem, and so on) can be set individually for each Voice (identical to the staff, in this case). In a simple two-stave system, however, you'll probably select two different clefs and adjust the staff distances as needed. The Space parameters also refer to the staff distances inside the Score Style itself.

Voice Separation Method

Additional staves are always treated as additional *Voices*. There are two different methods for assigning notes to voices. The appropriate parameters are found to the far right of the Score Style window, below the *Assign* header:

*   A fixed split point (between two lines in the *Split* column). This is a defined pitch, which determines the absolute border between two Voices. Notes above it, or at the same pitch, are assigned to the upper Voice. Notes below it are assigned to the lower Voice. This method is very simple, but has the disadvantage that none of the Voices, even briefly, can ever cross the border. Quite often, in "real life" situations, the border between voices needs to be flexible. A piano piece's right hand part may dip below middle "C", or the left hand may go above. It's not possible to notate this properly using a fixed split point.
*   Voice assignment according to the notes' MIDI channels (*Chan*): for each Voice, a different MIDI channel can be set in the *Chan* column.

Every note is now assigned to a Voice according to its MIDI channel. (The note's MIDI channel can be seen and edited in the Event List, Event Float, or in the Score window's Event Parameter box, when the note is selected). The different MIDI channels have no impact on MIDI playback, as the playback channel is determined by the Instrument Parameter box setting (Arrange window).

Given the use of MIDI channels for voice assignment, notes that aren't assigned to channels will not be displayed at all. This can, however, be used to your advantage, as it allows you to exclude certain notes from the display (improvised parts, trill notes, and so on).

There are two useful functions that can speed up the process of changing the MIDI channel settings of notes, in order to assign them to the desired Voices:

*   In the Score Preferences (*Options > Score Preferences*), there is a parameter called *Auto Split Notes at …* If this is activated, and the default Score Style in the selected Instrument Parameter box is a polyphonic Style, all played notes are automatically assigned MIDI channels that match the Score Style's Voice assignments. Notes at, and above, the split point are assigned the channel of the first Voice. Notes below are assigned the second Voice's channel (this feature only works for two Voices at a time). This creates a usable rough Voice assignment, which can be edited later.
*   For Regions that have already been recorded, use *Functions > Note Events > Split to Channels*, or the *Split to Channels* key command, to assign notes to Voices in the Score Style—according to the Auto Split pitch in the Score Preferences.

In most cases, it will still be necessary to change the Voice assignment (the MIDI channel) for particular notes, or groups of notes. There are several methods for doing this:

*   Editing the MIDI channel in the Event Parameter box or the Event List (also works with multiple selections).

- Changing the MIDI channel using the *Nudge Event Channel +1* and *Nudge Event Channel −1* key commands.
  Hint: these can be especially useful when used in combination with the *Select Next/Previous Event* key commands, which allow you to move the selection from note to note.
- Using the *Voice Separation tool*: this tool allows you to draw a separation line between the notes, thereby assigning them to the MIDI channels of the Voices. Place the tool between the staves, and draw a line where you want to separate the Voices, while holding down the mouse button. The following example shows the resulting separation line. If you make a mistake, just move the mouse back slightly to the left (with the button still pressed). This erases the separation line to the right of the tool. Then try again.

The result of the procedure will look like this:

Note: The Voice Separation tool can only be used if MIDI channels are pre-defined for each of the Voices that you want to separate. This is because Logic needs to know which MIDI channels to assign to the notes.

Voice Assignment When Using Mouse Input

If you insert notes with the mouse into a multiple stave Score Style, these are automatically assigned to the staff/Voice/channel in which they are placed. If the staff contains several Voices (see below), the MIDI channel will correspond to the *Insert Defaults* channel setting (but only if that particular channel is used by one of the Voices in the staff).

There is a *Staff* parameter in the Event Parameter box for most Symbols inserted into multiple stave Score Styles. This parameter determines which staff the symbol belongs to. This is also relevant for the vert.pos setting of the symbol.

Editing Single-Staff Polyphonic Styles
(With Several Independent Voices)

Polyphonic Score Styles are required when rhythmically different melodic lines need to be displayed in the same staff. Theoretically, up to 16 independent Voices are possible.

There are two possible ways to add another Voice to a staff in the Score Style window:
- Menu *New > Insert Voice*. The new Voice will be inserted at the insert mark (>) position, set with a click in the narrow column to the left of the staff numbers (this is important if you want to insert a new Voice between existing Voices).
- By clicking in the (empty) lower right portion of the Score Style window with the pencil tool. In this situation, the new Voice is simply added at the bottom.

In both cases, the newly inserted Voice will have the same parameters as the Voice above it. These can be freely edited.

A new line appears in the Score Style window for every new Voice. For additional Voices within the same staff, it is important that the staff field in the first column remains empty. If a number is displayed here, click on it. This will cause the number to disappear, and the corresponding staff to disappear from the Score display.

If there are two independent Voices throughout the piece, the parameters might be set as follows: Stem, Tie, and N-tuplet direction are set to *up* for the top Voice and *down* for the bottom Voice. Note that even with these general parameters, Note Attributes (see "Note Attributes" on page 398) can be changed for each note. Both Voices are displayed with automatically displayed rests (Parameter *Rest: Show*).

For Voice Separation (see "Voice Separation Method" on page 390), the same methods used in two-stave systems can also be applied. Either draw a line between the notes with the Separation tool, or edit the MIDI channels of the notes directly, according to the Voice assignment in the Score Style window.

While the Voice Separation tool is being used, the Help Tag indicates which of the Voices are being separated by the current process. This is indicated by two horizontal arrows between the numbers of the Voices, and is only relevant if there are more than two Voices. To switch to the lower Voices, Shift-drag to move the arrows.

Input and Recording of Polyphonic Voices
Via MIDI
If you record polyphonic voices as separate passes in real time, you should set your keyboard or MIDI controller to the appropriate MIDI channel for each Voice. This saves you from editing the channels after the fact. The same applies to step input.

Note: The original MIDI channel will not be recorded properly if the Sequencer Input Object's (see "Physical Input/Sequencer Input Objects" on page 177) *Channelize* function is activated in the Environment window.

Reminder: if you want to record an additional Voice into an existing MIDI Region, select the Region, and activate the *Merge New Recording With Selected Sequence* option in the Song Settings > *Recording Options*. You could also record two separate Regions, using different MIDI channels, and merge them later.

Mouse Input
Mouse input into polyphonic Score Styles is very easy, if you activate *View > Explode Polyphony* (also available as a key command). This forces all Voices to be displayed in separate staves, regardless of Score Style Staff settings (the other Voice parameters remain valid). If you insert a note into one of these staves, it is automatically assigned the corresponding MIDI channel. Following input, turn off the *Explode Polyphony* option. This will display all voices correctly in one staff, as per the Score Style settings. This mode is generally useful for all editing operations in polyphonic staves.

You can, of course, also insert notes directly into polyphonic staves without activating the Explode Polyphony option. In this situation, inserted notes are assigned the MIDI channel set in the *Insert Defaults* of the Event Parameter box (see "MIDI Channel and Velocity of Inserted Objects" on page 345).

Single-Staff Score Style With Optional Polyphony
Sometimes you need to add a second Voice to a staff that usually only requires one Voice, in order to properly notate a short, rhythmically-independent passage. This is not uncommon with orchestral scores, where the unison part for a group of instruments will temporarily separate from the other parts.

One solution is to use a Score Style with a "Main Voice" and a "Secondary Voice". The parameters for the Main Voice should be set as per a non-polyphonic Style. The Secondary Voice is set to Channel 16, and is displayed without automatic rests:
- The stem, tie, and tuplet directions for the Main Voice are set to *Auto*, which is necessary for the proper notation of unison parts. No MIDI channel is defined for the Main Voice, so all notes with a channel other than 16 will be assigned to the Main Voice. As long as no notes or rests with MIDI channel 16 are used, the score display looks the same as with a simple, non-polyphonic Score Style.
- For the second Voice, the stem, tie, and tuplet direction parameters are set to *down*, and the automatic rest display is deactivated (*Hide*). Only notes with channel 16 will be assigned to this Voice.

The following additional steps are necessary to improve the score's appearance:
- Rests in the second Voice need to be inserted manually where needed. In the example, this was done on the fourth beat of the second measure. The rest's MIDI channel must match the second Voice's channel (16, in this case). This can be edited in the Event List (see "Using the Event List" on page 297).
- In the polyphonic passages, the stems of the Main Voice need to be forced upwards by selecting the corresponding notes, and changing their individual stem parameters (see "Note Attributes" on page 398).

An advantage of this approach is that you don't need to worry about MIDI channels during recording or input, and notes won't disappear unintentionally. There is, however, the disadvantage that the Voice Separation tool cannot be used to assign notes to Voices.

Other applications for this method would include; the display of beamed grace notes, occasional polyphony in a guitar part, or the indication of rhythmic accents above or below beat slashes in rhythm section parts.

Don't forget that you can add further Voices to a staff, to display more complex parts (up to 16).

Multi-Stave Polyphonic Score Styles
(With more Voices than staves)

These Score Styles are mainly used for notating keyboard music. If you start Logic without using an Autoload or Template song file, an empty song appears. It contains polyphonic Score Styles (see "Predefined Styles" on page 382) for piano (*Piano 1+2/3+4*) and church organ (*Organ 1+2/3+4/5*, with three staves).

These Score Styles are simply a combination of the Score Style types covered in this section. To insert an additional Voice or staff, place the Insert Mark (>) at the desired position with the mouse (see illustration), and select *New > Insert Voice* or *New > Insert Staff*.

In these complex types of Score Styles, it's often best to use the Explode Polyphony (see "Input and Recording of Polyphonic Voices" on page 392) mode when editing.

Cross Staff Beaming
Music for keyboard instruments or harp (which is notated in two staves) sometimes contains passages where notes in the upper and lower staff (played by the left and right hand) are connected with a beam, to emphasize the continuing musical phrase.

Required Settings
Cross-staff beaming is only possible between staves that belong to the same Score Style, and therefore to the same MIDI Region. The Voices in this Score Style also require different MIDI channel assignments—it is not possible to achieve cross-staff beaming with a Score Style that only uses a split point pitch for Voice separation.

The Procedure in Detail
As notes can only be connected with beams if they belong to the same Voice, it's not possible to simply select notes in both staves, and apply the usual beaming attribute functions to them. As an example, let's imagine a two-staff Score Style with one Voice per staff. Before beaming the notes, you need to assign all notes that you want connected by a beam to the same Voice. Let's choose the Voice of the upper staff for this purpose.

To change the Voice assignments for the notes in the lower staff, you can either; use the Voice Separation Tool to draw a line below these notes or, select all notes, and change their MIDI channel to match that of the upper Voice (in the Event Parameter box).

Following this, all notes will be displayed in the upper staff, probably accompanied by a lot of ledger lines. The next step is to define the beaming connections, as desired. This can be done with the regular note attribute functions (*Attributes > Beaming > Beam* selected or the corresponding key command).

Now select the notes that you want displayed in the bottom staff, and choose the *Attributes > Voice/Staff Assignment > staff below Voice* menu function (or the corresponding key command). This moves all selected notes down to the lower staff, although they still remain part of the upper Voice.

You could also choose the opposite approach—first assigning all notes to the lower Voice, then moving some notes to the upper staff with *Attributes > Voice/Staff Assignment > staff above Voice*. To display all selected notes in their original staff, use *Attributes > Voice/Staff Assignment > default staff*.

Stem Direction
The default stem direction for notes beamed across staves is towards the center—the beam is displayed between the two staves, stems in the lower staff point up, stems in the upper staff point down.

The vertical position and inclination of the beam can be altered by use of the stem length change functions described above: To move the whole beam in parallel motion, select all beamed notes, and choose *Attributes > Stems > Up* or *Down* to change the inclination of the beam. Alternately, select the first or last note of the group and apply the functions.

You can also define the stem direction for all notes with the regular note attribute functions, thereby placing the beam above the top staff or below the bottom staff. If you decide that you like the in-between beam better, you'll need to select all notes, and choose *attributes > Stems > Default*.

Rest Display
As always, rests are displayed automatically in Logic, as per the *Rest* settings in the Score Style. Given the cross-staff beaming situation described above, however, most (or all) notes belong to the Voice of the top staff, and the lower staff will contain rests—some even at positions occupied by notes. To avoid this potential issue, you should use a Score Style where the automatic rest display is deactivated for the bottom staff's Voice. Wherever rest display is desired, insert it/them from the Part box, with the mouse.

Copying Voices or Staves

Copying Voices or Staves Into Other Score Styles

The Copy and Paste commands (*Edit* menu or key commands) allow you to transfer one (or several) voices and/or staves, inclusive of their parameters, into other Score Styles. Select the Voices you want to copy, by dragging the mouse vertically in the margin column to the left of the stave numbers. The selection will be indicated by a dark grey vertical beam. Now, select *Edit > Copy* (X). Switch to the target Score Style that you want to paste these voices into (this also works between different songs). Finally, set the Insert mark (>) and select *Edit > Paste* (X). Note that if a Voice is selected in the destination Score Style (indicated by a black beam in the left column), it will be replaced by the pasted voices.

Deleting Voices in a Score Style

To delete Voices or staves from a Score Style, select them (dark grey beam, see above) and press Backspace, or select *Edit > Clear*.

Drum Notation With Mapped Score Styles

Nowadays, most MIDI instruments contain a variety of drum and percussion sounds. Each MIDI note usually triggers a different sound. If a MIDI Region containing a drum part is displayed with a regular Score Style, you'll see notes with no apparent relationships (except MIDI notes triggering the corresponding sounds) to the sounds represented by them.

If you want to notate these musically meaningless pitches as a readable drum part—which uses special percussion note heads—you should use *Mapped Instruments* and *Mapped Score Styles*.

The Basics of Drum Notation With Logic

You need to use both a *Mapped Instrument* as a Track Instrument, and a *Mapped Score Style*, for drum notation to be displayed properly. We'll start with the Mapped Instrument.

Open an Environment window, create a new Mapped Instrument (see "Mapped Instrument" on page 170), and double-click its icon.

You will see the *Drum Map Editor* for the instrument. The default settings correspond to the General MIDI drum note assignments, but they can be edited.

In the column to the far right, there are three parameters relevant to notation:

Head

Determines the shape of the note head for notes triggered by this particular pitch. You can choose the shape from the pull-down menu, by click-holding on any of the note heads displayed here.

Group

Each MIDI note can be assigned to a *Drum Group* via a pull-down menu. A number of groups are pre-defined for the most commonly used drum sounds (Kick, Snare, Hi hat, Toms, Cymbals, and so on). If you want to define a new *Drum Group* for another instrument sound (such as Tambourine), select one of the *New Groups* in the pull-down menu, and double-click on it. This opens an entry field, allowing you to determine a name for the new *Drum Group*.

Drum Groups play an essential role in "Mapped Score Styles": a note must be assigned to a Drum Group to be displayed in a Mapped Score Style. If it's not, it won't be visible.

Rel. Pos.

This parameter assigns the note to a line in the staff. It defines the note's position, in relation to the top line of the staff. Integer values make the note fall on a line, fractional values result in a note position between two lines (the measurement unit of this parameter is the distance of one staff line to the next).

This position parameter can be set individually for each MIDI note. Positions can also be influenced in the Score Style window, but this affects all notes of a particular Drum Group.

These options allow you to have two different MIDI notes (different bass drum sounds, for example) displayed in the same way in the score, or on the same line, but with different note heads.

Different Drum Maps Within the Same Song

If you are using various MIDI instruments with different drum assignments, you can create a separate *Drum Map* (in the *Drum Map Editor*) for each instrument. The list of Drum Groups, however, is the same for all instruments in a song. This enables you to display different drum tracks with the same *Mapped Score Style*. All Snare Drums, for example, will be displayed in the same way. If you don't want this behavior, create additional drum groups (Kick2, Snare2, and so on), and also create a second *Mapped Score Style* for the display of these Drum Groups.

Mapped Score Styles

Take a look at the default Mapped Score Style in the Score Style window: You can select the default via the pull-down menu to the left.

• To the left side (*Staff*), everything is identical to non-mapped Score Styles (with the exception of the missing *Transpose* and *Key* parameters, which wouldn't make sense here). Choose a drum clef in the *Clef* column.

• Below *Voice* (in the top header line), you'll see a separate Voice column, where the different Voices are numbered automatically. The Score Style, in the example above, contains one staff with two independent Voices.

- The *Staves-Voices-Drum Groups* hierarchy runs from left to right, and is shown by horizontal lines, which indicate the borders between these elements: each Drum Group belongs to the Voice at the same horizontal position. The *Pos.* parameter affects the vertical positioning of all notes of the corresponding Drum Group. The value shown here is an offset, which is added/subtracted to the relative positions defined for the individual notes in the Drum Map Editor.

Creating and Editing Your Own Mapped Score Styles
This is very similar to creating non-mapped polyphonic Score Styles. Select *New > Mapped Score Style* in the Score Style window, and insert all desired staves, Voices, and Drum Groups—with menu functions (*New*) or the pencil tool.

The copy, insert, and paste functions for single staves, Voices, and Drum Groups also work as described in the Copying Voices or Staves into other Score Styles section (see "Copying Voices or Staves" on page 396).

Prior to defining the details of a Mapped Score Style, you should set up all Drum Groups, note head shapes, and relative note position parameters in the Drum Map Editor.

The best method is to use an existing drum MIDI Region, and open the Score window (to display the MIDI Region), the Drum Map Editor, and the Score Style window. This way, you can directly see how parameter changes affect the score display.

Using Mapped Score Styles for Non-Mapped Instruments
If you use a Mapped Score Style for the display of a regular (non-mapped) instrument, Logic will simply use the default settings for Mapped Instruments (which correspond to the General MIDI drum sound assignments), to determine the mapping of notes to Drum Groups. This is not recommended, however, as this method is less flexible (there will only be default Drum Groups available, for example).

Note Attributes
The term "Note Attributes" is used for all display parameters that can be set individually per note, regardless of the settings in other windows and boxes.

The Note Attributes window opens when you double-click on a notehead (presuming that *Preferences > Score Preferences > Double Click Note To Open: Note Attributes* is selected). The settings shown in this window correspond to the double-clicked note(head).

Different settings are assigned to a note by selecting the corresponding *Attributes* submenu, with the note selected. This attribute assignment can also be made for a group of selected notes. The same applies to the assignment of Note Attributes when using key commands.

Reset Note Attributes

This command (*Attributes* menu or key command) resets all Note Attributes to their default settings. Note that this also affects symbols directly attached to notes (accents, fermatas, Jazz symbols, and so on), which will be erased by a Note Attributes reset.

List of All Note Attributes

The following list shows all Note Attributes and provides information on accessing and altering various attribute options.

Special Note Heads (Default setting "normal" = round and black):
• Insertion from the Part box with the mouse
• In the Note Attributes window (*Head*)

Altering Note Size (Default: Size in the Score Style window)
• With the Sizing tool
• In the Note Attributes window (*Size*)

Horizontal Position Change (Default: as defined by the note's bar position)
• With the Layout tool
• In the Note Attributes window (*Horizontal Position*)

Accidental Distance from the Note (Deviation from the default setting in the Extended Layout Parameters window)
• In the Note Attributes window (*Accidental Position*)

Display of Accidentals (Default: display according to key signature)
• In the Note Attributes window (*Enharmonic Shift/Accidental Type*)
• Menu *Attributes > Accidentals*
• With key commands

Options:
• *Default Accidentals*: according to the default setting
• *Enharmonic Shift: #*: converts G flat to F sharp, or F to E sharp, for example
• *Enharmonic Shift: b*: converts D sharp to E flat, or B to C flat, for example
• *Flats To Sharps*: similar to Enharmonic Shift #, but leaves notes without flats unaltered (useful for multiple selection)
• *Sharps To Flats*: similar to Enharmonic Shift b, but leaves notes without sharps unaltered (useful for multiple selection)
• *Force Accidental*: forces the display of accidentals (and naturals)
• *Hide Accidental*: displays the note without accidentals (MIDI playback is not affected)
• *Guide Accidental*: forces the display of the accidental (and naturals) in parentheses.

Stem Direction and Length (Default setting in the Score Style window)

• In the Note Attributes window (*Stem Direction* only)
• Menu *Attributes > Stems*
• With key commands

Options:
- *Stems: default*: according to the default setting
- *Stems: up*
- *Stems: down*
- *Stems: hide*: hides a note's stem, and the corresponding beam or flag
- *Stem End: Default Length*: default setting
- *Stem End: Move Up*: moves the stem end upwards; depending on the direction. Also shortens or lengthens the stem
- *Stem End: Move Down*: moves the stem end downwards

Beaming of Notes (Default depends on the chosen time signature, the "Beat Grouping" setting in the time signature dialog box, and on the "Beam" Score Style parameter)
- Menu *Attributes > Beaming*
- With key commands

Options:
- *Beam Selected Notes*: forces a beam to the following note
- *Unbeam Selected Notes*: interrupts the beam to the following note
- *Default Beams*: uses the default setting

Voice/Staff Assignment: for Cross Staff Beaming (see "Cross Staff Beaming" on page 394)
- Menu *Attributes > Ties*

Options (requires a polyphonic multi staff style):
- *Default Staff*: according to voice assignment
- *Staff Above Voice*: moves the selected note(s) to the staff above the assigned voice
- *Staff Below Voice*: moves the selected note(s) to the staff below the assigned voice

Tie Direction (Default setting in the Score Style window)
- In the Note Attributes window (*Tie Direction*)
- Menu *Attributes > Ties*
- With key commands

Options:
- *Ties: default*: according to the default setting
- *Ties: up*
- *Ties: down*

Syncopation (Default setting in the Display Parameter box)
- In the Note Attributes window (*Syncopation*)
- Menu *Attributes > Syncopation*
- With key commands

Options:
- *Default Syncopation*: according to the default setting
- *Force Syncopation*: forces syncopated display

- *Defeat Syncopation*: defeats syncopated display

Interpretation (Default setting in the Display Parameter box)
- In the Note Attributes window (*Interpretation*)
- Menu *Attributes > Interpretation*
- With key commands

Options:
- *Default Interpretation*: according to the default setting
- *Force Interpretation*: forces Interpretation mode
- *Defeat Interpretation*: defeats Interpretation mode

Independent: Display as Independent Note or Single Grace Note (Default setting "Not Independent")
- Menu *Attributes > Independent*
- With key commands

Options:
- *Not Independent*: the note is displayed in the regular rhythmic context
- *Independent*: the note is displayed, independent of the rhythmic context
- *Independent Grace*: the note is displayed as a single (independent) grace note

Color
Single notes can also be assigned colors individually, in accordance with the three color palettes. The note must be selected, then menu *Attributes > Colors >* is used to assign the desired color (user palette 1 to 16) or color mode (pitch or velocity).

As Note Attributes, these settings have priority over the Score Style settings, but they only apply if the color mode is set to *Normal (Individual)* in the Score Edit window.

Instrument Sets and Score Display Levels
There are basically two parallel systems that determine which Regions are displayed, and which aren't in Logic's Score Edit window (linear view versus page edit view does not play a role here). The hierarchical system which controls Display Levels is basically the same in all Logic windows, but has a few special aspects in the Score Edit window.

Display Levels
You can work with the following Display Level settings in the Score Edit window:

Content Linked: activated by a double-click on the Link symbol. In this mode, only the object currently selected in another window (which is a single MIDI Region most of the time, but can also be a folder) is displayed in the Score window.

Content Catch: similar to Content Linked, but Catch is also activated. Only one MIDI Region is displayed at a time, but the display changes to the next MIDI Region on the same track, according to the current bar position, during playback.

Linked: (single click on the Link symbol) The Score window shows the same display (folder) level as the Arrange window. This is most relevant if you work with Folders.

Not Linked (Link button deactivated): in this mode, Logic simply stays at the currently visible Display Level, and doesn't react to MIDI Region selection in other windows. As an example, if you always want to see the full score in a particular Score window, choose this mode once the full score is displayed in the window.

Explode Folders
If the current Display Level allows more than one MIDI Region to be viewed simultaneously (Linked or Not Linked), the *View > Explode Folders* option will affect how things are shown: unlike the other editor windows, the Score window can display (or even print) the contents of different display (folder) levels at once. If the current Display Level contains folders, their contents are also displayed in the score (if this option is not activated, Folders will appear as grey beams in linear view, and won't be shown at all in page edit view).

Changing Between Single Sequence and Full Score Display
At all Display Levels, a double-click on a MIDI Region or folder will take you to the next lower level (into the Folder or the display of that particular MIDI Region). A double-click in the empty space below or above the staves will take you up to the next higher level (the next higher Folder, or to the full score display of all Regions in the song). Basically, the same principle applies, even if you don't use Folders at all: the highest of all levels (the complete song) could also be regarded as a folder, which contains all MIDI Regions.

Special Cases Concerning Score Display

In some situations, certain MIDI Regions will not be displayed in the Score window, no matter what the Display Level or Instrument Set settings are. These cases include:

- Muted MIDI Regions, if *Hide Muted Sequences* is activated in *Layout > Global Format*.
- MIDI Regions on muted tracks, if *Hide Muted Tracks* is activated in *Layout > Global Format*.
- MIDI Regions with Score set to "off" in their *Extended Sequence Parameters* (global menu *Options > Extended Sequence Parameters* or key command).

Instrument Sets

Apart from the system of display and folder levels, the Score window also features the Instrument Sets system. This determines which (track) instruments should be included in the score display of a particular Instrument Set. Each song can contain as many Instrument Sets as required. Instrument Sets allow you to:

- arrange the (vertical) order of instruments in the score, independently from the order of tracks in the Arrange window.
- assign a name and an abbreviated name to each track instrument, which will then be displayed and printed as instrument names in the score.
- determine which of the staves will be connected by brackets and/or bar lines.
- display or print a certain part of the score, such as a particular group of instruments. This also allows faster editing in very large files, as screen redraws are much faster when fewer instruments are displayed.
- exclude the display of tracks that are only relevant for playback, but not for the score (tracks that only contain MIDI controller data, for example).
- simultaneously reduce or enlarge all staves which are part of an Instrument Set, by using the Scale parameter. This allows you to use the same Score Styles for printout of full scores and parts.
- select from two different parameter sets (*Score* or *Part*) for page margins, header space height, vertical distance between stave systems, and the maximum number of bars per line.

An Instrument Set is selected in the *Instrument Set Box*, below the Catch and Link buttons. If Instrument Sets already exist in the current song, a pull-down menu showing all available Instrument Sets will appear when you click-hold on the box. New songs will only show the *ALL INSTS.* entry which—depending on the display level—will display all instruments. Double-click this box to open the Instrument Set window.

The Instrument Set Window
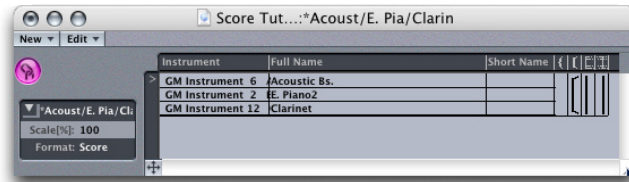
The Instrument Set window can be opened with:
- Double-click on the Instrument Set Box
- Menu *Layout > Instrument Sets…*
- Key command *Open Instrument Set Window*

If you have opened the Instrument Set window while the default "ALL INSTS." set was displayed, a warning indicates that the "ALL INSTS." Instrument Set cannot be edited. In the Instrument Set window, select *New > New Complete Set*. This will create an Instrument Set that contains all track instruments currently used in the Arrange window. Although this results in the same display as "ALL INSTS.", you can edit this Instrument Set (you cannot define instrument names or change the order of instruments; and the bar lines are always connected throughout the whole score, in the "ALL INSTS." Set). You will see columns with the following parameters (from left to right) in the window:

Instrument

This column is used to determine which (track) instruments are included in the Instrument Set, and their vertical order of appearance in the score. As in the Score Style window, there is a narrow column to the left that allows you to set an insert mark (>) with a mouse click, or make multiple selection marks by dragging the mouse vertically. These selection marks denote selected instrument entries. The usual cut/copy/paste commands (*Edit* menu or key commands) allow you to; move entries to reorder them, delete, or copy them into other Instrument Sets. If pasted, they will be placed at the insert mark position, which must be set beforehand.

A double-click below the instrument list results in a new instrument entry at the bottom. If you want to add an instrument to the middle of the list, set the insert mark accordingly, and select *New > Add Instrument Entry*.

Click-hold on the name of this new entry (*Instrument* column). A pull-down menu, containing all available track instruments, will appear, allowing your selection.

In most cases, it's more convenient to create a new Instrument Set with *New > New Complete Set*, as all instruments currently used in the Arrange window are automatically included. You can, however, also select *New > New Empty Set*, into which you can insert the desired instruments, one-by-one. Other options in this menu are: *Duplicate Set*; which creates a copy of the currently visible Instrument Set, for use as a basis for another set, and *New Set of Selected Insts.*, which creates a new Instrument Set that contains all currently selected instruments.

Track Instrument icons are also displayed in this column, at the highest zoom level.

Please note: you will not see a new Instrument Set in the Score window until it is chosen from the Instrument Set box pull-down menu.

Full Name
A click on any line in this column opens an entry field that contains the default "@(reference)". If you don't change this, the Track Instrument name will be used as the name for the instrument in the score. As the Track Instrument name is often identical to the corresponding synthesizer patch (Solostrings high, for example), you'll probably want to assign another name here. This name is automatically displayed in the score as the full name: "Violin 1", for example. Display parameters for instrument names are set in *Layout > Numbers & Names* (see "Numbers & Names" on page 414).

Short Name
You can also define an abbreviated name for each instrument, which is used if *short names* is selected for the instrument name display in the *Layout > Numbers & Names* dialog window.

Brackets and Bar Lines
You can define which staves in the Instrument Set are connected by brackets (two bracket types are available), and/or connected by bar lines (either at the beginning of each staff, or throughout), in the last four columns. Any of these connections can be set by dragging vertically in the column, until you see the appropriate display.

Brackets and bar lines can also be interrupted between staves, enabling you to form groups of connected instruments in a score. If you want to delete a line or bracket, grab the corresponding symbol at its end point, and drag it upwards, until it disappears. You can use the same method to shorten lines.

Bar line connections can also be edited directly in the score. Just click on the upper end of a bar line to connect it to the next (higher) staff. Repeating the procedure disconnects the bar lines.

Name of Instrument Set

The name of an Instrument Set can be edited by double-clicking on the name in the left column of the Instrument Set window, which opens a text entry field. Click-holding on the name box allows you to switch to another Instrument Set, by selecting it from the resulting pull-down menu.

Scaling, Format

These two parameters (below the Instrument Set name) make it possible to create both a full score and parts (see "Full Score and Part Layout" on page 407), for all instruments in a song file, without changing any settings.

Importing Instrument Sets From Other Songs

Select *Options > Import Settings.* In the resulting dialog box, activate *Instrument Sets* only, and click on *Import*. This imports all Instrument Sets from another song into the current song.

If another song file is already open during this procedure, it's Instrument Sets will be imported. If no other song is open, a file selector box will appear, allowing you to select the song that contains the Instrument Sets you want to import.

Additional Information on Instrument Sets

Relationship to Display Levels

An Instrument Set will only be displayed as defined if an appropriate Display Level (see "Display Levels" on page 401) is chosen. Content Linked and Content Catch only allow the display of one MIDI Region at a time, so they are not suitable for work with Instrument Sets. It's usually best to deactivate Link, once the desired Instrument Set is fully displayed. If only one MIDI Region is displayed, double-click below the staff, which will display the full score, then deactivate Link.

Note: It is possible to work with several open Score windows; each showing different Display Levels and/or different Instrument Sets.

New Instrument Sets for Selected Instruments

The Score window *Layout > Create Instrument Set from Selection* (or key command) option immediately creates and displays a new Instrument Set, which consists of all instruments used by the currently selected MIDI Regions. Selection of MIDI Regions can be made in either the Score or Arrange windows. As screen redraws are faster if fewer instruments are displayed, this is a good way to speed up editing. Instrument Sets created this way are automatically named after the instruments they contain. If you want to delete the set after editing, select *New > Delete Set* in the Instrument Set window (while the Instrument Set that you want to delete is displayed).

Automatic Display of Selected Instruments when Opening the Score Window

Opening a new Score window, while several Regions are selected in the Arrange window, automatically creates and displays an Instrument Set that only contains the instruments of the selected Regions. In other words, the *Create Instrument Set From Selection* function is automatically performed whenever a Score window is opened, and Regions on more than one track are selected in the Arrange window.

Instrument Sets created in this way are saved with the song file, and are also available for later use.

Different Instruments Using the Same Sound

If several instruments or staves use the same MIDI sound for playback (with the same MIDI channel on the same MIDI instrument), and you want to display these staves with different instrument names in the score, you need to create a separate track instrument for each staff, in the Arrange or Environment window.

Full Score and Part Layout

Some functions in the Instrument Set window, and some settings in the *Layout > Global Format* window make it possible to produce both the full score and individual parts (for all instruments) from the same Logic song file, without having to adjust any settings.

Part Extraction ("Instrument Filter")

Option-click-hold on the Instrument Set box in the Score window. A pull-down menu, containing all Track Instruments currently used in the Arrange window, will appear. If one is chosen, only this particular instrument will be displayed. This method allows you to quickly display (and print) instrument parts. You should note, however, that only the track instrument names will be used as instrument names in the score. So, if you use this method for printout of your parts, you need to be careful to use the "real" instrument names for the Arrange window Track Instruments.

Scaling Parameter for Instrument Sets

There is a *Scaling* parameter below the name of the Instrument Set in the Instrument Set window, which can be set to any desired size between 50 and 200 percent of the original size. This scaling will affect all staves, the distance between staves, all symbols associated with staves (all notes, rests, and other symbols), and all local text, including lyrics. All of these elements will be resized in accordance with the *Scaling* parameter value of the currently displayed Instrument Set.

The *Scaling* parameter does not affect Global Text objects (header text, text inserted outside the margins) and text such as page numbers, and so on

Scaling doesn't happen to parts extracted using the Instrument Filter function described above. As such, you can use the same Score Styles for full scores and parts: in extracted parts, the staves will appear at their original size, in the full score, their size is defined by the *Scaling* parameter.

Separate Layout Options for Parts and Score

In the *Global Format* dialog window (*Layout* menu) there are separate page layout parameters for score and parts. *Left*, *right*, *top,* and *bottom margins*, the (vertical) size of the *Header Space*, the *Line Distance* (additional vertical distance between stave systems), and the maximum number of bars per system (*Max.Bars/Line*) can be set separately for Score and Parts.

The parameters used for the display and printout of a particular Instrument Set depends on the setting of the *Format* parameter in the Instrument Set window (below the *Scaling* parameter). You can switch this setting by clicking on it.

Part settings are applied automatically when you use the Instrument Filter method (see above) to extract and print the parts for single instruments.

For the default ALL INSTS set, the Score settings will always be used, except when a single MIDI Region is displayed. In this situation, the Part settings will be used. Please note: the ALL INSTS set cannot be edited (and therefore, can not be scaled), so you'll need to create a dedicated Instrument Set for the full score, in most cases.

The margin and header values can also be changed directly with the mouse by dragging the margin (green) and header lines (blue) in page view mode. This only affects the Format setting which is currently in use for (Score or Part) display.

Line Breaks

Line breaks and individual stave margins can be determined individually for each Instrument Set, and also for each of the extracted parts.

In Page Edit view, you can use the Layout tool to edit line breaks. The automatic line break calculations are based on the *Layout > Global Format* (*Spacing* and *Max.bars/line*) settings, but can be changed with the following procedure.

To move the last bar of a stave system down into the next staff, grab it with the Layout tool, and drag it down until the symbol changes to a hand with a down-pointing thumb, then release the mouse button. The bar is moved to the next stave system, and the remaining bars in the line are distributed evenly over the entire width of the page. The same method works for several bars at once. If you grab the third to last bar of a staff, and drag it down, three bars will be moved to the next staff. You also can move the first bar(s) of a staff upwards into the preceding staff, by dragging them upwards (symbol: hand with thumb pointing up).

Logic stores the line breaks for each Instrument Set individually. This also applies to all parts created with the Instrument Filter function. These are all stored with the song file.

Restriction to Local Movement

When you move a bar with the Layout tool as described, all manually edited line breaks in subsequent lines are deleted, and the (automatic) line breaks are automatically recalculated from that line downwards. If you want to prevent this, perhaps because you only want to change one detail and keep the other staves as they were, hold Control while moving the bars with the Layout tool. Line breaks edited in this way will only affect the two (directly concerned) stave systems. All other stave systems are unchanged.

Combining Max.Bars/Line and Line Breaks

The *Layout > Global Format > Max.Bars/Line* parameter determines the maximum number of bars Logic will allow in one staff or stave system. The Layout tool can override this setting. As an example, you can set *Max.Bars* to 6, and still move additional bars into a line with the Layout tool. Any subsequent lines will contain no more than six bars. The full number of bars set here will only be displayed if the spacing settings are low enough to allow the proper display of that many bars.

Note: If you drag more bars into a line than would be displayed when employing the automatic line break function, this can result in overlapping notes and symbols!

Local Margins

The left and right margin of each individual stave system can be moved with the Layout tool (see "Editing With Tools" on page 371), so that they do not align horizontally with the page margins: click-hold (with the Layout tool) a little bit inside the beginning or end of the staff, and drag to the left or right side (see illustration). During this process, "Left/Right Stave Margin" will appear in the Help Tag.

In this situation, Logic also adapts the number of bars per line automatically (unless the line breaks have been manually adjusted beforehand): if the line is shortened, bars may be moved down to the next line, depending on the *Spacing* parameters in the Global Format window (see "Global Format" on page 410).

To realign a changed staff margin with the other staves, double-click at its end (or beginning). A dialog will ask if you want to *Reset Local Margin?* Confirming this dialog will reset the margin.

Hint: like manual line breaks, these local margins are also saved as part of the current Instrument Set, allowing different settings for every Instrument Set.

Deleting All Line Breaks and Local Margins

To delete all line breaks and all locally changed margins in the current Instrument Set, select *Layout > Reset Line Layout*.

Song Settings for Score Display

There are six pages of score settings in the *Song Settings* dialog box. You can switch between these and the other Song Settings dialog box pages directly, by using the pop-up menu on the page. In addition to the methods mentioned below, you can also select these pages in the global *Options > Settings >* menu.

These settings affect the whole song (in all Instrument Sets). They are saved with the song file, allowing each song to have different settings.

Note: In most cases, values of "zero" are not displayed in these settings. Zero values are denoted by an empty parameter box.

Importing All Score Settings

Select *Options > Import Settings* in the Score window. In the resulting dialog box, activate *Score Settings* only, and click on *Import*. This imports all Score Settings relevant to the score display (the settings of these six pages) of another song, into the current song.

If another song file is already open during this procedure, it's Song Settings (score only) will be imported. If no other song is open, a file selector box will appear, allowing you to select the song that contains the Score Settings you want to import.

Global Format

Global Format settings define page margins, spacing between notes, slanting of beams and format settings.

This window can be opened by:
• *Layout > Global Format…*
• Key command *Settings: Global Format*
• Double-click on the page margins in Page Edit view

Note: Distance values can be displayed in inches or centimeters. To switch between these options, just click on one of the unit depictions.

Settings that affect the general page layout (margins, for example) can be set independently for a part or the full score. This is indicated by the two input boxes. This allows you to print out single voices with a page layout that differs from the full score.

The settings in detail:

Top/Bottom/Left/Right Margin

These values show the margin distances to the outer border of the printable area on the page. A "Top Margin 0.0 inches" value means that printing will start as close to the top of the paper as the selected printer driver will allow. This means that the size of the printable area can be different with various printers, although the difference should be minimal.

Margins are only visible in Page Edit view, where they are displayed as green lines on the screen. These lines are not printed. It is also possible to change them directly, by dragging them with the mouse in the score.

Like the global page margins, the left and right borders of stave systems can also be edited individually. To change the left/right border of a staff system, simply use the Layout tool to click and drag the border to the desired position. The local margin (see "Local Margins" on page 409) can be reset by double-clicking the same position with the Layout tool.

Add Bracket Space

Creates additional space between the left margin line and the beginning of staves, for braces and brackets. If this option is deactivated, staves will be aligned directly along the left margin line.

Alternating Margins

If activated, the left and right page margin settings will be swapped on every second page. This can be useful if a score is going to be bound as a book: the inner margin usually needs to be a little bigger than the outer one. It's possible that the opposite might be preferable, in cases where extra space is needed for remarks that may be added to the score at a later date.

Header Space

Defines the height reserved for headers, between the first page's top margin, and the first staff's top margin (as per the assigned Score Style).

Note: Text elements inserted directly into this area automatically become Global Text (see "Global Text" on page 429), and are displayed as headers in all Instrument Sets (scores and parts).

This value can also be changed directly in the score, by dragging the dotted line above the first staff.

Line Distance

Defines additional vertical distance between stave systems on the same page. It applies to full scores, as well as single staff parts.

Max. Bars/Line

This parameter can be useful when using small spacing values (see below), to prevent too many bars from being displayed in one line. The number set here limits the number of bars that can be displayed per line.

Note: This setting can be overridden when using the Layout tool to change line breaks (see "Line Breaks" on page 408).

Constant/Proportional Spacing: Note Distance

These parameters determine the amount of horizontal distance between notes. *Constant Spacing* affects the distance from note to note, regardless of rhythmic value. *Proportional Spacing* also takes the note durations into consideration. If you only use *Proportional Spacing* (and set *Constant* to 0), every bar receives (more or less) the same amount of (horizontal) space. A whole note uses as much space as four quarter notes. In the opposite situation (high constant value, proportional value = 0), the distance from one note to the next is always the same, regardless of note duration. A half note takes the same amount of space as an eighth note. Other factors, such as accidentals, ties, and so on are also considered for note distance calculations.

The settings you should use depends on both your personal preference, and the style of the piece. Certainly, one should aim for a good balance between these two parameters. For best results, try different combinations when working on the final score layout.

Slash Spacing: Spacing of Beat Slashes

This is the distance parameter for slashes (used in Score Styles that display Beat Slashes instead of automatic rests). This is especially important if notes are inserted into staves displayed with slashes. As an example, musical styles such as funk use a lot of sixteenth notes, so you are likely to choose a higher slash distance than for music that doesn't go beyond eighth notes. This way, the proper relationships between notes and passages (containing only slashes and chord symbols) can be maintained.

Default Pedal Position

This determines the vertical position of pedal symbols (which are created and displayed automatically when you use the MIDI sustain pedal during a real time recording). If this parameter is set to zero, recorded MIDI sustain pedal controller events are hidden in the score. Pedal marks inserted from the Part box are not affected by this parameter.

Beaming Slant Factor/Min. Slant/Max. Slant

These three parameters affect the slant angle of beams. As with the Spacing parameters, these parameters work together. Appropriate settings need to be found by trying different combinations. The final settings will vary, depending on the style of the music, and on personal preference.

Beaming Slant Factor: determines the general amount of beam slanting, in relation to the intervals of the notes connected by beams.

Min. Slant: determines the minimum interval of notes that causes beams to be slanted.

Max. Slant: determines the maximum beaming slant angle.

These parameters work relatively to a particular scoring situation, which is why no explicit instructions on settings can be given. Again, it is essential to try different combinations when working on the final layout of a piece.

"Open" Single Staves

Displays single staves without vertical lines at their start point (left side of the clef).

Justify Last Staff

Lengthens the last line (the last staff system, in full scores) to the right page margin.

Hide Muted Sequences/Tracks

Excludes muted Regions, or Regions on muted tracks, from the score display. If these options are not activated, muted tracks and Regions will be displayed in the score, even though they won't be heard during MIDI playback.

Show Alias

Switches the display of alias objects (see "Aliases in the Score Display" on page 333) in the score on or off.

Allow Alias Editing

Switches Alias Editing (see "Aliases in the Score Display" on page 333) on or off.

Alternate Repeat Symbols

If this option is activated, all repeat signs in the song will be displayed with "Real Book Style" brackets.

Chord Symbol Language

This pull-down menu allows you to choose between
- International: default
- German1: B → "H", Bb → "B"
- German2: B → "H", Bb → "Bb"
- German3: C# → "Cis", Eb → "Es" etc…
- Roman: CDEFGAB → Do Re Mi Fa So La Ti

In all Chord Symbol Language formats, the current format is also accepted for the input of new chords. The "#", "b", "x" and "bb" characters are also active in the German3 mode, allowing for quick entry. In the Roman format, the second root string character can be omitted (typing "D7" or "Do7" in Roman mode will both result in "Do 7"). Changing the Chord Language automatically affects all chord symbols in the song. It is not possible to mix chord languages.

Numbers & Names

These settings affect the automatic display of page numbers, bar numbers, and instrument names in the score.

To open this window, select:
- *Layout > Numbers & Names…*
- Key command *Settings: Numbers & Names*
- Double-click on any bar or page number

Automatic page and bar number display, and automatic display of instrument names can be switched on and off for the whole song, by activating/deactivating the corresponding check boxes in this window.

For each of these, you can set Font, Size, and Face, (bold, underlined, italic, outlined, and circled. Each is activated by clicking on the appropriate symbol. The "circled" attribute is similar to "boxed", but a circle is used instead of a rectangle. An ellipse is used for wide text.

The corresponding Text Styles in the Text Style Window (see "Text Styles" on page 425) are automatically updated if you edit these settings.

Page Numbers

Hor. Position
The horizontal alignment on the page

alternating: alternating, beginning on the right side
left/right/centered
rev. alternating: alternating, beginning on the left side

Vert. Position
The vertical alignment on the page

top/bottom

Page Offset
This value is added to each actual page number, for display purposes. This can be useful when writing a piece consisting of several parts, which are saved as separate song files. To retain continuous page numbers throughout the score, you can set this parameter to the number of pages contained in all preceding parts (song files).

Hor. Distance
The horizontal distance from the outermost possible printing position on the page. This is only relevant for page numbers with the Hor.Position parameter set to *alternating* or *rev. alternating.*

Vert. Distance
The vertical distance to the highest or lowest possible printing position on the page (dependent on whether Vert.Position is set to top or bottom).

Hide 1st Page Number
Prevents display and printout of the page number on the first page (all others are displayed and printed).

Prefix
Allows you to enter text which will be displayed with every page number.

Example: if you use the prefix "Page", the word "Page", followed by a space and the actual page number will be displayed on each page. This means that page three will display "Page 3". If you want the page number in the middle of the prefix, you need to use the "#" symbol as a variable for the page number. An example: "- pg.# -" on the second page prints as "- pg.2 -".

You can also use the following text symbols to include automatically generated text in the prefix:

"\ i" for the Instrument Set name
"\ n" for the song (file) name
"\ s" for the name of the currently shown Display Level, which can be the MIDI Region or folder name (or even the song name, on the highest level)
"\ d" for the current date (at the time of printout)

Bar Numbers
Bar numbers are placed above or below the barlines, and at the beginning of the line, above or below the clef (they are automatically moved to a position where they won't overlap the clef).

Vert. Position
The height above the staff. If a negative value is set here, the bar numbers are placed below the staff.

Step
This value controls the interval (in bars) between the display of bar numbers. A value of *4*, for example, results in bar numbers at the first, fifth, ninth bar, and so on. If you only want bar numbers to be displayed at the beginning of each staff line, set this parameter to *line* (which appears instead of zero).

Bar Offset
This value is added to all actual bar numbers, for display.

Start with
Automatic numbering begins at the bar indicated here.

Hide Bar Numbers in Linear View
Does exactly what it says. Linear View refers to non-Page View.

Top/Bottom Staff only
In full scores, the bar number is only displayed above the top staff, if this option is activated (a negative Vert.Pos. value results in the number below the bottom staff).

Count Mult. Rests
Displays the first and last bar number below multiple rests. This makes sense if a negative Vert.Position value is chosen, causing the bar numbers to be shown below the staves.

Show at Double Bars
Displays bar numbers at every double bar line and repeat sign, independent of the chosen Step setting. As an example, *Step* = "line" and *Double Bars* activated will display bar numbers at the beginning of each staff line, and above or below all double bar lines and repeat signs.

Instrument Names
This determines the appearance of the names defined for the Track Instruments in the Instrument Set (see "Instrument Sets and Score Display Levels" on page 401) window, in the *full name* and *short name* columns. If nothing is defined here, or if ALL INSTR. is used as the current Instrument Set, the names of the Track Instruments (as displayed in the Arrange window) will be used in the score. (Short names don't exist in this case)

Position
above/beside staves

Align
left: at the left margin

right at the right margin (refers to the space preceding staves)

1st Staff
no names/short names/full names

Other Staves
no names/short names/full names

Clefs & Signatures
These are general display options for clefs, key signatures, and time signatures. Please read the sections on Clefs (see "Clefs" on page 355), Key Signatures (see "Key Signatures" on page 361), and Time Signatures (see "Time Signatures" on page 362).

You can open this window by:
• *Layout > Clefs & Signatures…*
• Option–double-clicking on any clef or time signature in the score.

The following display options are available for Clefs, Key Signatures, and Time Signatures:

- *Every Staff*
- *First Staff on Every Page*
- *First Staff on Page 1*
- *Hide All*
- *Display Warnings at Line Breaks*: this causes "warning" clefs, time signatures, or key signature changes to be displayed at the end a staff or stave system, if the actual change is at the beginning of the subsequent staff or stave system.

The following options are also available:

For Clefs:

Smaller Clef Changes (pull-down menu): clef changes (whether caused by a change of Score Style, or by a new clef inserted from the Part box) can be displayed at a smaller size than the clefs at the beginning of staves, depending on this setting.

For Key Signatures:

Automatic Key Transposition

This enables the automatic transposition of key signatures in transposing Score Styles. This will usually be activated. An exception would be for the notation of atonal music. If deactivated, all sharps and flats are displayed directly with the notes. Note that there is a similar option in the Score Style window (*Key* parameter), which allows you to switch off the key signature for individual Score Styles, or even for individual staves in multi-stave Score Styles.

Minimize Transposed Accidentals

This enables the use of enharmonically changed key signatures, if this results in a signature with fewer accidentals. As an example, if a piece is written in B major (5 sharps), the Bb instruments are notated in Db major (5 flats) instead of C# major (7 sharps).

Please note that Logic does not display key signatures with more than seven flats or sharps, whether this option is activated or not.

Show Naturals

This displays naturals at key signature changes, where preceding accidentals are no longer valid (when changing from E major to G major, or to C minor, for example).

Show Grace Accidentals

If this option is activated, courtesy accidentals are automatically displayed. This means: wherever a diatonic note is altered by an accidental, another accidental (a natural symbol, in many cases) will be displayed when that note appears (unaltered) in a subsequent bar.

For Time Signatures/Barlines
Hide Barlines
This option allows you to hide all barlines, which can be useful for educational material, gregorian plain chant notation, and other special situations.

Only automatically displayed barlines are hidden, so it's still possible to insert barlines from the Part box, including the "regular" bar line, which will be displayed and printed.

Octave Symbols
These settings enable you to edit the text string and text format of the different octave symbols.

Extended Layout Parameters
This is where you define a number of display settings for the whole song, such as; staff line thickness, stem length, distance between notes and ties, or notes and dots, and so on.

To open this window, select *Layout > Extended Layout Parameters*.

The first eight parameters determine the line thickness of the following objects: stave lines, stems, ledger lines, bar lines, repeat and end lines, tuplet brackets, text boxes (for boxed Text Styles), and crescendi/decrescendi (this last parameter also affects line objects and arrows).

Bar Start Spacing/Bar End Spacing changes the relative distance between the first and last note of a bar, and the preceding or subsequent bar line. Please note: Changing the default settings of these parameters only makes sense if rather extreme settings have been chosen for the general *Spacing* parameters in the *Global Format* window.

Dot/Note Distance determines the distance between the note heads and dots, for dotted notes. *Dot/Dot Distance* refers to double dotted notes.

Acc./Note Distance allows you to globally alter the horizontal distance of accidentals from the corresponding note heads. The default setting should only be changed if very small values are used for the spacing parameters, which results in a tiny distance between notes. This global setting can also be combined with the local *Accidental Distance* parameter of individual notes, in the Note Attributes (see "Note Attributes" on page 398) window.

Acc./Acc. Distance allows you to globally alter the horizontal distance between several accidentals, in chords.

Stem length is the default setting for stem length.

Hor. Tie Position and Vert. Tie Position determine the distances between note heads and related ties (which are displayed automatically). There is also a parameter for *Tie Thickness* as well as *Slur Thickness*.

Chord Symbol Alignment determines the general horizontal alignment of chord symbols (see "Handling Chord Symbols" on page 433) with an *Align* parameter set to def (default), in relation to their bar position.

Chord Symbol Accidental Scale changes the accidental size, in relation to the font size setting: Positive values result in an increased size, negative values in a diminished size of chord symbol accidentals.

Clicking on *Factory Defaults* resets all parameters to their default settings. If you have a high resolution printer, you should try to use smaller line thickness settings (2, or maybe even 1). Smaller staves, in particular, look much better and more professional. The other parameter settings are more a matter of personal preference.

These changes are only visible at the highest zoom levels on the screen. To really judge the results, try some printouts with different settings.

Guitar Tablature

Guitar tablature is an alternative method of notating music for fretted string instruments, especially for guitar and electric bass, but also for other fretted instruments with four to six strings (or courses of strings).

In this system, the horizontal lines represent the strings of the instrument. Notes are always written on the line/string at which they are played. The numbers of the frets are shown instead of regular note heads.

Logic automatically converts notes into tablature, if a Score Style containing a Clef parameter set to one of these Tuning Sets, is used. The exact characteristics of these Tuning Sets are determined in the Guitar Tablature window.

To open this window, use:
- *Layout > Guitar Tablature*
- Key command *Settings: Guitar Tablature*
- Double-click on the TAB clef, at the beginning of any staff that already uses tablature in the score.

Twelve different Tuning Sets can be defined. Each of them corresponds to one line in this window. The regular guitar and bass tunings are already included as defaults (first line and last five lines), as are some of the more common guitar tunings.

The following parameters (from left to right) are available for every Tuning Set:

Name: can be changed in the text entry field that opens with a double-click on the field.

Strings: number of strings (four, five, or six).

Assign: the method Logic uses for automatically assigning notes to strings. (see below)

1 to 6: the pitches that the "open" strings are tuned to.

Other common parameters:

Font, Size, and Face for the display of fret numbers.

Alignment of the numbers to the stem: to the side, or centered (can be switched by clicking on this box).

Bass String: the display of the lowest string: may be the same as the other strings, or a bit thicker. (can be switched by clicking on this box)

1/1, 1/2 Notes: if this option is activated, half and whole notes will be displayed with a circle around the fret number. As the note head is always a number, there would be no displayed difference between a half note and a quarter note, if this parameter wasn't available.

Assign
As most notes can be played at different positions (frets) on different strings, the *Assign* parameter plays an essential role in this system. In most cases, the MIDI channels of the individual notes determine the string assignment. (Remember: the MIDI channel parameter of an individual note has no impact on MIDI playback. The playback channel is determined in the Instrument Parameter box (see "The Instrument Parameters" on page 102) in the Arrange window.) The following options are available for string assignment:

Pitch
Logic assigns each note to the string on which it is playable, at the lowest possible position. In order to influence the string assignment, there is a rule (in Pitch mode only) that a note's fret position cannot be lower than its MIDI channel. This method is generally used when notes are recorded from a MIDI keyboard:

An A3 with MIDI channel 1 is displayed on the second fret of the G string. If you want the note to be displayed at a higher position (to correctly display the proper fingering of a passage), you need to set its channel to 3 or higher. This means that the fret position cannot be lower than 3 any more, so the note will be displayed at the D string's seventh fret. If the channel is between 8 and 12, the A3 is assigned to the A string on the 12th fret, and to the low E string (17th fret) for channels 13 to 16. If you want to force even higher positions, you'll need to use one of the other assignment modes.

Channel
In this mode, the number of the string (1 to 6, counted from the lowest string) simply corresponds to the MIDI channel. Channels 7 to 16 are also assigned to the highest string.

Inv. Chan
Like *Channel*, but counted from the highest string (1) to the lowest (6 and above). This way of numbering the strings is generally used in traditional guitar literature.

As most Guitar-To-MIDI-Converters send notes on different MIDI channels, according to the played strings, the last two modes are suitable if you use such an instrument to record MIDI Regions. In this situation, the tablature notation is displayed exactly as the music was played during recording.

Inv.Ch-1, Inv.Ch-2
These modes have been created for the purpose of recording and notating electric bass parts with Guitar-To-MIDI-Converters. "–2" is designed for four-string bass, "–1" for five-string bass (with an additional high B string). The principle is the same as *Inv.Chan*, but the number of the MIDI channel is reduced by 1 or 2, in order to convert the channels properly for bass string assignment.

The string assignment for a four-string bass will be 3 to 6, and 2 to 6 (counted from highest to lowest string in both cases) for a five-string bass, just as with guitar strings that sound one octave higher. Notes on channel 1 will be assigned to the highest string.

In all of these assign modes, notes below the lowest string are not displayed at all. A further point to note is that notes can generally only be assigned to strings on which they are actually playable. (F2 can only be played on the lowest string of a guitar, so the channel assignment is completely ignored in this case).

You can create a two-stave Score Style that displays the MIDI Region twice: once using regular music notation, and once as tablature. The indicated split point can be ignored in this situation. A default style for this (named *Guitar Mix*) is in the Logic default song.

Some More Information Concerning Tablature Notation in Logic:
- You cannot insert clef changes in staves using tablature. If you want to change between tablature and regular notation in the same staff, you need to cut the MIDI Region, and assign the desired Score Styles (see "Basics" on page 380) to the resulting Regions.
- Guitar tablature relates to a regular treble clef. If you use the octave-transposing treble clef (Treble-8) for guitar notation (as done in most guitar music, and in the example), you need to set the tablature's *Transpose* parameter to +12 in the Score Style window.

MIDI Meaning

The settings in this window determine, if and to what extent, the insertion of the symbols listed here affect the MIDI playback of notes that these symbols are attached to. The window is opened from the *Layout > MIDI Meaning* menu.

Two parameters can be determined for each symbol listed here. These symbols change the MIDI output of all notes they are attached to:

Velocity
This value is added to, or subtracted from the original velocity value of the corresponding note.

Length
The original note length is shortened in accordance with the percentage chosen here. This only affects the playback of the note, not the score display. The note length change can be seen in the Event Parameter box or in the Event Editor window.

How It Works

The MIDI Meaning functions are most useful to users who insert notes with the mouse. This makes it possible to work as if writing music on paper. First, you write/insert the notes. They will all have the same velocity, and identical rhythmic note values will have exactly the same length. Accents and phrasing marks are then attached to some of the notes, which changes the velocity and (playback) length of these notes. This makes playback sound much more realistic and "alive".

The default settings in this window (in new songs) are 0 for velocity, and 100% (no change) for length. If you don't change these values, the symbols will remain purely graphic and will not affect MIDI playback. If you record your Regions in real time, it's better to leave these settings at the defaults, as the notes probably already sound the way you want them to.

Important: If you do use MIDI Meaning, you need to adjust the settings before you begin to insert accents and so on. This is because the settings have no influence on accents and phrasing marks that have already been inserted.

Once set, the velocity and length of notes will be changed as soon as you attach one of these symbols to a note. When you delete the symbol, note velocity and length are reset to their initial values.

Color

Layout > Colors opens the color palette for the currently active song:

These color palettes are used by different coloring modes. Clicking on any color opens the standard color editing window, allowing this particular color to be changed.

Colors are saved with the song, and can be different in each song. They can be imported from any other song via *Options > Import Settings > Score Settings*.

There are three palettes, and some additional options in this window:
- *Pitch Colors*: Each note of the octave is assigned a color, they are arranged like piano keys. Diatonic/Chromatic determines whether there are twelve or seven different colors.
- *Velocity Colors*: These eight colors are applied in accordance with the MIDI velocity of notes, from left (minimum) to right (maximum).
- *User Palette*: These colors can be freely edited and named, using the text entry boxes beside them. These names are displayed as color options in different color selection menus (Score Styles (see "Basics" on page 380), Note Attributes (see "Note Attributes" on page 398)).
- *Note Color Options*: These options determine whether accidentals, dots, stems, and beams are displayed in color (according to their note associations), or in black. Rests refer to user rests, which are mainly used in polyphonic Score Styles.

Score Preferences

The Score Preference settings are global settings, which are saved when you quit Logic, and are effective for all song files. They can, however, be changed at any time, with an immediate effect on all open songs.

You can open the Score Preferences via:
- Local Score menu—*Options > Preferences > Score Preferences…*
- Global menu—Logic Menu > *Preferences > Score Preferences…*
- Key command *Score Preferences*
- Directly from one of the other pages in the Preferences window, via the pull-down menu.

Dashed Song Position Line

Determines if the Song Position Line in the Score Editor window is displayed as a solid line, or as a dashed line.

Show Sequence Selection Colored
If this option is activated, the stave lines of the currently selected MIDI Region are displayed in color (blue), all other Regions are displayed with black lines. This can be useful when changing the display parameters of Regions, as the parameters in the Display Parameter box (see "The Display Parameter Box" on page 374) only refer to the currently selected MIDI Region/s. If it is not activated, all staves will be displayed in black, whether selected or not.

Fast (Lower Resolution) Curves on Screen
This is mainly relevant for slower computers. The curves in slurs and score brackets are displayed at a lower resolution on the screen, which speeds up screen redraws. This setting does not affect the printout.

Display All Distance Values in Inches
This relates to the measurement units in the Song Settings and page rulers (Page Edit view only), which can be in inches or centimeters.

Use external Symbol Font (if Available)/Only for Printout
This option activates the use of the external fonts (see "Printout" on page 341) for display and printing of the whole score.

Open Floating Palettes
Default Setting for the shape of Part box Floating Palettes (see "Selecting and Inserting Part Box Objects" on page 348).

Double Click Note to Open…
This setting determines the editing window that will open when you double-click on a note head: Note Attributes, Event List, Hyper Editor, or Matrix Editor.

Graphic Export Resolution, Graphic Export to…, PICT File Creator ID
Parameters concerning the PICT Export function with the Camera tool (see "Graphic Export" on page 342).

Auto Split Notes at…
This parameter is only relevant if the chosen default Score Style (on the recording track) is polyphonic, and is using MIDI channels for Voice assignment. In this situation, newly recorded notes are automatically saved with the different MIDI channels used in the corresponding Score Style. They are allocated as per the split point set here.

Text: Input and Display
Text Styles
All text elements in Logic refer to user-definable default settings called *Text Styles*. You can assign any of the predefined Text Styles to text inserted into the score. This saves you from setting all text attributes, such as font, size, style, and so on, every time you insert a new text object.

Text Styles
All Text Styles used in a song are listed in the Text Style window. This window allows you to edit existing Text Styles, or create new ones. You can open this window in the following ways:
- Menu *Text > Text Styles…*
- Double-click on the Text Style name in the Event Parameter box (only visible if either; text objects or no objects are selected)

The first eleven lines contain the *System Text Styles*, which exist in every song (but can be edited, according to personal preference). Below these (separated by the slightly thicker horizontal line), you will find the user-created Text Styles. Text Styles are saved with the song file, allowing them to be different for each song.

Each line shows the Name and Font (selectable via the pull-down menu) of the Text Style, followed by its Size and different columns for the style attributes (activated by a click in the corresponding field): bold, underline, italic, outline, and circled. The circled attribute draws a circle around the text, which is stretched horizontally with longer text.

You can edit these settings for both the System and User Text Styles. Any text fonts installed on your system can be used.

The System Text Styles
Plain Text
The default setting for "regular" text

Page Numbers, Bar Numbers, Instrument Names
The Text Styles for automatic page and bar numbering, and display of instrument names. These functions are described in detail in the Numbers & Names section (see "Numbers & Names" on page 414).

These Styles can also be edited in the *Layout > Numbers & Names* window. Changes in one of the two windows automatically update the settings in the other window, and affect the whole song.

Tuplets
The Text Style for triplet and other tuplet numbers.

Repeat Endings
The Text Style for anything written into the repeat ending boxes (usually just numbers, but text can also be entered).

Chord Root, Chord Extension
Used for the display of chord symbols. Root concerns the root and the (optional) extra bass note in chord symbols, and Extension is anything else.

Multiple Rests
The Text Style for the number above multiple rests.

Tablature
Used for the display of fret numbers in guitar tablature (see "Guitar Tablature" on page 419).

Tempo Symbols
Used for the display of the numbers in tempo symbols (see "Tempo and Swing Symbols" on page 368), which can be inserted from the Part box.

Creating Additional Text Styles
Select *New > New Text Style*: a new line will appear below the bottom Text Style entry, allowing you to define the attributes of the new Text Style(s). The names of any new style can be edited in the text entry field, which opens when you click on the name of the Text Style.

Changing the Same Font in Several Text Styles Simultaneously
If you change a Text Style's font (pull-down menu) while holding Option, the change will affect all Text Styles that use the same font. This is a quick method for changing Logic's default Text Styles to preferred fonts, for example.

This method is also especially useful if you load a Logic song which was created on another computer, and uses text fonts that aren't installed on your system (if this is the case, a warning message is displayed when you open the song). The names of unavailable fonts are displayed in parentheses in the Text Style window.

Font References
When you activate *Options > Show Font References*, any Text Styles which were created by directly editing a text object's attributes in the Event Parameter box, or from the Text menu, are listed as Font References. *Delete Unused Font References* deletes any Font References that are no longer in use. Edits to Font References aren't possible in the Text Style window, with the exception of changing the font. This display option is primarily used to replace missing fonts in Font References.

Music Fonts as Fonts for Text Styles

Musical Symbol Fonts do not contain letters. They only contain musical symbols. Text objects that use these fonts in Text Styles can be used for free positioning of musical symbols anywhere in the score. (Such as special percussion symbols).

Text Input

TEXT   LYRIC   CHORD SEQ   INSTR
SONG   DATE

To insert text in the score, you need to get a Text object from the Part box, and drag it to the desired position with the mouse. During this procedure, the mouse cursor becomes the Text tool. You can also grab the Text tool from the Toolbox, and use it directly for text input. Each Text object (except text in the Header, directly at the page margins, or outside the margins) is saved as a Meta Event within a particular MIDI Region, at a certain bar position. This position can be seen in the Help Tag, as you insert the text object. Text events are also visible in the Event Editor, allowing you to change their position, but not the text itself.

Following the insertion of the text object at the desired position (and releasing the mouse button), a flashing text cursor appears at that position. Now you can enter text with the computer keyboard. The basic functions for moving the cursor, deleting parts of the text and so on are as per most word processors.
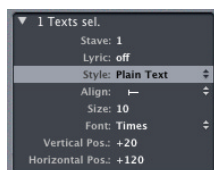
As long as you are in text entry mode (indicated by the flashing text cursor), you can click on any position in the text to place the cursor there. You can also select parts of the text by dragging the mouse, and applying the usual cut/copy/paste commands. Press Return, or click anywhere outside the text, to leave text entry mode.

The newly inserted or edited text object is selected (the text flashes), and you can see its parameters in the Event Parameter box:

Stave
Only relevant in multi-stave Score Styles. It determines the staff that the Text object is assigned to. The *vert.pos* parameter measures the vertical distance to the top line of the staff, which is indicated here. The *hor.pos* indicates the graphical horizontal deviation of the selected text object from its actual bar position (also in relation to the Align parameter).

Lyric On
Defines the text object as a Lyric Event (song text). If a Lyric Event is placed at the same bar position as a note (above or below it), the horizontal distance to the previous and subsequent notes or rests is automatically expanded, providing enough space for the text.

Style
The Text Style of the selected text object.

Align
Determines the horizontal alignment of the Text object. The first three settings relate to the bar position, the last three to the position on the page (each, left, centered, or right).
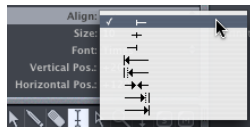
Size, Font
You can change the size and font of each individual Text object, independent of the initially chosen Text Style, which serves as the default setting.

You can also change the font, size, style, and alignment settings of Text objects via the sub-menus in the *Text* menu, while the desired Text objects are selected.

Generally, you shouldn't make these changes here, but rather create new Text Styles in the Text Style window, thereby making them available for other Text objects.

Simultaneous Text Input Into Several Staves
This works as per other objects (see "Simultaneous Input of Objects Into Several Regions" on page 346).

Example: simultaneous insertion of the text "accelerando al fine" into all instruments.

Editing Text

If a Text object is selected, its parameters can be edited in the Event Parameter box. If you want to edit the text itself, either click on it with the Text tool or double-click on it with the pointer tool. The flashing text cursor will reappear.

Deleting Text Objects

As with all other objects, selected Text objects (or selected text inside a Text object) can be deleted by pressing Backspace.

Copying Text Objects

Copying entire Text objects can be done with the usual methods:
- *Copy/Paste, Multiple Paste* and *Paste at original Position*
- Option-dragging, but this only works inside the same MIDI Region.

Global Text

Global Text objects appear in all Instrument Sets of a song (score, parts, and so on), although they are inserted just once. The position of Global Text does not relate to bar positions (unlike regular Text objects), but is defined as a graphic position on the page. Given this behavior, Global Text can only be inserted and seen in Page Edit view. The most obvious example of a Global Text object is a song name header line.

Input of Global Text

A Text object is automatically made "global" if inserted into one of the following areas on the page:
- In the Header space (which is set in *Layout > Global Format*)
- Outside, or directly on, any of the page margin lines

Following insertion of a Text object in one of these areas, and text entry, you will see an Event Parameter box that contains some additional parameters:

Pages
Defines the pages that text will be displayed on:

1 = first page, 2 = all pages except the first one, Odd = all pages with odd numbers, Even = all pages with even numbers, All =all pages.

Zone
The margin area that the text belongs to/is associated with: Top, Header, Side, Footer.

Align
You'll find two additional alignment options in this pull-down menu: for right and left alignment. You may select between alignment at the set page margin, or at the outermost possible position. Although alignments relating to bar positions are shown in the pull-down menu, they cannot be selected here.

Style, Size
These work as per regular Text objects.

Positioning of Global Text
Following insertion into one of the margin areas, Global Text can be moved anywhere on the page with the mouse. The regular mouse cursor (the Pointer tool) only allows vertical movement of a Global Text object. Hold down Option to move it horizontally.

Automatic Text Objects

The Text group in the Part box contains four objects which represent names that are automatically displayed, if inserted:

SEQ = Sequence/Folder: displays the name of the current Display Level. This can be a MIDI Region, a folder, or even the name of the song file (on the highest level).

INSTR: The name of the currently displayed Instrument Set (see "Instrument Sets and Score Display Levels" on page 401)

SONG: The name of the song file

DATE: The current date (at the time of printout)

These automatic Text objects can be inserted as both Global Text (in the margin areas), or as Text objects that are related to a bar position (in one of the staves/Regions). The appearance and exact positioning of these objects can be set in the Event Parameter box.

An Automatic Text Example
Insert the *INSTR* object above the top margin (centered, *Pages* set to 2). It will automatically be treated as a Global Text object. Now, create an Instrument Set (see "Instrument Sets and Score Display Levels" on page 401) named "Score" in the Instrument Set window. If you use this Instrument Set, a "Score" line will appear at the top of every page, except the first one. If you now extract parts for the individual instruments, each part will display the (track) instrument's name at the top of every page, except the first one.

Lyrics

There is a Part box object named *LYRIC*, which is designed for lyric entry. You should select the Text Style that you want to use for lyric entry prior to commencing lyric input. This is done in the Event Parameter box, with no object selected (indicated by "Default Inserts" in the title line of the box). Just click on any empty spot in the Score window, to deselect everything.

Now drag the *LYRIC* object below the first note of the melody, or click at that position with the Text tool. Watch the Help Tag: each LYRIC object must be at the same bar position as the note it belongs to (taking display quantization into account). Now, enter the text for the first note—and press Tab, not Return—which automatically moves the text cursor to the beginning of the next MIDI note. If a MIDI note is displayed as several tied (graphic) notes, press Shift-Tab to move the cursor to the next graphic note. This allows you to write several syllables below one longer note.

This method enables you to enter all lyrics in one process, although each syllable is saved as an independent LYRIC object.

Editing lyrics is just like editing regular text. The Event Parameter box displays the same parameters (with *LYRIC* is set to *on*).

Apart from the fast input mode (using Tab), the only difference between regular Text objects and Lyric objects is that the latter affect the distance between the notes they are assigned to. This provides enough space for the text to be displayed properly, without overlapping. If the text (or Text Style) is changed later on, the note distance will be recalculated accordingly.

Some Hints for Working With Lyrics

Setting all Words and Syllables to the Same Height

If you don't enter the lyrics in one continuous process, as described, the Lyric objects probably won't be set to the same vertical position. To quickly set all Lyric objects to the same height (*vert.pos*), select at least one Lyric object, then choose *Edit > Select Similar Objects*. This will highlight all Lyric objects. Now select the *Align Object Positions Vertically* key command.

Note: You do not want to use this method if there are multiple lines of lyrics for different verses. Doing so would set them all to the same height.

Several Verses Written below each other

There can be several Lyric objects assigned to the same note, enabling you to insert several verses for a song, one below the other. Start with the first verse and make sure the vertical distance to the notes is correct. Then start with the input of the second verse. As long as you stay in fast lyric input mode, all Lyric objects for the second verse will stay at the same height as the initial object—in this case, the first word of the second verse.

Note: It is important that Lyric objects are assigned to the right MIDI Region, if you're working in a full score display (Remember: selected staves are displayed with blue stave lines). It's generally recommended that you insert lyrics in linear view, and single MIDI Region display mode—especially if inserting more than one verse. In linear view, it's also easier to rubber band select several Lyric objects, to change all of their positions, for example.

Chord Symbols
Inserting Chord Symbols

Chord symbols (*CHORD* text object) are inserted into the score like regular Text objects, with the mouse from the Part box, or directly with the Text tool, while holding Option. A text cursor will appear. You first need to enter the root of the chord, and then any additional information.

Important: Ensure that you insert chord symbols at the correct bar position. Watch the Help Tag as you insert the chord object.

A chord symbol can include a root note, a separate bass note, and two lines of extensions. Try to insert a simple chord symbol first. Type *Eb7* and press Enter. The result will look like this:

$$E\flat^{7}$$

Now double-click on the root Eb. The following edit window will open:
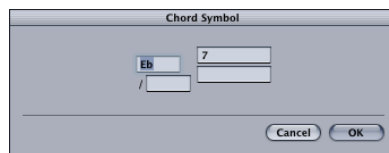
There are four entry fields for the different parts: one for the root, one for an additional bass note and two for extensions, which are placed above each other. If you click on any of these options, an entry field opens, allowing you to edit the chord symbol or enter the desired additional information.

As you enter the text for the chord in the Score window, you can influence the way the inserted text is distributed to the different fields of the Chord Symbol Edit Box:
• First, enter the root, then the extensions, then—after typing a slash—the (optional) additional bass note.
• As soon as you enter a number, everything following it will be placed in the upper extension line. If you write "G7(b9/b13)", the whole "7(b9/b13)" will be placed in the upper line, and the lower line remains blank.

- If you write letters before a number (FMAJ7/9, for example), Logic places the letters in the lower line, and everything after the first number in the upper line.
- You can influence this automatic placement by entering a comma in the text: everything before the comma will be placed in the lower line, and everything after it, into the upper line. Only one comma can be used. If multiple commas are entered, only the first one is relevant, and the others are ignored. Blank spaces can be entered, to create additional horizontal space between the extension and the root.

If you want to change a chord symbol, you can either double-click on the root, and edit the chord symbol in the resulting edit window, or double-click directly on one of the extensions. A text cursor will appear in the extension line, allowing you to edit the extension as per regular text.

The appearance of chord symbols can be edited in the Text Style window (see "Text Styles" on page 425), allowing you to choose different Text Styles for the root—*Chord Root*—and the extensions—*Chord Extensions*.

Handling Chord Symbols

Fast Input of Several Chord Symbols in One Process

If you want to insert several chord symbols into the same staff, there is a shortcut similar to the fast lyric input mode available. Following text entry of the first chord, press Tab, rather than Return. The text cursor automatically moves to the position of the next (displayed) note or rest. Enter the desired chord and repeat the process, or press Tab several times, to move to the target position for the next chord symbol.

Hint: if you want to insert exactly one chord per bar into a very busy part, it's much faster to create an empty MIDI Region, and enter the desired chords into it (the cursor moves to the next bar when you press Tab in empty Regions). Following chord entry, you can either merge the MIDI Region with the original MIDI Region in the Arrange window, or copy and paste all chords at once.

Enharmonic Change of Chord Symbols

The roots of chord symbols can be enharmonically changed with the same commands available to notes (*Attributes > Accidentals* or key commands). An example: "Gb7" becomes "F#7" by selecting *Attributes > Accidentals > Enharmonic Shift: #*. Only additional bass notes need to be edited directly in the Chord Edit window.

Transposition of Chord Symbols

Chord symbols in transposing Score Styles are automatically transposed, just like notes. Further to this, if the *Transpose* parameter (for playback transposition) in the *Region Parameter box* (Arrange window) is changed, all chord symbols in the MIDI Region will be affected accordingly.

German Chord Symbols: "H" Instead of "B"

If the *German Chord Symbols* option is activated in the *Global Format* dialog window, the note "*B*" in chord symbols is globally displayed with its German name "*H*". The English "*B flat*" is written as "*B*", according to its German name. This option is activated automatically, as soon as the letter "*H*" is used during chord symbol input.

Copying Chord Symbols

Chord symbols can be copied and pasted with the usual *Copy/Paste*, *Multiple Paste*, and *Paste at original Position* commands, or by Option-dragging them (if inside the same MIDI Region).

Precise Graphical Position of Chord Symbols

Horizontal Position: Bar Position, Align, Hor.Pos

Each chord symbol is stored as part of a MIDI Region at a certain bar position (there will often also be a note at that same bar position). This is the main parameter for horizontal placement in the staff.

The *Align* parameter determines which part of the chord symbol is aligned to the bar position: the left edge, center, or right edge of the letter representing the chord root. This is set via a pull-down menu in the Event Parameter box. The setting for newly inserted chord symbols is always *def.*: in this case, alignment is dependent on the global *Chord Symbol Alignment* setting in the *Extended Layout Parameters* window.

This window contains the same four alignment options: left, centered, right, and "| —". The last option in this list should only be used when loading a song with chord symbols that have been inserted or modified in an older Logic version (2.6 or earlier—the alignment parameter was unavailable in these versions). To achieve identical positions to the old version, set the global chord symbol alignment to "| —". As this setting is solely included for backward compatibility, it should not be used in new songs.

In addition to bar position and alignment, you will also find the *hor.pos parameter*. It determines an additional graphical deviation of the chord symbol from the bar position

Be careful: it's easy to unintentionally change a chord symbol's bar position with the Arrow tool. To avoid this, press Control during the procedure: the cursor turns into the Layout tool, limiting changes to vert.pos and hor.pos, but not the bar position itself.

Vertical Position: Vert.Pos, Stave

The *vert.pos* parameter determines the vertical position or height of the chord symbol, above or below the staff. In Score Styles with more than one staff, the *Stave* parameter determines the staff that the *vert.pos* parameter refers to.

A hint: to adjust a number of chord symbols to the same height above (or below) the staff, select them, and use the *Align Object Positions Vertically* key command.

Rhythm Section Parts

To create typical rhythm section parts with chord symbols and Beat Slashes, select a Score Style with a *Rest* parameter set to "Slash".

The Transform Window

The Transform window is a very powerful non-real time processing tool. It enables very specific data event changes to one or multiple MIDI Regions, through the use of user-defined conditions.

This window allows you to select, say, all note events with a velocity that falls between 80 and 86 to be adjusted to a fixed volume of 93. This can be done on one or a thousand MIDI Regions. The alternative of using another Logic editor to do this—note by note—is simply not feasible, or desirable, particularly on a thousand MIDI Regions!

Transform Window—Introduction
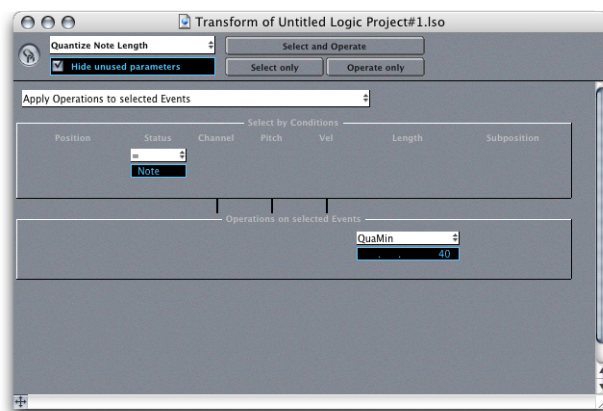
Usage

The Transform window can be used to alter existing events that match user-definable parameters.

The Transform window provides an extremely high degree of flexibility and power for complex edits and transformations of MIDI data.

Opening the Transform Window

Select *Windows* > *Open Transform* (Command-4) to open a new Transform window.

Effective Range

The Transform window is only used to edit events. As with other editors in Logic, the operations are only performed on selected events. These might be:
- All selected events (in one of the editors),
- All events in selected Regions, or
- All events in selected folders.

You can use the link button in the top left corner to link the effective range with other windows.

All selected events on the same display level fall within the effective transform range, as do all events in the selected Region.

The title bar of the Transform window indicates the effective range; the song name and the name of the first selected MIDI Region, if applicable, are shown.

Purpose of the Transform Window

Conditions

This part of a transform function defines which events will be edited. If the *Select and Operate* or *Select Only* options are used, the transformer checks to see whether the individual parts of the events (Position, Status, Channel, and so on) fall within the effective range, as defined in the pull-down menus in the *Select by Conditions* panel.

Operations

The Operations section of the Transform window defines the edit operations that you wish to perform. These operations are defined via the pull-down menus in the *Operations on selected Events* panel.

Actions

The three main buttons at the top of the Transform window work as described below:

Select only

All events (in the effective range) that fulfil the Conditions will be selected, but not transformed. You can use this option to refine your selection, and ensure that your Conditions are set to only affect the events that you truly want to "transform".

Operate only

All selected events are transformed, in accordance with the Operations settings (Conditions has no effect). This is useful if you want to edit events that you've already selected, manually.

Select and Operate
This is a combination of both actions: the events are selected in accordance with the Conditions, and are then transformed as per the Operations settings.

The title bar shows how many events have been selected and/or transformed after each action.

Use of *Select only*, followed by further selections in an editor, allows more refined (and/or safer) transformations—activated with *Operate only*.

Display
The *Hide unused Parameters* checkbox allows you to remove all unused pull-down menus in the Conditions and Operations panels. This provides a better overview of the settings being used, and also protects the hidden menus from any accidental alterations.

Transformation
Mode
Basic operating modes are defined in the pull-down menu above the *Conditions* panel:

Apply Operations to selected Events
As described above, Operations are performed on selected events (default setting).

Apply Operations & Delete unselected Events
The selected events are edited, and all non-selected events are deleted. This ensures that the only events remaining after the transform operation are those that matched the Conditions.

If you set the Operations up correctly, you can use the Transform window as a programmable filter in this mode—where only events that match the Conditions survive.

Delete selected Events
The selected events are deleted.

In this mode, you can use the Transform window as a programmable erase function. All events that match the Condition are deleted, and all other events remain unchanged. The Operations setting is irrelevant in this mode.

Copy selected Events & Apply Operations
The selected events are retained in their original form, as well as being copied and edited.

You can use this mode for applications such as:

Imagine you want to add a mod wheel controller event (#1) 10 ticks before each note, with a value that matches the note's velocity. To do this, you set *Status = Note* in *Conditions*. In *Operations*, set the *Position* to *Add* and enter a value of *10* in the field below it. Set *Status* as *Fix Control* and *Pitch (-1-)* as *Fix 1*. The last of these operations means "the first data byte (-1-) receives the value of 1" (the first data byte defines the controller number for controller events, and mod wheel events happen to be #1).

If we analyze these settings, we see that all note events will be selected for operation. A copy of each will be made, then moved 10 ticks earlier than the original, and converted to CC#1 (Mod Wheel)—with a value that corresponds to the velocity of the original note. This is because the second data byte (Vel) is left unaltered.

Event Parameters
Individual MIDI event parameters have their own columns in the *Conditions* and *Operations* panels:

Position
Time position of the event, referenced to the start of the MIDI Region (not of the song).

Status
Type of event.

Channel
Recorded MIDI channel of the event.

-1-/Pitch
First data byte (note or controller number).

-2-/Vel
Second data byte (velocity or controller value).

Length
Length of the note.

Subposition
Time position of the event, within a bar.

Conditions
The middle section of the window (*Conditions*) defines the conditions that determine which events are selected for edit operations. Each column represents a different MIDI event parameter.

The condition is considered to be fulfilled when an event matches the defined effective range of all event parameters. These ranges are determined in the pull-down menus found under each of the event parameter columns (except the Status column). The possible value conditions are listed below.

The *All* setting in the top box means that all values fulfil the conditions, making all other boxes in the same column superfluous.

Conditions for the Status

You have a choice of just two settings here, *All* (means all event types fulfil the condition) and "=". Clicking in the box below opens a pull-down menu, where you can select; note, poly pressure, control change, program change, channel pressure, or pitch bend.

Conditions for the values of Position, Cha, -1-/Pitch, -2-/Vel, Length, and Subposition

You can assign one of the following value conditions for each of the parameters (except the status):

"="
The value in the event and the box below it must be equal, for the condition to be fulfilled.

Unequal
The value in the event and the box below it must be unequal, for the condition to be fulfilled.

Smaller
The value in the event must be smaller than the value in the box below it, for the condition to be fulfilled.

Larger
The value in the event must be larger than the value in the box below it, for the condition to be fulfilled.

Inside
The value in the event must be within the value range of both boxes below it, for the condition to be fulfilled.

Outside
The value in the event must be outside the value range of both boxes below it, for the condition to be fulfilled.

Exchanging Parameter Values

You can replace the value of each of the three event parameters: *Cha*, *-1-/Pitch* and *-2-/ Vel* with the value of a different parameter from this group. Click on the lines between the Conditions and Operations fields to change the source for the parameter value. Note that the value is exchanged first, and then the operation is performed.
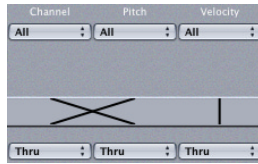
Operations

The bottom part of the window (*Operations*) defines the changes to events that meet the Conditions, and offers separate columns for each MIDI event parameter.

The *Thru* setting in the top box means that the relevant event type passes through unaltered, making the other boxes in the same column superfluous.

Status Operations

Thru
The event type passes through unaltered.

Fix
The event type is altered. Clicking in the box below opens a pull-down menu, where you can choose between; note, poly pressure, control change, program change, channel pressure, or pitch bend.

Operations on the Values of Position, Cha, -1-/Pitch, -2-/Vel, Length, Subposition

For all parameters (except status), the top box determines the type of operation that is performed, using the values defined in the boxes below (referred to as the "set value" below). The following operations are identical for the channel and the first or second data byte, with the value ranges being automatically adjusted in the boxes below.

Fix
The parameter is fixed to the set value.

Add
The set value is added.

Sub
The set value is subtracted.

Min

Parameter values lower than the set value are replaced by it. Larger parameter values remain unaltered.

Max

Parameter values that exceed the set value are replaced by it. Smaller parameter values remain unaltered.

Flip

The parameter values are reversed around a set point. Values above this amount are moved to the same distance below it and vice versa.

Mul

The parameter value is multiplied by the set value (4 decimal places).

Div

The parameter value is divided by the set value (4 decimal places).

Scale

The parameter value is multiplied by the top value, and the bottom value is then added. This is a combination of *Mul* and *Add*. Negative values can be used to generate an inversion of the plus/minus sign, and subtraction, rather than addition.

Range

Parameter values outside the set value range are replaced by the values of the (range) "limits" (combination of *Min* and *Max*).

Random

Random values are generated within the set limits.

+—Rand.

A random value between zero and the set value (positive or negative) is added.

Reverse

The parameter value is reversed within its value range (no value can be set here).

Quantize

The parameter value is quantized to a multiple of the set value.

Qua & Min

Like *Quantize*, but the quantization does not fall below the set value (a combination of the *Quantize & Min* functions, with the same set value).

Exponent.
The parameter value is scaled exponentially. The extreme values (0 and 127) remain unaltered. The set value determines the shape of the curve. Positive values result in the exponential scaling of data (increasing input values remain lower for longer, and then rise quickly), and negative values result in the logarithmic scaling of data (decreasing input values remain higher for longer, and then drop off more quickly).

Crescendo
This only works if the *Inside* position condition is selected (crescendos need start and end points.). Crescendo creates a smooth alteration of the current parameters, between the set value boundaries.

Rel.Cres
This only works if the *Inside* position condition is selected. The effect is similar to that achieved by Crescendo, but the previous values of the parameters being altered are taken into account when the crescendo is created, preserving the relative feel of the original.

Use Map
The set Map will be used when this operation is selected.

Parameter Sets
Presets
The twelve items in the pull-down menu are write-protected presets. You can alter the presets temporarily, but any changes you make will be discarded when you leave the preset. Here is a list of the Presets:

- Crescendo
- Scale 14 bit PitchBd (Pitch Bend data will be scaled, keeping the 14 bit information intact)
- Double Speed (doubles the tempo by halving positions and lengths)
- Half Speed (halves the tempo by doubling positions and lengths)
- Humanize (adds a random value to the position, velocity, and length of notes)
- Reverse Position (reverses the positions of notes within a section)
- Reverse Pitch (inverts the pitch)
- Transpose (transposes the notes)
- Exponential Velocity (alters the scaling of the velocity curve)
- Velocity Limiter (limits the velocity)
- Fixed Note Length (creates constant note lengths)
- Maximum Note Length (limits the maximum note length)
- Minimum Note Length (limits the minimum note length)
- Quantize Note Length (quantizes the note length).

Recalling Presets

Individual Transform sets can be selected directly via *Functions > Transform* submenu in the Event, Matrix, and Hyper Editor windows.

Tempo

17

Logic provides several different tools and methods to create and edit tempo events.

This chapter discusses these tools, and covers the possible interactions between tempo events and MIDI and Audio Regions.

Display and Functions

Tempo Display

If your song has a tempo that stays the same throughout, you can set this constant tempo in the Transport window.

The current tempo is always displayed here, even if you're using programmed tempo changes or external synchronization.

You can set the tempo display format on the *Preferences > Display > Global* preferences page.

Tempo Track

Tempo changes are controlled by tempo events, which are stored in a special Tempo track. This track can be displayed by choosing *View > Global Track Components > Tempo*. The Tempo track applies to the whole song. The tempo track also determines the relationship between incoming time code and the current song position.

Recording Tempo Changes

Open *File > Song Settings > Recording* and activate the *Allow Tempo Change Recording* checkbox. All tempo alterations made during recording are automatically stored as tempo events on the Tempo track. These events can be edited in one of the tempo editors.

Adjusting the Tempo to Fit Regions

The *Options > Tempo Adjust Tempo using Region Length and Locators* command adjusts the MIDI tempo, making the length of the selected Audio Region exactly match the distance between the locators (Cycle area). If you want to use this function to adapt the MIDI tempo to match the tempo of a drum loop, make sure that the drum loop is cycling smoothly (use the Sample Editor for this), and that the length of the Region corresponds exactly to a specific musical length of the audio material. As an example, to ensure that the Region measures exactly two bars when played back, set a Cycle to match the musical length of the Region (two bars, in this case), and select *Options > Tempo > Adjust Tempo using Region Length and Locators*.

Tempo List Editor

You can open the Tempo List by clicking and holding on the Transport's Sync button with the mouse. A pull-down menu will appear, allowing you to select *Open Tempo List* or you can simply select *Options > Tempo > Tempo List Editor*.

Note: The layout, and way you use the Tempo List, are very similar to the Event List (see "Using the Event List" on page 297).

To create a tempo change in the Tempo List:

1 Set the song position to the required point.

2 Click the *Create* button.

3 A tempo event (of the current song tempo) appears. You can alter the tempo in the tempo column.

You can also use the Pencil tool to create a tempo change:

1 Click on the word "Tempo" in an existing tempo event with the pencil tool.

2 A new tempo event will appear, accompanied by an open position input box. Enter the required bar position and press Enter.

To delete tempo changes in the Tempo List:

▪ You can delete tempo events by clicking them with the eraser, or pressing Backspace.

To copy a tempo change from a passage:

1 Set the locators to the passage containing the correct tempo change.

2 Choose *Edit > Select Inside Locators*.

3 Copy the tempo events to the Clipboard (Command-C).

4 Deselect all tempo events (by clicking the background).

5   Paste the tempo events from the Clipboard (Command-V).

6   A position input box appears at the first tempo event, allowing you to alter the bar position. If the first tempo change is not at the start of the bar in the passage, be sure to alter the bar number, and leave the beat, sub beat and frame or tick values unaltered.

7   Press Enter. The copied tempo changes will be selected, and you can undo the operation if necessary.

Other Functions

The entries in the tempo list interact with and affect each other. You can also make several synchronization settings here. All other functions are identical to those in the Event List (see "Using the Event List" on page 297).

Synchronization

Logic can be synchronized with external hardware and software via a number of different synchronization protocols.

This chapter discusses the synchronization of Logic—as both synchronization master and slave—in a number of different situations.

Functions

Switching on External Sync

Activation of the Transport *Sync* button synchronizes Logic to the chosen sync source.

You can use the *Sync* button to turn off external sync at any time, without changing your selected sync source. This allows you to temporarily remove Logic from the sync master's time axis. This could prove useful if you need to quickly edit a MIDI Region while the external sync source (tape machine, VTR, and so on) is still running, for example.

Recording With External Synchronization

When *Record* is pressed during external synchronization, Logic enters record mode, but does not start until it detects external time code.

Incoming MIDI Time Code Display

The flashing dot on the Transport window's Sync button indicates that Logic is receiving error-free MIDI time code.

If the dot "sticks", an error has occurred. Although Logic is capable of dealing with many MTC errors, you should nevertheless check the quality of your SMPTE signal, as well as any other potential error sources.

MTC Interpretation

As the MIDI standard only supports four of the possible six time code formats (the 30 fps and 29.97 fps formats cannot be differentiated), Logic needs to decide which format is "intended", when it encounters incoming time code:

Incoming MTC format is interpreted as:
- 24 fps–24 fps
- 25 fps–25 fps
- 30 drop fps–29.97 drop fps
- 30 fps–30 fps

In other words, the much more commonly used 29.97 fps and 30 drop fps formats are used in place of the uncommon 30 fps, and the virtually-unheard-of 29.97 drop fps formats.

You can, however, manually set the format to whatever you like in the *Song Settings > General > Frame Rate* pull-down menu: to convert material to 30 fps for black and white TV transmission in the NTSC format, for example.

Receiving MIDI Clock/SPP

Synchronization via MIDI Clock/SPP is the most accurate method to use—if Logic is being synchronized to a bar-referenced master.

MIDI Clock has a resolution of 24 PPQN (pulses per quarter note), while Logic has an internal resolution of 960 PPQN (some 40 times more accurate). For this reason, Logic needs to interpolate the 39 steps between two incoming clock pulses.

If you experience small variations in the timing between master and slave, you can tighten the sync (when in external sync mode) by entering the expected tempo changes from the master into Logic's internal tempo list as well.

Even if you don't take this step, synchronization should still be fairly tight, as long as you avoid large deviations, such as an internal setting of 200 bpm, with an external tempo of 40 bpm.

Continue Event

When a MIDI Continue Event is received, Logic doesn't leap to the last valid position received via MIDI Clock. Rather, playback continues from the current song position. This allows you to manually change the song position while the sequencer is stopped, and then restart from the new position, with a MIDI Continue command.

Synchronization Window

Overview

You can open this window from the Arrange window using *File > Song Settings > Synchronization*, or by click-holding the Sync button in the Transport window.

At the top, there are tabs for selecting the various pages: General, Audio, MIDI, Unitor.

General

This page of the synchronization window contains the major synchronization parameters for running Logic as a slave.

Audio

This page of the synchronization dialog window contains all parameters relevant to synchronizing Audio and MIDI.

MIDI

This page configures Logic to send timecode via MIDI, when the sequencer is running. This enables you to synchronize external devices as slaves to Logic, which acts as the master.

Unitor

This page is used to set the major synchronization parameters for the Unitor8.

General

Sync Mode

This parameter defines the master that Logic is synchronized to:

Internal

Logic's internal timer. Logic is the master. External devices can be synchronized via MIDI Clock or MTC (the relevant settings are made on the MIDI page).

MTC

MIDI Time Code mode. Logic runs as a slave. MIDI Time Code can either arrive at a MIDI In port, or be generated by a MIDI interface that "translates" it from incoming SMPTE time code.

MIDI Clock

MIDI Clock and Song Position Pointer. Logic runs as a slave. Clock and SPP can be received at any MIDI input.

Auto Enable external Sync

When this option is activated, Logic runs as the master (Internal sync mode), until it receives a synchronization signal—either in the form of MTC, Clock/SPP, or from the tempo interpreter.

Logic automatically locks to the first synchronization signal it receives. Please ensure that different synchronization signals don't arrive simultaneously—there can only be one time code master.

Frame Rate

This is where you set the frame rate (in "fps", frames per second). This frame rate applies to both transmitted and received time code.

Frame rate and typical applications
- *24*: Film
- *25*: Audio (Europe) and PAL Video
- *(30 d)*: Unusable (not realtime)
- *30*: Audio (USA) and NTSC Video (s/w)
- *29.97 d*: Audio (USA) and NTSC Video (color)
- *29.97*: Extremely rare (not realtime)

"d" stands for "drop frame". In "drop frame" formats, certain frames are left out, following a regular pattern. To distinguish between them, formats without drop frame are sometimes referred to as "nd" or "non drop".

Auto Detect Format of MTC

This checkbox, when active, analyzes the incoming time code and automatically sets the correct frame rate. You should generally leave this option switched on.

Please note that it is not possible to automatically distinguish between MTC frame rates of 29.97 and 30 because:
- the MTC standard does not allow a distinction, and
- a measured rate of 30 fps could also be 29.97 fps time code running too fast, and vice versa.

Logic automatically interprets frame rates of "approximately 30 fps" as either 29.97 df or 30 nd, depending on whether or not the drop frame format is used. This interpretation will usually be correct, because only these two formats are actually used as a standard.

"Auto Detect" only switches to 29.97 df or 30 nd if one of the other conventional formats was previously set. If you want to synchronize Logic to one of these unconventional frame rates, you need to define the format manually. This setting will not be altered by "Auto Detect".

Validate MTC

This pull-down menu option allows you to specify how often Logic checks for incoming time code, in order to ensure synchronization. In general, you should leave this option set to *always*. There are some devices, however, that generate timecode pulses that may require a specific number of frames to be set, in order to maintain synchronization. The *never, Jam Sync* option basically sets Logic to "free-wheel" if synchronization is lost. In other words, Logic will run on its own internal clock (at the most recently received tempo) if the synchronization pulse is lost. This approach ensures that recording will continue, even if the incoming timing pulse fails.

SMPTE Offset

This is where you set the SMPTE offset for the song. As songs don't always need to start precisely at bar 1, you can select any bar position to be played at the set SMPTE time.

The preset is 1/1/1/1 at 1:00:00:00. The SMPTE offset 1:00:00:00 is normally used, because it allows you to pre-roll an amount of time code.

Audio
MTC [fps]

This display shows the deviation between the incoming MTC, and its nominal frame rate.

If the deviation is too large, please make sure that you have set the right frame rate (on the General page of the synchronization window). If in doubt, set the frame rate to 24 fps and switch on *Auto detect format of MTC*.

If the frame rate is correct, you can use this display to adjust the tape speed of the master machine to the nominal value (the same speed used when the time code was recorded). Adjust the varipitch control on the master machine, until the vertical yellow line is centered.

Sample Rate (Hz)

This display shows the deviation of the sample rate from its nominal value.

Bear in mind that some audio hardware will not allow any variation in the sample rate.

Deviation (ms)

This display shows the current phase deviation of the word clock from the time code master—in other words, the deviation between audio and MIDI.

Varying time code signals shown in this display indicate how Logic regulates the sample rate of the hardware, when in *MTC continuous* sync mode. Even large time code variations result in no deviation between audio and MIDI. Your audio hardware must be capable of continuously variable sample rates, for this to function.

Small deviations between audio and MIDI are unavoidable, because MIDI can (and should) follow the time code master directly.

Audio Sync Mode

This is where you define how each individual piece of audio hardware should be synchronized to an external time code master.

Not all audio hardware can work in every sync mode described below. This is particularly dependent on whether or not the hardware's sample rate can be controlled.

MTC Continuous

Audio regions are started in sync, and the sample rate is continuously regulated in accordance with variations in the time code master signal. Even very long audio regions stay in sync in this mode.

MTC Trigger

Audio regions are started in sync, but are then played at a constant sample rate, regardless of any variations in the time code master signal. Logic always uses the set nominal sample rate (44.1, 48, 88.2, 96 kHz).

This mode is suitable when it is vital to retain the absolute pitch of a recording. If the speed of the time code master deviates from the nominal value, you may need to split long Regions into shorter sections.

External or Free

Logic has no influence on the sample rate. The audio hardware is responsible for ensuring that the position and sample rate of audio Regions match. This mode is only advisable if you are sure that the word clock and time code master are running in sync—by using an external SMPTE/wordclock synchronizer, for example.

MIDI

Transmit MIDI Clock

The checkboxes activate transmission of MIDI Clock. The pull-down menus determine the MIDI output ports for the MIDI Clock signal.

The two *Destinations* allow you to specify discrete MIDI ports.

Every time you start, "Song Position Pointer" (SPP) is also sent.

As not all devices can process SPP, the MIDI system realtime "Continue" message is also sent. The exception to this is when you start at position 1 1 1 1. In this situation, the realtime "Start" message is sent.

MIDI Clock can easily be sent with other normal MIDI events (notes, controllers). When using multiport MIDI interfaces (such as the Unitor8), better timing is achieved by sending MIDI Clock to *All* ports, rather than to several individual ports.

If MIDI Clock is transmitted to all ports, the events are only sent once from the computer to the interface. If you address individual ports, one event needs to be sent for each port, placing a higher strain on the bandwidth of all ports.

Transmit MIDI Clock Delay
This parameter allows you to delay the transmitted time code. Negative values mean that the MIDI Clock signal is transmitted earlier. This enables you to compensate for any reaction delays in external MIDI Clock slaves.

Transmit MTC (MIDI Time Code)
The checkboxactivates transmission of MIDI Time Code. The pull-down menu determines the MIDI output port for the MTC signal.

It is not advisable to send MTC to all ports. MTC is very data-intensive, so use a MIDI port that isn't being used for anything else.

Transmit MMC (MIDI Machine Control)
This is where you can switch on transmission of MIDI Machine Control (see "Sync Problems and Solutions" on page 460). These commands are then sent whenever you operate Logic's transport functions (Start, Stop, Rewind, and so on).

MMC is normally used when Logic is running as a slave to an external master (such as an ADAT), and you want to control the external master's transport functions from Logic. Logic therefore acts as MMC master, and MTC slave simultaneously.

If you want to use the external master's transport controls, you don't need to use MMC. In this situation, Logic will follow the MTC master as a slave.

You can also use MMC to place tracks on the MMC slave device into record-enabled mode.

Listen to MMC Input
Logic can be controlled by MMC (MIDI Machine Control) and so-called "Full Frame Messages" (Listen to MMC Input). *Transmit MMC* has been available in Logic for quite some time.

Logic recognizes these commands when "listening" to MMC Input:
• Play
• Deferred Play
• Stop

Deferred Play is a special command for mechanically slow synchronization slaves such as reel-based tape recorders. Rather than having the machine play immediately, it is asked to reach the desired SMPTE position before playback is started. You'll find no difference in Logic's response to the play and deferred play commands, as Logic can locate as quickly as any hard disk recorder.

Logic ignores these messages when incoming external MTC (MIDI Time Code) commands are detected.

Logic also obeys so-called "full frame messages", and sets Logic's song position line to a new location, without starting playback. Once again, incoming MTC data has higher priority, if conflicting information is received.

Some synchronizers send "Full Frame Messages" (instead of MTC) to locate the slave device (Logic in this case) to a new position, without implicitly starting playback. This is useful when in slow shuttle or single frame advance modes with video machines, because the slave device is perfectly located, without being in playback mode.

The MIDI Sync Preferences button launches the MIDI Synchronization preferences window (see "MIDI Preferences: Sync" on page 482).

Unitor
SMPTE Mode
Here, you can instruct the Unitor8 to write SMPTE. You must switch from Read to Generate, and set the frame rate and start-time in the "General" page. In Refresh mode, fresh time code is generated in sync with received time code. "Refresh" works with both VITC and LTC.

You should always use "Refresh" whenever you need to copy an LTC track, because you cannot directly copy LTC without a considerable loss of quality. When copying whole multitrack tapes, you should patch all tracks directly, but refresh the TC track via the Unitor8.

You should only use Refresh mode if you are copying time code.

SMPTE Type
This is where you define the SMPTE format that you want to use:

LTC: Longitudinal Time Code is written to a tape track.

VITC: Vertical Interval (or Vertically Integrated) Time Code is written invisibly to a video tape.

Freewheel
You can set the freewheel time in frames for LTC and VITC. The freewheel parameter affects the SMPTE reader, and specifies how long the synchronizer continues transferring MTC to the sequencer, after time code ceases to be read.

Long freewheel times can maintain synchronization, even if there are drop outs in the time code, but they also increase Logic's reaction time—after the time code master stops. In practice, you should set the value as large as necessary (for sustained operation), and as small as possible (for short waiting times).

TV Format

Allows you to define the television format for time code burn-in:

PAL: The video format used in Europe. If you are working with video in SECAM Norm, select PAL.

NTSC: The video format used in the USA and Canada.

You don't just need this setting when writing and reading VITC. If you're working with LTC, and you want to generate a video picture a with burned-in SMPTE time, you also need to set the correct format here.

VITC Line 1, VITC Line 2

VITC is written into two lines of the video picture, which are normally invisible. The lines should not be adjacent, and are usually situated between 12 and 20.

If "Scan" is enabled, the VITC lines are automatically recognized. You should only enter the lines manually if there are problems with "Scan" mode.

Visible Time Code Display

The parameters allow you to set the position, size, and color of the time code counter window, which is burned-into the video picture.

Bar Ruler—Time Ruler

Positioning Bars to Frames

If you want a particular bar in the song to coincide with a specific SMPTE time, you need to alter the tempo of the preceding passage.

The following procedure will save you from having to do this by trial and error:

1 Open the Tempo List (see "Tempo List Editor" on page 448).

2 Create a tempo event at the desired bar position.

3 Set the desired time position for this tempo event in the SMPTE-Position column. The preceding tempo event is automatically adjusted to generate the correct bar and time position for the inserted tempo event.

4 You can then delete the tempo event you inserted, if you want to keep the same tempo for the following passage.

Sync Problems and Solutions

Faulty Digital Synchronization

If Logic is synchronized to external wordclock (*Audio Sync Mode: External/free*), you must ensure that a valid digital signal is always available. If you encounter error messages such as "Sample Rate xxx kHz recognized" it may be that the DAT recorder (or whatever clock source you have connected to your audio hardware's digital input) does not transmit wordclock in stop or pause mode (or has switched itself off).

Faulty Synchronization to an External Tape Machine

Create a new song, make a new recording and see if that does the trick. Why? If an old recording on tape was not properly synchronized to time code, you won't be able to use it. One basic rule: the playback situation must be identical to the recording situation.

If everything is working fine with the new recording, this means the present setup is okay. Next, check whether anything has changed in your global setup. Has the frame rate changed? Has the tape speed changed? If you have changed a 30 fps setting, try variations such as 30 drop or 29.97.

If MIDI and Audio Are Not Synchronized

Open the *Synchronization > Audio* page and select the *MTC continuous* or *MTC Trigger/ ASD* Audio Sync Mode.

If your audio hardware doesn't support either mode, you should cut extremely long Regions into shorter sections.

If MIDI and SMPTE Are Not Synchronized

Check all frame rate settings. The frame rate of all connected devices must be identical, including the time code on the tape machine, the synchronizer, and in Logic itself.

Some synchronizers encode the wrong frame rate in MTC. In this situation, open the Tempo Editor, switch off the *Detect* option, and set the correct frame rate manually.

Video

Logic supports the viewing of QuickTime video files in the Arrange Video track, making film and TV scoring quick and easy.

You can also view QuickTime video files in a separate window. This chapter covers the use of video files in Logic.

Synchronizing QuickTime Movies

QuickTime is a Macintosh standard for digitized, data-compressed films which can run in individual windows. If you want to play these films, Quicktime must be installed on your system.

You also need a fast hard disk, and above all a fast Mac, allowing the movie to be played smoothly. If you want to record a film like this yourself from a video recorder, you need specialized hardware, and relevant software (such as iMovie).

You can make QuickTime movies run in a Logic window, in sync with a song. Wherever you move the song position the film follows, and vice versa.

Opening a Movie

Select the global *Options > Movies > Open Movie* function to open a typical file selector box. You can then select a QuickTime movie from your hard disk or other storage device.

If you select *Options > Movies > Open Movie as Float* you can open a QuickTime movie in a float window. This ensures that the movie window will always stay on top.

Reopening a Movie

The *Open Movie Again (as Float)* command reopens a movie window with the same film clip. This is particularly useful if you want to open the video clip in a different Screenset.

Working With Movies

In the QuickTime window, you can enter the SMPTE offset of the film in the *Movie Start* row. This is independent of the SMPTE offset for the song. Grabbing and dragging the position slider at the bottom of the video, or using the forward/rewind buttons to the right, moves the film to any position, and Logic will "chase" to the corresponding song position. All QuickTime transport functions interact with those of Logic.

Optimal Image Size

If you click once on the gray bar at the bottom of the video image, the QuickTime window will expand to fill the whole screen in such a way that the entire video image, whatever its shape, best fits your monitor. The window borders will also disappear (*Best Size without Borders*)

This proportional enlargement does mean that strangely-shaped images may not fill the entire monitor. There are two advantages to this: the proportions of the image is retained, and a faster screen refresh rate can be obtained, because the graphics card is not overloaded with conversion calculations for altering the movie's proportions.

Clicking on the gray bar at the bottom of the image restores it to its original format and size.

Options

Clicking and holding on the movie image opens the options menu. You can set various proportional image formats, from half-size to 8× size here.

The following image sizes are also selectable, allowing a non-proportional enlargement of the image if it is oddly-shaped for the monitor you're using:

Pixel 512 × 384
Changes image size to NTSC Underscan format.

Pixel 640 × 480
Changes image size to PAL Underscan or NTSC Overscan format.

Pixel 768 × 576
Changes image size to PAL Overscan format.

Make Proportional
This selects the next-largest proportional setting.

Center
Choosing this option places the video image in the middle of your screen.

Best Size without Borders
This option is equivalent to the click on the gray bar at the bottom of the video screen.

Synchronization Methods

The *Continguous Sync* option allows you to switch between the following sync methods:

When *Continguous Sync* is turned on, Logic controls the playback speed of the movie, keeping music and pictures in sync at all times. If the film has a soundtrack, the audio signal will be transposed slightly, if necessary, by means of sample rate conversion. This sync method is possibly more precise, but requires greater processing power.

Video to song adjust

Found under *Preferences > Video*, this global setting can be used to fine tune the starting point of a movie.

Song Settings and Preferences 20

The Song Settings and Preferences allow you to define many of Logic's basic operating parameters. This section explains each of these menu items individually.

Unless otherwise indicated, the descriptions of the various options apply when the selection box next to the option is checked (in other words, when it's active).

Song Settings and Preferences are accessible via the *File > Song Settings* and *Logic > Preferences* menu items. When either is selected, a Preferences or Song Settings window will be launched.

Each window features a number of icons and tabbed panels. These are much like menus and sub-menus. To adjust a given Preference, simply select the desired icon, then the appropriate panel tab, and then activate/deactivate the preference, or make your selection from a pull-down menu. Just close the window once you've made your selections.

In some instances, you will find a button that links to the Song Settings window, while you are in the Preferences window (and vice-versa). Clicking on this button will launch the Song Settings window, and will automatically select the relevant panel. As an example, the Preferences > MIDI > Sync panel features a MIDI Sync Song Settings button. Clicking on this button will launch the Song Settings > Synchronization > MIDI panel.

Both the Song Settings and Preferences windows can be visible at the same time, making the set up of Logic's operating parameters faster and clearer.

Some of these can also be reached directly from Logic's local menus (in the Score window, for example), or from the Transport buttons, via pop-up menus.

Saving of Song Settings and Preferences

The Song Settings are stored with the song file. If you want to start Logic with certain settings, simply make the desired settings in your Autoload song or a Template.

The Preferences are saved whenever you quit Logic. There are several Preference files, which are stored separately in the *$/User/Library/Preferences* folder. Logic preference files all begin with "com.apple.Logic".

Note: All choices made in the Song Settings window are specific to the saved song. All items selected in the Preferences window globally affect *all* songs.

Song Settings

Song Settings, as mentioned, are saved independently with each song, which means that different songs can have different song settings. You can save all of your standard settings in the Autoload Song, which is the default song file that is automatically loaded when you boot Logic (unless you've started the program by double-clicking on a specific song file instead of the actual program icon, or have selected a Template). This way, you can start each Logic session with your preferred working setup.

Synchronization Settings

All Synchronization Song Settings are described in the Synchronization Chapter (see "Synchronization" on page 451).

Metronome Settings

File > *Song Settings* > *Metronome* or a long click on the Metronome button in the Transport Bar opens a settings dialog window for the Metronome. This window combines all settings for the MIDI Click Environment Object.

In addition, the Metronome dialog features a virtual metronome sound source called *Klopfgeist* (see the Klopfgeist section in the Plug-in Reference). It can be used either, in addition to, or in place of, the speaker and MIDI click source.

MIDI Click Settings

These settings include the MIDI port of the MIDI Metronome and allow you to separately set the Channel, Note, and Velocity for the Bar, Beat, and Division (format value) of the click.

Klopfgeist Parameters

The *Klopfgeist* checkbox activates/deactivates this virtual metronome.

The *Tonality* parameter changes the sound of the virtual metronome from a short click to a pitched percussion sound, similar to a Wood Block or Claves.

Volume adjusts the overall sound level of the virtual click sound.

Output (assignment): Provided the audio hardware used by Logic offers more than two outputs, this field allows the routing of the Klopfgeist metronome sound to a different set of hardware outputs.

Note: Klopfgeist is a software instrument found in the Mono plug-in menu of Audio Instrument channels. Klopfgeist is inserted on Audio Instrument channel #64, by default. Logic will automatically create Audio Instrument channel #64 (with Klopfgeist inserted) when the *Klopfgeist* checkbox is activated. Theoretically, any other Logic or third-party instrument could be deployed as a metronome sound source—using Audio Instrument channel 64.

Klopfgeist can also be used as a simple and unique software instrument as well. The Klopfgeist Plug-in window offers a few additional sound parameters over those found in the Metronome window.

Other Settings

Metronome plays through built-in speakers
This sends the metronome click to the computer loudspeaker.

Note: The System Preferences > Sound pane must be set to Internal Speakers in order for the speaker click function to work.

Click while recording (e)
The metronome click is automatically switched on for recording. This is the same as activating the Metronome button in the Transport Bar during recording.

Only during count-in
When this option is active, the recording mode click will only be audible during the song count in, and is then switched off.

Click while playing (p)
The metronome click is automatically switched on for playback. This is the same as activating the Metronome button in the Transport Bar during playback.

Polyphonic Clicks
The MIDI Metronome Environment Object sends notes, as defined for bars, beats, and divisions. As an example, two or three notes may be sent simultaneously at the beginning of each measure. If this option is unchecked, the metronome will only transmit one note at a time.

Recording Settings

This page can be reached in various ways: by key command (default: Option-R), the *File > Song Settings > Recording* menu option, or from the *Recording* menu item, accessible by click-holding on the Metronome or Record buttons of the Transport.

The Recording Song Settings determine how Logic responds while in record mode. You can enable/disable some checkboxes via the computer keyboard, by using the keys indicated in brackets after the function name. Any key commands normally assigned to these keys will be temporarily deactivated while the Song Settings window is open.

General

Auto mute in cycle record

If recording in Cycle mode, this function creates a new Region for every cycle—provided that there is data input during each "pass". All Regions created in previous cycle passes are automatically muted. If the *Auto create tracks in cycle record* function (described next) is not active, all Regions are layered onto one track. Activation of this function deactivates both of the *Merge* functions.

Auto create tracks in cycle record

While recording in Cycle mode, this option creates a new track with each new cycle pass—provided that there is data input. The recorded Regions from earlier cycle passes are moved down to the track(s) below, with the "oldest" tracks ending up at the bottom of the list. Use of this option deactivates both *Merge* functions. This functionality is useful when attempting multiple takes of a solo, while cycling over a section of music. The recordings made during each cycle pass will appear on their own tracks, making it easy to sort through them, once you have finished recording.

Allow Tempo Change Recording

All tempo changes made while in record mode are recorded. For details on editing these "tempo recordings", please see the Tempo section (see "Display and Functions" on page 447).

MIDI

Merge new recording with selected Region

After each recording, all newly-recorded data is merged with all selected Regions on the recorded track, to form one Region. When *Merge new recording…* is activated, *Merge only new Regions in cycle record* is automatically activated as well.

Merge only new Regions in cycle record

When recording in Cycle mode, this function merges all data recorded during subsequent cycles to the Region recorded during the first cycle. It can be used independently of *Merge new recording with selected Regions*.

MIDI data reduction

Controller events are thinned out during recording, to reduce the data load on the MIDI bus during playback. This improves the timing of dense arrangements when using interfaces with only a few MIDI ports. The function actually reduces the duration of controller events, using an intelligent algorithm which retains the value at the end of a succession of controller messages.

Tuning Settings

A real-time tuning system is available for use with Logic's software instruments. There are a number of parameter settings that are accessible via the *File > Song Settings > Tuning* panel.

We'll discuss these options shortly, but before beginning, we'd like to cover some basics and background information.

About Alternate Tunings

The twelve tone scale that is currently used in Western music is a development that took centuries. Hidden in-between these twelve notes are a number of other microtones that represent different mathematical ways of expressing the frequency intervals between "tones".

To explain, let's take a look at the harmonic series, and the underlying harmonic theory. Imagine that you have a fundamental frequency of 100 Hz (100 vibrations per second), the first harmonic is double that, or 200 Hz. The second harmonic is found at 300 Hz, third at 400 Hz, and so on. Musically speaking, we know that when frequency doubles, pitch increases by exactly one octave. The second harmonic (300 Hz) is exactly one octave and a pure fifth higher than the fundamental frequency (100 Hz).

From this, you would assume that tuning an instrument so that each fifth is "pure" would be the way to go, right? In doing so, you would expect a perfectly tuned scale, as you worked your way from C though to the C above or below. Close, but no cigar.

To simplify this example, we'll start tuning at a frequency of 100 Hz and we'll call it 'C' (a real 'C' would be closer to 130 Hz). The first fifth would be tuned by adjusting the pitch until a completely clear tone is produced, with no beats (beats are cyclic modulations in the tone). This will result in a 'G' at exactly 150 Hz. This is derived from this calculation:

- the fundamental (100 Hz) $\times$ 3 (=300 Hz for the second harmonic)
- divided by 2 (to drop it back into the same octave as your starting pitch).

This relationship is frequently expressed in terms of the ratio 3:2.

For the rest of the scale:

Tune the next fifth up: $150 \times 3 = 450/2 = 225$ (which is more than an octave above the starting pitch, so you need to drop it another octave to 112.5.

Note	Frequency (Hz)	Notes
C	100	× 1.5/2
C#	106.7871	divide by 2 to stay in octave
D	112.5	divide by 2 to stay in octave
D#	120.1355	divide by 2 to stay in octave
E	126.5625	divide by 2 to stay in octave
F (E#)	135.1524	
F#	142.3828	divide by 2 to stay in octave
G	150	(× 1.5) divided by two
G#	160.1807	
A	168.75	
A#	180.2032	
B	189.8438	
C	202.7287	

As you can see from the table above, there's a problem!

Although the laws of physics dictate that the octave above C (100 Hz) is C (at 200 Hz), the practical exercise of a (C to C) circle of perfectly tuned fifths results in a C at 202.7287 Hz.

This is not a mathematical error. If this was a real instrument, the results would be clear.

There is, as you can see, a choice. Either:
• each fifth is perfectly tuned, with octaves out of tune, or
• perfectly tuned octaves with the final fifth (F to C) out of tune.

It goes without saying that detuned octaves are more noticeable to the ears.

The Comma

The difference between a perfectly tuned octave and the octave resulting from a tuned circle of fifths is known as the "comma".

Over the centuries, numerous approaches have been taken to solve this mystery, resulting in a range of scales, and finally arriving at the concept of "equal temperament".

Other temperaments that have been devised throughout history maximize or emphasize different aspects of harmonic quality. Each compromises in some way or another. Some maximize pure thirds (Mean Tone) while others emphasize pure fifths, at the expense of the thirds (Kirnberger III, for example).

Every temperament has its own "character", and a given piece of music may sound fine in one key, but awful in another. Transposing a piece to a new key can completely change its character.

Careful attention must be paid to the selection of temperaments for authentic performances of historic keyboard music. The wrong choice could result in an unsatisfactory and historically inaccurate musical experience.

About Equal Temperament

Equal temperament takes the tuning 'error' (the comma), and spreads it equally between each step of a chromatic scale. The result is actually a scale of equally mis-tuned intervals, with no interval grossly out of tune, but none in perfect tune. Equal temperament has become the de-facto standard for two main reasons:

*   Convenience—Retuning an instrument to a specific temperament that is better suited to a particular piece of music is a hassle.
    Many instruments are not capable of being alternately tuned (fretted string instruments, for example).
*   Portability—All Western musical pieces can be performed (adequately) on an instrument tuned to equal temperament. Obviously, some of the nuances may be missing for pieces that were originally performed in another temperament. On the flipside, pieces that depend on equal temperament may sound terrible by the placement of various mis-tuned intervals.

Software Instrument Pitch

Tune

This parameter determines the global tuning of all software instruments. The default is concert pitch A=440 Hz. To adjust, simply grab the slider and move it to the left or right. Detuning is in cent (1/100th of a semitone) steps.

Scale

Activation of alternate tuning scales is achieved by clicking the appropriate radio button in the *File > Song Settings > Tuning pane*. The selected tuning scale will be saved when the song is saved, and reloaded the next time the song is opened.

Equal Tempered

This mode disables any tuning, and uses an equal tempered scale—just like earlier Logic versions.

Fixed Tuning

This option activates a number of fixed tuning Scales and Keys. The *Type* pull-down menu provides you with the most important historic tuning scales, amongst others.

The *Root Key* pull-down menu allows you to select a global key (*C–B*) for the chosen scale as an easy way to reference the chosen historic scale to any root note.

This mode tunes keys to different degrees of scaled tuning, and delivers a "key signature character". When playing mostly white keys (in the *Pure* setting, and with *C* as the *Root Key*), C major will be the main focus, and tuning will be scaled to that chord. An A major chord that is played immediately after a C major (and is therefore subject to C major scaled tuning) will be affected somewhat by the scaled tuning effect, but will not sound completely tempered. If you normally play polyphonic music, this mode (when using the *Pure* setting) will sound most pleasing to your ears.

The Fixed Tuning scales are ideal for a number of Baroque and Mediaeval instruments and styles of music.

User
Each semitone can be detuned from equal temperament in semitone steps. To do so, just click-drag—vertically—on each semitone box until the desired value is reached. Alternately, you can double-click in each semitone box, and type in a value. Press Enter or click on another box to exit the text entry mode.

The *Reset* button will reset all of your tuning adjustments to their default values.

The *Stretch Lower* and *Stretch Upper* sliders can be used to stretch the tuning in the bass and treble, to simulate the "stretched tuning" of some instruments, for example acoustic pianos.

Stretch Lower determines the deviation from the equal-tempered scale in the bass end of the sound. The higher the value, the further down the low notes are tuned. A setting of 0 results in an equal-tempered scale tuning.

The Stretch Upper parameter does the same in the treble end of the sound.

MIDI Settings
This page can be reached from the main menu *File > Song Settings > MIDI* option. These settings determine the behavior of the MIDI inputs and outputs. Simply click on the appropriate tab to access the parameters described in each section.

General: Miscellaneous
After loading Song, send:
Used Instrument MIDI settings
Sends the checked Instrument MIDI Settings (see "Adjusting the Sound of a Track" on page 104) automatically after loading a song.

All fader values
This option causes all Environment fader values (see "Special Functions" on page 183) to be automatically sent after a song is loaded.

MIDI Remote
Global button for controlling Logic via MIDI Commands. Clicking on the *Configure* button will launch the Key Commands window (see "To assign a function to a MIDI message:" on page 43).

General: MIDI Thru
SysEx with MIDI Thru function
Incoming SysEx messages are passed through the computer to the MIDI output(s), along with other MIDI data. This is particularly important when using hardware programmers, as only then will you be able to immediately monitor the changes to the synth you are editing. If you just want to record SysEx dumps, don't select the checkbox. It rarely makes sense to divert dumps through the computer unless you want to record a dump, and simultaneously transmit it to a second device of the same type.

Instrument without MIDI Thru Function
The instrument selected here will not pass events through the computer, when the instrument is assigned to the selected Arrange track. Normally, you would set the "No Output" instrument here.

If your master keyboard does not have a "Local Off" setting, you can use this feature to avoid unwanted note doubling when recording:
• With multitimbral sound sources, assign the instrument (usually channel 1) which plays the part that is heard when playing with the computer turned off.
• With mono-timbral sound sources, assign the instrument which represents the sound generating part of your master keyboard.

In either case, you should turn down the volume control of your master keyboard whenever you are recording tracks for any other instrument.

It is possible to disable MIDI Thru for any MIDI track in the Arrange window selectively, by simply disabling the "R" button to the left of the track name.

General: Software Instruments
Use MIDI Controllers
This pull-down menu allows you determine the behavior of software instruments when addressed by MIDI Controller messages higher than CC #65.

Input Filter
The input filter switches are used to filter out certain event types at the sequencer input. When a switch is enabled (checked), it will filter the corresponding incoming events. You can filter the following event types:
• Note events.
• Program Change events.
• Pitch Bend events.

- Control Changes (such as the modulation wheel of a MIDI keyboard).
- Aftertouch events (channel pressure).
- Polyphonic Aftertouch (polyphonic key pressure).
- System Exclusive data (such as patch dumps from synthesizers).

Chase

This MIDI Song Settings panel is used to alter the Chase Events (see "Chase Events" on page 89) settings.

You can reach this page via the main menu *File > Song Settings > Chase Events* option.

You will see a number of checkboxes that determine the event type(s) that will be chased. If a checkbox is ticked, it indicates that chase events is activated for that event type.

Notes

This button only affects Note On and Note Off events in Regions played by instruments where the No Transpose box is *not* checked.

Sustained

Activation of this checkbox causes Logic to search (before the current playback start point) for any notes that should still be playing because of a sustain pedal message.

In 'No Transpose' Instruments

Activation of this checkbox ensures that all notes (including instruments with an active *No Transpose* parameter) are chased. If these are instruments for drum sounds or loops, as is typically the case, this box should *not* be checked.

Program Change

The most recent program change event (before the current playback start point) is sent.

Note: Please keep in mind the time that your sound module may require to respond to an incoming program change event.

Pitch Bend

Pitch bend data is searched for.

Control Changes

If this switch is active, you can switch three groups of MIDI controllers (control change messages, such as modulation, volume, pan, and sustain) on and off individually:

0–15

Controller numbers 0 to 15 are chased. These include the following controllers: modulation wheel, breath, foot, volume, pan, portamento time, balance, and expression, plus the MSB (most significant byte) for data entry and bank selection.

64–71

"Switch" controllers 64 to 71 are chased. These include: sustain, sostenuto, hold 2, soft pedal, and portamento.

All other

All other controller numbers are chased.

Aftertouch

(Channel) Aftertouch data is chased.

Polyphonic Aftertouch

Polyphonic Aftertouch data, generated by pressure sensors under the individual keys of the keyboard controller, is chased.

System Exclusive

The most recent SysEx message(s) in the Regions (before the current playback start point) are transmitted. If a Region contains pre-recorded SysEx fader data, the fader will be set to its correct state at the playback start point.

Note: Chase events cannot always fully restore the correct state of SysEx data at the playback start point. To do so would involve not just searching for, but also analyzing all SysEx messages for the entire song, both before and after the playback start point. Given the non-standardized data structure of SysEx messages, this is completely impossible.

If even a couple of sound parameters have been recorded, each with separate SysEx faders of differing settings before the playback start point, there will be deviations in the sound. To circumvent this issue, try recording controller data for remote-control of the SysEx faders during playback. As chase events searches all controller numbers separately, any sound parameter SysEx settings (that have been substituted with controllers) will be correct at the playback start point. Another advantage to this method is that controller events can be edited graphically in the Hyper Editor, or by using Hyper Draw.

Chase separate channels in 'All Channels' instruments

This option affects multi instruments with the Channel parameter set to All. All defined event types in Regions that are started part-way through are chased separately for each MIDI sub-channel of the multi instrument.

Chase on Cycle Jump

Switches on the chase events function for cycle jumps (when a Cycle reaches its end point, and returns to the Cycle start point). Notes are only chased in a cycle jump when both the *Notes* checkbox and the *Chase on Cycle Jump* checkbox are activated.

Send full MIDI Reset before Chasing

A full MIDI reset (for all ports and all MIDI channels) is sent before any event chasing begins.

Score Settings

All Score Song Settings are described in the Score Section (see "Song Settings for Score Display" on page 410).

Preferences

The settings made in Logic's Preferences panels are saved as a number of files in the *$/User/Library/Preferences* folder. Keyboard shortcuts (key commands) are saved in a separate file in the same folder. Preference settings apply to all songs.

Note: You can't open the Preferences files directly. Any changes must be made in Logic.

Initializing the Preferences…

If you erase any of the Preference files, Logic will create new Preferences files the next time it is launched. All parameters will be reset to their default values. When you erase the Preferences files, you also lose all of your customized key commands.

…and how to do it without losing your keyboard assignments

If you'd like to initialize the Preferences, but don't want to lose your customized key commands, select the *Preferences > Initialize all except Commands* menu item.

Global Preferences

Global Preferences: Song Handling

Hide Windows of inactive Songs

Only the windows of active songs are displayed. All other windows belonging to songs currently in memory are hidden. In this mode, you must use the main *Windows* menu to switch between songs.

When opening a song, ask to close current song(s)?

Whenever you load a new song before closing the old one, a dialog box will appear, and ask whether or not the current song should be closed. If this option is left unchecked, you will not be asked the question, and the current song will remain open.

Export MIDI File…' saves single MIDI Regions as Format 0

If only one MIDI Region is selected when you make use of the *File > Export MIDI File…* function, the contents of the Region are saved in MIDI file format 0. This file format is guaranteed to be compatible with every MIDI file player.

Automatically open most recent song on startup

Activation of this option will automatically launch the song that you were working on when Logic was last closed.

Auto Backup:
This pull-down menu switches on, and controls the automatic backup (see "Saving
Songs" on page 58) function. The menu options are self-explanatory.

Global Preferences: Editing
Right Mouse Button:
This pull-down menu determines the right mouse behavior. Options are:
Is Assignable to a Tool, which allows any tool to be assigned to the right mouse button.
The *Opens Toolbox* option does just that, when the right mouse button is clicked.

Limit Dragging to One Direction In: Matrix and Score
In the Matrix or Score Editors, you can only move notes in one direction (horizontally or
vertically), per operation. This means that a note may be either transposed or moved in
time, but not both at once. This prevents accidental alteration of one or the other
parameter.

Limit Dragging to One Direction In: Arrange
This restricts the direction you can move Regions and folders in the Arrange window, in
a similar way to, and for the same reasons, as the option above.

Double-clicking a MIDI Region opens:
This pull-down menu allows you to select which Editor opens when you double-click
on a MIDI Region in the Arrange window. Options are the Score, Event, Matrix, and
Hyper Editors.

Limit Multiple Undo Steps
Limits the number of Undo Steps (see "Undo" on page 32). Click on the arrows to
increase or decrease the number of Undo steps.

Add 'Last Edit Function' to Region Name
After performing any edit operation (cutting, for example), the description of the edit
operation is added to the name of the arrange Region (or resulting Regions).

Global Preferences: Cycle
Cycle Pre-Processing
In order to ensure a smooth cycle jump, the cycle jump is processed slightly before its
actual position. This pull-down menu setting allows you to change the value of the pre-
processing time.

Smooth Cycle Algorithm
This improves the timing of cycle jumps, making it easier to set the length of sample loops while in Cycle mode—although this is somewhat mitigated through the use of Apple Loops. If your computer has a very slow CPU, this setting reduces the processing performance for graphic operations. In general, you'll want to keep this on, whenever possible, especially if you're working in a style which involves frequent cycling of musical sections. If you find that your Cycled sections are not as smooth as you'd like them (and that your loops are actually perfect), you may wish to disable this parameter.

Global Preferences: Catch
Catch when sequencer starts
Every time you start the sequencer (start or pause), the Catch (see "Relationships Between Windows" on page 28) function is automatically switched on, in all windows.

Catch when moving song position
Activation of this option ensures that whenever you move the SPL, the Catch function is automatically switched on.

Allow content Catch by position if Catch and Link are enabled
If the catch and content catch functions are active, the contents of the Region at the current song position are shown. If this option is inactive, the window view still follows the song position within the displayed Region, but does not update to show the contents of subsequent Regions as the SPL passes them in play or record mode.

Global Preferences: Caps Lock Keys
Enable Caps Lock Keys
A further *Enable Caps Lock Keys* option allows you to completely enable or disable the Caps Lock Keyboard functionality.

Space bar acts as Sustain Pedal
Should you wish to use the Space Bar key command (usually Start/Stop), rather than as the Sustain function for the Caps Lock Keyboard (when active), you can disable the *Space bar acts as Sustain Pedal* option.

Show window when active
After familiarizing yourself with the operation of the Caps Lock Keyboard for a while, you may wish to prevent the window from appearing when using it. To do so, disable the *Show window when active* option in the Preferences > Global > Caps Lock Keys menu.

Audio Preferences

Audio Preferences: General

Create Overview after recording

To allow you to view new recordings of audio files in the Arrange window, Logic has to create an overview. Before it can do this, the whole audio file has to be read, which can be time-consuming, depending on the amount of data involved. If you want to continue working in the Arrange window without the waveform display, you can switch off the creation of the overview after the recording. If necessary, the menu option "Update File Information" in the Audio window will recognize that the overview is missing, and create it later.

Audio engine overload message

If switched off, the playback will simply stop in an overload situation instead of displaying an alert box.

Sample accurate automation

As the name implies Sample accurate automation is the most precise type of automation. However, it requires more overall system performance. Therefore Logic offers three options:
- *Off*: needs less system performance and might be required for older songs (pre version 5 songs);
- *Volume, Pan, Sends*: the most important parameters are automated with sample accuracy;
- *Volume, Pan, Sends, Plug In Parameters*: all of these parameters are automated with sample accuracy. Please note: not all Audio Unit plug-ins can be automated in this way.

Recording File Type

Lets you the determine the file type of recorded audio files. The options are:
- SDII = SoundDesigner II
- AIFF = Audio Interchange File Format (Default)
- WAVE = Most common Audio Format on Windows PCs

Crossfade Time

Determines a global crossfade time for all crossfade operations in the Arrange window.

Crossfade Curve

Determines a global crossfade curve type for all crossfade operations in the Arrange window.

Audio Preferences: Drivers

The Audio Driver preferences are covered in the Audio Driver chapter (see "Audio Drivers" on page 271).

Audio Preferences: Display

Display Color in Audio Window

If audio regions in the Arrange window are very brightly colored, it can sometimes be difficult to make out the waveform display in the Audio window. You can, therefore revert to a black and white display here.

New Style Audio Objects

This setting toggles the look of the Audio Objects between the old and new (since V 3.0) style.

Open Plug-in window on insertion

With this setting on, the window of a plug-in or a virtual instrument is automatically opened after inserting it in the corresponding slot of an Audio Object.

Audio Preferences: Sample Editor

Warning before process function by key command

Before you carry out a destructive edit in the Sample Editor using a key command, a warning appears—giving you the opportunity to cancel it, before altering the data.

Dependent on the key commands and window combinations you are using, there is a danger of executing edit commands accidentally. To avert any disasters, Logic is preset so that an alert box appears before a destructive audio edit is carried out. If you feel confident that you won't accidentally process a file, you can switch off the alert here.

Record "Normalize" in Undo History

Disable this parameter if you do not wish to create any undo files once the Normalize function is invoked.

Note: As normalization is generally the last step in sample editing, this parameter (if active) can destroy the undo history. As a safety feature, a warning will be shown if an undo history exists (and the switch is on), providing you with the opportunity to create an undo file.

Number of Undo Steps

This parameter limits the maximum number of recorded undo steps. Use the mouse as a slider to adjust the (number of) step(s) value.

Store undo files in Song Folder

Activate this parameter if you would like the Undo History to be stored in a sub-folder alongside the song.

Note: This is switched on by default if the song is part of a project (see "Projects" on page 51).

Global undo file path

All Undo History files are saved into a "global" location (a user-defined folder) if the *Store undo files in Song Folder* option is not switched on.

Audio Preferences: MP3

Bit Rate (Mono/Stereo)

The bit rates are selectable between 8 kbps and 320 kbps, but default to 80 kbps mono, and 160 kbps stereo. These rates offer acceptable quality and good file compression. If you can afford the extra file size, we recommend selecting 96 kbps for mono and 192 kbps for stereo streams for better audio quality. You can, of course, choose even higher rates, but the quality improvement in bit rates above 96/192 kbps is minimal.

Use Variable Bit Rate Encoding (VBR)

Variable Bit Rate encoding compresses simpler passages more heavily than more harmonically rich passages, generally resulting in better quality MP3s. Unfortunately, not all MP3 players can accurately decode VBR-encoded MP3s, which is why this option is off by default. If you determine that the listener/s of your MP3 can decode VBR-encoded MP3s, you can switch this option on.

Quality

Keep this set to *Highest* whenever possible. Reducing the quality will speed up the conversion process, but at the expense of audio quality.

Use Best Encoding

Again, like the *Quality* parameter, if you uncheck this option, you will gain encoding speed at the price of audio quality. This should always be kept on unless conversion time is an issue.

Filter Frequencies Below 10 Hz

When this option is checked, frequencies below 10 Hz (which are usually not reproduced by speakers, and are not audible to human ears at any rate) will be removed, leaving slightly more data bandwidth for the frequencies which we can hear, resulting in an improvement in perceived quality. Only uncheck this if you're experimenting with subsonic test tones, or exporting MP3s for whales…

Stereo Mode

You can select joint stereo or normal stereo mode. Depending on the original file, these settings may (or may not) offer any audible difference. Experiment with both settings to determine your preference.

Audio Preferences: Reset

Send Reset Messages to Audio Instruments:

Reset messages of the specified type (*Control 64 off (Sustain), Control 1 (Modulation) to zero* and *Pitch Bend to center position*) are sent to all active Audio Instrument channels for each of the checkboxes. This may be useful if you are encountering hung notes, or are finding that controller settings are incorrect when in Cycle mode or when returning to the beginning of a section or the Song start point.

MIDI Preferences

This page handles Logic's communication with your MIDI interface and other programs. All active CoreMIDI Drivers are automatically available in Logic. There is no need for further settings.

MIDI Preferences: General

Use UME (Unified Virtual and Classic MIDI Engine)
The Unified Virtual and Classic MIDI Engine unifies the Classic MIDI Engine (used for hardware MIDI devices) with the use of Virtual MIDI Instruments (software instruments). This engine is switched on by default, which is the recommended setting. For compatibility reasons, it can still be switched off, and an alternate MIDI engine will be used.

Note: Not all Arrange features are available for software instrument use (the Loop parameter, for example) when this setting is switched off, so leave it on, unless you're having problems.

External Stop ends Record Mode
If you are using external synchronization, and the time code stops during the recording, record mode is switched off. If there is no check in this box Logic stops, but remains in record mode (record + pause).

Always stop when opening song
With this setting on, a song will always be opened in Stop mode, even if it was saved in Play mode.

Reset All MIDI Drivers
The *Reset All MIDI Drivers* button resets all MIDI drivers. This may help should you experience MIDI communication problems.

MIDI Preferences: Sync

All MIDI Output: Delay:
This slider delays or advances the MIDI Output for all ports, allowing you to compensate for any timing differences between Audio and Audio Instrument tracks, and MIDI tracks. Simply drag the slider to the left or right to set the desired (positive or negative) millisecond value. Alternately, you can type the desired value into the *ms* field.

MIDI Clock: Allow Song Position Pointer while playing
Song Position Pointer data is not normally sent while the sequencer is in play mode (this is in accordance with the MIDI Standard). This option allows Logic to send SPP while the sequencer is running. The advantage is that external devices can also follow Logic in Cycle mode. If your external devices cannot process SPP, you should switch off this option.

Note: If your devices can follow MTC (MIDI Time Code), you should leave this option unchecked, and make use of Logic's MTC functions.

MIDI Time Code (MTC): Pickup Delay
This parameter should generally be set to zero to ensure the quickest possible pickup time while Logic is in MTC sync mode. There are, however, some devices which seem to transmit imprecise MTC commands when first started. As a result, sync might not be perfectly reliable, and there could be an offset every time synchronization is established. In such situations, you can set a delay for MTC pickup, and Logic will ignore the initial MTC commands. A (frame) value of 25 to 30 corresponds to a delay of about a second, depending on the frame rate. Use this parameter when synchronized to hard disk recorders and other devices, if the sync doesn't appear to be consistent.

MIDI Time Code (MTC): Transmit MTC Delay
This parameter allows you to delay the transmission of MIDI Time Code. Negative values result in MTC being transmitted earlier. This facility enables you to compensate for any reaction delays (to incoming MIDI Time Code) in external MTC slaves.

MIDI Sync Song Settings
Pressing this button will launch the MIDI Sync Song Settings window.

MIDI Preferences: Reset Messages
This page is only left for compatibility reasons with older MIDI hardware. Logic handles MIDI Reset Messages automatically and intelligently, so you should generally make sure that all options are switched off (this the default).
All selected checkboxes will send a reset message for the selected controller type to all MIDI outputs. This reset message will be sent on Cycle jumps and when playback begins, but the use of these options shouldn't be necessary.

Display Preferences

These parameters alter the general appearance of Logic. Before we take a look at them, we'd like to cover a global setting. Namely changing the:

Interface Language

Logic features a Mac OS X compliant method to set the dialog language:

To set Logic's interface language:

1 Select the Logic application in the Finder.

2 Press Command-I (to open the Information dialog).

3 Select/Flip open the "Languages" section.

4 Choose the preferred language, and uncheck all other languages.

Display Preferences: General

Windows: Anti-aliased text
Displays all Logic text strings in the Mac OS X Anti-aliased mode.

Windows: Large local window menus
The title and items of the local menus are displayed using the normal System font. If the is not checked, a smaller font is used instead.

Windows: Wide song position line
A thicker Song Position Line is used.

Windows: Show Help Tags
This enables help tags throughout Logic. As the mouse cursor hovers over parameters and tools, a small pop-up description (or value) of the item will momentarily appear onscreen.

Menus: Use hierarchical pull-down menus
Hierarchical pull-down menus are used in the Arrange window Track List and elsewhere in Logic.

Menus: Sort Instrument menu by layers
The instruments in the pull-down instrument selection menu are sorted by (Environment) layers.

Displays: Display Middle C as:

This pull-down menu option affects the description of notes in the editors. The bottom C on a five-octave keyboard (note # 36) is labeled C1, and middle C (#60 or c') is labeled C3. According to this standard, the lowest MIDI note (# 0) is called C-2. This is the official standard, and is used by most manufacturers. Use of the *C3 (Yamaha)* option will set Logic to this "standard" mode.

Should you select the *C4 (Roland)* option, the bottom C on a five-octave keyboard is labeled C2, and middle C is labeled as C4. In this standard, the lowest MIDI note is C1.

Display Preferences: Other

Environment: Allow 'All Objects' layer option

A layer, showing every Object in your Environment, is accessible from the *Layer* menu in the Environment. If this checkbox is not selected, the "All Objects" layer will not be available.

Matrix Background Colors: Background Type

These radio buttons allow you to select a *Dark* or *Light* Matrix editor background color. By default, a Light color scheme is selected.

Matrix Background Colors: Matrix Color Setup Panel

The Matrix Editor (see "Display" on page 324) features a grid that follows the pattern of the keyboard keys shown on the left hand side. The colors of the Matrix window grid, background, lines, and so on can be adjusted for both the "Light" and "Dark" Background views with the parameters in this recessed panel.

- *White Keys:* Double-click on the color swatch to launch the Mac OS X Colors applet. Select or determine the desired color for the grid lines aligned with the white keyboard keys.
- *Black Keys:* As above, for the black keyboard keys.
- *C, D, E Key Brightness:* This slider allows you to intensify the brightness of these specific keys in all octaves, making transposition easier by providing a consistent reference point.
- *Bar Lines/Dotted:* As with the White and Black Keys options, you can select a color for the bar lines. The Dotted checkbox will change the appearance of the solid bar line to a dotted line.
- *Beat Lines/Dotted:* As above for beat lines.
- *Division Lines/Dotted:* As above for division lines.
- *Reset:* This button resets all user changes to default values.

Score Preferences

The Score Preferences are described in detail in the Score chapter (see "Score Preferences" on page 423).

Video Preferences

Adjustments: Video to Song

A global setting for fine tuning the start point of a movie.

Video Song Settings

This button launches the Video Song Settings window.

Automation Preferences

The Automation preferences globally affect all Automation tracks.

Move Automation with Regions:
This pull-down menu allows you to select what happens to Track Automation data when you move Regions. You can choose between *Never, Always,* and *Ask*, which should be self-explanatory. *Ask* is the default setting.

Ramp Time:
The time required by a parameter to return to its previously recorded setting, is selected via this panel. Double-click on the value to enter a new number (in milliseconds).

'Write' Mode Changes To:
This pull-down menu option determines the mode that faders automatically change to once the recording of Track Automation data was completed. Options are: *Off, Read, Touch, Latch,* and *Write.*

Touch/Latch/Write Erase:
The checkboxes in this section determine the types of Track Automation data that can be written in Touch, Latch, and Write Erase modes.

Automation Quick Access:
These parameters are discussed in detail in the Automation Quick Access section (see).

Control Surfaces Preferences

The Control Surface preferences are discussed in the Control Surfaces chapter (see).

Control Surface Support

Logic offers dedicated support for several surfaces plus the option to program unsupported devices. Control surfaces are hardware units that enable the operation of Logic using faders, rotary knobs, switches, and displays.

There are a number of simple control surfaces that feature conventional faders and no displays. More progressive units are equipped with motor faders, rotary encoders, LED rings, and programmable displays. The more feedback a control surface provides, the easier it is to use, as you don't need to watch the computer screen in order to determine what mode the unit is currently in.

Although we recommend the Emagic Logic Control and Logic Control XT, other control surfaces are supported as well.

Logic supports many functions of modern control surfaces. Its modular concept and learning mode allows the addition of support for new control surfaces, or enhancements to existing support. The extensible control surface plug-in architecture allows the full use of all possibilities of a given controller, down to the finest details.

The following chapter describes functions applicable to all control surface models. Specific documentation for various models is available in individual PDF files.

Installation
Control Surface Plug-ins
Dedicated control surface support is achieved through the use of special plug-in files. These files are automatically added when Logic is installed.

They are located in the *Contents > MIDI Device Plug-ins* sub-folder of the Logic application bundle (to view the bundle contents, Control or right-click on the Logic application icon, and choose *Show Package Contents* from the menu). Logic also checks for control surface plug-ins in the (optional) "/Library/Application Support/Logic/MIDI Device Plug-ins" and "~/Library/Application Support/Logic/MIDI Device Plug-ins" (the "~" denotes your user home directory) folders.

When new control surface plug-ins are released independently from a Logic update, please place them in the folders described above (or as advised in the documentation supplied with the plug-in).

The Setup Window
Some control surface units (Logic Control, for example) are automatically detected when Logic is launched. Units which are not detected automatically can be added via the Setup window. This is accessed via the *Setup* option in the *Preferences > Control Surfaces* menu.

Installation is very easy: all you need to do is select the devices that you wish to use in Logic, in the following ways:

1 Select *New > Install*, and in the ensuing Install window, select the desired device from the list.

2 Press the *Scan (or Add)* button. The selected units will appear onscreen.

• Optionally, you can also click *Scan all*. This will search for all supported control surface unitson all MIDI ports. Please be aware that this may take a while.

• The *Scan* function, *Setup* window and *Install* window can all be accessed directly in the *Preferences > Control Surfaces* menu.

Rebuild Defaults
The *Preferences > Control Surfaces > Rebuild Defaults* option re initializes the support of all connected control surfaces.

The Install Window

The Install window is used to automatically scan for devices, or to install them manually.

Selecting the Models

First, select the desired devices in the *Install* window before you scan or manually add them. You may select one or more models. If you select more than one model, Logic performs the desired operation for each model in turn. Logic displays the icon of the selected device beneath the buttons.

- To select just one model, select it by clicking on the name.
- To select more than one model, select them with Shift held down.

Scanning

Click the Scan button to start the process. You can also press Enter or double-click the device name. Logic will then analyze your MIDI system, and will automatically install the devices it finds, including the correct connection settings.

This option is preferable to manual installation, as Logic is able to gather the maximum amount of information about the devices.

Scan All

If you don't want to select the models to be scanned manually, simply click this button. Logic will then scan for all supported models. This can take some time.

The *Scan All* function is also directly available via *Preferences > Control Surfaces > Scan*. This will automatically scan all MIDI ports for all supported control surfaces.

Manually Adding Devices

Some control surfaces don't support automatic scanning. Such devices must be added manually to your setup. In this scenario, you will need to manually set the MIDI In and Out port parameters.

To manually add the selected devices to your system:

- click the *Add* button,
- or Option–double-click on one of them.

If a control surface of the selected type already exists in your setup, you will be asked whether or not you really want to add the new device. You will need to manually alter the MIDI In and Out port values in the device parameters to match those of the connected unit.

Done

Once you have completed the scanning or installation of the devices, click *Done*. The window will close.

Setup Window Parameters

Device Parameters

Each control surface unit must be connected to an independent MIDI In and Out port. The automatic setup or *Scan* procedure should have automatically found, and set, the correct MIDI In/Out port settings for each unit.

In the event that the MIDI In or Out port identification is incorrect, you can manually select the appropriate one for the unit. To do so, click-hold on the MIDI *Input* and *Output* pull-down menus, and select the appropriate port(s) of your MIDI interface.

Some devices allow you to define a device ID (or global/basic channel). This can be set in this area. Module name, model name and firmware version are also displayed in the device parameters.

Special Parameters

Some control surfaces may allow the definition of "special" parameters. An example of this is fader touch sensitivity. Such parameters can be found in the *Special Parameters* area. A detailed description can be found in the documentation of the particular control surface plug-in.

Display Parameters

Flip Mode

Many control surfaces offer both a fader and a rotary encoder for each channel strip. *Flip Mode* allows you to swap the encoder assignment with that of the fader for each channel. Alternately, you can assign both controls to the same parameter.

There are four "flip" or "swap" modes.
- *Off*—disables *Flip Mode*, making the fader act as a volume control.
- *Duplicate*—makes both the fader and encoder active for the currently selected encoder parameter.
- *Swap*—swaps the fader and encoder, making the fader a Pan control and the encoder a channel volume control, for example.
- *Mute*—disables the faders. This is useful for situations where recording is taking place in the same room as the control surface, and you wish to avoid the mechanical noise of the faders. Any existing automation data will still function as per normal.

Display Mode

If there is insufficient space available for the display of both the parameter name and value (on the control surface LCD), you can specify what is displayed here:
- *Value*—displays the parameter value
- *Name*—displays the parameter name

Clock Display

- *Beats*—the song position display shows Bars/Beats/(optional) Sub Division/Ticks
- *SMPTE*—As above, but in Hours/Minutes/Seconds/Frames

Note: The exact elements displayed, and thus their positions, depend on the selected SMPTE or bar/beat display option defined in Logic's Preferences.

Track View Mode
This parameter determines which tracks or channels are displayed:
- *Mixer*—displays channels in their order of appearance in the Track Mixer window (while Global mode is disabled). Instruments/channels used by multiple tracks are merged into one channel.
- *Global*—displays all Objects of certain type(s)—MIDI or Bus channels, for example—independently of their usage by tracks. They merely need to be defined as an Environment Object. The Object types to be displayed are defined by another parameter which is not shown in the parameter list. If a control surface supports switching to Global View, it also allows you to define which Objects to display.
- *Arrange*—displays channels in their order of appearance in the Track List of the Arrange window, including multiple tracks using the same instrument or channel. The Hide button status is taken into account, with tracks hidden in the Arrange window also being hidden on the control surface.

Mixer View Fader Bank
This parameter affects the *Mixer and Arrange View* mode by shifting channels by the defined amount. Imagine that your control surface has eight channel strips, and you were looking at audio tracks 1–8 in the Arrange window. These would appear as channels 1–8 on the control surface. Using the *Mixer View Fader Bank* parameter, you could offset this view by a defined number of channels, looking at audio tracks 3–11, for example.

Global View Fader Bank
The *Global View Fader Bank* parameter does the same thing as the *Mixer View Fader Bank*, but only applies if multiple Object types are enabled. When single Object types are enabled, there are separate fader bank parameters (these aren't displayed in the parameter list).

Track/Channel Parameters
Track Parameters
Defines the current Track Assignment behavior for the encoders. Options are:
- *Volume*—adjusts channel volume.
- *Pan*—adjusts channel panorama.
- *Mode*—adjusts/selects channel mode (mono/stereo).
- *Input*—adjusts/selects channel input source.
- *Output*—adjusts/selects channel output (main outs/busses).
- *Automation*—adjusts/selects channel automation mode.
- Displayed parameter—adjusts the automation parameter displayed in the Arrange window. This is especially useful if you set the control surface to Arrange View mode, and your Arrange window shows multiple sub-tracks with various parameters.

EQ Band

EQ Band allows you to select the current band in the *EQ Multi Channel View*.

EQ Parameter

Related to the selected band, defined by the *EQ Band* parameter. This determines the current EQ Assignment behavior for the encoders in *EQ Multi Channel View*:

• *Frequency*—Determines the frequency of the selected band.
• *Gain*—Changes the gain of the selected EQ band. For the Low Cut and High Cut bands of the Channel EQ, this parameter controls the slope.
• *Q*—Changes the Q factor of the selected band.
• *On/Off*—Bypasses the selected EQ band.

EQ Parameter Page

Defines the first EQ parameter displayed in the *EQ Channel Strip View*. This parameter is required if the Control Surface Group displays fewer than 64 parameters simultaneously.

Send/Plug-in Parameters

Send Slot

Determines the currently selected *Send* slot. Normally, a value of 1 would be used, as this accesses the first (top) Send on each channel. A value of 2 accesses the second Send, and so on, up to the eighth Send. The Send slots are accessed by pressing the *Up/Down* buttons.

Send Parameter

Defines the currently displayed encoder Send parameter when in the *Send Multi Channel view*:

• *Destination*: encoder is used to determine the Bus channel number for the Send slot.
• *Level*: encoder is used to adjust the Send level.
• *Position*: Sets Pre and Post fader modes.
• *Mute*: Mutes/Unmutes the selected Send slot.

Send Parameter Page

Much like the EQ parameters, up to 32 parameters are available in *Send Channel Strip View* on a given channel (8 Send slots multiplied by the four parameters listed above). *Send Parameter Page* determines the current page for these parameters.

Split: no. of upper parameters

Control surfaces that support split mode allow the display of two separate parameter sections within one plug-in (or even different plug-ins). They are called Split Upper and Split Lower.

This parameter defines how many encoders belong to Split Upper, leaving the remaining encoders to Split Lower. A value of 0 means that Split Mode is off—all encoders then belong to the Split Upper area.

Instrument Parameter Page

Determines the parameter index (counted from 1) which is assigned to the left-most encoder when editing a software instrument. The next Instrument parameter is assigned to encoder #2, and so on.

With Split Mode enabled, this applies to Split Upper.

Inst Parameter Page (Split Lower)

As with Instrument Parameter Page, but for Split Lower.

Insert Slot

Determines the current insert slot number for both selecting a plug-in (in *plug-in Channel Strip View)* and editing its parameters. A value of 1 accesses the first (top) plug-in slot on each channel. A value of 2 accesses the second plug-in slot, and so on.

With Split Mode enabled, this applies to Split Upper.

Insert Slot (Split Lower)

As with Insert Slot, but for Split Lower.

Plug-in Parameter Page

As with Instrument Parameter Page, but for editing plug-ins. Having these parameters separate allows you to quickly switch between editing an instrument and a plug-in on a track, without the need to adjust the parameter page every time.

With Split Mode enabled, this applies to Split Upper.

Plug-in Parameter Page (Split Lower)

As with Plug-in Parameter Page, but for Split Lower.

Track

Specifies the currently displayed track for Channel Strip Views.

With Split Mode enabled, this applies to Split Upper.

Track (Split Lower)

As with Track, but for Split Lower.

Track Lock

When this parameter is set to "on", selecting a track in Logic does not change the Track and Track (Split Lower) parameters. In other words, the control surface group continues to display the same track, independent from the currently *selected* track.

When Track Lock is disabled, the control surface group automatically switches to the selected track, whenever a track is selected.

Other Parameters

Track Name Format

Changes the track name display to show the track name alone, or the track name, and it's track number. As an example, a track named "Audio1" may actually be placed on track 12 in the Arrange window. When a value of *#:Name* is toggled, "Audio1" would be displayed as "12:Au1".

Parameter Page Shift Mode

Defines whether the parameter is shifted by an entire "page" or by one parameter.

Relative Change Mode

This determines the behavior of assignments with a relative value change mode (e.g. rotary encoders).

* *Coarse*: the parameter can be adjusted in coarse steps.
* *Full*: the parameter value is set to its minimum if delta < 0. If greater than 0, it is set to the maximum. This way, you can jump to the last or first track instead of the next or previous bank.
* *Fine*: the value is incremented/decremented in fine steps—one tick/by one "unit". In this mode, the adjustable resolution is ignored, and the highest possible resolution is used instead. As an example, using the Sample Delay parameter: every encoder rotation tick in/decreases the value by 1 ms, no matter what the value of the resolution.

Coarse is the mode used by default.

Mix Group

When in Group Edit mode, this parameter defines the edited group.

Group Parameter Page

As with Instrument Parameter Page, but for the parameters of the edited group.

Control Surface Preferences

The Control Surface preferences window is accessible via the *Logic Menu > Preferences > Control Surfaces > Preferences* menu.

General

Resolution of Relative Controls
This defines the default resolution of controls that change values in a relative manner. The default is 128 steps.

As an example: adjusting the Sample Delay (value range 0 to 4000 ms) in/decreases the value by 40 ms with every encoder rotation "tick", if resolution is set to 100.

Maximum MIDI Band Width
This slider determines the maximum amount of MIDI bandwidth that can be used by your control surface. By default, this is set to 50%, which should be suitable for most situations. You can adjust the value if you find that your MIDI or Automation playback is being affected.

Touching fader selects track
Activation of this parameter will automatically select the track that corresponds to the selected fader. You require a device that features touch-sensitive faders for this functionality to work.

Jog resolution depends on horizontal zoom
If your control surface features a jog/shuttle wheel (or similar), the precision of any scrubbing is affected by the horizontal zoom level of Logic. To retain a consistent resolution, regardless of Logic window zoom levels, disable this checkbox.

Pickup Mode
Enable this option to activate Pickup Mode. Pickup Mode is used by Controller Assignments that use a *scaled* value mode and have either; no feedback or local feedback (when the user operates the control, feedback occurs locally due to the control's mechanical nature). In Pickup Mode the current value must be reached ("picked up") by the control before a value change can occur. This link is broken (Pickup Mode is non-functional) whenever the parameter changes its value by playing back existing automation data. In this mode, move the control towards the parameter's current value (which is then "picked up") if you want to change the parameter with the control. When the Pickup Mode option is disabled, adjusting a fader modifies the parameter immediately.

Multiple Controls per Parameter
These parameters determine whether one, or multiple, encoders are used per parameter when editing effect plug-ins or software instruments.

When multiple encoders are used per parameter, the encoders are subdivided into groups (for example 1/2, 3/4, 5/6, 7/8). The first encoder of each sub-division controls the parameter shown in the display. The remaining encoder(s) are inactive.

Using more than one encoder per parameter shows fewer parameters at any given time, but you gain space on the LCD to cater for longer parameter names and values. The more control surfaces you have within a Control Surface Group, the more you benefit from this feature.

The *Multiple controls per parameter* pull-down menu defines the maximum number of encoders which will be used for a single parameter.
- *1*: parameters are always displayed using one encoder per parameter, with the least space available for parameter name and value in the LCD.
- *2*: on each unit, encoders 1 and 2 are used for the first parameter, encoders 3 and 4 for the second, and so on.
- *4*: on each unit, encoders 1 to 4 are used for the first parameter, encoders 5 to 8 for the second, and so on
- *8*: on each unit, encoders 1 to 8 are used for the first parameter, and so on.

The default setting is "2".

Only when all Parameters fit in one Page
When this option is checked, the defined number of encoders are only used when there are sufficient encoders available to show all parameters without changing pages. As an example:
- You have a Logic Control and two Logic Control XTs, providing you with 24 encoders.
- A plug-in with 13 parameters will be shown with one encoder per parameter. Eleven encoders will remain unused.
- A plug-in with 11 parameters will be shown with two encoders per parameter. Two encoders will remain unused (and of course the inactive encoders of the above mentioned sub-divisions).

When the option is unchecked, multiple encoders are used for each parameter, which may require scrolling. This would not be the case if only one encoder was used for each parameter.

Show Value Units For:
Allows you to adjust whether parameter values will be appended by the measurement "unit", where applicable—"Hz" or "%", for example. You can set this option separately for *Instrument/Plug-in parameters* and *Volume and other parameters*. If you can do without the value units, the display is less cluttered.

Controller Assignments
The *Controller Assignments* button launches the Controller Assignments Editor.

Setup
The Setup button launches the Control Surfaces Setup window.

Help Tags
Control Surfaces that have freely programmable displays which cover multiple controls in one row, can use Control Surfaces help tags. These help tags are similar to Logic's help tags, showing additional information during operation. You can define the information that is displayed in the help tags pane of the Control Surfaces preferences.

While Editing Show Long Names For:
- *Parameter Name*—While editing a parameter, the upper LCD line displays the full parameter name, rather than an abbreviated form of it.
- *Parameter Value*—While editing a parameter, the lower LCD line displays the full parameter value. If the *Show value unit for* Parameter box (see below) is checked, it will be appended by the measurement unit, where applicable—"dB", "Hz" or "%".

Note: The following options only have an effect if at least one of the two parameters above is active.

Display duration (s)
Use the mouse to adjust the time that parameter names and values remain on the LCD display, following selection/adjustments.

Allow multiple info
This determines the behavior when you edit multiple parameters simultaneously. When enabled: the long name info remains in the display, until the most recently edited parameter's display times out. This may cause overlapping text. When disabled: the long name display is only shown for the most recently edited parameter. This can cause flicker.

Show info when selecting tracks
When this option is checked, and you select a track, you will see "Selected" in the upper row, and the selected track's name in the lower row of the LCD. You can disable this feature, if you find it disconcerting.

Show info when editing volume
When this option is checked, and you edit a track's volume, you will see "Volume" in the upper row and the new volume value in the lower row. You can disable this feature, if you find it disconcerting.

Show Value Units For:
Allows you to adjust whether parameter values will be appended by the measurement "unit", where applicable—"Hz" or "%", for example. You can set this option separately for *Instrument/Plug-in parameters* and *Volume and other parameters*. If you can do without the value units, the display is less cluttered.

Note: This parameter only applies while editing.

Customizing Control Surfaces
Logic allows you to program new assignments for unsupported control surfaces. This facility allows you to extend the use of faders, knobs, and switches, either directly or through the use of modifier commands.

To assign a MIDI control to a parameter:
1   Click the destination parameter that you want to "teach" Logic.
2   Activate Learn by pressing Command-L (default), or via the *Logic > Preferences > Control Surfaces > Learn Assignment for "xxx"* menu option (the parameter name is appended to the menu item text).
3   The Controller Assignments window is opened, with the *Learn Mode* button enabled.
4   A help tag will indicate what needs to be done next (move control, for example).
5   After the first message has been received, you can assign another MIDI control by simply clicking the desired parameter and operating the desired MIDI control. This allows you to learn multiple assignments in one go.

Note: If no MIDI messages are received, releasing the Command (modifier) key(s) leaves the *Learn Mode* button enabled, allowing you to immediately retry the generation of the intended control message. You will need to disable the *Learn Mode* button manually, once the procedure is completed.

To abort the learn procedure:
▪   Either press Command-L a second time, or click the *Learn Mode* button. You can re-enable the *Learn Mode* button to assign a message.

To delete a MIDI control assignment:
1   Click the destination parameter that you would like to delete.
2   Select *Edit > Clear* from the main menu bar.

To assign a control surface button to a key command:
1   Select the desired key command in the Key Commands window.
2   Click the *Learn New Assignment* button.
3   Press a control surface button that sends a MIDI message.

Note: After about 5 ms, the *Learn New Assignment* button is automatically deactivated to prevent recording of a button release message.

It is also possible to assign a key command to a button/key release message:

1 Press and hold the desired button/key before you enable the *Learn New Assignment* button.

2 When you release the button/key, the selected key command is assigned to the button release message.

To delete a key command assignment:

1 Select the desired key command in the Key Commands window.

2 Press the Backspace key.

Shortcuts for Defining Multiple Assignments

If you would like to make multiple assignments for a number of consecutive parameters, Logic offers you a shortcut. You can assign the first parameter and the last parameter of a row to two controllers. Provided that the controller number distance is the same as the parameter distance, Logic will offer you, to assign the parameters in between to the corresponding controllers automatically.

Example 1: assign faders 1 to 16 to volume of tracks 1 to 16

1 Learn volume track 1 for fader 1.

2 Learn volume track 16 for fader 16.

3 As the track "distance" (15) is the same as the controller number distance for the two most recently learned assignments, the following message appears: "It seems you have just defined two assignments for the first and last of a consecutive row of parameters. Would you like to fill up in between?" Select OK to automatically fill the faders with corresponding Volume assignments for each track.

Note: This feature also works for any other track parameter (Pan, Solo, Mute, and so on).

Example 2: assign knobs 1 to 16 to plug-in parameters 1 to 16

1 Learn parameter 1 for knob 1.

2 Learn parameter 16 for knob 16.

3 As the gap between parameter numbers (15) is the same as the gap between controller numbers for the two most recently learned assignments, the following message appears: "It seems you have just defined two assignments for the first and last of a consecutive row of parameters. Would you like to fill up in between?" Select OK to automatically fill the knobs with corresponding Parameter assignments for each.

Note: This feature also works for instrument parameters. Currently, this only works for knobs that send a single channel message, where the first data byte is the controller number and the second data byte is the value. Alternatively, the controller number can be encoded in the MIDI channel, with a fixed first data byte.

The Controller Assignments Window

The Controller Assignments window is opened via the *Logic > Preferences > Control Surfaces > Controller Assignments* menu item.

It allows you to edit all assignments of the Controller Assignments table. This table is a part of the Control Surfaces Preferences and is stored (along with all other control surface support settings) in the *~/Library/Preferences/com.apple.Logic.express.cs* file.

The Controller Assignments window offers the following parameters:
- Track (default): This field can be used to specify the track parameter you would like to assign. You can choose between the option Selected (which is the default, if creating assignments on the selected track) or a fixed track number (if you want to set up your controls as a mixer surface).
- Parameter: Displays clear text of the addressed parameter.
- Input message: Displays the incoming message data.

Only the parameters of one assignment are visible. You can choose the desired assignment with the left/right arrows at the bottom of the window. If you activate the Follow option at the top of the Controller Assignments window, the window always selects the assignment that matches the most recently received incoming MIDI message.

Glossary

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.

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.

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 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.

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.

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.

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

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.

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

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.

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 Mac OS X 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.

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.

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.

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.

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.

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

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

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

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.

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

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.

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.

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 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.

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.

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.

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.

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.

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.

Preferences window A window that is accessed via the Logic > Preferences menu. All Logic preferences can be set in this window.

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.

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.

routing Generally refers to the way audio is sent through processing units. Also often used to describe specific input and output assignments.

sample A digital recording of a sound at a particular instant in time.

sampler Device used for sampling. In Logic, this generally refers to the EXSP24 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).

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.

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.

software instrument Logic's software counterpart to a real sound source or a sampler or synthesizer module.

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.

stereo Short for stereophonic sound reproduction of two different audio channels. Compare with mono.

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.

toggle To switch between two states such as on or off (applies to windows, parameter values and so on).

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.

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.

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word length. *See* bit depth

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