MetaSynth 2.5

User Guide & Reference

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Table of Contents

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MetaSynth

Introduction

Welcome to MetaSynth a vast creative space where your two most precious senses, sight and hearing, meet and interact in wonderful new ways. MetaSynth presents a new paradigm for sound design and music composition, enabling you to paint sound and create vivid sonic textures beyond your imagining. MetaSynth allows you to sculpt all aspects of the sounds you create—stereo imaging, dynamics, tonal space, spectral content—by manipulating *sound pictures*, MetaSynth's pictorial representation of sound and music.

What exactly is MetaSynth? It is hard to say. It is a tool so unique and of such extraordinary richness that we've never found a single sentence description that could capture its essence. Once you have used MetaSynth, we think you'll agree that the only reply is, "Well, it's MetaSynth!" It is a sound rendering engine that can function as:

- a synthesizer capable of additive, wave table, granular and simple FM synthesis
- a thousand voice sampler
- a sample editor
- an effects processor
- a sequencer
- a microtonal composition tool
- a spectral analysis and resynthesis tool

MetaSynth is a pretty darn neat painting application, too!

MetaSynth uses pictures to 'describe' sounds. Think of each pixel in an image as an oscillator or tape recorder over which you have absolute control. The picture determines where in space the oscillator plays, how loud, for how long, and what type of sound the oscillator plays. The pixels can trigger sine waves (in which case the picture is the sonogram of the resulting sound), or other sounds as well: simple waveforms, FM sounds, and samples/sound files. You can even set different pixel ranges to trigger different samples!

Why MetaSynth?

MetaSynth makes it possible to see the content of sound or music in a way that traditional waveform-based sound editing tools cannot and integrates sound design and music composition into a single elegant paradigm. When you look at traditional waveform displays of sound files, you can see changes of volume in the sound, but you cannot see

the details of the music—how the frequencies of the sound are changing over time. MetaSynth shows you at a glance not only the volume of the sound but also its harmonic content and the stereo placement of each harmonic or note that comprises the sound. With MetaSynth's painting tools, you can alter the sound in astounding ways. Imagine creating sounds whose low harmonics move from left to right while the high frequencies move in the opposite direction!

MetaSynth's creator, Eric Wenger, needed a tool to realize the complex electronic compositions that played in his mind. He needed a tool that could be used for creating sample-based contemporary electronic music, realistic orchestral compositions, and abstract electronic compositions. There were several capabilities required of the tool: 1) the ability to control the envelope (dynamics) of each harmonic of a sound, 2) the ability to generate sounds with a nearly unlimited harmonic range, 3) the ability to determine the location in space of each harmonic at any moment in time, and 4) the ability to define arbitrary tonal spaces so that one could compose in microtonal spaces as easily as in traditional semitone spaces.

While working on a computer painting program, he realized that the graphical manipulations which were so common in advanced graphics applications could be applied to sound if you thought of stereo sound as a color picture—*sound pictures*—in which color represented stereo placement, brightness represented volume, and the horizontal and vertical axes represented time and pitch.

Once Eric began to work with this new metaphor, he found that the tools in these graphics applications yielded wonderful, useful musical results, and the Image Synth, the heart of MetaSynth, was born. With each new version of MetaSynth, more graphics tools have been added to MetaSynth so that it is no longer necessary to use any other application to manipulate *sound pictures*. You will be amazed by the sounds and effects you can create.

This new paradigm allows you to use the same tool to analyze sound and to create it. MetaSynth can convert existing sounds into pictures as easily as it can turn *sound pictures* into sounds, making it possible to invent new, mind-stretching instruments by manipulating *sound pictures*.

Unlike traditional music software, there is no distinction between sound design/creation and composition. With no external hardware required, you can create music that goes from your brain to CD, retaining the crystalline clarity of the music as you first imagined it.

About This Manual

If you are like us, you rarely read software manuals. We recommend that you make an exception with this one. MetaSynth is such a new paradigm that, as good as our user interface is, there is much that MetaSynth can do that you won't discover without a few glimpses at this manual.

MetaSynth's richness is akin to a furniture maker's workshop. Before you can make a beautiful table, you need to understand not just how to use the individual tools but also the method by which the products of each tool are put together to make the final product. Our hope is that this manual and the provided tutorials will provide both types of information.

We suggest perusing the *Overview* chapter then getting your feet wet with the *QuickStart* hands-on tour. On the CD, we've provided seven step-by-step tutorials that demonstrate a number of valuable techniques. A summary of the tutorials is provided at the end of this manual.

After you have explored a bit, come back to the manual and read a section. You will be rewarded with new discoveries that will make your MetaSynth experience richer.

Spend some time learning to use MetaSynth in each of its guises. Learn to create sounds, to shape or mis-shape existing sounds and to compose note-based music. Explore the Instruments and sample preset files provided on the CD. They will give you an idea of the many wonderful things that MetaSynth can do for you and how to do them.

Most of all, HAVE FUN!

What's New in 2.5

A lot has changed since MetaSynth 2.0 was released. This chapter covers the highlights but is by no means complete. There have been a lot of changes under the hood.

- Displacement Maps
- Master Tuning/Reference Pitch in the Image Synth
- Numerical control of brush size, scaling and rotation for increased precision.
- Double-click to display tool options for: Brush Size tool, Scale Picture tool, Rotate tool, Offset tool, Contrast and Luminance tool
- Remap Colors dialog
- Brush Size Options
- New Hot Filters: Quantize & M Blur
- Improved real-time preview
- Improved granular synthesis
- Wave shaping
- Spectrum synthesis and filtering
- Import/Export Custom Scales/Tunings
- Custom Scales/Tunings with up to 1024 divisions
- Open Dialog: sound and picture previews and favorites menu
- Blue Grid submenu
- Sample and Instrument names now remembered with presets
- plus many other refinements, bug fixes and optimizations.

Installation and System Requirements

MetaSynth is a stand-alone application that creates sound in non-real-time. It runs on a wide range of Macintoshes. Though computation time varies with processor speed, the resulting sounds will be identical on any machine.

Hardware & Software Requirements

CPU

MetaSynth runs on any Power Macintosh or clone. A processor speed of 120 MHz or faster is recommended but not required. The Image Synth's real-time preview function may be limited by the processor's speed on machines with slower CPUs.

System

MacOS 7.3 or later is required. MetaSynth is compatible with System 8.5.

Virtual Memory should be disabled via the Memory control panel.

Sound Manager™ 3.1 (or later) is required. Sound playback and recording is done through the currently selected Sound Manager device. MetaSynth will work in conjunction with any third-party sound card, provided that a SoundManager driver has been installed.

Memory

MetaSynth requires a minimum RAM partition size of 20 megabytes. Hence, the computer must have 32 megabytes or more RAM. 64 or more megabytes are preferred.

Note *Virtual Memory should be disabled via the Memory control panel.*

MetaSynth does memory-based processing. With the minimum partition size, MetaSynth is limited to the creation (or loading) of 18 seconds of stereo sound (or 36 seconds of

mono sound). The preferred partition size for most work is 60 megabytes or more. Larger partition sizes allow for the creation of larger sounds and the loading of larger instruments. With a large RAM partition, you can create pieces five minutes or longer.

Performance Notes and Set-Up

A 233 MHz PowerPC can preview up to 400 simultaneous oscillators (pixels) in real time when using sine waves as the input source. The other input sources (samples, instruments and Procedural Synth) are computationally more intensive and will reduce the number of oscillators that can sound at once when doing real-time previews. If you experience intermittent playback when previewing, you can select a portion of the picture and preview the selected portion.

32-bit color mode (millions of colors) is recommended, however resolutions down to 8-bit (256 colors) are supported.

It is recommended that you adjust the brightness of your display to its maximum setting to enhance pixel display. Increasing brightness helps to make low amplitude pixels visible. The *Gamma* control panel which is included with some graphics applications can be very useful for adjusting the brightness curve of your display.

For the best results, we recommend connecting your computer‘s sound output to a stereo receiver or mixing board which is connected to high quality speakers (or headphones). If you are connecting the sound output to a mixing board, remember to pan the mixer channels hard left and hard right. The internal speakers of your computer (or AV monitor) cannot do justice to the sounds you will create with MetaSynth.

There are no known Extension or Control Panel conflicts, other than Virtual Memory. However, real-time previewing can be compromised by any software which steals CPU cycles in the background. If you experience stuttering effects when previewing sounds, try turning off any extension which operates in the background (such as *Norton DiskLight* or Fax Modem software). You may want to use the *Extension Manager* control panel or other startup set manager to create a custom MetaSynth startup set.

Installation

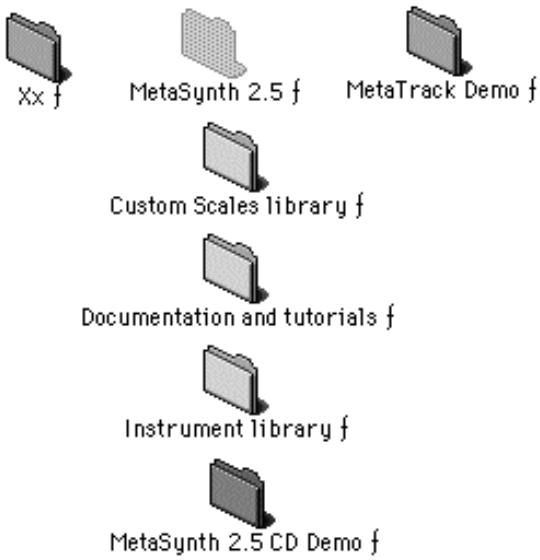


Figure 1. MetaSynth CD Contents

Place the MetaSynth CD into your Macintosh CD-ROM drive. When the CD's icon appears on your desktop, double-click on it to open the disk.

Copy the folder *MetaSynth 2.5 ƒ* to your hard drive.

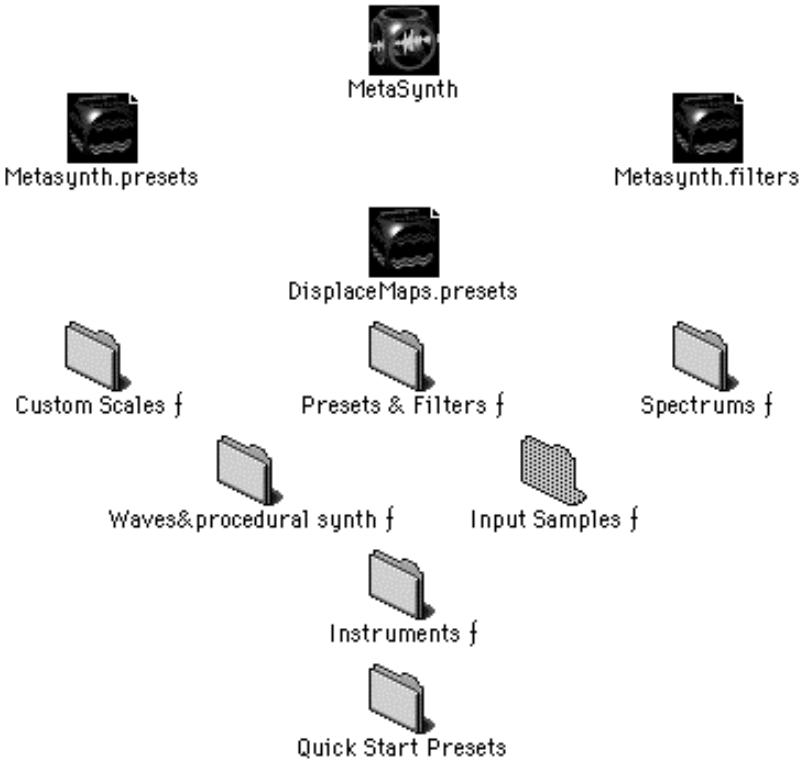
Open the folder you copied to your hard drive, and double-click the MetaSynth application. The first time that you start MetaSynth, you will be asked to enter your name and serial number. You can find the serial number on the registration card.

The CD contains a wide range of files of interest to MetaSynth users. There are hundreds of megabytes of instruments, sound files, sample preset libraries, tutorials and a soft copy of this manual. Also supplied are demo versions of some exciting UI Software applications:

- Xx, a MIDI sequencer and algorithmic composition tool which can read and write MIDI files and convert these files into pictures that MetaSynth can render

- MetaTrack, a multi-track audio sequencer that uses MetaSynth preset libraries

What's Installed



The picture above shows the contents of the folder you have installed on your hard disk.

The files *MetaSynth.presets*, *MetaSynth.filters* and *DisplaceMaps.presets* are all used by MetaSynth. MetaSynth requires files with these names to operate. If you delete these files, new, empty ones will be created at start-up. If you would like to use your own preset, filter and displace map libraries by default, you can replace the provided files with your own of the same name.

The other folders are not required but are convenient. They contain a number of instruments, preset and filter libraries, spectrum files, sound files and custom scales we think you will find helpful. Remember that there are even more of these files (hundreds of megabytes of them) on the CD.

If you need to free up disk space, you may delete any of the items you wish.

Overview

About This Chapter

This chapter is intended to orient you in MetaSynth's sometimes bewildering world. MetaSynth is so good at creating surprising, surreal soundscapes that it is easy to forget that it is also a wonderful tool for accomplishing such "mundane" tasks as sequencing a rhythm groove or rendering orchestral music. The goal of this chapter is to introduce MetaSynth's basic organization and operating principles and to give you an idea of what MetaSynth can do. The following chapter, the **QuickStart**, provides a hands-on tour.

Once you have read this chapter, you may want to jump in and start exploring MetaSynth on your own. In fact, we encourage it. After a bit of exploring, skim through the manual and discover some of the rest of what MetaSynth can do.

What MetaSynth Can Do

MetaSynth can be used to create new sounds from scratch, and it can filter, shape and deconstruct existing sounds. What is more, MetaSynth can be used as a sequencer to make music from these sounds. When using MetaSynth as a sequencer, you can create amazingly realistic dynamics and articulations that would be impossible with other sequencer/sampler combinations. And, of course, you can create music whose very nature defies credulity. How you accomplish these tasks will depend on how you use and set up the various tools MetaSynth provides.

People often ask what they are supposed to do with the sounds created in MetaSynth. Some users will use the sounds in their hardware samplers. Others will create tracks they will import into multi-track mixing applications. Still others will create complex, atonal compositions and explore MetaSynth's custom micro and macro –tonal tunings. It all depends on how you choose to use this tool.

Anatomy of MetaSynth

MetaSynth has several work areas where you accomplish different tasks. Each of these work areas puts quite a range of tools at your disposal. Understanding the relationship between these areas is critical to getting the most out of MetaSynth. Below is a brief description of the primary work areas. A more detailed summary of each area is provided later in this chapter. A complete reference for each area is provided in the reference section of this manual.

Spheres of Influence

MetaSynth has two spheres of influence about which its functionality is structured. The Image Synth, where sounds are created according to the *sound picture* paradigm, lies at the center of one sphere. Its satellites include the Wave Table Palette, the Procedural Synth and Instruments. Its output is sent to the Sample Editor which is served by the Effects Palette, the Filter Palette, the Procedural Synth and five of the application's seven menus. The Sample Editor's output can be played, saved to disk or fed back into the Image Synth where it can be used as an input source for playing pictures or analyzed to create a new sound picture.

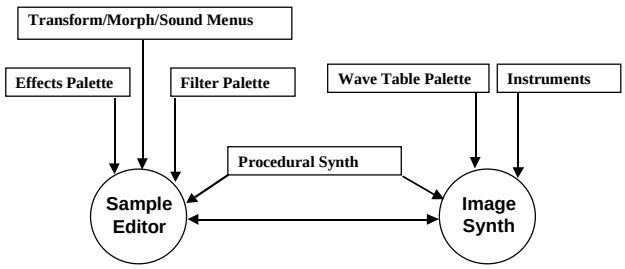
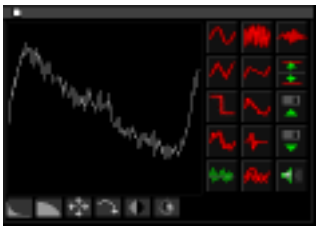


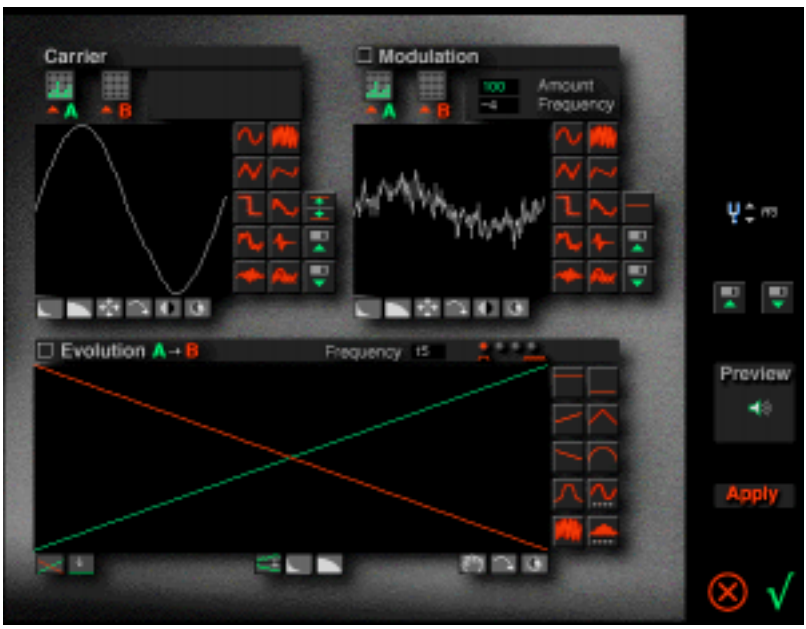
Figure 2. MetaSynth's spheres of influence

The Image Synth & Its Allies

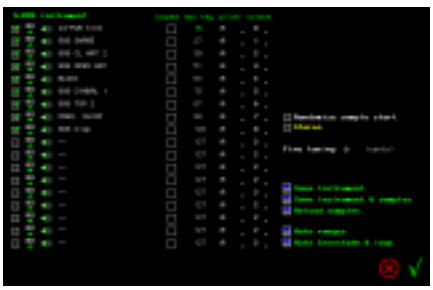
Image Synth—This is the heart of MetaSynth. The Image Synth renders the picture in the display area as sound. The picture it contains can be either rendered (in non-real-time, at full fidelity) or previewed (in real-time at reduced fidelity). When the image is rendered, the output is loaded into MetaSynth's Sample Editor. In addition to being able to render sound pictures, the Image Synth is a sophisticated image processing application.



Wave Table Palette—A wave table/waveform generator that can be used as an input source by the Image Synth.



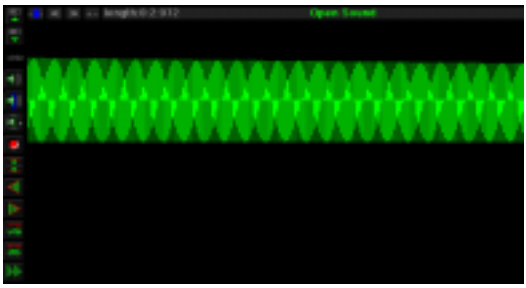
Procedural Synth—The Procedural Synth is a two operator FM-based sound generator accessed from the Sounds menu. It serves double duty. It can be used as an input source by the Image Synth, and it can generate sound directly into the Sample Editor.



Instruments Dialog—The Image Synth's most powerful input source. Instruments are multi-sample collections that are used to map up to 18 different samples to different pitch

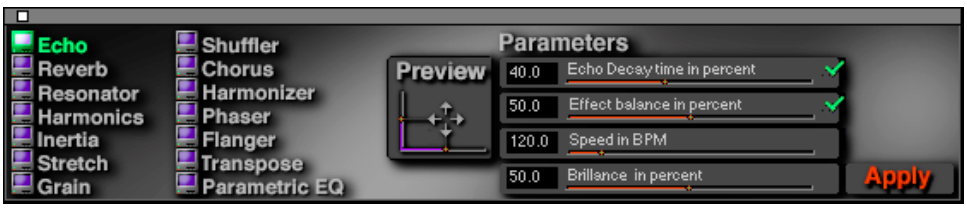
ranges. Instruments turn MetaSynth into a non-real-time sampler with hundreds of voices and incredible, note-by-note envelope control.

The Sample Editor & Its Allies



Sample Editor— The Sample Editor is a full-featured sound editor where sounds are edited and transformed with the various filters, effects and morphing processes provided by the Sample Editor's satellites. Most of the application menus serve the Sample Editor.

Filter Palette—This palette is used to create time-variant, attenuating filters that are applied to the currently loaded sound. The image processing tools available are similar to the tools available in the Image Synth though the images here serve a different function. Rather than generating sound, they filter it. The luminance of the blue pixels in the Filter Palette's filter canvas determine how much of the original signal passes through.



Effects Palette—This palette provides a number of sophisticated digital signal processors. Familiar effects such as delay, chorus and reverb are offered along with spectacular granular synthesis-based effects that are all applied to the currently loaded sound.

Transform/Morph/Sounds menus—These menus provide a number of sophisticated processes for transforming and morphing sounds in the Sample Editor.

User Interface

Tools

The moment you launch MetaSynth you will see that MetaSynth has a look and feel unlike any music application you have ever used. We want the visual experience of using MetaSynth to be as unique and stimulating as the experience of using it. As a result, many of the windows have user interface features that won't be immediately familiar.

Every icon, picture and glyph that you see in MetaSynth's palettes and windows does something. We call these items tools. Many of these tools are commented; as you move the cursor over the tool, its title or some information about it will appear in the **Tips Display** of its window. Some tools are simply meant to be clicked. Others need to be pressed and dragged vertically or horizontally or both. The mouse cursor changes to indicate how the tool is operated (see **Cursors** below).

Tools that are influenced by both vertical and lateral motion can be constrained to the influence of one or the other using modifier keys: shift for horizontal-only control, shift-option for vertical-only control. Detailed description of each tool is provided in the reference section of this manual.

Menus

MetaSynth's menus work somewhat differently from those found in other applications. With the exception of the **Instruments** and **Windows** menus, the menus found in the menubar apply to the Sample Editor. This enables you to execute independent editing operations (cut, copy and paste) in both the Sample Editor and the active graphics display area (the Image Synth or Filter palette) without disturbing the selection or clipboard of the other. MetaSynth maintains separate sound and pict clipboards.

Command keys, therefore, apply to the Sample Editor. The equivalent commands in the graphics display areas (the Image Synth and Filter Palette) are executed by pressing a key *without using* the command key. For example, to select all of the waveform displayed in the Sample Editor, press command-a. To select all of a displayed picture, you simply press the 'a' key by itself.

Cursors

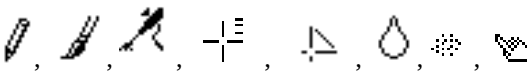
For all tools, the cursor provides important feedback about how to operate the tool.

The standard arrow cursor indicates that clicking on the tool does one of the following: instructs MetaSynth to perform a specific action, toggles the tool's state or pops up a palette or menu.

These cursors indicate that dragging the mouse in the indicated directions changes the tool's settings. Many tools are capable of changing two different but related parameters, such as Brightness and Contrast simultaneously via gestural control where the entire screen acts as a control surface.

The crosshair cursor belongs to MetaSynth's selection tool. It allows you to draw a selection rectangle in the graphics display areas.

The hand cursor lets you scroll a picture. There are no scroll bars in MetaSynth. Press the spacebar to invoke this cursor when the mouse is over a drawing area.



These cursors are associated with brush tools and are discussed in detail in the Image Synth chapter of this manual.

Numeric Fields

In a number of dialog boxes and some of the palettes, you will encounter fields for entering numbers. Numbers can be entered two ways, clicking on the field and dragging the mouse up and down to increment and decrement the value or by clicking on the field and typing a number.

When entering numbers by typing, you can usually type the return key to complete entry of the value. (This does not work in the Image Synth where pressing return is the shortcut for the Preview tool). Values can also be confirmed by pressing the tab key which completes the entry and activates the next numerical field. The delete and backspace keys do not function in these fields. To correct an entry, press the return or tab key then click on the field and enter the desired value.

Tips Display

In the Image Synth, Sample Editor and the Filter Palette, there is a region of the window where helpful information is displayed as you roll the mouse over a tool or display area. This information might be the name of the tool or the pitch associated with a particular pixel or some other helpful text.

Launching MetaSynth

When MetaSynth is launched by double-clicking its icon, it opens the files **MetaSynth.presets** and **MetaSynth.filters** located in its home folder and loads a simple waveform into the Sample Editor. You can replace the default preset and filter libraries

with your own, but they must be named **MetaSynth.presets** and **MetaSynth.filters** to be loaded automatically.

Drag and Drop

MetaSynth can also be launched using the Macintosh Drag & Drop mechanism. A preset library dropped on the MetaSynth application icon will become the active library. Sound files and Instrument files dropped on the icon are loaded and added to the **Sounds** and **Instruments** menus respectively. The last sound file dropped on the application icon will be the current sample when MetaSynth finishes loading.

Since filter libraries have the same format as preset libraries, dropping a '.filters' file on MetaSynth opens it as a preset, not filter, library. Filter libraries must be loaded using the Open Filters File command of the Image Synth's File submenu.

Files can also be dropped onto the MetaSynth application icon while it is open.

Open/Save Dialogs

New in 2.5! MetaSynth now features custom **Open** and **Save** dialogs with a couple of handy features: a **Preview** display area and **Favorites** and **Recent Files** pop-up menus.

Preview Area

The **Open File** dialog box has a new **Preview** area. This area is active when opening sounds, preset and filter libraries, and custom scales files. When opening sounds, a **Play** button appears if the highlighted file is a SoundDesigner II file. AIFF files are not currently supported for previewing. When opening preset and filter libraries, the preview area displays the first three presets of the highlighted library. When opening custom scale files, the first 4 lines of the file are displayed.

Favorites and Recent Files

Both dialogs now feature **Favorites** and **Recent Files** pop-up lists which are persistent between sessions.

 The **Favorites** pop-up menu has a command which adds the highlighted file or folder to the menu. Choosing an item from the list navigates the dialog to the appropriate location and highlights the item. If you choose a file of a different type than appropriate for the dialog (if you choose a sound file's name when you are in the Open Preset Library dialog, for example), the dialog box still navigates to the item's directory. An item named **Metasynth.prefs** will be listed at the top of the menu. Selecting it takes you to MetaSynth's home folder.

To remove an item from the **Favorites** list, hold down the option key, and select it in the list.

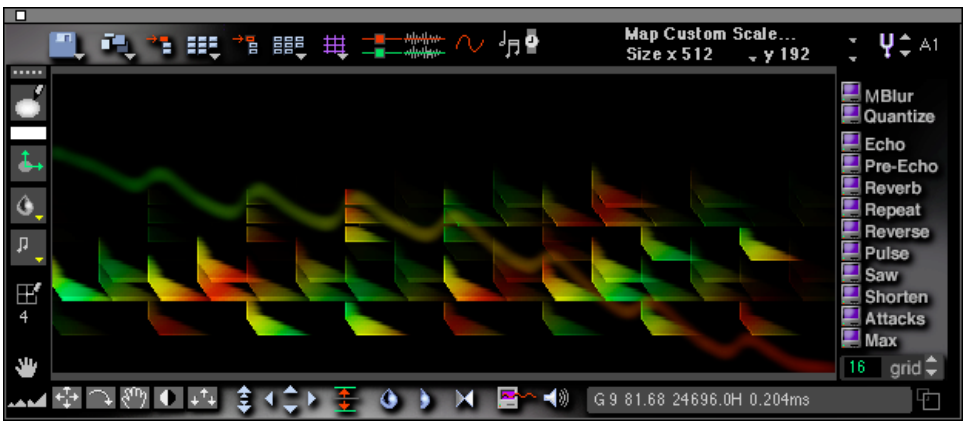
The **Recent Files** pop-up menu lists the ten most recently opened files. The most recently opened file is always at the top of the list. As with the Favorites list, you can select a file of a different type than the dialog is asking for, and it will navigate to the item's directory. This is especially handy if you store Instrument files in the same folder as the samples from which they were built. Let's say you have opened an Instrument file and decide to edit one of its sample files. Choose Open Sound then choose the Instrument's name in the Recent Files list. The dialog box locates the directory where the Instrument and samples are stored.

Canceling/Interrupting Time-Consuming Processes

Some MetaSynth processes are time-consuming: rendering complex pictures that use **Sample** or **Instrument** input sources, **Morph** operations with long sounds and some others. To cancel such processes/computations, click in the application's menubar.

Note! Unlike other Macintosh applications, MetaSynth doesn't ask you to save your changes when you quit. Remember to save your sounds or add your presets to a library if you want them saved.

Image Synth Overview



About the Image Synth

The Image Synth lies at MetaSynth's heart. The central area of the palette, the canvas, is where sound pictures are edited and created. The canvas area is surrounded by the Image Synth's tools which are described in the reference section of this manual. These tools provide a broad range of functions and are designed to manipulate graphics in a musical way. You can create pictures from scratch or work with pictures imported from other applications. MetaSynth's **Custom Scales** feature enables you to explore non-standard and microtonal tunings in ways never before possible.

The Image Synth is used for both sound design and music composition–sometimes both at the same time. It all depends on what the picture is and how you set up the Image Synth. In certain respects, the Image Synth resembles the piano roll type display found in conventional MIDI sequencers. In other respects, the Image Synth resembles a super sonogram.

The displayed picture can be heard by previewing the sound picture or by synthesizing/computing it. Computing the sound generates a CD-quality 16-bit 44.1 kHz sound. When computed, the sound is automatically loaded into the Sample Editor and played back. Previews are performed in real-time in mono at reduced fidelity. Previewing will give you a rough idea of what the picture will sound like and is convenient for checking your work as you go when working with pictures that take a while to compute. In some cases, if the picture is simple enough, MetaSynth will preview the sound at full-fidelity. When previewing, the sound is not routed to the Sample Editor.

How MetaSynth Plays a Picture

Pictures are converted to sound using a few simple rules (though the effects are not so simple!) The vertical axis represents pitch. The higher up the picture you go, the higher the pitch. The horizontal axis represents time. The color of the pixels represents stereo placement. The time it takes to play the picture is defined by the user. Pictures play back from left to right.

The brightness of the pixels (the dots which make up a picture) determine the amplitude, or volume, of the sound at that moment. Complex amplitude envelopes can be created by varying the brightness of the pixels. Specialized tools have been provided to perform tasks such as smoothing and sharpening attacks and decays and more.

Sound pictures can be mono or stereo. A mono sound picture is grayscale and results in a mono sound. Stereo sound pictures are color and result in stereo sounds.

The color of a stereo sound picture's pixels determines the stereo placement of the sound. MetaSynth uses an RGB (red, green, blue) color model. Green represents the right channel. Red represents the left channel. In RGB, yellow is the combination of red and green and plays back in the center of the stereo field.

Blue is ignored by the Image Synth which allows you to set up silent blue rhythmic and harmonic grids over which you paint with other colors.

The sound triggered by the pixels is determined by the input source for the picture. The input sources can be: sine waves or other simple waveform defined in the Wave Table palette, the currently loaded sound, the Procedural Synth or any of the currently loaded multi-sample instruments.

A picture rendered with sine waves will yield a very different result from the same picture rendered with a piano or drum instrument.

Pictures can be created from scratch or imported into MetaSynth. Sound pictures are typically saved into preset libraries which store a number of sound pictures. Each picture in the open library is immediately available from the Select Preset pop-up menu.

Getting Started

If you can't wait to jump in, launch MetaSynth now. There are a few tools with which you'll need to be familiar in order to start exploring:

-  the **File** submenu—use it to open preset and filter libraries
-  the **Preset Selector** (Select Preset tool)—hold down the mouse button to display a pop-up menu of sound pictures (presets)
-  the **Synthesize** tool—click on this tool to compute full-fidelity, stereo sound
-  the **Preview** tool—click on the icon to hear a mono preview of the sound

Use the **Select Preset** tool to try out some of the presets in the default preset library. Use the <**return**> key as a shortcut to preview the picture. Press the mouse button to halt the preview. Don't forget to listen to the full-quality rendered sounds, too, by pressing the **Synthesize** icon.

Notice the **Tips Display** at the lower-right corner of the palette where helpful information is displayed as you mouse around.

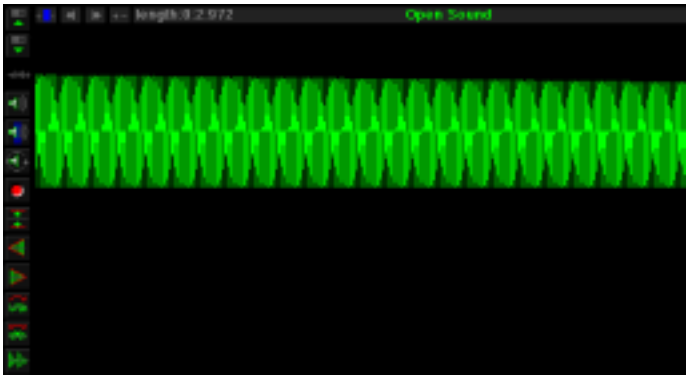
See the **QuickStart** chapter which follows for a hands-on tour.

Other Features

The Image Synth provides a host of specialized tools for creating sound pictures. There are a number of brush types for painting and filtering. There are filter presets which filter the displayed image. There are Hot Filters which apply musically useful graphic processes such as Echo, Pre-Echo, and Quantize. The image size is customizable as are the reference pitch and tuning of the picture.

See the **Image Synth** chapter in the reference section for a full description of the Image Synth and its tools.

Sample Editor Overview



MetaSynth's streamlined sample editor is non-modal and always available. Here is where you modify the sounds created with the Image Synth or transform any SoundDesigner II or AIFF sound files. It provides standard editing tools and some not-so-standard effects and filtering tools. Edits are automatically crossfaded to ensure seamless, clickless edits. No need to worry about zero crossings! (If that means nothing to you, be glad). It is RAM-based to make it very responsive. The **Tips Display** is found in the upper-right portion of the Sample Editor (just below the menubar) and displays helpful information.

Only one sound can be open at a time though any sounds opened during a session are available from the **Sounds** menu. The Sample Editor's tools are displayed on the left and top edges of the screen.

The Sample Editor can be hidden by typing command-w or choosing **Hide Sample Editor** from the **Windows** menu. This action merely hides the Sample Editor; the open sound file is not closed. Typing command-w shows the Sample Editor if it was previously hidden.

Note *Currently, MetaSynth only works with 16 bit, 44.1 kHz sound files.*

User Interface Note

The default tool in the Sample Editor is the scroll tool. Click on the waveform and drag left or right to scroll it. Scrolling has a unique inertial throw behavior. You can throw the waveform to the left or the right with the mouse. Clicking on the moving waveform stops its scrolling.

Several important functions are handled by pressing a keyboard modifier while using the mouse.

- **Selecting**–Selection within the waveform is performed by command-dragging the mouse. (There is no separate selection tool).

- **Extending selections–**Extending a selection is performed by pressing the shift and option keys while dragging.

- **Zooming**–Zooming in and out is performed by option-dragging the mouse.

See the **Sample Editor** chapter in the reference section for a full description of the Sample Editor and its tools.

Filter Palette

The Filter Palette is a 128-band time-varying filter with a pictorial interface. The filter modifies the sound currently loaded in the Sample Editor.

The Filter Palette allows you to create a variety of unique filter effects in addition to providing standard EQ and filter operations. You can use it do analog synthesizer-like filter sweeps. Because you can see the sound to be filtered in the palette's background, you can create high-pass, low-pass, band-pass or other filters custom tailored to the frequency content of the underlying sound. As you mouse around in the Filter Palette, helpful information is displayed in the Tips Display in the upper-right portion of the palette.

How The Filter Palette Works

Like the Image Synth, the Filter Palette has a canvas upon which you paint the filter. The vertical axis represents frequency and the horizontal axis represents time. The duration of the picture is equal to the duration of the current sound (not the current sound picture).

The filter is drawn with blue pixels. The brightness of the pixels determines how much sound passes through the filter. Where the filter is black, no sound passes through.

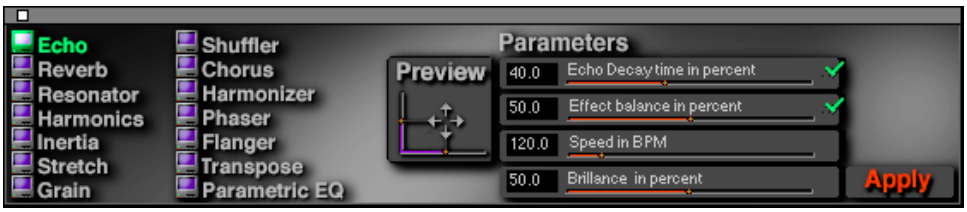
Orange pixels have no effect on the filter. They are like the Image Synth's blue channel. You can do a frequency analysis of the current sound to the 'orange channel' by clicking on the **Analyze Sound** tool. This gives you a template of the current sound over which you can draw your filter. Where the blue and orange pictures intersect, sound passes through the filter.

The Filter Palette can open preset libraries so that you can save and re-use your favorite filters. Also, any picture can be pasted into the palette and used as a filter.

A full complement of tools similar to the Image Synth's are available in the Filter Palette.

See the **Filter Palette** chapter in the reference section for a complete description of the Filter Palette.

Effects Palette



The Effects Palette provides high-quality effects with which you can modify the Sample Editor's current sound. It includes a full complement of standard effects (**Echo**, **Reverb**, **Flanging** and the like) as well as unique granular-synthesis based effects such as **Inertia**, **Stretch**, **Grain**, and **Shuffler**.

All of these processes provide real-time previewing with x-y mouse control where the entire screen serves as a virtual control surface with which you can dial in your settings. When you are happy with the effect, you apply it permanently to the currently loaded sample (which can be restored to its previous state by choosing **Undo** from the **File** menu).

See the chapter *Effects Palette* in the Reference section for a complete description.

Sound Advice…

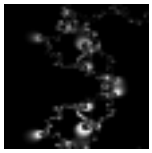
It can be helpful to remember that MetaSynth can serve a variety of functions. As you explore MetaSynth, we have found it useful to mix free exploration and more focused exploration.

Spend some sessions which focus on particular areas:

- the Image Synth as a sound design/sound sculpting tool
- the Image Synth as a composition tool/sequencer for creating note-based music
- the Image Synth as a multi-sample player/renderer (using Instrument input sources)
- the Effects Palette as a granular synthesis tool
- the Morph Menu sound convolution functions

You will find that using MetaSynth iteratively provides a limitless terrain for exploration. Generate samples from the Image Synth that you use the Filter and Effects Palettes and Morph functions to modify. Then, use those sounds as input sources for the Image Synth, and on, and on, and…?

Check the MetaSynth web site from time to time. New tutorials and ‘tips and tricks’ are posted frequently. The site also features a lively users forum where MetaSynth users from around the world share their ideas. The site’s address is found on the information page which follows the title page.



QuickStart

This chapter provides a hands-on, whirlwind tour of MetaSynth's highlights. The QuickStart has something for everyone: MetaSynth newcomers and experienced users alike. While some of the material is quite basic, there are advanced techniques as well. If you hate to read manuals, this is a good place to make MetaSynth's acquaintance.

If you are new to MetaSynth, you might want to check out the **Overview** chapter before proceeding with the QuickStart though it is by no means a requirement. Our goal in this QuickStart is to let you get your feet wet and quickly see the neat things MetaSynth can do. We don't slow you down with explanations of material covered elsewhere in the manual. Don't worry if you feel a bit lost at first. MetaSynth's is a strange, new world.

We recommend that everyone take the **self-tour**. It shows off some pretty nifty sounds, many of which make use of new features like custom tunings/scales.

This chapter only scratches MetaSynth's surface. Remember that there are several tutorials provided on the CD which demonstrate many valuable techniques. A summary of the tutorials is provided at the end of this manual.

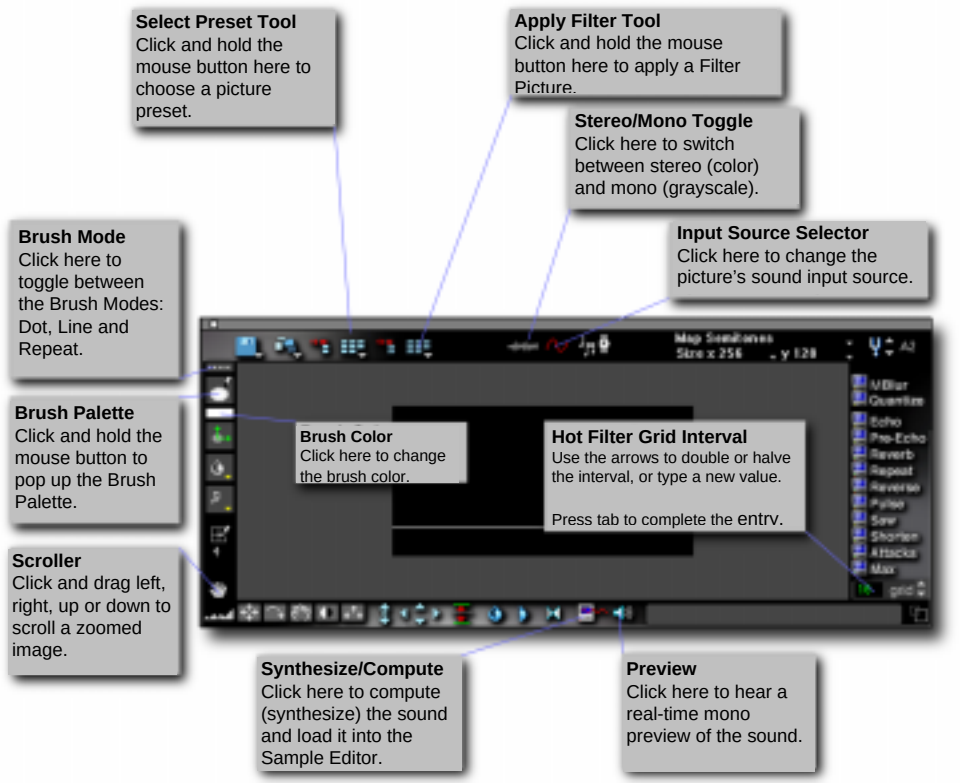
A Simple Convention

In this chapter, we use a simple convention to distinguish explanatory text from steps to execute. Steps to execute are marked with bullets.

- Get ready to have fun!

The Image Synth

If you are new to MetaSynth, take a look at the picture of the Image Synth Palette below. It points out Image Synth interface features you will use in the Self-Tour and first lessons.



Pre-Flight: The Self Tour

In this section, you will open the Self-Tour preset library and listen to a variety of sound pictures. The Self-Tour will give you an idea of the kinds of sounds that you can create in MetaSynth.

During the course of the Self-Tour, you will occasionally be prompted by MetaSynth to find a file. Don't worry if you don't understand why. The dialog box will have the name of the file you are looking for. It will be found in either the *Input Samples ƒ* or *Instruments ƒ* of MetaSynth's home directory. Some pictures in the Self-Tour have comments in blue. If you are not sure what they mean, don't worry.

- Launch MetaSynth.
- Click on the **Image Synth Palette** to bring it to the front (if it isn't already).
- Type 'o' to open a preset library.
- Choose the file *Self-tour.presets* which is found in the *QuickStart* folder in MetaSynth's home directory.
-  Click on the **Select Preset** tool to pop-up a menu of the library's presets.

  Presets, also called *sound pictures*, are pictures stored in a MetaSynth preset library, such as the file you just opened. Presets contain information about how MetaSynth should interpret the image when using it to synthesize a sound.
- Choose the first preset. It points out the most important Image Synth controls.
- Choose each of the presets in order, and listen to them.

  There are two ways to listen to sound pictures:

   You can click on the **Synthesize** icon to compute a full-fidelity, stereo sound.

   You can click the **Preview** icon to hear a real-time mono preview at reduced fidelity.

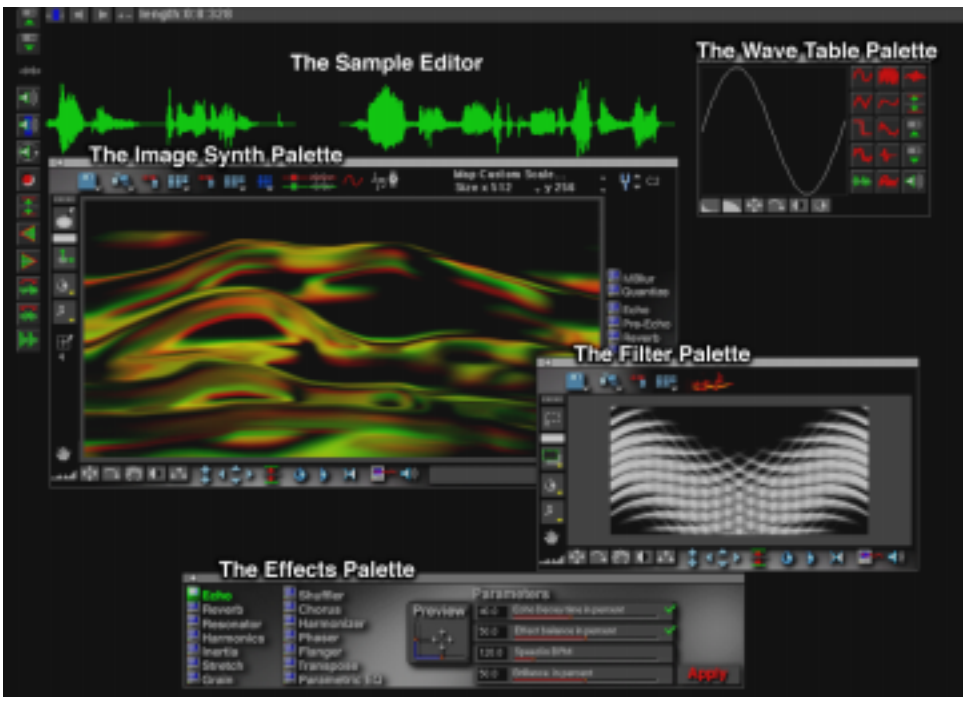
  IMPORTANT! Don't forget to synthesize (not preview) pictures with red & green in them to hear the impressive full-stereo impact.
- Quit from MetaSynth before progressing to the next lesson.

MetaSynth Basics

Setting up the Work Space

- Launch MetaSynth by double-clicking on its icon in the Finder.

When MetaSynth first launches, the **Sample Editor** (the area where the green waveform is displayed) and all of the MetaSynth palettes are visible: the **Image Synth Palette**, **Filter Palette**, **Effects Palette** and the **Wave Table Palette**. When you quit from MetaSynth, it remembers which palettes were open and opens only those ones the next time you launch.



MetaSynth and its palettes

Hiding and Showing Palettes

An individual palette may be hidden by clicking in its close box. To show a hidden palette or bring a palette to the front, choose its name in the **Windows** menu or press the command-key equivalent, which is displayed beside the item's name in the menu.

The **Sample Editor** does not have a close box but can be hidden by choosing **Hide Sample Editor** from the **Windows** menu or by pressing **command-w**. Unlike most other Macintosh applications, MetaSynth treats **command-w** as a toggle to either show or hide the **Sample Editor**.

Note *Unlike other Macintosh applications, MetaSynth doesn't ask you to save your changes when you quit. Remember to save your sounds or add your presets to a library if you want them saved.*

The black background which hides the Macintosh desktop and other applications is the Sample Editor's background. The black background is helpful as it makes dim pixels easier to see in the Image Synth and Filter Palette. If you want access to the windows open in other applications or the Macintosh desktop, you may hide the Sample Editor.

- Close the **Filter**, **Effects** and **Wave Table** palettes.

  If you are not sure which palette is which, refer to the illustration above, or choose the palette's name from the **Windows** menu to bring it to the front.

- The **Image Synth** and **Sample Editor** should both still be visible.

- Click and drag the Image Synth Palette's grow box until the window is a convenient size.

-  Click on the **Magnify**/**Zoom** tool to make the picture a comfortable size while keeping the entire picture in view. Use the grow box if needed. You can use the plus and minus keys as shortcuts for zooming in or out.

  MetaSynth has no scroll bars. If the gray area which surrounds the picture disappears, it is an indication that not all of the canvas (the picture) is visible. You can use the Scroller hand to scroll the picture or press the spacebar and drag the canvas directly to scroll it.

Lesson 1: Getting Acquainted

When MetaSynth is first opened, the canvas area displays the following picture, a single horizontal white line that runs across the width of the canvas:

In the Image Synth, the vertical axis represents pitch and the horizontal axis time. This picture plays a single pitch for the time specified by the **Tempo/Duration Tool** (described later). The red sine wave displayed at the top of the palette indicates that the **Wave Table** is the current input source for the picture.

Preview & Tips Display

-  Press the **Preview** tool to audition the picture. An orange dot rides along the top of the picture as the sound plays.
- Press the **return key** as a shortcut for clicking on the **Preview** tool. You can stop playback by pressing it a second time.
- Move the mouse over the canvas area, and observe the **Tips Display** area located at the lower-right portion of the Image Synth palette. The pitch and time associated with the cursor position are displayed in the **Tips Display** when the mouse is over the canvas.
-  Press either the up or the down **Octave Transpose** arrows and preview the picture.

  If you lose the line off the canvas, it can be recovered by typing ‘z’ or by typing ‘.’ (which is the shortcut for the **Add Fundamental** command found in the Image Synth’s **Pitch and Harmonics** submenu).
- Type ‘z’ to undo the transposition.
- Move the mouse over each of the tools, and note the **Tips Display** for each one.

Play the Current Sample

The green waveform towards the top of the screen is the display of the currently loaded sample. At start-up, a simple waveform is loaded by default.

The Sample Editor has two toolbars: one found above the waveform display, the other at the left edge of the screen.

- Press the **enter key** to play the Sample Editor's current sound.
- Mouse over the tools, and observe their names displayed in the Sample Editor's **Tips Display** area which is located at the upper-right of the screen.
-  Press the **Open Sound** icon.
- Navigate into the Input Samples folder in MetaSynth's home folder, and open the sound *Ana MetaSynth Speech*.
-  Press the **Play Sound** icon to hear the sound.
- Press the command key and drag over the beginning of the sound.
-  Press the **Play Selection** icon to hear the portion you selected.

Input Sources: Sample, Wave Table, Procedural Synth

MetaSynth can use several different sound sources to play Image Synth sound pictures. In this section we explore some of them.

Sample Input Source

-  Click on the Input Source Selector. (If you have changed the input source, the icon will be that of the chosen input source. Sine/Wave Table is the default source).
- 

Choose **Sample** from the list of available input sources which appear:
-  Press the **Preview** icon to audition the sound.
- Hold down the **option and shift** keys and press the up arrow of the Octave Transpose tool, and play the sound.

Note *Like many graphics applications, when you hold down the option key, a copy of the original picture is left behind. Pressing the shift key when clicking Octave Transpose transposes the selection (or the entire picture if there is no selection) by a fifth.*

Wave Table Input Source

- Click on the **Input Source Selector** and choose **Wave Table**.
- Preview the sound. You will hear two sine waves a fifth apart.
- Choose **Wave Table** from the **Windows** menu.
- Click on any of the wave shaping tools and drag to the right.
- Click on the **Image Synth Palette** to bring it back to the front.
- Preview the picture.

Procedural Synth

- Click on the **Input Source Selector** and choose **Procedural Synth**.
- Choose **Procedural Synth** from the **Sounds** menu to open the Procedural Synth.
- Modify the **Modulator** wave by applying any of the wave shaping tools.
- Experiment with different amount and frequency settings by clicking on the numbers and dragging up or down.
-  Click the OK icon button to confirm the settings.
- Preview the picture.
- Re-choose **Wave Table** with the **Input Source Selector**.

We will come back to the **Instrument** and **Looped Sample** input sources later.

Stereo & Mono, Applying a Filter

In the Image Synth, grayscale images play back in mono and color pictures play in stereo. To hear the sound in stereo, you must synthesize the sound. Preview plays back a mono rendition of the sound.

Filter pictures can be applied to the canvas image to modify it. The filter is applied by multiplying the pixels together. This process is described in detail in the Image Synth chapter of the manual.

-  Click on the **Mono/Stereo Toggle** to turn the picture into a stereo picture.

  The picture becomes color. The white line turns a shade of yellow. Red/Green balance determines panning. Yellow plays in the middle since it is the combination of red, which plays the left channel, and green, which plays the right.

-  Press the **Apply Filter** tool, and choose the filter picture which fades from red to green by selecting it in the picture list which pops up.

  The picture now fades from red to green.

- Choose the input source of your choice using the Input Source Selector (Wave Table, Sample, or Procedural Synth).

-  Synthesize the sound by clicking the **Synthesize** tool.

  The previously loaded sample has been replaced by the computed sound, and the sound starts playing on the right channel and pans to the left.

- Press command-z to restore the previously loaded sample.

Brushes and Tools

The Image Synth's left-hand toolbar contains a number of painting tools and menus that modify the note pitches.

- Choose **Wave Table** with the **Input Source Selector**.
- Open the **Wave Table Palette**.
- Click on the sine wave tool and drag to the right to return the waveshape to a sine wave.
- Bring the **Image Synth** to the front
- Press the **delete key** to delete the canvas image.
- Click on the **Choose Brush Tool** (also called the **Brush Palette**).

  This tool displays the icon of the active tool. The **Air Brush** icon (shown below) will be on display unless you have chosen another brush tool.

-  Choose the **Air Brush** if it isn't already selected.

-  Double-click the **Brush Size** tool. Make the brush 5 pixels wide (the upper number) by 3 pixels high with a **minimum spacing** of 3.

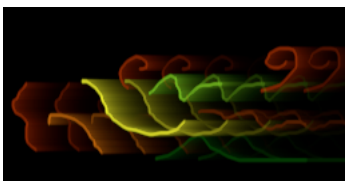
-  Click the OK icon button.

-  Click on the **Brush Mode** tool until the **Line Mode** icon is displayed.
- Draw a few simple lines and curves, periodically changing the brush color by choosing a color from the Brush Color Selector. You will have something like this:

- **Preview** or **Synthesize** the sound. (It won't sound like much yet.)
- Click on the **Frequency Map** selector (it will be displaying the text **Map Semitones**).
- Choose **Micro32**. (This Frequency Map maps 32 pixels per whole tone.)
- Preview the sound.
-  Click on the **Master Tuning** tool's up arrow to tune the picture to A3.
- Preview or Synthesize the sound.
-  Click on the **Hot Filter Grid Interval** (at the lower-right of the Image Synth) and type 32. Press the tab key to confirm the value.

  If you need to correct your entry, do not type the delete key. It will delete your picture. Press the tab key until the number is displayed with green, and enter the new value.

- Press **Echo** in the Hot Filter list once or twice.
- Press **Reverb**.
- The picture will look something like this:



- Preview or Synthesize the sound.
- Click on the **Frequency Map** selector again and choose **Custom Scale**.
- Enter '16' for the **Divisions Per Octave**.
- Select **Linear Subdivisions**.

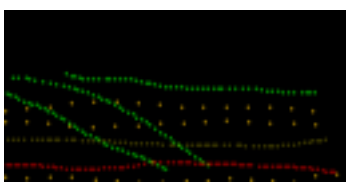
- Option-click **Compute Ratios**.

  Option-clicking generates the harmonic series rather than a scale with linear or exponential subdivisions.

-  Click the OK icon button.
- Listen to the picture.
- Experiment with higher and lower Master Tuning settings (A1, A3, etc). Option-click to increment this reference pitch by semitones.
- Click and drag some of the tools in the lower toolbar and observe their effects, and listen to your changes.
-  Change the brush mode to **Dot Mode** (the usual mode) by clicking the **Brush Mode Toggle** until you see the **Dot Mode** icon.
- Delete the current picture by pressing the delete key.
- Paint on the canvas using different brush colors.
- Double-click the **Brush Size** tool and enter a m**inimum spacing** setting of 16. Press the OK icon button.
- Paint and observe the effects of changing the minimum spacing setting. Feel free to experiment with other minimum spacing settings.
-  Optional step: switch to **Line Mode** and note the effect that the minimum spacing setting has.

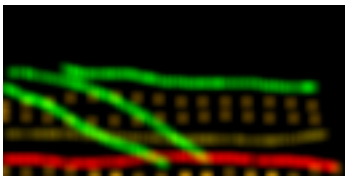
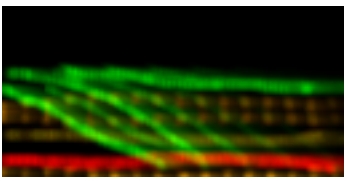
  In **Line Mode,** the minimum spacing setting determines the minimum distance between vertices.

-  If the image is dim, press the Normalize tool to brighten it. Here is an example image:

-  Choose **Blur More** from the **Processes** submenu in the left-hand toolbar. (**Normalize** again if necessary).

Note *Thick pixel clusters like this work well with Custom Scales based on the harmonic series and sometimes with tunings like Micro32. In semitone and major scale frequency maps, such pictures are pretty dissonant.*

- After blurring the image looks like this: 
- Apply **Echo** and **Reverb** again and synthesize (not preview) the picture.
- The result is: 

Adjusting the Tempo

There are two ways to change the speed at which a picture plays back: dragging the **Tempo/Duration Tool**, or by editing the settings of the **Tempo/Duration Dialog Box**.

-  Click and drag the **Tempo/Duration Tool** to the left or right. While the mouse is down, the sound picture's duration is displayed.
- Play the picture at its new tempo.
- Double-click the **Tempo/Duration Tool** to open the **Tempo/Duration Dialog**.
- Enter a new tempo. Click OK, and play the picture.

Creating a Preset Library

-  Choose **New Presets File** from the Image Synth's **File** submenu.
- Save the new file to the location of your choice.

Adding/Deleting Presets

-  Click on the **Add Preset** icon to add the canvas image to the preset library.
- To delete a preset: hold down the **option key,** and click on the **Select Preset** tool. The cursor becomes an X cursor. Choose the preset to delete it.

Accessing the Previous Library

To access the presets of the preset library previously open in the current work session:

- Hold down the **command key**, and click on the **Select Preset** tool. Observe that the presets of the previous preset library are displayed.

- Select any preset.
- Click on the **Add Preset** icon to add the canvas image to the preset library.

Voila! A quick way to copy presets (or filters) between libraries!

Intermediate Techniques

Lesson 2: Preparing a Sound with the Effects and Filter Palettes; Looped Sample Mode

In this section, we delve into the **Effects** and **Filter Palettes** to convert a spoken syllable into a pitched sound source. The **Grain**, **Resonator**, and **Harmonics** effects are use to prepare the sound by pitching it and giving its general characteristic. We use the **Filter Palette** to give the sound a harmonic/filter envelope.

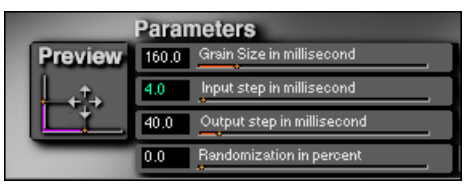
Sample Editing

We use the sound file **Ana MetaSynth Speech** in this lesson.

-  If the sound isn't open, choose **Open** from the **File** menu, and click on the Recent Files icon. Choose the file from the list.
- Hold down the **command key** and drag over the first two syllables to select "Welcome."
- Audition the selection by pressing the **enter key**. If the selection wasn't right, try again.
- When you have selected "Welcome", type **command-g** (or choose **Crop** from the **Edit** menu) to crop the sound to the selection.
- Choose **Save As** from the **File** menu, and save the sound as *Ana Quick.*
-  Click on the **Time Reverse** icon.
- Click the **Time Reverse** icon again to return the sound to its original orientation.

The Effects Palette: Grain, Resonator and Harmonics

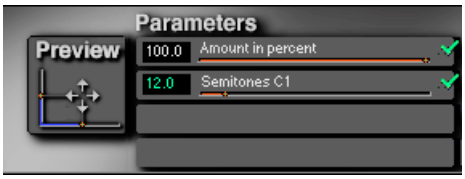
- Bring the **Effects Palette** to the front by choosing it in the **Windows** menu.
- Click on the **Grain** effect.
- Click on **Preview** and drag the mouse around the screen.
- Enter the following settings: **Grain Size**: 160.0; **Input Step**: 4.0; **Output Step**: 40.0; **Randomization**: 0



- Click **Apply**.

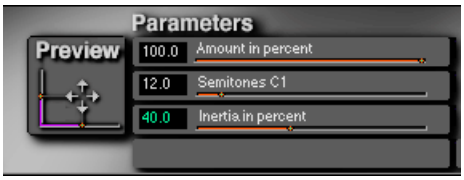
  Note! Applying an effect changes the sample loaded in the Sample Editor. You can use the **File** menu's **Undo** (**command-z**) to undo the effect.

-  Click the left-hand toolbar's **Normalize** icon.
- Click on the **Resonator** effect and enter these settings: **Amount in Percent**: 100; **Semitones**: 12.0



  C1 was chosen because an Image Synth frequency analysis of the sound revealed that C was a prominent harmonic in the sample.

- Click **Apply**.
- Click on the **Harmonics** effect and enter these settings: **Amount in Percent**: 100; **Semitones**: 12.0; **Inertia in Percent**: 40.0



- Click **Apply**.
- Click the left-hand toolbar's **Normalize** icon.
- Choose **Save As** from the **File** menu and save the sound as *Ana Pitched*.

  The **Harmonics** effect uses the Wave Table palette's waveform to derive the final effect. You can create very complex sounds by experimenting with different Wave Table settings.

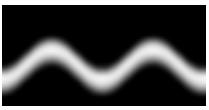
The Filter Palette

- Bring the **Filter Palette** to the front by choosing it in the **Windows** menu.
-  Click on the **Analyze Current Sample** icon.

Note *The image drawn in orange is a frequency analysis of the currently loaded sound (*Ana Pitched*). The image has no effect on the filter but acts as a guide or template over which a filter can be overlaid.*

The Filter Palette's tools are nearly identical to the Image Synth's, **but** the speaker icon does not preview the filter; it plays the unfiltered sample.

-  Click on the **Choose Filter** icon and choose this filter:



- Click on the Synthesize icon to apply the filter.

The resulting sound only contains the frequencies where the filter and the unfiltered sound (the orange picture) overlap.

- Undo the filter application by typing **command-z.**
-  Nudge the filter up or down to adjust the overlap.
- Apply the filter.
- Repeat the previous 3 steps, if necessary, until you have a sound you like.
- Save the sound as *Ana Filtered*.

Using the Sample (Looped Sample Mode)

- Bring the Image Synth to the front.
- Type 'o' to invoke the **Open Preset Library** dialog box.
- Open the library **QuickStart.Presets** found in the **QuickStart** folder of MetaSynth's home directory.
- Click on the **Preset Selector** and choose this preset (the first in the library):

- Click on the **Input Source Selector**, and choose **Looped Sample**.
- Preview the sound.
- Double-click the **Tempo/Duration Tool**.
- In the **Tempo/Duration Dialog**, click the button **Fit Duration to Current Sample**.
-  Click the OK icon button, and play the sound.
- Command-drag in the Sample Editor's waveform display to select all of the sample except for the beginning. We want to give the sound a sharp attack.
- Type **command-g** to crop the sound.

- Choose **Sample** as the Input Source.
- Preview the sound picture and note the difference between how it plays in Sample and Looped Sample modes.

  In Looped Sample mode, the notes trigger points progressively later in the sample rather than triggering it from the same start point each time.
- Press the **delete key** to delete the image.
- Switch back to **Looped Sample** mode.
- Type '.' to draw a line across the canvas. '.' is a shortcut for the **Add Fundamental command** found in the Image Synth's **Pitch and Harmonics** submenu.
- Preview the sound and let the picture play through several iterations. Note that the sample plays continuously.
- Choose **Sample** from the Input Source Selector.
- Click the preview icon and notice that the sample plays through once and stops playing.

Stereo-ize the Sound Picture

- Click on the **Stereo/Mono Toggle** to colorize the picture.
- Press the **command key** (temporarily changing the brush to the selection tool) and select only the region containing the notes.
- Click on the **Filter Selector** and choose any color Filter Picture that has vertical red/green changes.
- Select **Looped Sample** as the input source (if it isn't already).
- Synthesize the sound and note the stereo effect.

Lesson 3: Instruments and Sound Convolution Techniques

Instruments

- Choose **Open Instrument** from the **Instruments** menu.
- Open the instrument *FemaleSoftVoices* from the *Female soft voices m f* folder found in the Instruments folder in the MetaSynth home folder.
- The Instrument Dialog is opened and displays the samples in the Instrument.
- Click on any of the speaker icons to audition the corresponding samples.
-  Click the OK icon button.
- Choose the following preset (the second in the library) from the **QuickStart.Presets** library:

- Control-click anywhere in the picture to hear the note played by that pixel location. Note that the sample's name is displayed in the **Tips Display** while the mouse is down.
- Press the **return key** to audition the picture.
- **If the preview stutters or fails**, select a small portion of the picture (by command-dragging) and press the return key to audition the selection.
- Type 'd' to de-select the selection if you made one in the previous step.

Note *The CD contains many, many more instruments and preset files which we hope you will explore.*

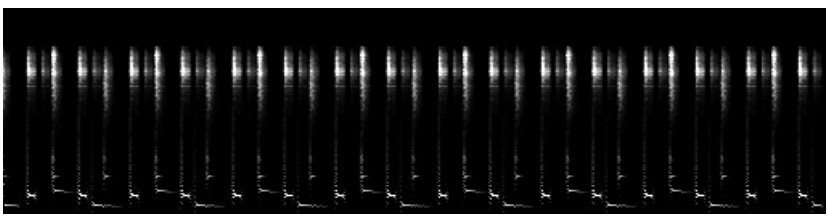
- Press the option key and select the instrument's name in the Instruments menu to unload the instrument from memory.

Lesson 4: Filtering Mozart with Drums (Techno-Mozart)

- Choose this preset, the third one: 

Note *The TR808 drum instrument may be loaded automatically. If not, find it in the* ***Instruments*** *folder of MetaSynth's home directory.*

- Choose **512** from the Image Synth's **Size x** submenu.
- Click on the **Hot Filter Grid Interval** and type '64'.
- Click on **Repeat** in the Hot Filter list to fill the canvas with the drum pattern.
-  Click on the **Synthesize** icon to compute the sound.
- Type 'n' (or choose **Analyze current sound** from the Image Synth's **File** submenu).
- The analysis will resemble following picture:



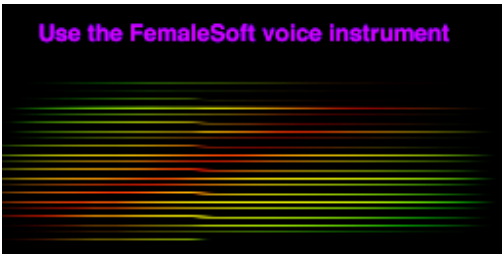
- Press 'c' to copy the picture.
- Bring the **Filter Palette** to the front.
- Type 'v' to paste the image you copied.
- Look in the Sample Editor's upper toolbar and note the length of the sound (about 7.8 seconds).
- Choose **Open** in the main menubar's **File** Menu, and open the sound *Requiem Mozart.L* in the *Input Sample ƒ*.
- Use the command key and select about 7.5 seconds of the sound.
- Type **command-g** to crop the sound.
- Type **command-n** to normalize the sound.
- Press the Filter Palette's compute (Apply Filter) icon.
- Type **command-z** to restore the sound.

-  Press the Filter Palette's **Octave Transpose** up arrow, and apply the filter.

Note *The Filter Palette and Image Synth have slightly different frequency ranges. The Image Synth with the default Master Tuning setting (A2) has a range which starts at A0. The Filter Palette starts at A –1. When pasting a picture copied from the Image Synth, you may generally want to transpose it up one octave to have the frequencies match.*

Lesson 5: Using Convolve for a Vocoder Effect

- Open the instrument *FemaleSoftVoices* from the folder *Female soft voices m f* found in the **Instruments** folder of MetaSynth's home directory.
- Choose this preset:



- Synthesize the sound picture by pressing the Synthesize tool.
- Choose **Convolve** from the main menubar's **Morph** menu.
- Choose the sample file *Ana MetaSynth Speech*. (A quick shortcut is to choose it from the recent files menu in the Open Sound dialog box.)

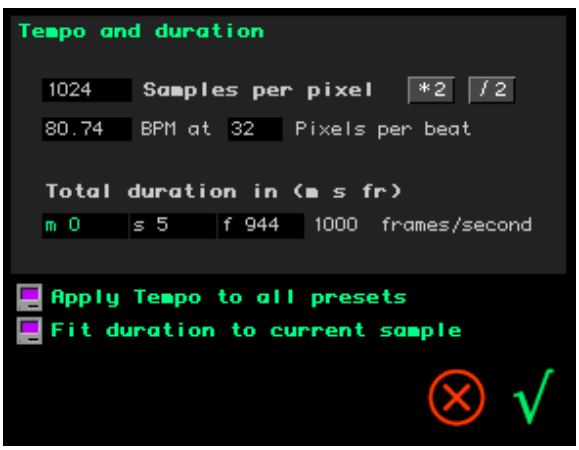
Note *Convolution is a CPU-intensive task. On slower machines, this may take a while to compute.*

MetaTip *To cancel a time-consuming operation, click in the menubar.*

Lesson 6: Building and Using Grids

When creating tonal music, it is often useful to create rhythmic and/or harmonic grids to provide a framework. The Blue Channel can be used for such templates. The Blue Channel's contents are ignored by the Image Synth when it synthesizes images. It can also be used, as you saw in *Self-Tour.presets*, to display text comments. Only color pictures have a blue channel.

- Bring the **Image Synth** window to the front.
- Delete the canvas image by pressing the **delete key**.
-  Click on the **Blue Grid** submenu and choose **Delete Blue Channel**.
- Choose **Semitones** from the **Frequency Map** selector.
- Make sure that the Image Synth is in color mode by clicking on the Mono/Stereo toggle, if necessary.
- Set the canvas width to 256 and the height to 128 by choosing these values from the **Size X** and **Y** pop-up menus at the upper-right of the Image Synth palette.
-  Double-click the **Tempo/Duration icon** to open the Tempo/Duration dialog.



- Enter 16 as the setting for Pixels per Beat
- Enter 160 as the BPM (tempo) setting.

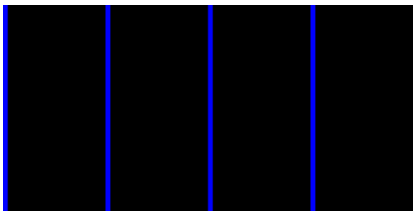
  MetaSynth may adjust this value slightly which is ok.
-  Press the **OK** icon button.

Creating Rhythmic Grids

In this exercise, we create a rhythmic grid with thick blue lines every 4 beats and thin blue lines every beat: a convenient grid for working in 4/4 time signatures.

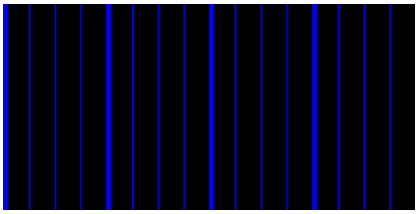
- 

Click on the **Hot Filter Grid Interval** and type ‘64’ (4 beats at 16 Pixels Per Beat).
-  Click on the Blue Grid submenu, and choose **Draw Blue X Grid**.
-  Click on the **Channel Edit Mode Selector** icon.
-  Choose the Blue Channel only mode. In this mode, editing commands apply only to the Blue Channel. The default mode is Red and Green only (for color pictures).
- Press option-right arrow two times to thicken the lines (right-arrow moves the selection; the option key leaves a copy behind).



- 

Enter 16 as the **Hot Filter Grid Interval**.
- Choose **Add Blue X Grid** from the **Blue Grid** submenu which yields a Blue Channel with thick lines at measure boundaries and thin lines at beat boundaries.



-  Click the **Add Preset** icon to add the preset to the current preset library.

Creating Harmonic Grids

In this exercise, we create a simple chord structure and paste it to the Blue Channel. This technique provides a template over which notes can be placed or filtered. In this example, we create an arbitrary chord progression. You can, of course, use more interesting harmonic grids.

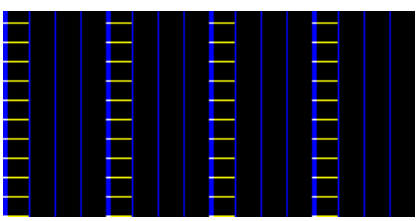
- Click on the Channel Mode Selector.
-  Choose Red/Green only mode.
-  Turn on the **Brush Grid** by clicking on the grid icon. (It is on when the icon is green).
- Click on the **Brush Grid Interval** and enter 16 (one beat at 16 Pixels/Beat).
-  Choose the **Pen Brush** from the **Brush Palette**.
-  Double-click the **Brush Size Tool**.
- Set the brush to be 1 pixel high and 16 pixels wide.
- Set the **Hot Filter Grid Interval** to 64 (one measure).
-  Click on the **Brush Mode Toggle** until **Repeat Mode** is active.

  We will create a grid for the chord sequence Am, D, C, D with the chords changing on the beat. (You won't get a Grammy, but…)
- Press the Caps Lock key (which results in octaves being entered while in Repeat Mode).
- Move the mouse near the first grid line and click on any A.

  The pitch is displayed in the **Tips Display** at the lower-right corner of the Image Synth.

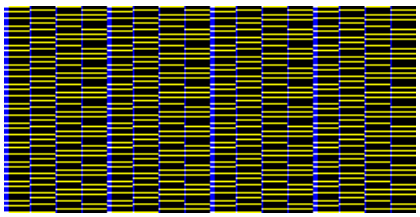
Note *Zoom the picture and grow the Image Synth window if it makes entering the notes easier.*



- Click on any pixel which corresponds to a 'C' in the same column as the first note.

- Click on any ‘E’ in the first column.
- Proceed to the next column and enter the notes: D, F#, A.
- Proceed to the next column and enter the notes: C, E, G.
-  Press the command and option keys to pop up the brush palette.
-  Choose the **Selection Tool**.
- Drag a rectangle around the second column (the **Brush Grid** keeps the selection aligned to the grid).
- Enter 32 as the **Hot Filter Grid Interval**.
- Type **option-shift-right arrow** which moves the selection by the Hot Filter Grid Interval. Repeat this until the picture is filled.

  The picture should look like this:

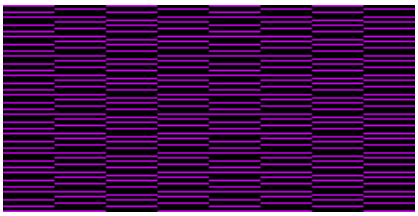


- Click on the **Add Preset** tool to add this picture as a preset.
- Type ‘d’ to deselect the selection.
- To create a grid that contains both the harmonic and rhythmic data, type ‘c’ to copy the picture.
- Press the delete key to delete the Red/Green channel (the sound channel).
- Choose **Paste To Blue Channel** from the **Blue Grid** submenu.

Using the Blue Grid as a Harmonic Tool

- Reselect the last version of the preset saved (with the harmonic and rhythmic data).
- Choose **Delete Blue Channel** to remove the rhythmic grid.
- Press ‘c’ to copy the harmonic grid (the yellow pixels).
- Press the delete key to delete the Red/Green layer.

- Choose **Paste to Blue Channel** from the **Blue Grid** submenu.



- Turn off **Repeat Mode** by clicking on the **Brush Mode Toggle** to choose **Line Mode** or **Dot Mode**.
- Turn Caps Lock **off.**
-  Choose either the **Pen**, **Air**, **Attack** or **Note** brush.
- Set the brush size to be several pixels high and the width of your choice.
- Draw freely in the Red/Green Channel.
- Experiment with different brush colors and sizes. Use any of the available tools.
- Experiment with different brush size/brush grid interval combinations. For example, set the grid to 4 and the brush width to 3 or 4 to enter 16th notes. Double the values for eighth notes, etc.
- Choose **Filter with Blue Channel** from the **Blue Grid** submenu.

  Voila! Your picture is now consistent with the harmonic structure you entered. Of course, you can use these tricks with any harmonic and rhythmic structure that you'd like.

  If you only want to filter part of the picture (to allow leading tones and other notes that aren't in the chords that make up the blue grid), you can use the selection tool and select only that portion of the picture that you want filtered by the Blue Channel.

Moving On

Before you leave the **QuickStart**, you may want to play the rest of the presets in the **QuickStart.Presets** file. These sound pictures demonstrate sounds made with some advanced techniques to give you an even greater sense of what the Image Synth can do.

Ideas For Exploration

You've now had a brief tour that, hopefully, has given you an idea of MetaSynth's possibilities. If you haven't read the **Overview** section, now would be a good time to take a look at it.

There are several detailed tutorials provided on the CD to show you more useful techniques that will help you get the most out of MetaSynth. The appendix provides a list of the provided tutorials with a brief synopsis of each.

The folder you installed on your hard disk contains a variety of preset and filter libraries worth exploring as well as highlights from the Custom Scales library provided on the hard disk. The sample folder contains a number of sounds that work great as input samples for the Image Synth.

Don’t forget to explore the hundreds of megabytes of MetaSynth Instruments provided on the CD that range from beautiful, natural samples of acoustic instruments to wild electronic and hybrid sounds. Most instruments include sample preset libraries that will give you a sense of their possibilities.

MetaSynth Reference

The Image Synth
&
Its Allies

Image Synth Palette
The Wave Table
Instruments
(Procedural Synth)

Image Synth Palette

About This Chapter

This chapter describes the individual tools and operations of the Image Synth Palette. It is assumed that you are familiar with the material covered in the Overview section of this User Guide. The variety of applications for the Image Synth is enormous, and this chapter does not attempt to cover them. Read this chapter for information about the components of the Image Synth and how they work. For ideas about how to use the Image Synth, take a look at the QuickStart chapter of the User Guide and the tutorials supplied on the MetaSynth CD.

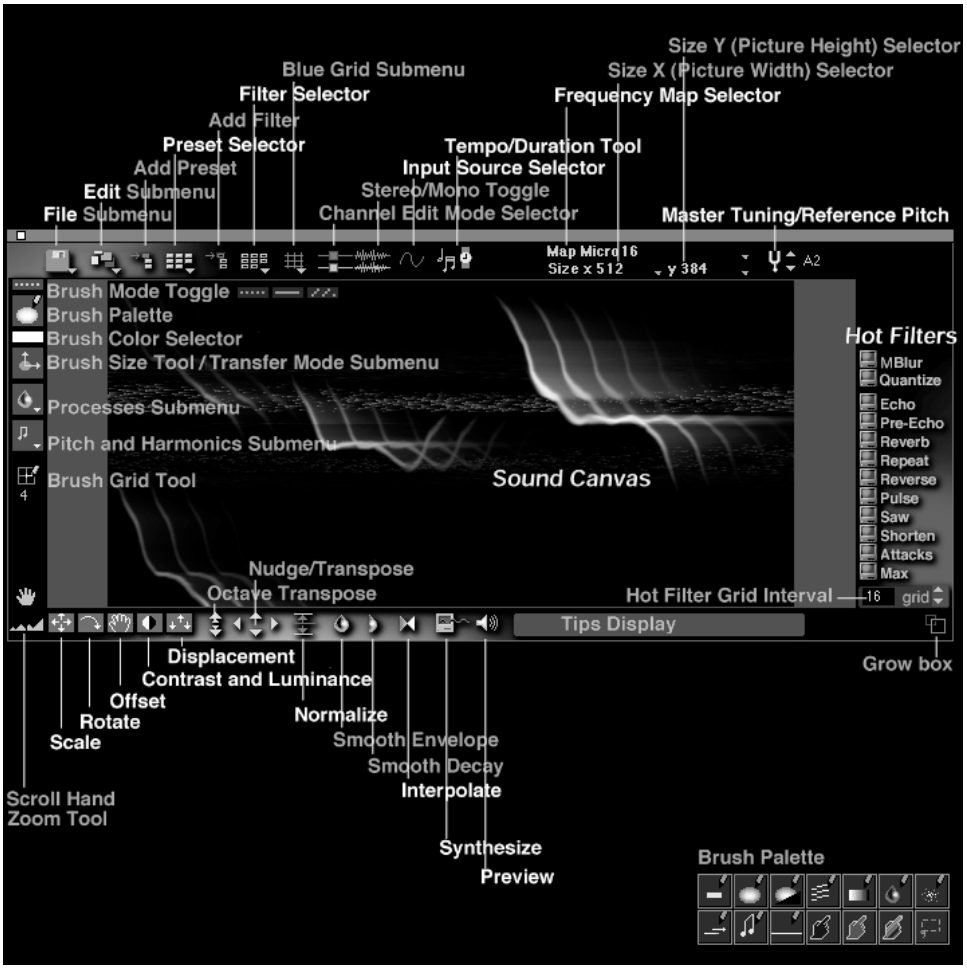


Image Synth Basics

The Image Synth lies at MetaSynth's heart. It is a full-featured image editor whose features have been optimized for the musically meaningful manipulation of images. (Try saying that ten times fast!) It started as the obvious solution to Eric's problem of controlling a large number of oscillators and envelopes. Once he happened upon the visual paradigm, it became evident, as you will find, that image manipulation provides a method of sound manipulation without equal. Over the past three releases MetaSynth has also developed into a powerful image processing tool. This is where you will probably do most of your image and, by consequence, sound manipulation.

Additionally, the Image Synth can reverse the process. Any sound loaded in the Sample Editor can be turned into a picture using the Image Synth's sound analysis function.

While the visual processing of sound may take some getting used to, you will begin to recognize the sorts of visual patterns or 'coherences' that are musically meaningful. You will develop a synesthetic sense for how a picture will sound and how to paint the sounds you want.

You can create both individual sounds and entire compositions with the provided tools, depending on the picture you use and how you set up the Image Synth's parameters. You can think of the Image Synth as a bank of oscillators or tape players which is controlled by the image displayed on the canvas. The vertical axis determines the sound's pitch and the horizontal axis determines when the sound is triggered.

The Image Synth makes use of two special kinds of files: preset libraries and filter libraries. When MetaSynth is launched, the preset library named **Metasynth.presets** and filter library called **Metasynth.filters** are automatically opened and available with the Preset Selector and Filter Selector tools. You can add to these libraries or create your own with the commands described in this chapter. Both libraries are collections of pictures.

Preset libraries are collections of **sound pictures**. A sound picture consists of an image and the parameters used to play it back: the scale to use, tempo/duration of the image and the input source. **Filter libraries** are collections of images that can be applied as filters (more on this later) to the picture displayed on the canvas. Any image can be added to either type of library.

MetaTip *The Image Synth has its own clipboard for copy, paste, and undo which it shares with the Filter Palette. The Image Synth's (and Filter Palette's) clipboard operations are handled by keyboard shortcuts* that do not use command keys. *For example,* ***Copy Pict*** *is handled by simply typing 'c'. Command-key shortcuts apply to the Sample Editor and do not alter the image clipboard.*

How MetaSynth Plays a Picture

Pictures are converted to sound using a few simple rules (though the effects are not so simple!) The vertical axis represents pitch. The higher up the picture you go, the higher

the pitch. The horizontal axis represents time. The color of the pixels represents stereo placement. The time it takes to play the picture is set with the Tempo/Duration Tool. Pictures play back from left to right.

The brightness of the pixels (the dots which make up a picture) determine the amplitude, or volume, of the sound at that moment. Complex amplitude envelopes can be created by varying the brightness of the pixels for which task several tools have been provided.

Sound pictures can be mono or stereo. A mono sound picture is grayscale and results in a mono sound. Stereo sound pictures are color and result in stereo sounds.

The color of a stereo sound picture's pixels determines the stereo placement of the sound. MetaSynth uses an RGB (red, green, blue) color model. Green represents the right channel. Red represents the left channel. In RGB, yellow is the combination of red and green and thus is played back in the center of the stereo field.

Blue is ignored by the Image Synth when rendering sound which allows you to set up silent blue rhythmic and harmonic grids over which you paint with other colors. The Input Source Selector determines the sound source triggered by the picture's pixels: whether it is the Wave Table's waveform, a Procedural Synth patch, the Sample Editor's current sound, or a multi-sample MetaSynth Instrument.

Canceling/Interrupting Time-Consuming Processes

Some MetaSynth processes can be time-consuming: rendering complex pictures that use **Sample** or **Instrument** input sources, **Morph** operations with long sounds and some others. To cancel such processes/computations, click in the application's menubar.

Image Synth Concepts

There are a few terms and concepts that are important to understand when discussing the Image Synth.

Blue Channel. The Blue Channel refers to the blue pixels or blue layer of a sound picture. It is ignored by the Image Synth when sounds are generated and serves as a guide or "comments" channel. The Blue Channel is often used for harmonic and rhythmic templates or grids. When working with a series of sound pictures whose sounds will be mixed together, you might copy an image, clear the canvas and paste the PICT Clipboard to the Blue Channel to start working on a new sound while being able to see the content of the other sound.

MetaTip *Only color images have a Blue Channel.*

Color Channels. In a sound picture, color represents stereo placement. Color channels are analogous to a sound's left and right channels. A mono sound picture has a single channel (grayscale). A stereo sound picture has 3 channels: red (left), green (right), and blue (comments). When applying image manipulations, it is sometimes useful to think of

color pictures as having three layers where pixel brightness in each layer is scaled from 0 to 1. Where you see red in an image, the red pixel has a value > 0 and ≤ 1 and the pixels of the green and blue layers have values of 0. Where you see a shade of yellow, the red and green pixels have approximately the same brightness. Where you see white the red, green and blue pixels have the same brightness. It is possible to edit the pixels of the individual color channels using the **Channel Edit Mode Selector**.

Filter Library. A filter library is a file that contains a collection of pictures that can be used as filters. Any image displayed on the canvas can be added to the current filter library by clicking on the **Add Filter** icon. There is always an active filter library. At startup, MetaSynth automatically opens the library named **MetaSynth.filters** found in the same folder as MetaSynth. The active filter library is accessed by clicking on the **Filter Selector** icon. Filters and preset libraries (see below) share the same file format.

Filter (Filter Picture). A picture found in a filter library. When discussing the Image Synth, a filter or filter picture is an image chosen from the active filter library that is applied to the canvas using the multiply transfer mode described below. These are attenuating filters as MetaSynth uses units between 0 and 1 to represent brightness.

Frequency Map. To play back a sound picture, MetaSynth needs to know how to map the vertical scale of a picture to pitch (frequency). This is done with frequency maps. There are a number of built-in frequency maps to handle whole tone mapping, semitones, and a number of other common mappings, including microtonal mappings. It is also possible to define your own custom scales. This makes MetaSynth a perfect tool for exploring almost any imaginable tuning or intonation system.

Multiply. This is the most commonly used transfer mode. When you apply a **filter picture**, this transfer mode is used. When two images are combined using the multiply transfer mode, the pixels of the corresponding color channels are multiplied together (red channel times red channel; green channel times green channel) to calculate the new image. Only pixels common to the corresponding color channels of both images remain. Each pixel's brightness is the product of the luminosity of the contributing pixels. Brightness is measured on a scale of 0 (black) to 1 (maximum brightness) (except when using the Filter Brush).

When a red picture (i.e. the green layer is black) is multiplied by a green picture (i.e. the red layer is black), the result is black. When yellow is filtered (multiplied) by green the result is green. And so on…See **Color Channels** above.

Preset. A sound picture that has been stored in a Preset Library. A preset stores the image and settings required to play it back: input source, tempo, frequency map and tuning.

Preset Libraries. Preset libraries are files that contain collections of sound pictures. There is always an active Preset Library. If MetaSynth is launched by double-clicking a preset library (or by dropping one on MetaSynth's icon), that preset library is made active; otherwise, MetaSynth automatically opens the library named **MetaSynth.presets** found in the same folder as MetaSynth. The active preset library is accessed by clicking on the Preset Selector icon.

Reference Pitch. A sound picture has an associated reference pitch which is set with the Master Tuning tool. The reference pitch determines the base pitch for a sound picture.

Sound Picture. A sound picture is an image intended for sound synthesis. Sound pictures contain image data as well as an associated frequency mapping, input source, and tempo/duration. Presets are sound pictures stored in a preset library.

Transfer Modes. Frequently, you will use one image to process another image. When an image is applied to another image, the corresponding pixels in the two images are processed together to create the resulting image. Each color channel only interacts with the corresponding channel. A full discussion of these operations is discussed in the section **Transfer Modes** later in this chapter.

Canvas

The Image Synth's central area is its painting surface, the canvas. The canvas is where images are created and edited. Images can be painted from scratch, imported using the **Open Pict** menu command, chosen from a preset library, or pasted onto the canvas. The Image Synth's toolbars provide a wide of array of brushes and tools for working with images.

When MetaSynth first launches, the Image Synth contains a picture with a single horizontal line pitched at the picture's reference pitch which, by default, is A2 (220.5 Hz).

Auditioning Notes

Control-clicking on the canvas will audition (play back) the pitch which corresponds to the mouse position using the picture's input source. If the input source is an instrument, the sample file name will be displayed in the **Tips Display** in the lower-right corner of the palette.

Tools

The canvas is surrounded on each side by tools.

The **upper toolbar** serves as the palette's menu bar and is where you set the parameters which govern the image's playback: input source, number of channels, playback speed, scale and tuning. The Image Synth has its own **File** and **Edit** submenus with many special paste modes. The Image Synth also has its own clipboard which it shares with the Filter Palette. This PICT clipboard is independent from the Sample Editor's sound clipboard which is accessed via the application's menu bar and command keys.

The **right-hand toolbar** contains the **Hot Filters** which are processes like echo and reverb that work in the time domain.

The **left-hand toolbar** contains the tools for choosing among the many available brushes and brush modes. There are also pitch tools for modifying the picture's vertical (frequency) domain (pitches and harmonics).

The **lower toolbar** contains a number of other useful tools. The **Synthesize** (compute/render) and **Preview** tools are found here as are the **Displacement** tool and tools for rotating and scaling the image and adjusting the brightness and contrast of the image.

Upper Toolbar

File Submenu

Pressing the **File Submenu** icon displays a menu with the following items:

Open Pict File

Open a PICT file and display it on the canvas. This command invokes MetaSynth's Open File dialog and imports the selected PICT file.

Note *MetaSynth imports the image. and does not actually open the file. The original image is not modified. To export the changes to a PICT file, use the* ***Save As Pict File*** *command. Normally, you will save images by adding them to a preset library. See* ***Add Preset*** *later in this chapter.*

MetaTip *MetaSynth only opens PICT format files. To import JPEG, GIF or other graphic file types, open the picture in an application capable of opening them and use the copy command to copy the image into the clipboard. The image can then be pasted into the Image Synth. If the* ***Mac OS Easy Open*** *Control Panel is installed, you may be able to open JPEG, GIF and TIFF files directly.*

Save as Pict File (s)

Save the image displayed on the canvas as a standard Macintosh PICT file. This command invokes MetaSynth's Save dialog and saves the canvas area as a standard Macintosh PICT file.

MetaTip *This command only needs to be used when you want to open the picture with another application. Usually, you will save the canvas area as a preset using the Add Preset tool.*

New Presets File

Create a new preset library. The library becomes the active preset library.

MetaTip *Enable the option **Include Wave Table with preset** in the **Preferences** dialog to save wave table data with your presets.*

New Filters File

Create a new filter library. Invokes MetaSynth's save dialog which allows you to create the new library on any mounted volume. The library becomes the active filter library.

NOTE *The preset library file format has been changed. While you can still open preset libraries created with MetaSynth 2.0, libraries created with the new version can not be read by MetaSynth 2.0.*

Open Presets File (o)

Open a preset library and make it active. This command invokes MetaSynth's Open File dialog and makes the selected file the active preset library.

The Open Presets File Dialog has a preview area which displays the first 3 presets in the selected library. Preset and filter libraries share the same format and may be opened interchangeably.

Open Filters File

Open a filter library and make it active. This command invokes MetaSynth's open file dialog and makes the selected file the active filter library.

The Open Filters File Dialog has a preview area which displays the first 3 presets in the selected library. Preset and filter libraries share the same format and may be opened interchangeably.

Analyze Current Sound (n)

Create a picture based on the Sample Editor's current sound. One of MetaSynth's most powerful and misunderstood features, Image Synth frequency analysis can be used as a starting point for synthesis, pitch detection and harmonic content analysis. See the tutorials and appendices for detailed examples of using this function.

By pasting a copy of the analysis into the **Filter Palette**'s canvas area, you can create morphing and vocoder effects when the filter is applied to another sound. See the QuickStart chapter of this manual for a step-by-step example in which Mozart's Requiem is morphed with a techno drum beat.

You can also extract melodies or harmonies from a sound file by doing an analysis. This requires some work manipulating the resulting image, but the results are well worth the investment. Another use for analysis is to create new instruments with some of the characteristics of a sampled instrument.

Analyze Current Sound performs a Fast Fourier Transform (FFT) of the currently loaded sound and places the resulting sonogram on the canvas. The analysis is quantized to the current Frequency Mapping and uses the current settings of the Image Synth for picture duration.

As a result of quantization artifacts, re-synthesized sounds will not sound the same as the original sound. For the best results, you will need to adjust the Image Synth settings to match your goal. Experiment with different frequency maps and picture sizes.

MetaTip *It is advisable to use the **Fit duration to current sample** command in the **Tempo and Duration Dialog** (discussed later in this chapter) before performing an analysis. Frequency and time resolution can be fine tuned to the sound. In some cases microtonal tunings give the best results. Similarly, wide pictures can be used to improve time resolution and transient response.*

MetaTip *The tutorials and appendices of this manual have useful information for getting the most out of this feature.*

MetaTip *Use analysis to tune samples precisely. Perform an analysis in semitones. Mouse over the prominent harmonic (the sound's actual fundamental) and observe the frequency in the **Tips Display**. Set the **Master Tuning** parameter of the Image Synth to a pitch near the sample's fundamental. Set the frequency map to **Micro32**. Mouse over the fundamental and observe the frequency in the **Tips Display**. Use **Transpose** in the **Effects Palette** to transpose the sample to the desired frequency. More information about this technique is provided in the **Instruments** chapter of this manual.*

Edit Submenu

The Image Synth maintains separate clipboards for graphic data and sound data. This submenu affects only the graphics clipboard. The keyboard shortcuts for this menu do not use the command key.

The operations available from this menu provide sophisticated processes for combining images. Pasted images can be applied as filters to (multiplied against), added to, merged with, subtracted from, faded into or out of the current sound picture. In addition, the Transfer Modes available from the left-hand toolbar's **Transfer Modes** pop-up menu affect the way that data pasted with the **Insert** command interact with the underlying image.

When an image is pasted it is scaled to the current selection (or the entire canvas if there is no selection). If the shift key is held down when pasting, the image is scaled to the entire canvas area **and** clipped to the selection area. In this case, if the source image is the same size as the canvas, the marquee acts as a clipping region and no rescaling is done.

Edit operations respect the setting of the **Channel Edit Mode Selector**. Operations **only** apply to the active color channels.

Many of these commands can be combined to accomplish frequently desired effects such as brightening or dimming the current image.

Images from any graphics application can be pasted onto the canvas.

We encourage you to explore the effects possible with the various transfer modes and paste processes. The tutorials provided on the CD provide examples of how to use some of these features.

Note *Each of the special paste commands has an analogous Transfer Mode. For a table of the transfer modes with pictorial examples, see the section* ***Transfer Modes*** *later in this chapter.*

MetaTip *Stereo pictures cannot be pasted into single color channels. If you attempt to do so, MetaSynth will beep. Mono pictures pasted into a stereo channel are pasted to both channels. I.e. a grayscale image pasted into a stereo image appears yellow.*

Pressing the **Edit Menu** icon displays a menu with the following items:

Undo (z)

Undo the most recent edit operation. Undo toggles between Undo and Redo. MetaSynth maintains a single level of undo.

Copy Pict (c)

Copy the current selection (or the entire canvas if there is no selection) to the PICT Clipboard. Only information from the active color channels (see **Channel Edit Mode Selector** later in this chapter) are copied. For example, if the **Channel Edit Mode Selector** is set to the red channel, only the red pixels will be copied.

Paste Pict (v)

Paste the clipboard into the current selection, scaling the image to fill the selection or canvas area. The new pixels replace previously existing pixels. To paste without scaling the image, use **Insert Pict**.

MetaTip *Pressing the shift key when pasting, causes the clipboard to be scaled to the entire canvas area and clipped to the selection area. This is useful for pasting in part of an image without rescaling. For example, select all of the sound (press 'a') canvas and copy (press 'c'). Clear the canvas by pressing the delete key. Use the marquee tool to select a part of the canvas. Press* ***shift-v****. Voila! The pixels originally located in the selected region reappear unscaled!*

Insert Pict (b)

Paste the clipboard maintaining the original proportions and using the current transfer mode. The selection does not necessarily replace the pixels of the existing

sound picture. The inserted material is added as a floating selection. It is initially centered but can be moved. The transfer mode can be changed after inserting the clipboard and the selection moved to achieve a wide variety of effects.

Use this command to maintain the proportions of the inserted image or if you want to apply the selection with one of the transfer modes. If there is a selected region, the inserted image will be scaled to the selection.

Insert Pict makes the **Selection Tool** the active **Brush Tool**, and the **Color Selector** is replaced by the **Transfer Mode Selector**.

MetaTip *To see how this works, choose a preset. Copy the canvas (type 'c'). Insert the image (type 'b'). Now, use the Transfer Mode Selector to change the transfer mode to* ***Subtractive*** *or* ***Differences*** *and move the selection around.*

MetaTip *Insert Pict can be used to add comments to a picture. To do this, open a text application and type the text you would like to add as a comment. Use a screen capture tool such as* SnapzPro *or* Capture *to copy the text as an image. In the Image Synth, use the Channel Edit Mode Selector to select the blue channel only.* ***Insert Pict*** *will add the text image to the Blue channel.*

MetaTip *You can advance through the transfer modes by pressing the '/' key.*

Clear (delete)

Delete (erase) the current selection (or the entire canvas image if there is no selection). The selection area becomes black.

Invert (i)

Inverts the colors of the selection area (or the entire canvas image if there is no selection).

MetaTip ***Invert*** *can be used to load any Filter on to the canvas. Clear the canvas (press the delete key). Invert the canvas (type 'i'), making the canvas yellow or white depending upon the channel edit mode. Choose the desired image using the Filter selector.*

Max Pict (k)

Paste the PICT Clipboard contents into the selected area, treating the clipboard's black pixels as transparent. Where there are coincident pixels, the brightest one is kept. Scaling is performed as described for the **Paste Pict** command.

Min Pict

Combine the PICT Clipboard contents with the selected area, keeping the pixels of lowest amplitude in the combined image. Where either picture is black, the result is

black. Where there are coincident pixels, the least bright is kept. Scaling is performed as described for the **Paste Pict** command.

Add Pict (e)

Combine the PICT Clipboard with the selected area adding the luminosities of the two images. Scaling is done as described for the **Paste Pict** command.

MetaTip *Add Pict is a quick, convenient way of brightening an image or selection. To brighten the canvas image, copy the canvas (type 'a' then 'c') then use the* ***Add Pict*** *command (type 'e') as many times as necessary.*

Subtract Pict (l)

Subtract the contents of the PICT Clipboard from the selected area. Darker colors from the PICT Clipboard overlay and replace the pixels of the selection. This command can be useful for forcing a rhythmic or harmonic structure on an existing image. Scaling is performed as described for the **Paste Pict** command.

Multiply Pict (*)

Multiply the selected region (or the entire canvas if there is no selection) by the PICT Clipboard. This is the same operation that is performed when applying a filter picture with the **Filter Selector** tool. The luminosities of the corresponding pixels of the selection and the clipboard are multiplied together.

Luminosities are represented internally as values from 0 (black) to 1 (maximum brightness). When a stereo image is multiplied by a stereo image, the pixels of the corresponding color channels are multiplied. Hence, green times red is black. Yellow times green produces green. Black times anything yields black. If either pixel is less than maximum brightness the result will be attenuated luminosity. Scaling is performed as described for the **Paste Pict** command.

Shift-selecting this command inverts the PICT Clipboard before applying it.

Merge Pict (m)

Merge the PICT Clipboard with the selected region (or the entire canvas if there is no selection) using a 50% blend. Scaling is performed as described for the **Paste Pict** command.

Crossfade Pict (x)

Crossfade the PICT Clipboard with the selected region (or the entire canvas if there is no selection). A linear crossfade is performed from left to right with a 0 to 100% gradient.

Shift-selecting this command performs a right to left crossfade.

MetaTip *Create a symmetrical image using the following key combination: c (copy), t (reverse time), x (crossfade).*

Fade in out Pict (u)

Fade the PICT Clipboard in and out while also fading the selected region out then in. This process results in a gradient blend effect.

Shift-selecting this command reverses the fading scheme.

MetaTip *Fade the current picture in and out with the following key combination: c (copy), delete, u (fade in/out).*

Paste to Blue (])

Paste the PICT Clipboard to the Blue channel regardless of the Channel Edit mode. This is a convenient way to move a stereo (red/green) color image into the Blue Channel.

To delete the Blue Channel, use the Channel Edit Mode Selector to make the Blue Channel the active channel then press the delete key.

MetaTip *You may want to create a preset library with different Blue Channel templates.*

Note *Paste to Blue does not work with mono (grayscale) images.*

See the provided tutorials for examples of using the Blue Channel.

Select All (a)

Select all of the pixels of the canvas.

Deselect All (d)

Deselect the current selection.

Add Preset

Click here to add the currently displayed sound picture to the active preset library. The sound picture is added to the first empty position in the active preset library. The Add Preset function saves not only the picture but also the frequency map, sound input source, tempo/duration, and optionally, the associated Wave Table data (see Preferences in the File Menu chapter).

If the sound picture's input source is Instrument, Sample or Looped Sample, the instrument name or sample file name is stored with the preset. This sample or instrument file will be opened when the preset is selected if the preference L**oad Instrument With Preset** is turned on in the **Preferences** dialog box.

Typically, you will save sound pictures by using this function to add them to preset libraries. If you would like to export an image as an independent file, use the **Save as Pict File** command in the **File** submenu.

Option-click to replace the most recently selected preset. This functionality lets you choose a preset, modify it and save it back to the same location in the preset library.

To remove a preset: hold down the option key (the cursor becomes the X—delete—cursor) and choose the preset to be deleted with the **Preset Selector** (see below).

Preset Selector

Also called the **Select Preset Tool**. Click and drag here to display a menu of the active library's presets. If the chosen preset's input source is a sample, looped sample or instrument file, the appropriate file will be opened if the preference **Load Instrument With Preset** is turned on in the **Preferences** dialog box. If the sound/instrument file is not in the original location, MetaSynth looks in the same folder as the preset library.

Drag past the pop-up's lower boundary to display more presets as there may be more pictures stored than can be displayed in a single screen. The selected sound picture and its settings replace the current one.

By default, the file **Metasynth.presets** found in the same folder as MetaSynth is the active library. Use the **Open Presets File** command in the Image Synth's **File** submenu to make another library active.

To view the presets of the previously opened library, command-click the Preset Selector. This is very handy for working with two preset libraries and copying images between them.

To remove a preset: hold down the option key (the cursor becomes the X—delete—cursor) and choose the preset to be deleted with the **Preset Selector.** This command cannot be undone!

MetaTip *The MetaSynth folder and the CD both contain a large number of sample preset files worth exploring.*

Add Filter

Click here to add the displayed sound picture as a filter picture in the active filter library. The image is added to the first blank space in the active filter library.

MetaTip *To replace the most recently selected filter, option-click the Add Filter tool.*

Filter Selector

Click and drag here to pop up a menu of the active library's filter pictures. When chosen, the selected filter picture is applied to the selection (or the entire canvas if there is no selection) using the multiply transfer mode. Drag past the lower boundary to display more filters as there may be more than can be displayed in a single screen. The selected filter is applied to the selected region of the current sound picture using the multiply transfer mode.

Grayscale filters can be applied to color pictures and are applied equally to each active color channel. When applying color filters, the best results are achieved with

color pictures. Mono pictures can be made stereo by clicking the Mono/Stereo Toggle.

By default the file **Metasynth.filters** found in the same folder as MetaSynth is the active library. Use the **Open Filters File** command in the Image Synth's **File** submenu to make another library active.

Filters have a large number of uses. Color filters can be used to stereo-ize a picture. They can also be used to provide complex envelopes to sounds and note. They can be used to remove dissonance. They can be used to adjust the harmonics of a sound picture. When using sine wave/wave table synthesis, this process is similar to subtractive synthesis and amplitude shaping.

The default filter library has pictures that act as high and low pass filters and that perform various linear and non-linear fades.

To invert a filter before application, shift-select the filter.

To view the filters of the previously opened library, command-click the Filter Selector.

To remove a filter, option-click the Filter Selector. The cursor becomes the delete cursor.

Blue Grid Submenu

The Blue Grid Submenu contains a number of commands for managing the Blue Channel. It is only available for color (stereo) pictures.

Draw Blue X Grid (g)

Replace the current Blue Channel with vertical grid lines whose spacing is determined by the **Hot Filter Grid** interval. The grid replaces the previous Blue Channel contents. This is a useful tool when composing music as it gives you a grid with the metric interval of your choice.

Add Blue X Grid (shift g)

Overlay vertical grid lines whose spacing is determined by the **Hot Filter Grid** interval. This is a useful tool when composing music as it gives you a grid with the metric interval of your choice.

Draw Octaves Grid

Replace the current Blue Channel with horizontal gridlines indicating the "octaves" of the current Frequency Map. A grid line is drawn every n pixels where n corresponds to the **Custom Scale Dialog**'s **Divisions Per Octave** setting.

Echo Octaves (y)

Draw the pixels (pitches) of the Red and Green channels to the Blue Channel and shadow the pitches in every octave. This command creates a template which helps

you to avoid unwanted dissonances when painting music (yes, we do it!) directly on the canvas.

Copy Blue Channel

Copy the Blue Channel contents to the PICT Clipboard.

Paste to Blue Channel (])

Paste the PICT clipboard contents to the Blue Channel. Duplicates the functionality offered by the Edit submenu's Paste to Blue command.

Filter with Blue Channel

Filter the selection (or the entire canvas) with the Blue Channel picture.

MetaTip *Construct a Blue Channel image from a melodic figure using Echo Octaves then paint freely in the Red and Green channels. Choose* ***Filter With Blue Channel*** *to remove notes that don't fit.*

Delete Blue Channel

Delete the Blue Channel contents.

Channel Edit Mode Selector (q)

Click here to pop up a palette of the various channel edit modes. This tool allows independent processing of the left (red) and right (green) channels which makes for mind-bending effects. The channel edit mode determines which channels are affected by edit operations. Most editing operations and Image Synth tools apply only to the active color channel which makes incredible stereo manipulation possible.

The icon's appearance in the toolbar changes to reflect the current channel edit mode. The area is left blank if the canvas is set to mono.

The available modes are: red and green active, red only, green only, blue only, all (red, green and blue) active.

The default mode is red and green active.

New in 2.5**:** In MetaSynth 2.5, brushes respect the channel edit mode (in version 2.0 they did not).

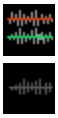
Shortcut *Type 'q' to toggle through the Channel Edit modes.*

MetaTip *Try applying different filter pictures to the red and green channels of an image! For example, you might apply a fade in filter to one channel and a fade out filter to the other.*

MetaTip *Try applying different* ***Hot Filters*** *to the left (red) and right (green) channels of a picture! For example, incredible effects can be created by using different grid*

*intervals for the red and green channels when applying the **Pulse**, **Saw**, or **Echo** Hot Filters. Or, start with a mono image, and apply Echo to the red channel and Pre-Echo to the green.*

See the tutorials provided on the CD for more examples of how to use this tool.



Stereo/Mono Toggle

Click here to change whether the sound picture is mono (grayscale) or stereo (color). When stereo mode is chosen, the Channel Edit Mode Selector becomes visible and active. Stereo pictures have three color channels: red (left), green (right), blue (comments). The Channel Edit Mode selector allows you to selectively manipulate individual color channels. Mono pictures have a single, grayscale channel where luminosity determines amplitude. Mono pictures have no comments (Blue) channel.

Input Source Selector

Click here to select the sound source played by the sound picture. The palette which pops up lets you choose any of the following as the picture's input source: Wave Table, Sample, Looped Sample, Procedural Synth, any open Instrument. Each pixel triggers the input source according to the pixel's vertical position.

Wave Table

Use the **Wave Table Palette**'s waveform as the input source. The default waveshape is a sine wave. This waveform can be changed interactively in the Wave Table Palette. See the chapter **Wave Table Palette** for more information.

Be careful with waveforms that have significant high frequency content. When used with sound pictures which themselves have significant high frequency content, the results can be undesirable. If this is the case, you can use the **Smooth/Filter HF** tool in the **Wave Table** palette to reduce the source waveform's high frequency content.

MetaTip *If the option **Include Wave Table With Preset** is turned on in the **Preferences** dialog, the waveform will be stored with the sound picture in the preset library.*

Sample

Use the sound currently loaded in the Sample Editor as the input source. A picture can play back literally hundreds of voices derived from the sample. (Try that with your sampler!) When the input source is set to Sample mode, the sample is not

looped. If a horizontal line exceeds the length of the sample, the sample ends. If you want the sample to loop continuously, use Looped Sample mode (described below). The sample is re-triggered where silence (black) is followed by a non-black pixel.

When using sample mode, think of each pixel of the picture as a tape recorder whose playback speed is relative to its vertical position. The playback speed (duration) of the sample is affected by the pitch shifting.

The pixel line that corresponds to 220.5 Hz (A2) on the canvas will play the sample without altering its pitch or duration. This is true regardless of the Master Tuning setting of the picture. As a result, this mode often works best with images that don't span a large frequency spectrum (though extreme pitch-shifting can yield interesting results). To avoid extreme pitch shifts, you can use **Instruments** which map different samples to different pitch ranges. Also, the **Octave Up** and **Octave Down** commands in the **Transform** menu as well as the **Effects** palette's **Transpose** effect can be used to adjust the sample's pitch to a more optimal range for the picture.

Note. The **Tips Display** shows the degree of the sample's transposition when the mouse is moved over the canvas. The degree of transposition, measured in semitones, is indicated in the display's second column (beside the note and octave indication).

MetaTip *Sample mode is computationally intensive. Complex pictures may be challenging for MetaSynth's real-time preview. If previewing the picture stutters or yields no sound, use the* ***Selection Tool*** *to select a portion of the picture then preview the selection.*

MetaTip *You can create extremely rich sounds with this input source mode. A picture can play hundreds of pitch and amplitude modulated versions of the sample. If you synthesize (render) the picture, you can use that output again to render the picture and have tens of thousands of voices. This is a great trick to try with samples like flutes with simple harmonic content. After a few iterations the picture can sound like a full orchestra!*

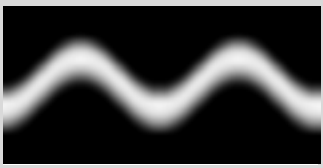
Looped Sample

(Formerly called Crossfaded Sample). This mode is similar to Sample mode except that the sample is looped. The loop is created by overlapping the sample's beginning and end and crossfading them. As a result, the looped sample does not play from the beginning of the actual sample. Once triggered, the sample loops until a black pixel is encountered.

The **Looped Sample's** start point is determined dynamically for each note as opposed to **Sample** mode where the sample plays from the beginning whenever it is triggered. In **Looped Sample** mode, when a note triggers the sample, the sample plays back with a start point determined by the note's horizontal position. This allows you to create dramatic "sweep" effects as described in the inset below. This procedure is demonstrated in the **QuickStart** chapter of this manual.

Create an analog synth "sweep" effect with Looped Sample input sources

Load a sample of a rich sustained note. Rich waveforms generated by the Image Synth are good sources, especially if enriched using the **Morph** menu's **Wave Shaping** command.



Sweep Filter

Repeating Figure

Give the sound a sweeping harmonic envelope with the **Filter Palette** by applying a filter like the one pictured above. Create or choose a preset that plays a repeated rhythmic figure like the one shown. Set the picture's input source to **Looped Sample**. Transpose the picture up or down as desired.

Listen to the notes sweep through the sample's envelope. Each note starting progressively later in the sample (as opposed to triggering it from the beginning as in Sample mode), creating the impression of a sweeping filter.

Note: The preset shown is included in the file **QuickStart.Presets**.

MetaTip *If you need sustained, looped notes whose start points to correspond to the sample start, use an **Instrument** based on that sample as the input source. **Instrument** mode is a more sophisticated input mode where you can have many different samples mapped across the frequency range each one with its own loop points. See the **Instruments** chapter for detailed information about MetaSynth Instruments.*

Procedural Synth

Use the current settings of the Procedural Synth as the input source. The Procedural Synth is a frequency modulation (FM) synthesis tool accessed through the **Sounds** menu.

When used as an input source, the carrier wave's frequency is determined by the note's pitch in the Image Synth. The modulation frequency, however, does not change; hence, the relationship between the carrier and modulator changes with the pitch. In a sound picture whose pixels cover a relatively narrow frequency range, this is generally not a problem. Sometimes, this behavior may be undesirable. In such cases, it is best to press the **Apply** button in the **Procedural Synth Dialog** and use

the generated sample as the input source. You may also want to consider creating an Instrument from a number of samples generated with different pitches.

See **Procedural Synth** in the **Sounds Menu** chapter for detailed information about the **Procedural Synth**.

Instrument

Up to six open instruments are available for selection from the Input Source Selector. Instruments are collections of up to 16 different samples where each sample is mapped to a different frequency range which allows you to minimize pitch-shifting of individual samples and allows pictures to play composite instruments such as drum sets. If no instruments have been loaded, these slots on the pop-up menu will be inactive.

Instruments turn the Image Synth into an extraordinarily powerful sampler. Unlike hardware samplers where notes have the same envelope every time they are triggered, you can create rich, human articulation by modifying individual notes' envelopes (using the **Smooth** tool, for example). **Instruments** can be applied to a wide variety of applications from the bizarre to the realistic.

See the MetaSynth CD for a large number of instruments and the preset libraries built for them.

See the chapter **Instruments** for detailed information about Instruments.

Tempo/Duration Tool

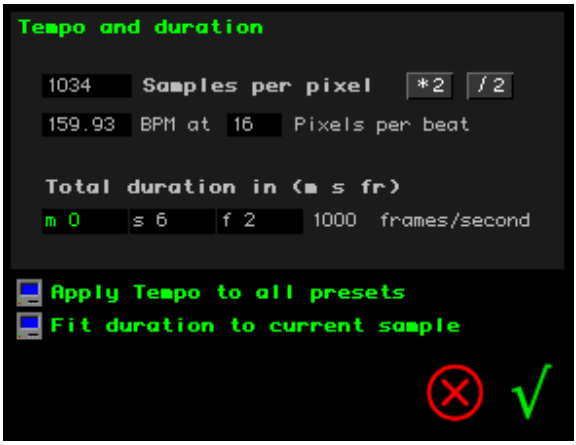
Use this tool to adjust the duration of the picture. Clicking and dragging to the left and right of the icon adjusts the picture's duration. While the tool is dragged, the picture's duration is displayed beside it. Option-clicking displays the picture's duration in terms of the Samples Per Pixel (SPP) and Beats Per Minute (BPM).

New in2.5:*Double-clicking* this tool invokes the **Tempo/Duration Dialog** which is described below. This tool allows for sophisticated modification of a sound picture's time-related parameters.

Changing the width of a picture changes its duration without changing the setting for samples per pixel. All sounds in MetaSynth have 44,100 samples per second.

For a detailed discussion of tempo and duration, as they relate to sound pictures, see the description of the Tempo/Duration Dialog below.

Tempo/Duration Dialog



The Tempo/Duration dialog is invoked by double-clicking the Tempo/Duration tool. This new dialog box allows you to conveniently set the tempo and duration of an image. The duration of a picture can be defined in terms of either samples per pixel (spp) or beats per minute (bpm). MetaSynth can even fit the duration of the picture to match the length of the currently loaded sound!

The following settings can be changed via the dialog:

- **Samples per pixel**
- **Beats per minute (bpm)**
- **Pixels per beat**
- **Total duration (minutes/second/frame)**

By default, BPM settings are based on a setting of 32 pixels per beat which you can, of course, change.

The dialog box also has buttons to perform the following utility functions:

***2** and **/2**–These buttons multiply or divide the SPP and tempo by 2.

Fit duration to current sample –Set the duration of the sound picture to the duration of the currently loaded sound. This is especially useful when you intend to use the **Analyze Current Sound** function.

Apply tempo to all presets–Change the tempo/duration settings for each preset of the current library. This function makes it easy to set all of the presets in a library to the same tempo. This is useful when the preset library contains sound pictures that will be used to construct a song.

NOTE! *Be careful not to press this button accidentally. This function cannot be undone.*

MetaTip *Higher SPP values yield longer sounds but less precise envelopes. Small values (20 to 150) are good for sounds with rapid transients while higher are more suited to ambient, slowly varying "pads".*

Tempo, Duration, and Samples Per Pixel—Tech Note

While there is no longer any need to do manual calculations to set the tempo and duration of a picture, it may be useful to understand how MetaSynth makes these calculations internally. Since the Image Synth is pixel based, all internal calculations are done on the basis of pixels and sample rate, both of which are integer values. The value is stored as Samples Per Pixel.

The number of pixels is determined by the picture's Size X. setting. The Sample Rate is 44100 samples per second. Hence, the number of samples played by a sound picture = Samples per Pixel * Pixels, and the duration of a picture = (Samples per Pixel * Pixels) / Sample Rate. Tempo and duration settings are thus rounded to the nearest value which corresponds to an integer value of the Samples per Pixel setting. At 32 pixels per beat and 256 pixels, typing '92' into the BPM field will yield a tempo of 92.07 which corresponds to 898 samples per pixel.

The duration parameter uses units in minutes : seconds : frames format. Therefore, a value of 1000 will give you millisecond precision for the frames and a 10 sample accuracy at 4410 frames per seconds. The Frames per Second setting is modified in the **Preferences** dialog.

Frequency Map Selector

Define the mapping of the canvas' vertical axis to pitch. Click on the tool to pop up a menu of the scale/tuning choices. The name of the current frequency map is displayed in the toolbar if it is one of MetaSynth's built-in tunings. Otherwise, the words **Map Custom Scale** appear. The selector provides a **Custom Scale** option which invokes the **Custom Scales Dialog** that allows you to define, import and export custom frequency maps. This dialog is described in the following section of this chapter.

Frequency mapping allows you to explore vast harmonic realms previously unreachable with all but the most esoteric tools. You can create compositions in an almost infinite array of micro and macro tunings. Explore Just intonation, Pythagorean and pentatonic scales, 50 tone scales or any imaginable mapping. With the Custom Scale option, you can define frequency maps with up to 1000 divisions per octave.

Most of the commands in the **Pitch and Harmonics** submenu of the left-hand toolbar are affected by the frequency map. **Fit to Scale**, **Filter Scale** and **Add Harmonics** will yield different pictures when the frequency map is **Semitones** than they would if the map were **Whole Tones**. In some frequency mappings, the precise frequency demanded by a process may not be available (i.e. when using Add Harmonics in a frequency map that that has wide spacing between pixels). In these cases, MetaSynth will try to match pitches as well as possible.

The pre-defined frequency mappings are:

Exponential. The pixels represent consecutive integer ratios of the fundamental. The first pixel is 1:1, the next pixel is 2:1 (the octave), etc. This mode can be used to

create interesting waveforms when there are stacked clusters of pixels. In this mapping, the notes get closer and closer together as you reach the top of the canvas.

Custom Scale. Choosing this option invokes the Custom Scale dialog which is described in the next section.

Major Scale. Each pixel represents one step of the major scale. The lowest pixel will sound 2 octaves below the sound picture's reference pitch. In this mapping there is not an even mapping of consecutive pixels as there will be a whole step (tone) between some pixels and a half step (semitone) between others. There are seven pixels to an octave in this tuning.

Whole Tones. A whole tone (200 cents) separates each consecutive pixel. There are six pixels to an octave with this tuning.

Semitones (the default setting). A semitone (100 cents) separates consecutive pixels. There are 12 pixels per octave in this tuning.

Quartertones. A quartertone (50 cents) separates each consecutive pixel. There are 24 pixels per octave in this tuning.

Micro8. One-eight of a whole tone (25 cents) separates the pixels. There are 48 pixels per octave in this tuning.

Micro12. 1/12th of a whole tone (18.75 cents) separates the pixels. There are 72 pixels per octave in this tuning.

Micro16. 1/16th of a whole tone (12.5 cents) separates the pixels. There are 96 pixels per octave in this tuning.

Micro 32. 1/32nd of a whole tone (6.25 cents) separates adjacent pixels. There are 192 pixels per octave in this tuning.

Micro50. 1/50th of a whole tone (4 cents) separates adjacent pixels. There are 300 pixels per octave in this tuning.

Pythagorean. Consecutive pixels are mapped to the seven note Pythagorean scale whose pitches are arranged with the classic Pythagorean ratios: 1, 9/8, 81/64, 729/512, 3/2, 243/128.

To see the pitch played by a particular pixel, move the mouse over the pixel and read the Tips Display in the lower right hand corner of the window. You will see the pixel's pitch displayed as a note and octave (i.e. A2), a degree of pitch shifting, and absolute frequency.

When designing sounds, you can achieve some very interesting effects by applying a process that generates frequencies (such as **Add Harmonics** or **Fit to Scale**) then changing the frequency map. This allows you to quickly generate a number of harmonics that do not conform to the harmonic series.

MetaTip *You can use this technique to generate the odd harmonics: choose **Micro8** as the frequency map, draw a line, choose **Add Harmonics** from the **Pitch and Harmonics** submenu of the left toolbar then change the frequency map to **Quartertones**.*

See the MetaSynth CD for tutorials which explore MetaSynth's custom scales.

When changing the frequency map it may be advisable to change the vertical size of the picture. The frequency range possible in a picture is determined by the frequency map and the vertical (Y) size of the picture. When working with microtunings, larger pictures tend to be desirable. With widely spaced tunings, large vertical sizes are not needed as some pixels will be outside the audible range. Observe the frequency range of a picture by regarding the Tips Display while mousing over the low and high pixels of a picture. Several useful processes are available from the **Pitch and Harmonics** submenu of the left toolbar when changing frequency map. You can contract or expand the vertical spacing of the canvas' pixels with these commands.

MetaTip *MetaSynth considers A to be 441 Hz. rather than 440 Hz. in order to optimize the required calculations (since CD quality sound use a sample rate of 44,100 samples per second).*

MetaTip *Use custom scales based on the harmonic series (we've provided some in the Scales folder found in MetaSynth's folder) to create new waveforms and sounds to use as input sources or for your sampler.*

Custom Scales Dialog

To invoke this dialog, choose **Custom Scale** from the **Frequency Map** pop-up menu.

Some commonly used scales, like equal-tempered semitones, are provided in the Frequency Map pop up list as presets, but much more interesting sounds can be created using Custom Scales.

Custom Scales allow you to tune the Image Synth any way you want. You can enter values directly or import and export custom scale files. Scale files are text files where each note of the scale is defined in terms of fractions, cents or absolute ratio values. Hundreds of files which define scales used by a wide variety of cultures and civilizations have been provided (thanks to Andrew Souter) on the MetaSynth CD and in the **Custom Scales** folder of MetaSynth's home directory.

Highlights of the provided scales are:

- Pentatonic scale.
- Harmonic minor scale.
- Natural minor scale.
- Major scale in Just intonation.
- **Harmonic 16** and **Harmonic 32** are 16 and 32 note scales which follow the natural harmonic series (ratios of 1, 2, 3, 4, etc). It is a very interesting non-linear mode where the Image Synth behaves almost like a subtractive synthesis filter. Each pixel line is a specific harmonic of the fundamental. The second note in the sequence is already equal to second octave. So you get an interesting wrapping of pitches as you ascend the scale. For example when using **Harmonic 16,** the pixel at y=16 is much higher in pitch than the pixel at y=17. Great techno and synthesizer sounds can easily be simulated using these scales. Harmonic16 and 32 are great for constructing sounds since even dense blocks of pixels yield interesting wave forms.

Custom Scales Dialog Items

Scale Name. The name of the Custom Scale is displayed here. This field is not directly editable. The name displayed is either the name stored in the scale file or an algorithmically generated name if the **Compute Ratios** button was used.

 **Import Scale**. Display the Open File dialog for you to choose a custom scale stored in a text file. A large number of scales are provided in the **Scales** folder of MetaSynth's home folder. This dialog contains a preview area that displays the first several lines of any selected scale file.

Option-click the **Import Scale** button to import a spectrum file (created with the Morph menu's Instant Spectrum command) as a custom scale. This option is great for sound design. Use this option with dense pictures to create wild, new sounds.

 **Export Scale**. Export the current scale as a text file which can be reused in other presets.

Compute Ratios. Press this button to have MetaSynth fill in the scale according to the algorithm chosen. Option-clicking this button fills in the harmonic series if the **Linear Subdivision** option is chosen. The options are:

Linear Subdivision. The octave is divided into equal steps with the same difference consecutive scale steps. These divisions can be interesting as they often have perfect fourths and/or fifths (unlike equal temperament), depending on the number of steps per octave. The formula for determining a particular step's frequency ratio $r = 1 + \frac{n}{\text{divisions}}$ is where r is the frequency ratio and n the scale step.

Exponential Subdivision. The difference between the scale steps is scaled exponentially with the steps separated by increasingly large intervals. The

formula for determining a particular step's frequency ratio is $r = \exp(\frac{n \log(2)}{divisions})$

where r is the frequency ratio and n the scale step.

Randomize Values. Randomly fill in the scale steps. This is interesting for experimenting and coming up with wild new sounds.

Divisions per octave. The number of steps that make up an octave or scale cycle (in cases where the scale spans more than an octave). This number can be any value from 1 to 1024. Though only the first 64 steps are editable within the dialog. Scales can be exported and edited with any text editing application.

Frequency ratios. This is a set of editable text fields which displays the frequency ratios of the scale's steps. Only the first 64 steps are editable from within the dialog. There is no restriction on the values. The scale steps may actually span more than an octave and do not need to be in order.

MetaTip *Option-clicking the **Compute Ratios** button when the **Linear** radio button is selected generates the **standard harmonic series** (ratios of 1, 2, 3, 4, etc. up to the table size).*

Notes for Advanced Users:

Non-linear scales/scale wraparound

Custom scales are typically defined with ratios given in increasing order between 1. 0 (the fundamental) and 2.0 (the first octave). The new implementation allows more flexibility.

Ratios do not have to be constrained to one octave or ordered by increasing values. When unordered values or values greater than 2 (the octave) are used, the Image Synth's frequency space will not be linear and will exhibit wrap around where moving up can actually cause a downward frequency jump. Transposition in the picture domain will modify the harmonic content of the sound. With such scales, a diagonal line going up will not play a simply ascending scale, a property which can be used to create some very interesting sounds and effects **Try it!**

Open the **Custom Scales** dialog. Set **Divisions per octave** to 16. Click **Linear Subdivision.** Option-click **Compute Ratios**. Click the OK icon button. Draw an upward diagonal line across the canvas. Preview the sound. Note how every sixteen pixels the pitch jumps back down to the next "octave" of the tuning.

MetaTip *To see the pitch which is played by a particular pixel, move the mouse over the location and read the Tips Display in the lower right-hand corner of the window. You will see the pixel's pitch displayed as a note and octave (i.e. A2), a degree of pitch shifting, and the absolute frequency in Hertz.*

Working with large scales

Custom scales of up to 1024 divisions are allowed though only the first 64 divisions are editable from within MetaSynth. The algorithmic scale generation (activated by pressing the **Compute Ratios** button) will work regardless of the number of scale steps. If you need to edit these scales, you can open them with a text editor to edit the

values. This feature was added to allow MetaSynth to import large scale files generated by other applications.

Custom Scale File Format

Custom Scales are just text files with a simple format. Open any of the supplied files and examine them.

The first line in the file defines the scale's name. It should begin with a '!' character.

The second line should start with '!' and is used for comments. Its contents are ignored.

The third line should be left blank.

The fourth line is an integer that indicates the number of steps in the scale. It corresponds to the **Divisions Per Octave** setting in the Custom Scales dialog box.

The next line begins with '!' and is ignored.

The rest of the lines are the specifications for the scale steps. There should be the same number of step definitions as there are Divisions Per Octave (or, more correctly, Divisions Per Cycle).

A scale step can have any of the following formats: integer, floating point or a fraction. Fractions may have integer or floating point numerators and denominators. I.e. 5/3 and 5.12/2.9 are both allowed. Commas are not allowed. If a step definition contains a '.', there must be a digit on both sides of the period. There should be a 1 or a 2 (or 2.0 or 2/1) in the scale but not both.

Note! MetaSynth does no (or very little) error checking. If your custom scale is not working or loading correctly, examine the file to make sure that it matches the rules mentioned above.

Size X (Picture Width) Selector

Set the pixel width of the canvas. Click here to display a pop-up menu of available picture widths. When composing music in the Image Synth, picture widths divisible by 2 should be used for duple meters (4/4, 2/4, 2/2 etc). Picture widths divisible by 12 (288, 576, 1152) are well-suited to triple meters such as 3/4, 6/8 and 9/8.

Changing the picture width changes the duration of the picture.

MetaTip *Use the Temp/Duration tool to adjust a sound pictures' duration or tempo.*

MetaTip *When designing sounds with rapidly changing dynamics or explosive, percussive attacks, you may want to use wide pictures with short durations.*

Size Y (Picture Height) Selector

Set the pixel height of the canvas.

The frequency range of a picture is determined by three factors: picture height, frequency map and the master tuning (reference pitch) parameter. With microtonal frequency maps, larger picture heights are needed to give reasonably broad frequency spectra.

When changing the frequency map for a picture it is sometimes useful or necessary to change the picture size. There is no need for tall pictures in semitone or whole tone frequency maps as only a limited number of pixels is required to cover the entire audible range.

The left toolbar's **Pitch and Harmonics** submenu contains a number of functions useful when changing pict sizes and frequency map. These functions can expand or contract the vertical spacing of a picture's pixels and thus adjust the pitches to account for wider or narrower spacing of pitches.

MetaTip *To check the frequency range of a picture move the mouse over the pixels from bottom to top and read the Tips Display in the lower right hand corner of the window. Pixels outside of the audible range have their pitch displayed as dashes.*

Master Tuning/Reference Pitch

Set the reference pitch used to play the sound picture. The default setting is A2 (220.5 Hz) and can be set in semitone increments from A -2 through A12 (16Hz. through 22050 Hz). Changing this setting changes the pitches played back by the canvas image. The reference pitch is also taken into account when the **File** submenu's **Analyze Current Sound** command is executed.

Click on the tuning fork icon to display the Master Tuning dialog that allows you to set the reference note and octave for the sound picture. The corresponding frequency is displayed but cannot be edited directly.

Click on the up or down icons to change the reference pitch in one octave increments. This behavior is handy when computing sounds to be used in multi-sample Instruments. **Option-click** the up and down icons to increment /decrement the pitch by semitones rather than octaves.

See the tutorials provided on CD for an example of how to use this feature to quickly build Instruments from computed waveforms.

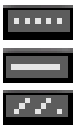
Optimizing Frequency Analysis with Master Tuning

When analyzing the sample of a note, you can sometimes optimize the analysis by using this technique. Perform the first analysis with A2 as the reference pitch and the semitones frequency map. Observe the basic pitch of the note. Set the reference pitch of the picture to that note and octave. Change the frequency map to a microtonal or harmonic frequency map and set the picture height only as large as needed to accommodate the sample's frequencies. Perform the analysis again. Harmonic frequency maps (see Custom Scales) work well for analyzing stringed instruments.

Note *In previous versions of MetaSynth, the reference pitch was invisible and fixed at A2 (220.5 Hz).*

Left-Hand Toolbar

This toolbar contains painting tools, and submenus with pitch/harmonic-content related processes.



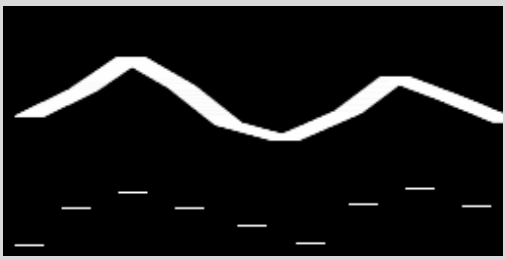
Brush Mode Toggle

The Image Synth has three brush modes: **Line**, **Dot**, and **Repeat** modes.

The behavior of the various brushes is influenced by both Brush Mode, Brush Size and the Brush Options (see the Brush Option dialog later in this chapter). The Brush Options have somewhat different meanings in Dot and Line modes. Repeat Mode is a special case of Dot Mode.

When exploring the brushes it is worthwhile to get a little hands-on experience with the difference between Dot and Line Modes as the effects are more easily understood when experienced than when described.

The picture below demonstrates the difference between **Dot** and **Line** modes. Both portions where drawn with the same brush following the same contours. The upper portion was drawn in line mode while the lower portion was drawn in **Dot** mode. The brush was 15 pixels wide, 1 pixel high and had a minimum spacing (see Brush Options Dialog) of 30 pixels.



Dot Mode

This is the default brush mode and results in diffuse, discontinuous strokes. In Dot Mode, the **minimum spacing** setting in the **Brush Option Dialog** (invoked by double-clicking the **Brush Size Tool**) determines the minimum distance between notes/strokes. This mode can be used to leave discrete notes along the mouse path. The speed with which the mouse is dragged influences the continuity of the strokes regardless of the minimum spacing. Dragging quickly results in increased space between notes.

This brush is well-suited to entering discrete notes or copies of the brush shape.

Line Mode

In **Line Mode**, the resulting brush strokes are always continuous as you drag the mouse. The **minimum spacing** setting in the **Brush Option Dialog** (invoked by double-clicking the **Brush Size Tool**) determines the minimum spacing between vertices. A line segment's path is not determined (or visible) until the mouse traverses the minimum distance at which time a straight line is drawn connecting the end points of the line.

This brush mode is nice for creating notes with modulating pitches. Create glissandi by painting in **Line Mode** with small brushes and a **minimum spacing** of 1. Use the **Brush Size** tool and **Brush Option** dialog to determine the smoothness of the lines and the space between vertices.

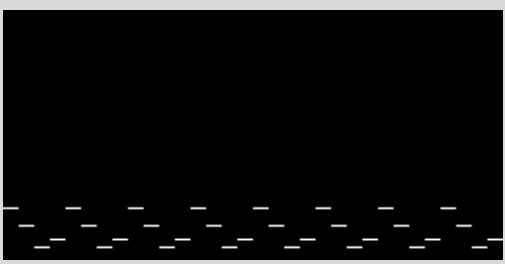
Repeat Mode

This is a special case of **Dot Mode** in which every stroke is repeated in time across the grid specified by the **Hot Filter Grid Interval** (discussed later in this chapter). **Repeat mode** is handy for creating drum patterns and repetitive musical structures. It will usually be used with the **Brush Grid** turned on (see below).

MetaTip *Press the caps lock key to repeat the strokes in all its octaves both above and below the painted stroke. This feature is especially useful for creating harmonic grids to be pasted into the blue channel and for creating pictures to use as filters.*

MetaTip *Use this mode to create super-rich sound pictures (try using the Add Harmonics command to make it even richer) then paint with sweeping strokes of a thick filter brush to selectively remove harmonics.*

MetaTip *See the provided tutorials for examples of using **Repeat Mode**.*



This picture was created in **Repeat** mode with the **Brush Grid** (see below) turned on. Only the first four notes were entered directly; the other notes are repetitions generated by this brush mode. The **Brush Grid Interval** is 8 pixels. The **Hot Filter Grid Interval** is set to 32 pixels.

Brush Palette

Choose a brush or tool for working in the Image Synth. MetaSynth provides a number of brushes optimized for entering music and sound. There are brushes for painting notes, for adding harmonics, for filtering, for smearing existing pixels, for refining note envelopes and more. Several settings work in conjunction with the Brush Palette: Brush Mode, Brush Color and Brush Size. Each brush type remembers its size and mode settings.

MetaTip *Holding down the command and option keys together pops up the Brush Palette when you click on the canvas, making it easy to switch brushes while working.*

MetaTip *Pressing the command key, temporarily changes the brush to the selection tool.*

Note. There is an additional related tool which does not appear on the palette. When you press the option key, the eye dropper tool is activated. An eye dropper cursor appears and picks the color beneath it when the mouse is clicked.

Brush strokes can be constrained with the **Brush Grid** described later in this chapter.

MetaTip *Pressing and holding the shift key before painting constrains painting horizontally (as well as quantizing the note start to the Brush grid). If the brush width is smaller than the Brush Grid interval, the result is pulsed strokes.*

MetaTip *Pressing option-shift while painting constrains strokes to the vertical axis and applies vertical grid quantization. This is great for dragging chords.*

Pen Brush (shift-p)

A hard-edged, opaque, rectangular brush with a square on/off envelope that adds paint with the current brush color. Pen Brush strokes are anti-aliased.

In line mode, continuous lines are drawn. The Brush Size Dialog's **minimum spacing** setting acts as a sort of line grid. In Dot mode, the Brush Size Dialog's **minimum spacing** setting has the effect of ensuring space between notes.

This brush is frequently used for entering notes that will be played with an Instrument input source (in cases where it is desirable to retain the Instrument samples' inherent envelopes).

Air Brush (shift-a)

A round-edged brush with translucent edges useful for creating smooth attacks and decays. Use small brushes a pixel high for notes and large size brushes for unpitched clusters (or rich harmonic clusters, depending upon the current frequency map).

MetaTip *Large size brushes can be used to great effect with frequency maps (custom scales) based on the harmonic series.*

Note *This brush's hot spot is at the center of the brush. When the* ***Brush Grid*** *is on, the center of the brush stroke is aligned to the grid.*

Filter Brush (shift-f)

A brush that filters pixels by applying the selected brush color with the multiply Transfer Mode. While similar to filter pictures (filter presets), **Filter Brushes** can be used to *amplify* as well as attenuate pixels. (Filter pictures by contrast cannot amplify/brighten pixels). With Filter Brushes, neutral gray is the shade which, when applied, leaves pixels unaffected; with filter pictures, the neutral color (identity multiplier) is bright white. In effect, the filter's brightness is scaled from 0 (black) to 2.0 (white) whereas the values are scaled from 0 (black) to 1 (white) when applying filter pictures.

This is a great tool when designing sounds. It gives you fine control over the harmonics in an image. Use colored filter brushes to adjust stereo placement.

Harmonics Brush (shift-h)

A brush that paints a fundamental pitch and the first five overtones of the harmonic series. The brightness of each harmonic is less than the previous harmonic. The harmonics are: fundamental, octave, octave plus a fifth, second octave, second octave plus a third, second octave plus a fifth.

This brush is sensitive to the Frequency Map setting and will do its best to accommodate the current map.

This tool is useful for creating "thick" sounding waveforms to which you can apply the filter brush.

MetaTip *Try switching to different frequency maps when painting with this brush then switching back to the intended map. This technique works especially well with microtonal tunings.*

Attack Brush (shift-t)

A brush that paints with a hard left-edge (hence a sharp attack) with a soft decay. The upper pixels of the brush (if it has a vertical dimension greater than a pixel) fade out faster than the lower pixels. This brush is great for creating percussive attacks with bell-like decays.

MetaTip *Try this brush with microtonal frequency maps, like Micro50, or with custom scales based on the harmonic series, like Harmo16 and Harmo32.*

Smoothing Brush (shift-s)

A brush that smoothes the pixels over which it passes, giving notes smooth attacks and decays. This brush affects only existing pixels.

Spray Brush

A spray paint type brush. Great for creating grainy, noisy textures.

Decay Brush (shift-d)

A brush that extends existing pixels to the right to increase durations. This brush affects only existing pixels.

MetaTip *An alternate technique for extending durations is to select the desired region and press option-right arrow to extend the pixels. (Make sure the **Transfer Mode** is set to **Maximum**).*

Note Brush

New in 2.5! A brush for freeform note drawing. Press and drag to leave a trail of notes in the mouse's path. Notes are always quantized to the current Brush Grid interval. The edges of the notes are less hard-edged than the Pen Brush. Generally, this brush is used in **Dot** mode, leaving a trail of notes where the mouse passes though interesting effects can be created in **Line** mode where it can be used to draw lines and polygons with large Brush Grid interval settings.

MetaTip *You may want to apply the **Filter Scale** or **Fit to Scale** processes after painting with the note brush if you are not using a custom scale which prevents dissonance.*

Note *This brush is similar to the note brush found in Xx, MetaSynth's MIDI sequencing sister.*

Line Brush

Also called the **Harmonics Brush**. A brush that paints a horizontal line (a harmonic or overtone) with the brush color across the width of the canvas. This brush is most commonly used when using the Wave Table as the picture's input source. It is useful when using the Image Synth to create waveforms.

MetaTip *You can use this tool in the Blue Channel to provide a harmonic grid to use as a guide when composing music in the Image Synth.*

Smear Brush

A brush that smears the existing pixels. The brush "grabs" the pixels beneath it when the mouse is clicked and smears them as you drag. This brush is nice for modifying a note's amplitude or pitch envelope (depending upon whether you smear horizontally or vertically).

This tool is unaffected by the Brush Mode.

MetaTip *Don't forget that you can smear black. This technique is useful for making dense parts of a picture more diffuse.*

Smear Brighter Brush

A brush that smears the existing pixels with a brighter gradient than the Smear Brush. When using this brush, bright pixels 'win' when smeared. Very handy for adding glissandi at notes' boundaries.

This tool is unaffected by the Brush Mode.

MetaTip *Use this brush and the Smear Brush in microtonal frequency maps for creating glissandi, pitch bends, vibrato and other similar effects.*

Clone Brush

This brush captures the pixels under the brush when the mouse button is first pressed and allows you to paint with the captured pixels. Nice effects can be created in both Dot and Line modes. It is a handy tool for retouching notes' edges.

MetaTip *Nice Random textures can be created with the Clone Brush when using Dot Mode* ***AND*** *a large minimum spacing (see Brush Options Dialog)* ***AND*** *a Brush Grid interval of 16 or more.*

MetaTip *With small brush size and* ***minimum spacing*** *settings the* ***Clone Brush*** *does a nice job as a retouching tool since you can quickly pick the color where you click and spread it.*

Selection Tool(shift-m)

A tool to create a marqueed selection similar to the selection tools found in most graphics applications. The Selection Tool, also called the Marquee Tool, allows you to select a rectangular selection which can be moved by dragging it directly or by using the Transpose/Nudge tools (and their keyboard equivalents). The active selection (or the entire image if there is no selection) is the target of all Image Synth tools and commands (with the exception of the **Synthesize** tool which acts upon the entire canvas and brush strokes which are not clipped to the selection).

Shortcut: To temporarily switch to the **Selection Tool**, press the command key.

When the Selection Tool is the active brush tool, the **Brush Size** tool is replaced by the **Transfer Mode** submenu. When a selection is dragged (or option-dragged) or inserted (using the **Insert** command in the **Edit** submenu) it is applied to the existing pixels using the current Transfer Mode. See the description of the Transfer Mode submenu for more information about Transfer Modes.

The **Edit** submenu's paste commands scale the clipboard image to fit the selection size. Pressing the shift key when pasting causes the clipboard image to be scaled to

the canvas size then clipped to the selection region. This was the behavior in versions prior to 2.5.

The Selection Tool makes it easy to move a portion of a picture, copy it, or fine tune it with the Image Synth's tools. When the Brush Grid is turned on, selection and movement is aligned with the grid.

The selection's behavior follows the standards observed by most graphics applications:

- Option-drag (or option-arrow key) leaves a copy of the selection behind,
- Shift-drag constrains the selection and displacement to the Brush Grid,
- Arrow keys displace the selection by a pixel in any direction,
- Delete key clears the selected region
- 'a' selects all (and automatically makes the Selection Tool the active brush tool)
- 'd' deselects the currently selected region.

The following shortcuts are useful when transposing/moving a selection (or the entire canvas):

- Up/Down/Left/Right arrows–nudge the selection one pixel in the indicated direction,
- Shift-Up/Down arrows–transpose up/down by current **Brush Grid Interval**,
- Shift-Left/Right arrows–shift left/right by the **Hot Filter Grid** interval,
- Page Up/Down arrows–transpose up/down by octaves
- Shift-Page Up/Down–transpose up/down by fifths.

MetaTip *Pressing the option key when using the above commands leaves behind a copy of the selection.*:

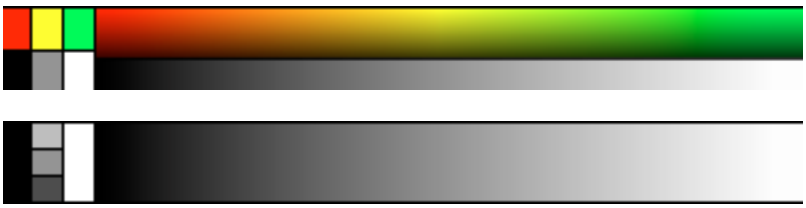
MetaTip *Use the selection tool when previewing. Previews are limited to the selected region which is convenient when fine tuning one area of the sound picture or when working with sound pictures too complex to be previewed in their entirety.*

MetaTip *If **Preview** plays back silence when it shouldn't, type 'd' to deselect the selection. There may be an empty selection.*

MetaTip *To deselect the selection, press 'd'. This returns you to full-length previews.*

New in 2.5! The selection behaves somewhat differently than in earlier versions of MetaSynth. It is now persistent and is maintained when you switch tools which allows you to work and preview a part of the sound without having to reselect the area when switching tools.

Brush Color Selector



Choose a brush color **or** change the selection's color. Click and drag on the Brush Color Selector, found below the Brush Palette icon, to change the brush color. The current brush color is displayed in the tool's display in the toolbar. The palette of colors which is displayed reflects the canvas' color mode. At the left edge of the selector's pop-up palette are six convenient preset colors.

When there is an active selection, selecting a color applies the new color to the selection using the multiply transfer mode. You cannot change red pixels to green or vice versa, but you can change the amplitude of any pixels or the degree of panning.

Hold the option key to invoke the Eye Dropper Tool which picks the color under the eye dropper and makes it the current color. This tool is not available when the Selection Tool is the active brush tool.

Brush Size Tool

Change the brush size by clicking and dragging this control **or** double-click the control to open the Brush Options Dialog (see below). The Brush Size tool is a two-dimensional control. Click on the tool and drag horizontally and/or vertically to change the brush size.

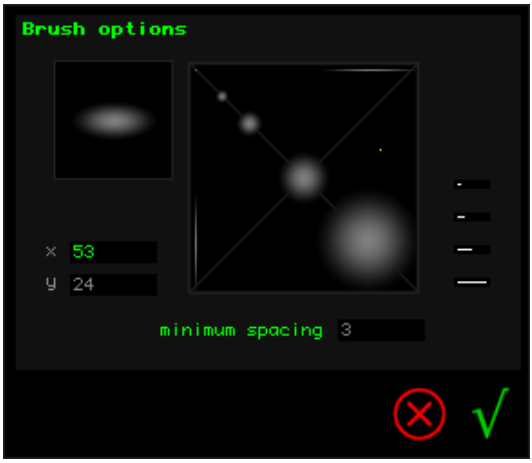
When changing brush size, the entire screen (not just the Image Synth palette area) area is active. Drag to the lower left corner of the screen to reset the brush to 1 X 1. Drag up and to the right to increase the brush's vertical and horizontal dimensions.

Use the shift key to constrain the tool to the brush's width. Use shift-option to constrain the tool to changing the brush height.

While the mouse button is down, the tool displays the brush's size in pixels with the width displayed on top. Double-click on the tool's icon to open the **Brush Options Dialog**.

Note *This tool is not available when the **Selection Tool** is active in which case its position in the toolbar is occupied by the **Transfer Mode** submenu.*

Brush Options Dialog



New in 2.5! This dialog provides a convenient way to precisely set the brush size and spacing. To invoke the Brush Option Dialog, double-click the Brush Size tool. The **Brush Size Tool** is not available when the **Selection Tool** is active.

Brush Shape Display

The Brush Display at upper-left corner of the dialog shows the appearance of the brush with its selected size and shape. The Brush Tool selection affects the appearance of the brush and is reflected in this display.

Brush Shape Canvas

This canvas provides continuous control over brush shape. Click anywhere to immediately change the brush shape. Areas between the displayed shapes are active. Press and drag the mouse through the canvas and watch in the **Brush Shape Display** as the brush shape changes continuously.

The Brush Size can be further refined with direct numerical entry in the Brush Width or Brush Height fields.

Brush Picker

Click here to pick any one of several brushes convenient for entering notes. Each brush in this list is one pixel high.

The Brush Size can be further refined with direct numerical entry in the Brush Width or Brush Height fields.

x (Brush Width)

A numerical control for setting the brush width.

y (Brush Height)

A numerical control for setting the brush height.

Minimum Spacing

A numerical control for modifying the minimum spacing setting. This number determines the spacing between brush strokes when dragging the mouse in Dot and Repeat modes or the length of lines when in Line brush mode.

The effect of this setting is quite different in Line and Dot brush modes. In Dot mode, the effect is to ensure space between brush strokes if the minimum spacing is larger than the brush size. No paint is added in the space between strokes in this mode. In Line Mode, this setting acts as a sort of line grid—in effect, it sets the minimum line length.

Transfer Mode Submenu

This menu is available in the space below the Brush Palette tool when the Selection Tool is active. The transfer mode determines how a selection interacts with the pixels of the existing image. Most of these processes have a corresponding paste command in the **Edit** submenu. The selection may be created by using the Selection Tool or by using the **Edit** submenu's **Insert Pict** command (shortcut: 'b'). The transfer is not complete until the region is deselected.

Shortcut You can advance through the transfer modes by pressing the '/' key.

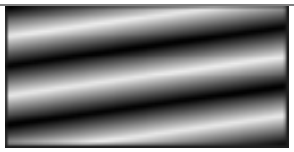
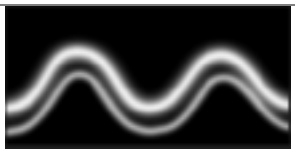
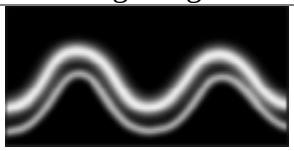
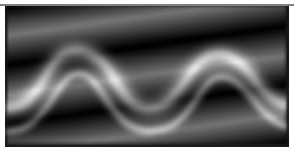
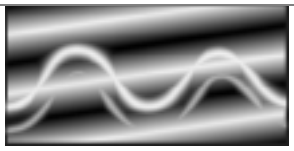
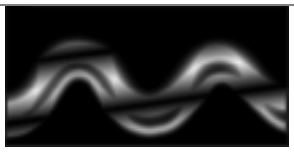
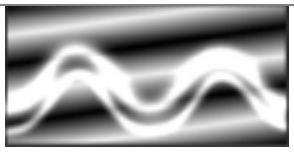
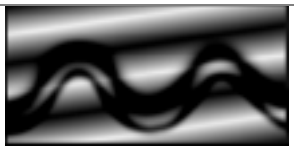
In some transfer modes (**Differences** or **Subtractive**, for example), the image may appear to disappear when perfectly aligned with the selection. Slight movements of the selection can have interesting effects.

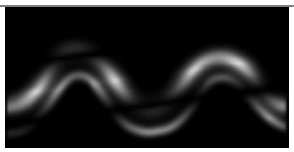
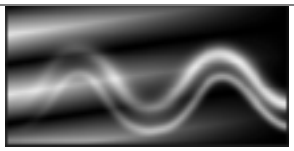
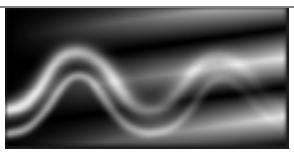
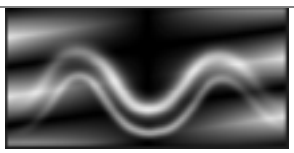
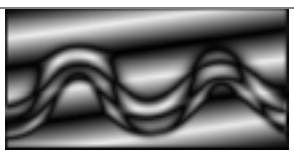
MetaTip *Try this, select a preset with a dense image. Type 'c' to copy the image. Type 'b' to insert the image. Choose **Differences** from the **Transfer Mode** submenu. Now, use the arrow keys to move the image around, and see what happens!*

See the provided tutorials for examples of using the transfer modes.

The default transfer mode is **Maximum**.

The following table demonstrates the transfer modes:

	 Canvas Image	 Inserted Image
Transfer Mode	Resulting Image	Notes
Erase		The selection replaces the existing pixels.
Blend		A 50% blend of the two images is made.
Maximum		The default Transfer mode. The images are combined with the brightest pixels taking precedence.
Minimum		The images are combined with the least bright pixels taking precedence.
Additive		The images are combined by adding the brightness of the two layers.
Subtractive		Subtract the selection's pixel values (brightness) from the existing image's. Subtracting black pixels has no effect.

Multiply		Multiply the brightness values of the two images' pixels. This is the same process used when applying filter pictures. Multiplying by black results in black.
Fade in		Crossfade the two images (the selection fading in as the existing pixels fade out).
Fade out		Crossfade the two images (the selection fading out as the existing pixels fade in).
Fade in out		Fade in the selection then fade it out while fading out the existing pixels then back in again.
Xor		Combine the two images by keeping the pixels that exist in one but not both images.
Differences		Pixel values are determined by the absolute values of the differences between the two layers.

Processes Submenu

This menu provides a number of graphical processes useful for shaping images into sounds. While these processes are not musical in the same sense as the commands in the **Pitch and Harmonics** submenu, they can help you transform just about any picture into a sound picture. They can also create graphics beautiful in themselves.

MetaTip *Importing pictures is a nice way to discover found sounds, but most pictures that were not intended to be sounds need some help in their metamorphosis. Pixel density and distribution generally need to be altered. Use the commands in this submenu to massage found pictures into sounds.*

MetaTip *Don't forget to experiment with custom scales and microtonal frequency maps when using these processes with your images. You may discover sounds you never imagined!*

Blur (#)

Apply vertical and horizontal smoothing. Since it applies to both axes, **Blur** influences both the harmonic content and envelope of the sound. Successive applications of this process force an image to grow increasingly out of focus. This process yields especially nice results when used with microtonal frequency maps to create haunting, other-worldly sounds.

Blurring has very interesting effects in microtonal tunings and tunings based on the harmonic series.

MetaTip *You may find it useful to apply the lower toolbar's **Normalize** tool after applying this process since process tends to reduce the overall brightness.*

MetaTip *Create a halo effect with this sequence: 'c' (**Copy Picture**), '#' (**Blur**), 'e' (Add Picture).*

Blur More

A more intensive blur effect, resulting in an "out of focus" look. Adds dissonance to an image by blurring adjacent frequencies.

MetaTip *You may find it useful to apply the lower toolbar's **Normalize** tool after applying this process since process tends to reduce the overall brightness.*

MetaTip *For a glow effect try this sequence: 'c' (**Copy Picture**), **Blur More**, 'e' (Add Picture).*

Triangle Filter

A solarization effect where luminance above 50% is changed to black across the canvas (or the selected region). This process is useful for reducing the density of images with lots of bright pixels.

MetaTip *You may want to normalize the picture (or selection) or increase its brightness before applying this process to ensure that there are pixels above the filter's threshold.*

MetaTip *Create nice, psychedelic images by repeatedly normalizing the picture then applying the **Triangle Filter**.*

Noise Filter

Remove isolated pixels. This is useful for cleaning up noisy pictures and sound analyses. Often when you create a picture by using the **Analyze Current Sound** command (in the **File** submenu), there are little quantization artifacts (especially when analyzing speech or other sibilant sounds) or other isolated pixels which this process can remove.

Emboss Left

A convolution filter that tends to emphasize the trailing edges of shapes and, in some cases, creates a three-dimensional impression of a light source coming from the above left. Pixels tend to shift to the right. Applying this process repeatedly can result in solarization effects

MetaTip *You will generally apply this process a few times until you get the desired effect. It is often useful to apply the lower toolbar's **Normalize** and **Smooth** tools when you apply this process.*

MetaTip *Interesting effects can be created by applying this process to a single color channel.*

Emboss Right

A convolution filter that tends to brighten the leading edges of shapes and, in some cases, creates the three-dimensional impression of a light source coming from the above right. Pixels tend to shift to the left. Applying this process repeatedly can result in solarization effects

MetaTip *You will generally apply this process a few times until you get the desired effect. It is often useful to apply the lower toolbar's **Normalize** and **Smooth** tools when you apply this process.*

MetaTip *Interesting effects can be created by applying this process to a single color channel.*

Quantize

Rhythmic quantize. Force notes to start and end at the positions determined by the current grid interval. Quantizes all notes to the duration specified by the Hot Filter Grid interval and to the brightness of the brightest pixel in each pixel group. **Quantize** is similar to the "pixelate" function found in some graphic editing applications. MetaSynth, however, only applies the effect horizontally (in the time domain).

This command is identical to the Quantize hot filter. For a full description, see Quantize in the **Hot Filters** section of this chapter.

Trace Edges V

Trace edges vertically. Traces the edge of pixel lines along their horizontal boundaries. Where adjacent pixels are on **Trace Edges V** turns them off. If there is a large difference in brightness between adjacent pixels, a pixel will appear at the boundary in the resulting image.

When applied to a solid rectangle, for instance, the resulting image is a pair of vertical lines at the rectangle's left and right edges. When applied to a horizontal line, the result is a pair of pixels defining the line's endpoints.

MetaTip *To achieve a classic edge tracing effect use this command sequence:* ***Trace Edges V****,* ***Copy Pict*** *('c'),* ***Undo*** *('z'),* ***Trace Edges H****,* ***Max Pict*** *('k') or* ***Add Pict*** *('e').*

Trace Edges H

Trace edges horizontally. Traces the edge of pixel lines along their vertical boundaries. Where adjacent pixels are on **Trace Edges H** turns them off. If there is a large difference in brightness between adjacent pixels, a pixel will appear at the boundary in the resulting image.

When applied to a solid rectangle, for instance, the result is a pair of horizontal lines at the rectangle's top and bottom edges. When applied to a single pixel high line, the resulting image is two new lines either side of the former line's location (which will be black in the resulting image).

MetaTip *To achieve a classic edge tracing effect use this command sequence:* ***Trace Edges V****,* ***Copy Pict*** *('c'),* ***Undo*** *('z'),* ***Trace Edges H****,* ***Max Pict*** *('k') or* ***Add Pict*** *('e').*

Repeat Twice (r)

Paste a copy of the first half of the canvas (or the selected region) onto the second half. This command is useful for repeating a pattern or phrase when switching to a larger picture width.

Reverse Time (t)

Flip the canvas (or the selected region) horizontally to reverse it in time. The pictorial equivalent of playing a record or tape backwards.

Swap Red and Green (j)

Swap the red pixels to the green channel and the green pixels to the red channel.

MetaTip *To move only the red or green pixels, set the* ***Channel Edit Mode*** *to edit that color channel, choose* ***Copy*** *(type 'c'), switch the* ***Channel Edit Mode*** *to the channel to paste into and* ***Paste*** *('v') the clipboard image.*

Pitch and Harmonics Submenu

This submenu is dedicated to processes in the pitch (vertical) domain. Unless otherwise noted, the current frequency map affects the outcome of the operation.

New in 2.5: Add Fundamental, **Add Harmonic**, **Fit to scale**, and **Filter scale** have all been modified to support the new possible scales and the new master tuning tool. They will give the closest approximation of the solution, depending on the frequencies available in the current frequency map.

Lower Even Lines

Lower the brightness (amplitude) of the even numbered pixels. Several applications in a row are needed to actually remove the pixels. This process acts like a comb filter. The frequency map does not effect this command. This command can help reduce the clutter in dense pictures.

MetaTip *To remove the odd numbered pixels, transpose the picture up or down one pixel with the arrow keys before applying the process then shift them back into position when done.*

Fit to Scale... (=)

Remap pixels to fit a user-definable diatonic scale. Pixels not found in the chosen scale are shifted up or down to the nearest pitch in the scale. A dialog box appears with pop-up menus to choose the key center and scale. You can further customize the scale by editing the remapping of individual pitches.

This is handy for remapping a composition from one scale to another or for turning freeform drawing into notes.

MetaTip *When working with non-semitone based music, you can temporarily change the frequency map to semitones, apply this command then change back to a custom scale. While the results are variable, this is a nice tool for discovering new modalities.*

Filter Scale ... (f)

Remove pixels that do not fit a user-definable diatonic scale. Unlike **Fit to Scale**, pixels are removed not remapped. A dialog box appears with pop-up menus to choose the key center and scale. You can further customize the scale by editing the remapping of individual pitches.

MetaTip *When working with non-semitone based music, you can temporarily change the frequency map to semitones, apply this command then change back to a custom scale. While the results are variable, this is a nice tool for discovering new modalities.*

MetaTip *Use this tool when extracting melodies from a sound's analysis to remove unwanted dissonance or microtonality.*

Filter Octaves And Fifth

Attenuate all pixel lines of the canvas (or the selected region) except for the octaves and fifths centered around the sound picture's reference pitch (see **Master Tuning).** This adds a pitched resonance and is most commonly used to add a sense of pitch when working with "noisy" pictures.

Add Fundamental (.)

Draw a horizontal line with the sound canvas' reference pitch (see **Master Tuning).** This command is useful when starting to draw a sound. Frequently, this command will be followed by an application of the command **Add Harmonics** to generate overtones.

Add Harmonics (h)

Add harmonics (overtones) of the picture's existing pixels, a sort of "vertical echo". The overtones correspond to the first five overtones of the standard harmonic series (octave, 8va fifth, 8va octave, 16va third) and are added with decreasing amplitude.

Option-select this command from the submenu to generate the first 30 harmonics rather than just the first five. (This option is only available when choosing the command from the submenu).

MetaTip *To thicken up sounds, successively apply **Add Harmonics** which will add harmonics of the harmonics.*

MetaTip *After applying this command, you will probably want to use the Filter Brush to adjust the contours of the harmonics so that the sound will "breathe".*

Expand 2

Vertically expand the pixel spacing by a factor of two. Expansion is done from the bottom up. Use this command to maintain a picture's relative harmonic content when switching between frequency maps (i.e. going from semitones to quarter tones). Pixels disappear when they are expanded beyond the canvas height. It is a good idea to increase the canvas' height to accommodate the expansion.

Since expansion is done from the bottom, absolute pitches will change. The image can be transposed after expansion to restore the absolute pitch of the unexpanded picture.

MetaTip *Before expansion, identify the pitch of a line in the picture by mousing over the pixels and observing the pitch displayed in the **Tips Display**. After expansion (and the selection of the new frequency map), mouse over the corresponding pixels to find their new pitch. Now, simply transpose the pixels back into place with the up and down arrows.*

Expand 4

Vertically expand the pixel spacing by a factor of four. See notes for **Expand 2** above.

Expand 12

Vertically expand the pixel spacing by a factor of twelve. See notes for **Expand 2** above.

Contract

Contract the vertical space between pixels by a factor of two. Use this command to restore the relative pitch of pixels when changing frequency maps (for example, when switching from Micro8 to Quartertones or Quartertones to semitones). There is a reduction of pixel brightness (to avoid pixel 'clipping'). The command can, of course, be applied repeatedly to contract the pitch even more (as when switching from Micro50 to semitones).

MetaTip *Generally, you will want to normalize the picture after each application of this process.*

MetaTip *The absolute pitch can change when applying this process. See the notes for **Expand 2** for tips about restoring the original pitch.*

Invert Pitch

Flip the canvas (or the selected region) vertically to invert the picture's pitches.

Repeat Pitch

Replace the upper half of the canvas (or the selected region) with the lower half. This command is not affected by the current frequency map.

MetaTip *You may want to adjust the brightness of the new pixels after applying this process.*

Maximum (;)

Find the maximum brightness of the pixels of the canvas (or the selected region) and replicate them horizontally. Use this command to create long, sustained tones, generate a harmonic grid in the Blue Channel or create a filter from the frequency spectrum of the analysis of a sound.

Brush Grid Tool

New in 2.5! The **Brush Grid** allows painting and selection operations to be aligned to grid points defined by the **Brush Grid Interval**. Turn constraint on by clicking the Brush Grid toggle or hold down the shift key and paint. Brushes and the Selection Tool are constrained to the grid when it is active.

The **Brush Grid** allows you to easily enter or select notes "in time" by setting the Brush Grid Interval to appropriate pixel widths. Use this tool in conjunction with the **Tempo/Duration Dialog** to set up the sound canvas for the direct entry of note-based music.

This tool provides instant access to the Brush Grid (formerly hidden in the **Preferences** dialog) and provides a way to turn on the grid (for painting with rhythmic constraints) without needing to press the shift key while painting.

MetaTip *With the **Brush Grid**, it is easy to enter musical figures and rhythm patterns directly. See the tutorials provided on the CD for detailed lessons that show you how.*

MetaTip *Here is an example of how to set up the grid. In the **Tempo/Duration Dialog,** set your tempo and set the **pixels per beat** to 16. Setting a **Brush Grid Interval** of 16 will restrict your notes to occurring on the beat. Setting the **Brush Grid Interval** to 64 will restrict notes to occurring on the first beat of a measure. Setting a **Brush Grid Interval** to 4 will restrict notes to 16th note boundaries. And, so on…*

Brush Grid Toggle

Click on this toggle to turn the **Brush Grid** on and off. When the toggle is on, it is "lit up." The grid can be turned on temporarily by pressing and holding the shift key prior to initiating a paint stroke or selection.

When the Brush Grid is on, modifier keys can be used to achieve these constraints:

- Shift key: constrain to the Brush Grid Interval **and** constrain stroke horizontally.
- Shift+Option keys: treat Brush Grid Interval as a vertical grid and constrain to the horizontal Brush Grid.
- Shift-Option will constrain strokes to a vertical grid (using the Brush Grid Interval) without horizontal constraint when the Brush Grid is off.

MetaTip *Use vertical constraint (shift-option), to paint chords and other interesting harmonic structures. Set the **Brush Mode** to **Dot Mode**. With a semitone frequency mapping, for instance, set the **Brush Grid Interval** to 5, and use vertical strokes to paint stacks of fourths.*

Brush Grid Interval

The horizontal width between grid points. This is a standard MetaSynth numerical field. Type a number and press tab to confirm the value. To activate the grid press the shift key before using a brush or selection tool, or turn it on by clicking the **Brush Grid Toggle**.

Scroll Hand (spacebar)

Scroll the canvas within its frame. When the Image Synth is zoomed in, some of the picture may lie beyond the visible frame. This tool replaces the functionality provided by the standard Macintosh scroll bars.

There are two ways to use the tool: click on the tool and drag in any direction to scroll the image. Alternately, move the mouse over the canvas area, press the spacebar to get the hand cursor and drag the mouse to pull the desired portion into view.

Shortcut: Press the spacebar and drag the mouse in the sound canvas to scroll it directly.

Note *Don't confuse this tool with the* ***Offset Tool*** *whose icon is the outline of a hand.*

Zoom Tool (+ / -)

Zoom the image in and out while maintaining the image center. Use the plus and minus keys as shortcuts.

Command-spacebar-click zooms in on the clicked location.

Option-command-spacebar-click zooms out from the clicked region.

Lower Toolbar

The toolbar at the bottom of the Image Synth window has a number of the most frequently used tools. The **Preview** and **Synthesize** tools are here as are tools to scale, rotate, and offset the canvas (or the selected region). Also, two of the Image Synth's most exciting features are found here: displacement maps (with which you can "bend" a picture with another picture) and color remapping.

Scale Picture

Scale the picture vertically and/or horizontally with or without wraparound. The tool can be invoked in two ways: clicking on the tool and dragging the mouse or double-clicking the tool's icon to invoke its dialog box.

When clicking and dragging, up and down movements change the vertical scale while horizontal movements change the horizontal scale. Scaling can be constrained horizontally to the Hot Filter Grid interval by holding down the shift key before scaling. Vertical constraint, in 32 pixel increments, is achieved by holding down option-shift.

To invoke the **Scale Picture Dialog Box**, double-click the tool's icon. The dialog allows numerical entry of horizontal and vertical scale amounts and allows wraparound to be turned on and off. By default wraparound is turned on. The dialog provides a **Scale From Center** checkbox which determines whether scaling is done from the center or the left edge of the sound canvas.

When wraparound is turned on, shrinking the image results in copies of the image being wrapped into the vacated region. This is useful for creating repetitive motifs.

Rotate

Rotate the image freely with or without image wraparound. The tool can be invoked by clicking and dragging the tool or double-clicking to invoke its dialog box.

When dragging the tool, left-right mouse movement rotates the image. Rotation can be constrained to 45 degree intervals by holding down the shift key before clicking the tool.

The dialog box allows numerical entry of the rotation amount and allows wraparound to be turned on and off. Wraparound is on by default.

With wraparound turned on, parts of the image that are rotated beyond one boundary are rotated back in at the opposite boundary.

Offset

Offset the image vertically and/or horizontally with or without wraparound. The tool can be invoked by clicking and dragging the tool or double-clicking to invoke its dialog box.

When dragging the tool, the image is offset in the direction of the mouse movement. Use the shift key to constrain movement horizontally by the Hot Filter Grid Interval, or use shift-option to constrain movement to vertically by 32 pixel increments.

The dialog box allows numerical entry of the offset amount and allows wraparound to be turned on and off. By default, wraparound is turned on.

With wraparound turned on, the parts of the image that are shifted beyond the canvas' boundary are wrapped around to the opposite boundary.

Contrast and Luminance

Adjust the image's brightness and contrast. The tool can be used by clicking and dragging or by double-clicking to access the **Remap Color Dialog**.

When dragging, horizontal movement changes the image contrast and vertical movement changes the brightness (luminance). Use the shift key to constrain the tool to contrast adjustments and option-shift to constrain to brightness adjustments.

Remap Colors Dialog

Double-clicking the **Contrast & Luminance** tool invokes the **Remap Colors Dialog**. This tool can be used to create a range of effects. You can use it to achieve the visual equivalents of audio compression, gating and expansion or to create wild psychedelic effects.

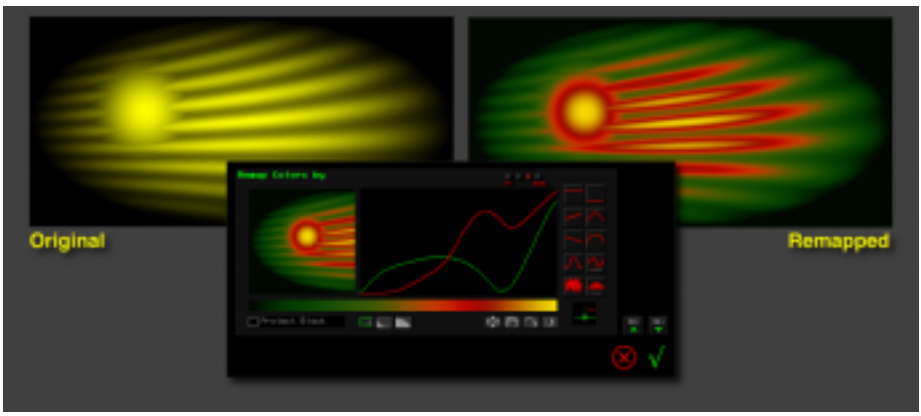
At the left of the dialog is a display of the image as it will appear with its colors remapped. The central area is the remapping canvas which is a standard MetaSynth envelope editor (see the section **Envelope Editors** of this manual) Beneath the envelope canvas is a color bar that displays the remapped spectrum.

The red and green envelopes are independent. The red envelope controls remapping of the red color channel. The green envelope controls remapping of the green color channel. Click on the channel toggle beside the color bar to switch between envelopes.

The **Protect Black** checkbox can be used to ensure that silence remains silence. Turning this option off allows black to be remapped which can result in undesirable side-effects if you don't make sure that some other shade is remapped to black.

MetaTip *Use this tool to remove faint pixels after doing an analysis of a sound.*

MetaTip *To apply the same curve to both channels, export the envelope data by pressing the Save Envelope icon button to save the date then activate the other envelope and import the data.*



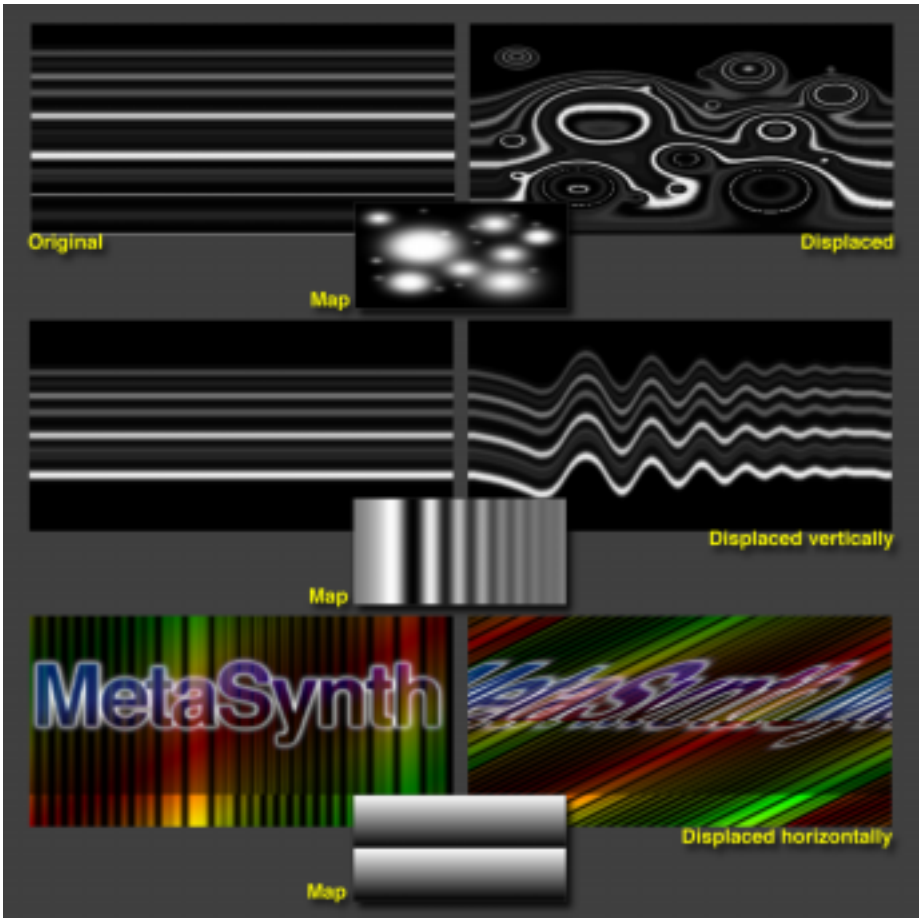
Displacement Maps

New in 2.5! Displace the image by warping it against another image. Displacement maps are one of MetaSynth's most powerful graphic manipulation tools. You will probably find it useful for creating beautiful images in addition to creating sounds.

To use this tool, double-click its icon to open the Displacement Map dialog. Choose a Displacement Map using the Displacement Map Selector. Click the OK icon button to dismiss the dialog. Click on the tool and drag the mouse in any direction to deform the image by bending it against the selected displacement map.

The amount of displacement is determined by the luminosity of each pixel of the image used as the displacement map. Gray values (127) are neutral while Black and White will create maximum displacement in opposite directions. When smoothing is turned on (in the Displacement Map Dialog), lines are bent in smooth, continuous curves. When it is turned off, lines break discretely where edges occur in the displacement map.

Use displacement maps with smoothing on to skew images and create pitch modulation effects (such as vibrato, pitch bending, and glissando). Use displacement maps with smoothing off for diffusion effects and to re-contour melodic and rhythmic lines. Use them in the **Filter Palette**, to create filter sweeps.



Displacement mapping can be constrained horizontally with the shift key or vertically with shift-option.

See the tutorials provided on the CD for lessons in making use of this incredible feature.

The first time you click on the tool, or any time you double-click on it, the Displacement Map dialog box is opened.

Displacement Map Dialog

This dialog box lets you choose an image to use as a displacement map. The dialog box has the following controls:

File submenu

This submenu provides commands to open or create new preset libraries. Any MetaSynth preset library can be used as a displacement map library. A special library **DisplaceMaps.presets** has been provided with images that work well as displacement maps.

Displacement Map selector

Use this selector to choose a displacement map. Remove an item from the list by holding down the option key, pressing the selector icon to display the pop-up list then selecting the preset to be deleted.

Open Pict

Press this button to open a PICT file, and add it to the preset library used by the Displacement Dialog.

Paste Pict

Press this button to add the PICT clipboard image to the preset library used by the Displacement Dialog.

Copy Pict

Copy selected displacement map to the PICT clipboard.

Smooth before displace checkbox

Turning this option on results in continuous curves when the image is displaced. (See illustration above.) Smoothing works well when creating filter sweeps. (See

the tutorials for a lesson on creating filter sweeps). For other effects, discontinuity is often desirable. Turn smoothing off for melodic remapping and diffusion effects.

Octave Transpose

Transpose the image up or down in one octave increments. Hold down the option key when transposing to leave a copy behind.

Shift-click to transpose the image up or down by a fifth.

Nudge/Transpose

Nudge the image in single pixel increments. Modifier keys can be used to nudge by other increments:

- Up/Down/Left/Right arrows–nudge the selection one pixel in the indicated direction,
- Shift-Up/Down arrows–transpose up/down by thirds,
- Shift-Left/Right arrows–shift left/right by the Hot Filter Grid interval,
- Page Up/Down arrows–transpose up/down by octaves
- Shift-Page Up/Down–transpose up/down by fifths.

Holding down the option key, leaves a copy behind.

Normalize

Click here to normalize the image. Normalization remaps brightness so that the image's brightest pixels are remapped to maximum brightness with the rest of the pixels being remapped accordingly. This process results in sharper, brighter images and louder sounds. Use it any time that the brightest pixels in the image are dim.

Smooth Envelope

Soften the left and right edges of all pixel lines of the canvas (or the selected region). This command softens the attacks and decays of a sound picture's notes. Unlike the **Blur** process, diffusion happens only in the time domain; the harmonic content is unchanged. Repeated application removes sharp attacks.

Smooth Decay (Smooth Right)

Soften and extend the decay of all pixel lines (notes) of the canvas (or the selected region). Use this tool to add sustain and soft decay to notes without affecting the attack.

MetaTip *Option-click this tool to smooth the attacks (left edges) only.*

Interpolate

Create smooth (interpolated) transitions in amplitude along the time axis. Interpolate is usually used to modify the envelopes of individual notes or clusters of notes. A smooth gradient is calculated between the pixels at the right and left boundaries of the selected region. Interpolate is the visual equivalent of crossfading.

Generally, you will select either the attack or the decay of a note (or note cluster) before applying this process. Use this tool to smooth out abrupt changes in brightness.

Use this tool to lengthen note durations (by selecting the end of a note and the area to the right of the note).

Synthesize/Compute

Render the canvas as a sound and load it into the Sample Editor. The entire sound canvas is rendered. The sound is automatically played back after it is computed. While the sound plays, an orange **Play Position Indicator** dot moves across the top of the picture to indicate the play position. The computed sound is a 44.1 kHz, 16-bit sound.

Synthesize is a CPU-intensive task. The computation time is influenced by a number of factors: the size of the picture, the number of non-black pixels in the image, the input source. Sound pictures with wave-table input sources require the least computation and multi-sample Instruments require the most.

Option-Synthesize. Holding down the option key when clicking the tool's icon results in amplitude being scaled inversely to frequency. As a result high harmonics have attenuated amplitudes. This can be used to compensate for the loss of envelope resolution when working with low amplitude harmonics (since a picture has only 255 values for amplitude). Option-Synthesize lets you use the full brightness range to paint high harmonics and have them scaled down during rendering. In some cases, option-Synthesize has pleasing, natural results. This technique emphasizes the bass and can result in clipping if the low frequency pixels are too bright.

MetaTip *Computation can be aborted by clicking in the menubar.*

Preview (Return key)

Improved in MetaSynth 2.5! Real-time preview. Play a real-time preview of the canvas (or the selected region). For simple pictures the preview is done in mono at full-fidelity. For more complex pictures, a mono 22K representation of the sound is played. The currently loaded sound does not change. While the picture plays, an orange **Play Position Indicator** dot moves across the top of the picture to indicate the play position.

Even at reduced fidelity, some complex pictures will not preview well when previewed in their entirety. If the preview stutters or produces no sound, select a portion of the picture before previewing.

Pressing the option-key, previews the sound with the amplitude scaled inversely to frequency. See the full-description of this feature in **Synthesize/Compute** section above.

Tips Display

The **Tips Display** provides information about whatever is under the mouse. When the mouse is over a tool, the tool name is displayed. When the mouse is over the sound canvas, the pitch and time information corresponding to the mouse position is displayed.

When the mouse is over the sound canvas the following information is displayed: note name and octave, number of steps of pitch-shifting (for Sample input sources), absolute frequency, x-axis position expressed in seconds.milliseconds format.

Grow Box

Change window size without changing zoom ratio. Drag this control to change the size of the Image Synth palette.

Right-Hand Toolbar (Hot Filters)

The right-hand toolbar contains the Image Synth's Hot Filters which are time-domain (x-axis) effects. These tools can be used to: add echo and reverb, add a rhythmic pulse to a picture, increase or blur the attacks of notes, and more. Hot Filters are available at the click of the mouse and are applied with the spacing determined by the Hot Filter Grid Interval indicator displayed at the base of the toolbar.

Hot Filters are applied to the selected region (or the entire picture if there is no selection).

MetaTip *For ear-bending effects, apply Hot Filters separately to the left and right (red and green) channels or different frequency ranges using different grid intervals!*

MetaTip *Apply these processes to the pitch domain to achieve surprising harmonic textures by rotating the picture 90 degrees to the right, applying the process, then rotating the picture back into position.*

M Blur

New in 2.5! Motion Blur. Smooth out rapid transients and remove short, isolated pixels. The intensity of the filter is determined by the Hot Filter Grid interval. It is especially useful when applied to analyzed sounds to remove quantization artifacts and to generate slowly moving pads.

Use this Hot Filter to smooth out or remove the 'static' in a noisy picture (one with lots of dots or isolated little pixel islands). It is also great for smoothing out the attacks and decays of pictures with lots of hard edges.

MetaTip *Apply this separately to the red and green channels with different Hot Filter Grid settings.*

Quantize

New in 2.5! Rhythmic quantize. Force notes to start and end at the positions determined by the current grid interval. Quantizes all notes to the duration specified by the Hot Filter Grid interval and to the brightness of the brightest pixel in each pixel group. **Quantize** is similar to the "pixelate" function found in some graphic editing applications. MetaSynth, however, only applies the effect horizontally (the time domain).

This Hot Filter is great for finding interesting rhythmic patterns, especially when processing analyzed sounds. Try it on slowly evolving sounds to add some 'groove' to them.

Option-Quantize (holding down the option key when clicking the Hot Filter) results in the average, rather than the maximum, brightness to be used.

MetaTip *After applying **Quantize**, it is often useful to apply the **option-Shorten** Hot Filter to separate adjacent notes.*

MetaTip *Interesting effects can be created by inverting an image before and after quantizing. Type 'i' to invert the canvas. Apply the Quantize Hot Filter. Type 'i' to invert the canvas again, returning it to its original color orientation.*

See the tutorials on the CD for examples of using this Hot Filter.

Echo

Echo the canvas (or the selected region) by repeating the pixels to the right with decreasing brightness (volume). The Hot Filter Grid interval determines the echo delay.

MetaTip *Get a multi-tap delay effect by successively applying Echo with different grid intervals.*

Pre-Echo

Pre-Echo the canvas (or the selected region) by repeating the pixels to the left with decreasing brightness (volume). The Hot Filter Grid interval determines the pre-echo delay time.

Reverb

Simulate reverb by extending and fading the durations of all pixels of the canvas (or the selected region).

MetaTip *In addition to creating a reverb effect, this process is useful for selectively increasing the decay time of notes in different regions of a picture.*

Repeat

Repeat pixels identically across the canvas (or the selected region). The Hot Filter Grid interval determines the grid used to repeat the pixels. Unlike Echo, there is no alteration of pixel brightness.

MetaTip *Use this process to duplicate a motive or pattern across an entire picture. For example, set the canvas width to 64, set a picture's* ***Pixels Per Beat*** *setting (in the Temp/Duration dialog) to 16 and set the desired tempo, paint in a rhythmic or melodic pattern, increase the picture size to 1024, set the Hot Filter Grid interval to 64 and press* ***Repeat*** *to repeat the pattern across the entire picture width.*

MetaTip *Create an instant pattern out of the canvas by setting the Hot Filter Grid interval to 16 and executing the following commands: Repeat, Reverse (t), Repeat…*

Reverse (t)

Reverse the canvas (or the selected region). Similar to playing a tape or record backwards.

Note. The Hot Filter Grid has no effect on this command.

MetaTip *To create a symmetrical image, execute the following command sequence: Copy (c), Reverse (t), Add Pict (e).*

Pulse (p)

Pulse the pictures of the canvas (or the selected region) by removing pixels using the current Hot Filter Grid interval. A grid interval of 16 removes every other 16 pixels of the picture (i.e. 16 pixels unchanged followed by 16 pixels of silence and so on).

This command is useful for creating strong rhythms.

MetaTip *There are a number of processes which complement* ***Pulse*** *in helping to create rhythmic interest in a picture. Try using* ***Echo*** *and* ***Pre-Echo*** *or* ***Reverb*** *after applying the* ***Pulse*** *Hot Filter.*

MetaTip *Try applying the* ***Attack*** *Hot Filter a few times (with the same grid interval) after applying* ***Pulse****.*

MetaTip *Create a swelled pulsing effect by setting the Hot Filter Grid interval to a medium-small interval (8 pixels, for example) and executing the following edit sequence:* ***Copy*** *(c),* ***Clear*** *(delete key),* ***Fade in out Pict*** *(u),* ***Pulse*** *(p)…*

MetaTip *For pulses that morph into sustained tones, use this command sequence:* ***Copy*** *(c),* ***Pulse*** *(p),* ***Crossfade Pict*** *(x)…*

Saw (w)

Similar to **Pulse**, but a fade out effect is applied at the intervals specified by the Hot Filter Grid interval rather than hard cuts to silence. This effect is great for adding a rhythmic drive to material.

MetaTip *Try the same tips as suggested for the* ***Pulse*** *Hot Filter.*

Shorten

Shorten the duration of pixel lines in the canvas (or the selected region) by a pixel. Single pixels are not removed. To remove single pixels, use the **Noise Filter** command from the **Processes** submenu. This tool is handy for shaping decay envelopes.

MetaTip *It is often useful to apply* ***Shorten*** *a few times before applying* ***Quantize, Pulse, Saw*** *or* ***M Blur****.*

Option-Shorten. This separates notes (pixel lines) at the specified grid boundaries by removing the ends of notes if the pixels on either side of the grid boundary have different luminosities (volume).

MetaTip *Option-Shorten is especially useful after applying the* ***Quantize*** *Hot Filter. It keeps notes from running into one another.*

Attacks

Sharpen the attacks of notes. Brighten by 1.5 times the first pixels of all pixel (horizontal) lines except where first pixel is faint. Use this command to add a percussive attack to notes. It is often used several times in succession to achieve the desired degree of percussiveness.

MetaTip *It is often desirable when creating percussive music to use wide pictures with a low* ***Samples Per Pixel*** *setting (specified using the Tempo/Duration Dialog). Such settings allow for precise control of note envelopes and attacks.*

Max

Replicate the brightest pixel (maximum intensity) vertically at the intervals specified by the Hot Filter Grid interval. When applied to an entire picture, this results in vertical lines or bands.

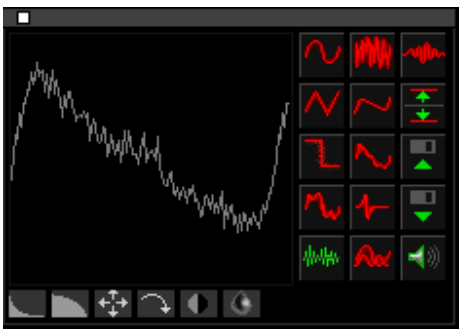
This command is most often used when creating images to be used as filters.

MetaTip *Use this command on the Blue channel to make rhythmic grids.*

Hot Filter Grid Interval

Set the spacing for the **Hot Filter** processes. The spacing is expressed in terms of pixels. Click on the up or down arrows or type in a number to change the Hot Filter grid spacing. Clicking on the arrows doubles or halves the current value. The Hot Filters are time domain processes, which makes the Hot Filter Grid a horizontal grid.

Wave Table Palette



About This Chapter

This chapter describes the user interface and operation of the Wave Table Palette. Familiarity with the **Image Synth Palette** is helpful for getting the most out of this chapter. For more information about using the Wave Table Palette, see the **QuickStart** chapter of this manual and the tutorials provided on the MetaSynth CD.

Wave Table Palette

The Wave Table Palette is used to create simple waveforms that can be used as Image Synth input sources. The Wave Table Palette is the default input source for the **Image Synth**. The waveform displayed on the Wave Table canvas is played by the pixels of the **Image Synth**. The palette features a set of specialized tools for shaping waveforms from sine waves to square waves to “cosmic” waves and beyond. Click and drag on the waveform to morph it directly, or click and drag on any of the palette’s tools. As you shape the waveform, MetaSynth plays it so that you can hear the effect of your manipulations in real-time. The Wave Table Palette can be brought to the front by clicking on it or choosing **Wave table** from the **Windows** menu. The Wave Table palette can be hidden by clicking on its close box.

With this palette, you can easily create the classic analog synthesizer waveforms: square/pulse waves and sawtooth/ramp waves. Using note-based sound pictures, envelope shaping and liberal use of the **Filter Palette**, you may be surprised how much the results can sound like classic synthesizers (if that’s your pleasure).

The palette’s contents are changed when a new preset is chosen in the **Image Synth Palette** if the preset had wave table data stored with it. The Wave Table data can be

saved with presets if the Preferences dialog setting **Include Wave Table with preset** is turned on. Wave table data can be saved or opened using the palette's **Open** and **Save** buttons. These data files are compatible with those created by the MetaSynth's envelope editors. The Wave Table stores 1024 samples which is about 23 milliseconds at 44.1 kHz.

By default, the Wave Table is set to a sine wave. As a result, sound pictures with the Wave Table input source are played with sine wave synthesis unless the Wave Table is modified by the user.

MetaTip *As you work with the palette, try to maintain an overall balance of the waveform above and below the center line. Imbalance can result in DC offset which has some undesirable side effects such as clicking. The **Clean** and **Remove DC Offset** commands in the **Transform** menu can be used to remove these artifacts after a sound picture has been synthesized.*

MetaTip *Be careful with waveforms that have significant high frequency content. When used with sound pictures which themselves have significant high frequency content, the results can be undesirable. If this is the case, you can use the **Smooth/Filter HF** tool in the **Wave Table** palette to reduce the source waveform's high frequency content.*

Window Features and Tools

Canvas

Click on any point of the waveform and drag the mouse up or down to move it. The waveform is played back, instantly reflecting any changes to it, as the mouse is dragged.

MetaTip *Notice that the tool name is shown in the display area at the bottom right of the palette.*

Lower Toolbar

Square/Contract

Click on this tool to contract the waveform inward. The amplitude is multiplied by itself to achieve this effect (amplitudes being measured on a scale of 0 to 1)

MetaTip *Repeated application of this button followed by **Square Root** tends to create a wave shape with a rich timbre, eventually evolving into a reedy square wave-like sound.*

MetaTip *Apply the **normalize** tool to restore signal strength if repeated applications of this tool reduces the maximum amplitude levels of your waveform.*

Square Root/Expand

Click on this control to expand the waveform outward by taking the square root of amplitude values—which range from 0 to 1.

Scale Frequency

Click and drag left or right to scale the waveform horizontally. *Shift-option drag* to scale the waveform's amplitude (the vertical scale).

Dragging to the right has the effect of increasing the frequency of the waveform by increasing the number of wave cycles.

Rotate

Click and drag left or right to rotate the waveform on its axis. Great for making subtle adjustments to the blend of a waveform's harmonics. The visual effect is similar to vertical scaling.

Contrast

Click and drag to the right to increase the waveform "contrast"—i.e. the difference between the waveform's peaks and valleys. This tool has a normalizing effect. Dragging to the left restores the original waveform.

Filter HF (Smoothing)

Click and drag to the right to reduce high frequency harmonics. Drag to the left to restore the original waveform. *Option-drag* to smooth less.

MetaTip *Waveforms rich in high frequency can be problematic when playing pictures that have significant high frequency content. In such cases, use this tool to reduce the HF content.*

Right-Hand Toolbar

Most of these tools morph the waveform towards the picture displayed on the tool's icon when the mouse is dragged to the right. The original waveform is restored by dragging to the left. The tools are listed in column order

Sine Wave

Drag to the right to morph the current waveform towards a sine wave. Sine waves are pure tones with a flute-like quality. They are the basis for frequency analysis (FFT). This is the default waveform.

When playing a picture with a sine wave table, the sound picture is the sonogram of the resulting sound.

Option-drag doubles the frequency.

Saw Wave

Drag to the right to morph the current waveform towards a saw(tooth) wave. Sawtooth, or ramp, waves have often been used as the starting points for synthesizing brass instruments with conventional analog synthesizers and consist of the fundamental plus its even harmonics.

Square Wave

Drag to the right to morph the current waveform towards a single cycle square wave. A square wave has a hollow, reedy sound and is comprised of the odd-numbered harmonics.

MetaTip *To create a pulse wave, click on the **Scale Frequency** tool and drag to the left to change the pulse width.*

Octaves

Drag to the right to morph the current waveform towards a waveform that consists of the fundamental plus the octaves above it. This waveform has a pipe organ-like timbre.

From Sample

Drag to the right to morph the waveform towards a waveform derived from the first 1024 visible samples of the currently loaded sample.

MetaTip *Scroll the sample loaded in the Sample Editor to change the waveform which this tool "steals."*

Randomize

Drag to the right to randomize the waveform. Randomize has the effect of increasing the high-frequency content of the waveform. Use the smoothing tool to filter some of these harmonics.

Voicy

Drag to the right to morph the current waveform towards a waveform with a voice-like timbre. The waveform consists of the first five overtones of the harmonic series with a 1/f amplitude decay.

Minors

Drag to the right to morph the current waveform towards a waveform with a "minor" quality. The wave shape is made of the fundamental plus overtones spaced a minor third apart.

Brass like

Drag to the right to morph the current waveform towards a waveform with a mellow, brass-like timbre.

Add Octaves

Drag to the right to add octave overtones to the waveform's existing harmonics. This tool has the effect of creating mini-waveforms within the larger waveform.

Cosmic

Drag to the right to morph the current waveform towards a waveform with a "cosmic" high-pitched resonance (remember the Outer Limits?!) **Cosmic** is the product of the multiplication of a sine wave and a Gaussian curve.

MetaTip *Option-drag will halve the frequency.*

Normalize

Drag to the right to morph the current waveform towards a normalized version of itself. Amplitudes are scaled upwards so that the peak reaches maximum amplitude.

Open Wave Table

Click here to invoke a standard Macintosh file which allows you to open any previously save Wave Table data.

MetaTip *A library of Wave Table data files is located in MetaSynth's home folder.*

Save Wave Table

Click here to save the current Wave Table data as a file on any mounted volume.

Play

Click and hold here to play the current waveform.

Instruments

& the Instruments Menu

About This Chapter

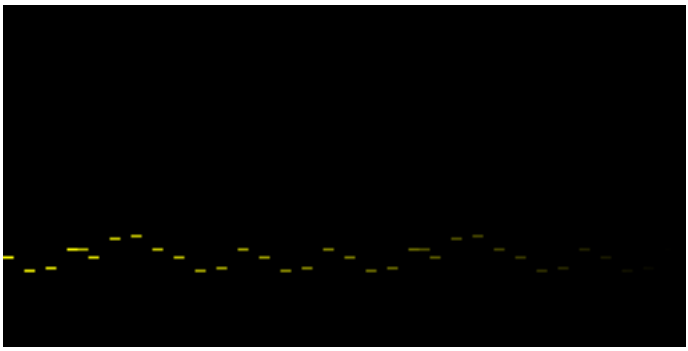
This chapter describes MetaSynth Instruments and the commands found in the Instruments menu. Unlike the other menus in the menubar, this menu applies only to the Image Synth. Familiarity with the **Image Synth** chapter of this manual is essential for understanding Instruments. A solid understanding of frequency maps (see the **Image Synth** chapter) and the canvas' vertical axis is recommended.

MetaSynth Instruments

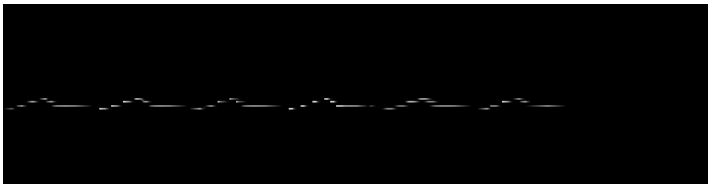
Instruments are the most powerful of the Image Synth's possible input sources. They are user-definable collections of up to 18 different samples (sound files) which are mapped to different vertical regions of the canvas. For users familiar with hardware/MIDI samplers, this concept will be familiar. A MetaSynth Instrument is exactly analogous to a sampler's sample banks. In fact, when Instruments are used as the input source, the Image Synth acts as an integrated non-real-time sequencer/software sampler. Unlike hardware samplers, there is virtually no limit to the number of voices that can be sounded at once (OK! there **is** a limit of 1024 simultaneous voices, but who's counting).

In addition to being great for creating the startling and unusual sounds for which MetaSynth is renowned, Instruments are a great tool for composers who wish to explore orchestral music and for musicians who are looking to achieve a greater degree of realism than traditional samplers allow. One of the limitations of traditional samplers is that each time a sample is triggered, its volume may change (in response to keyboard velocity) but its envelope (i.e. the attack and decay) will be unchanged.

The picture below imitates the response of a typical sampler. The volume varies from note to note. But, the notes merely trigger playback at a particular volume. The sample's envelope remains constant from note to note.



With MetaSynth, you can vary the envelope and articulation over the course of each note, and each note can have its own envelope/articulation. With the same source sample, you can have staccato notes with sharp attacks and notes with smooth attacks and long decays. The picture below shows how articulations can be given to samples played by the Image Synth. Note how some notes have diffuse edges and others bright, sharp edges. The attack and decays of the notes will be correspondingly sharp or smooth.



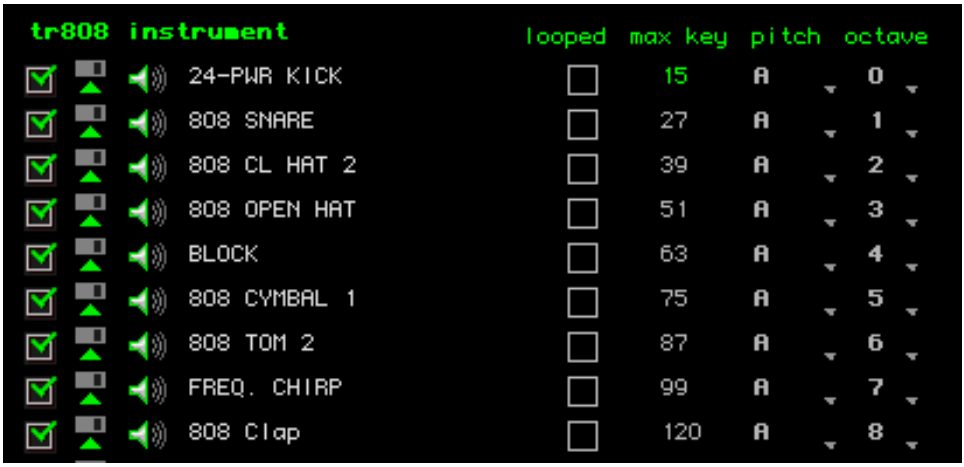
Another area of exploration rich with possibilities is the use of custom tunings (frequency maps) with Instruments. Now, you can compose pieces for any possible tuning system and render them with high-quality realistic samples. You are not restricted to using the samples provided on the MetaSynth CD. You can use samples from commercial sample libraries or record your own as Instruments are built from standard mono or stereo 44.1 kHz Sound Designer II or AIFF files.

Instrument Basics

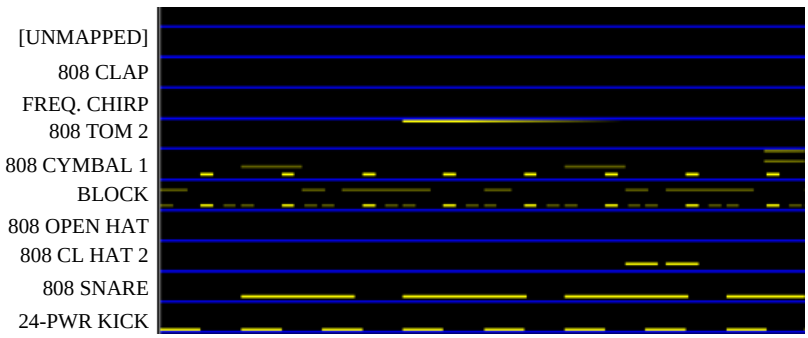
An Instrument is a user-definable mapping of sample files (sound files) to pitch ranges that can be used as an input source for the Image Synth. Up to 18 different sound files totaling up to 16 megabytes can be used to define an instrument. When an Image Synth sound picture “plays” an Instrument, a pixel plays the sample mapped to the range in which the pixel falls, and the sample is pitch-shifted relative to the base pitch defined for the sample. Each sample can be looped or not.

For example, a violin Instrument might be made up of 10 violin samples, each sample recorded at a different pitch. with the sample recorded at A2 mapped to the canvas’ A2, the sample recorded at E2 mapped to E2, etc. When the sound picture is played, pixels corresponding to A2 play the A2 sample (without any pitch shift since that is the base pitch). Pixels at B2 play the violin’s A2 sample pitch-shifted up one whole tone. Pixels at

E2 play the E2 sample without pitch-shift. Or, you might create a drum Instrument. Shown below is a portion of MetaSynth's **Instrument Dialog** for such an instrument.



The samples' base pitches are all mapped an octave apart (A0, A1, A2, etc). The picture below is an Image Synth sound picture created for this instrument. It is a techno-music rhythm part. The key at the left (and the blue grid if you are viewing the pdf version of this document) indicates the base pitches (the A's) of the instrument's samples and is labeled with the corresponding sample names.



Using Instruments

Creating and Opening Instruments

You may use either pre-built **Instruments** (hundreds of megabytes of them are provided on the MetaSynth CD) or create your own. There are two methods of creating instruments. The Build Instrument command automatically builds instruments from the samples in a chosen folder. This command will even correctly map the samples to pitches if the sample names follow a common convention (described in the section Build Instrument later in this chapter). **New Instrument** lets you manually build an **Instrument**.

Normally when an **Instrument** is saved, only the mapping of sample files to pitches and a few options (such as whether to loop the samples) are saved. These files are quite compact. MetaSynth also provides an option to store the sample data as part of the **Instrument** file.

After an **Instrument** is built or opened, its name is added to both the Image Synth's input source selector (pop-up menu) and the **Instruments** menu. Choosing the instrument name in the input source selector makes the **Instrument** the input source for the displayed sound picture. Choosing the instrument's name from the **Instrument** menu re-opens the **Instrument Dialog** for that instrument. Option-selecting the instrument's name removes its name from the list and removes the samples from memory.

Hint: Remember to choose the instrument with the **Image Synth**'s input source selector after you open it, or the instrument will not be played by the picture.

Auditioning Notes on the Canvas

When an instrument is the input source for a picture, you may audition the sample played by a particular pixel by control-clicking the mouse at the desired location. The appropriate sample from the Instrument, pitch-shifted according to the vertical position, is played back, and its name is displayed in green in the Image Synth's **Tips Display** area.

Saving/Loading Presets Made with Instruments

When you add a preset to a library, the Instrument's name and its location on disk are saved with the preset. When you choose a preset made with an Instrument, the instrument is automatically found and loaded if the **Load Instrument With Preset** setting is turned on in the **Preferences** dialog.

Note *If the preset was saved by a version of MetaSynth prior to 2.5, the instrument will not be loaded. MetaSynth will present its open file dialog, giving you an opportunity to open an instrument. Unfortunately, since instrument names were not saved with presets in older versions, you will not be prompted with the instrument's name.*

Instruments and Memory

MetaSynth must be able to load the entire instrument into memory in order to use it. When working with large instruments, you should give MetaSynth the largest memory partition possible. Partitions of 80 to 100 megabytes are recommended when using large instruments.

You may want to use the **Preferences** command to maximize the reserved memory space. See the **File** menu chapter for information about the **Preferences** command.

Computing and Previewing Presets with Instruments

Computing (synthesizing/rendering) presets that use Instrument input sources is computationally intensive and make take significantly longer than presets that use **Wave Table** and sample input sources. Also, real-time preview is more likely to fail, especially if the picture is complex. If this happens, use the marquee (selection) tool to select portions of the image to preview.

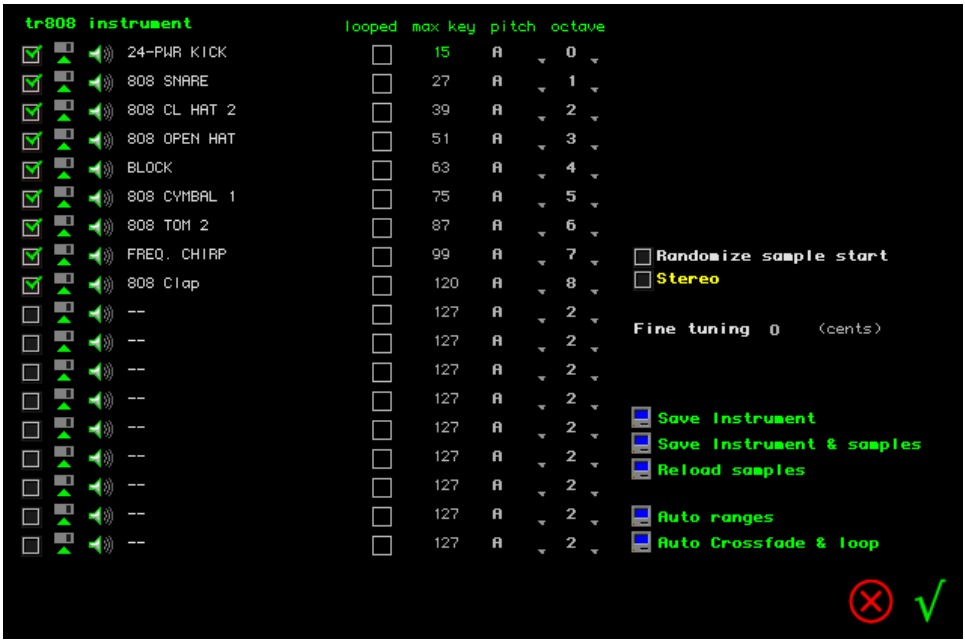
Ideas for exploration

The following techniques are often useful for rendering music with MetaSynth instruments.

Render (synthesize) the same sound picture with different **Instruments** (made from different sets of violin samples, for instance) then use the **Crossfade** command to mix the renditions. Use envelopes that fade back and forth between the renditions. The **Crossfade** command maintains unity gain so the volume of the passage remains steady as the samples fade back and forth. This technique can provide some of the timbral variation often missing from sampler-based music.

Explore microtonal tunings such as Micro8, Micro12, Micro16 and Micro32 to achieve interesting pitch articulations (glissando, vibrato, etc). Compose the basic melody in semitones. Increase the vertical size of the picture. Choose a microtonal frequency map then use the **Expand** commands in the Image Synth's **Pitch and Harmonics** submenu to restore the correct relative pitches. For example, if you go from semitones to Micro16 (i.e. 1/2 of a step per pixel to 1/16 of a step per pixel), choose **Expand 4** then **Expand 2** to restore the original relationship between the notes.

Instruments Dialog



The Instruments Dialog is MetaSynth's interface for creating and loading Instruments. Whether you are opening an existing Instrument or creating a new one, this window will appear at some point during the process.

Remove Sample

Unchecking this checkbox deletes the sample from the Instrument. Checking this checkbox has no effect.

Load Sample

Click here to load a sample into the Instrument. MetaSynth's open file dialog box prompts you to choose a sample file. Any stereo or mono 44.1 kHz Sound Designer II or AIFF file can be selected; however mono and stereo samples cannot be mixed in the same Instrument.

Loop markers in Sound Designer II files are respected if the **Loop** checkbox (see below) is checked.

If the sample's name ends with a pitch and octave number (*Eric Guitar A3*, for example), the sample will be inserted in the appropriate location and the pitch and octave fields assigned accordingly. You can re-assign the pitch and octave if you would like the sample placed elsewhere. Dual mono/split stereo pairs should have

the channel suffix AFTER the note name for MetaSynth to auto-map them (i.e. *Eric Guitar A3.L* and *Eric Guitar A3.R*).

Preview Sample

Press this button to hear the sample played back. **Preview** does not loop the sample.

Sample Name

This field displays the name of the sample file.

Loop

Turning this option on loops the sample if notes in the picture exceed the sample length. If the sample file contains Sound Designer II-style loop markers, they will be used for the looping; otherwise, the entire sample is looped.

Max Key

This field indicates the highest note (using MIDI note numbers) played by this sample. Normally, you do not set this value. When you create the Instrument**,** you will generally use the **Auto Ranges** button to calculate the **Max Key** values for the Instrument's samples.

Pitch and Octave

These pop-up menus are used to set the base pitch for the sample. The base pitch is the note in Image Synth sound pictures which plays back the original sample without pitch shifting. If the sample file is of a pitched instrument, you will generally choose the sample's original pitch and octave.

If the sample's name ends with a pitch and octave number (*Eric Guitar A3*, for example), the pitch and octave will automatically be assigned when the sample is loaded though you may re-assign these values if you prefer.

Randomize Sample Start

When this option is turned on, the start points will be randomized when the Instrument's notes are triggered so that same notes won't play exactly the same way each time they are played. This option can add a human touch when using instrument samples.

Note *The random start point is picked from the first 6000 samples (136 milliseconds) of the sample file. If the note has a rapid attack, it is possible for the attack to be missed.*

Stereo

This checkbox indicates whether the instrument is mono or stereo. Instruments can be built from either mono or stereo samples but not both in the same instrument. (While MetaSynth won't actually prevent you from mixing mono and stereo samples in an instrument, they will not play back correctly). The first sample loaded determines whether it is mono or stereo. Stereo may be turned off to make an instrument of stereo samples mono. An instrument built from mono samples cannot, however, be made stereo. See **Load Sample** above for more information about loading stereo samples.

Fine Tuning

This option allows you to fine tune all the samples in an instrument. The transposition is non-destructive, leaving the sample files themselves unaltered.

This option is necessary because we have discovered that samples provided in some sample libraries are not tuned precisely to A 440. In such cases, it may be necessary to fine tune the instruments to standardize their reference pitch. The fine tuning is given in cents (hundredths of a semitone) which means that a value of 100 will transpose everything up one semitone.

MetaTip *A simple way to check the tuning of a particular sample is to perform an analysis in the Image Synth using the Micro 32 frequency mapping to see how much the fundamental diverges from the given note. In Micro 32, each pixel of offset represents 1/16th of a semitone or 6.25 cents. To perform the analysis, open the sample in the Sample Editor and choose the command Analyze current sound from the Image Synth's File submenu.*

Advanced User Note: MetaSynth's Sine/Wave Table Synthesis is based on A2 = 441 Hertz. Many sounds use a reference pitch of 440 Hz. or lower. If you plan to mix sounds computed from both Instruments and sine waves, you will want to make the reference pitch for your instruments A 441 Hz. To do this, set the Fine Tuning parameter to 3 or 4 (3.824 would be the exact value). Most real acoustic instruments have unstable pitches and are approximate in the first place. Tuning different instruments together is more of an art than a science. If you experience problems with Instrument tunings, you will ultimately need to use trial and error and render the same image with different Instrument to see how the sounds interact. Beating or chorus-like effects are indications that fine tuning is needed. Ultimately, you may need to modify one or more of the original samples with the **Effects Palette**'s Transpose effect.

Save Instrument

This command presents a save file dialog box for you to save the Instrument. Saving the Instrument creates only one file, the Instrument file. All of the options (looping, stereo, and fine tuning settings) are stored in the created file. These files take up very little space on disk.

Note *Don't forget to use this button when creating new instruments. Clicking the Instrument dialog's OK icon button will load the instrument during the current session, however the Instrument is only saved to disk if you choose* ***Save Instrument*** *or* ***Save Instrument & Samples****.*

Save Instrument & Samples

Create the Instrument file and save copies of the sample files to the selected location. This leaves the original sample files unchanged. If the **Auto Crossfade** button (described below) was used prior to saving the Instrument, the encapsulated new sample files will contain the crossfaded data.

Option-click this button to normalize the samples before they are copied.

Stereo samples are saved in interleaved format (regardless of their original format) with the ".LR" suffix.

Reload Samples

Reload the Instrument's samples. This command is useful if you have edited any of an Instrument's samples since it was opened during the current MetaSynth session.

MetaTip *If you have used the Auto Crossfade button and would like to reload the un-crossfaded samples, use this button.*

Auto Ranges

Sort the samples by pitch and calculate optimal key ranges (the **max key** values). MetaSynth sets the **max key** values to minimize the amount of pitch shifting that needs to be done. The **max key** value for each sample is set half-way between the sample's base pitch (pitch and octave) and the next sample's base pitch.

Note *This action reloads the sample data into memory.* ***Auto Crossfades*** *are lost (unless they were saved to disk with the* ***Save Instrument and Samples*** *button).*

Auto Crossfade & Loop

Fade the beginning and end of unlooped samples so that they loop smoothly. This command modifies the loop data in memory but not the sample files themselves. Crossfades are not calculated for samples that are already looped (i.e. have loop points/markers).

If you would like to save the crossfades permanently, choose **Save Instrument and Samples**.

This command is useful if you have sample files which you want looped that do not contain loop markers and which do not loop smoothly by themselves. Sample duration is reduced by the crossfade calculation.

MetaTip *__Auto Crossfade__ works best for "pads" and other sounds without a strong attack. Long samples (6 seconds or longer) tend to yield the best results. The looping of shorter samples tends to be more obtrusive.*

MetaTip *Instrument-style crossfades can be created in the Sample Editor by option-clicking the __Auto Crossfade__ tool.*

Auto-Crossfade notes

Some operations (like pressing the **Auto Ranges** button) reload the samples from disk in which case the crossfades are destroyed—unless they were saved to disk using the **Save Instrument and Samples** button.

Since all editing functions made in the **Sample Editor** destroy loop points, it is strongly advised that you calculate crossfades at the final stage to ensure smooth looping.

OK

Confirm changes made in the Instruments Dialog. The Instrument is added to the list of available input sources in the Image Synth's input source selector, and it is added to the Instrument menu's list of recent instruments.

Note *The __OK__ button only confirms changes to the Instrument settings. The Instrument is loaded regardless of whether __OK__ or __Cancel__ were pressed. To remove the Instrument from memory, option-select the instrument's name in the Instruments menu.*

Cancel

Cancel any edits made to the Instrument. **Cancel** does not cancel loading only the changes made to the Instrument's settings. Auto crossfades, however, are not removed. To remove them, press the **Reload** button to reload the samples from the disk.

To remove the Instrument from memory, option-select the instrument's name in the Instruments menu.

Instruments Menu

New Instrument…

Create a new Instrument. An empty Instrument Dialog is opened with the empty sample slots spaced an octave apart. Load individual samples manually by pressing the **Load Sample** icon buttons. Assign the base pitch for the sample using the **pitch** and **octave** pop-up menus.

Important! If you would like to use the Instrument in future MetaSynth sessions, you must press the Save button.

Open Instrument…

Open an Instrument file. MetaSynth presents an open file dialog box to select the Instrument then presents the Instrument dialog for the Instrument. Press the OK icon button to confirm loading or press the Cancel icon button to cancel loading.

If any of the Instrument's samples are not found, you will be prompted to find them. If there is not enough memory available, you will be alerted and only some of the samples will be loaded.

Build Instrument…

Automatically create and map a new instrument with "related" samples. MetaSynth presents an open file dialog for you to choose a sample file. If other related sample files are found in the same directory they are automatically added to the instrument and mapped with to the pitch and octave suggested by their names. To be "related", the files must share the same base name which is the file's name minus the pitch designation. For example, *Guitar A2*, *Guitar C2*, and *Guitar E2* are related. But, *Guitar A2* and *Eric Guitar C2*. The '.L' and '.R' extensions of split stereo/dual mono file pairs is ignored when determining the base name.

Many commercial SampleCell sample libraries follow this naming convention.

MetaTip *If you have a group of samples from which you would like to build an Instrument, it is generally more convenient to rename the files in the Macintosh Finder according to this convention and have MetaSynth build the Instrument than to manually load samples and assign their pitches in the Instrument dialog.*

(Opened Instruments List)

Every time you open or create an Instrument during a work session, its name is added to the Instrument menu. Selecting a name from this list re-invokes the Instrument dialog for that instrument.

Option-select an item from this list to delete its name and free the memory it occupied.

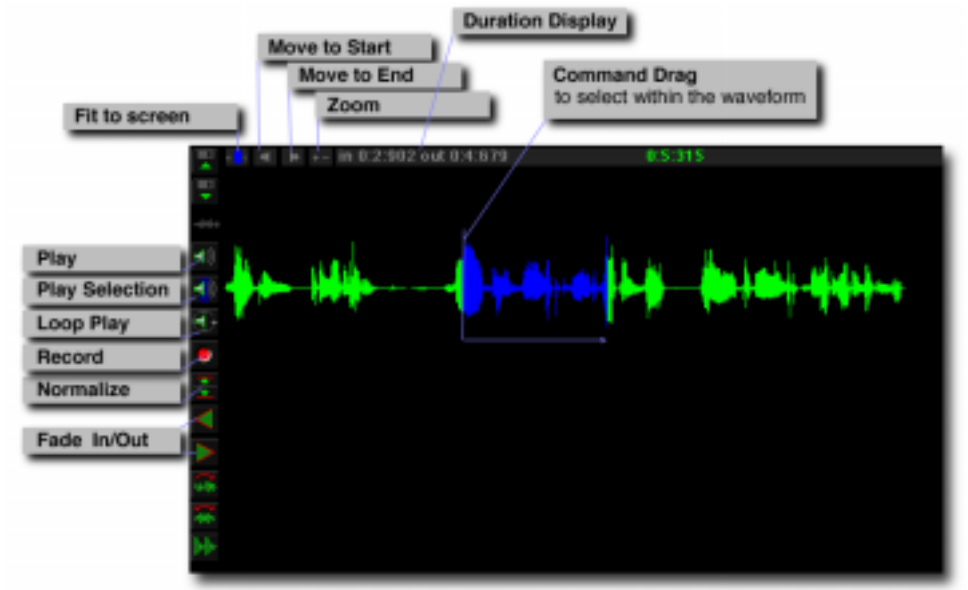
Procedural Synth

The Procedural Synth falls into both the Image Synth and Sample Editor spheres of influence. See the **Sounds** menu chapter of this manual for a detailed description of the Procedural Synth and its operation.

The Sample Editor
&
Its Allies

Sample Editor
Filter Palette
Effects Palette
Envelope Editors
The Menus

Sample Editor



About This Chapter

This chapter describes the basic tools and operations of MetaSynth's built-in **Sample Editor**. Complete descriptions of the available menu commands are given in the chapters which cover the individual menus: **File**, **Open**, **Sounds**, **Transform** and **Morph**). Familiarity with the information covered in the **Overview** section of this manual is helpful for getting the most out of this chapter.

Sample Editor

The green waveform you see in the background when you launch MetaSynth is the Sample Editor's waveform display. The Sample Editor is a full-featured, memory-based sample editor which features clickless, auto-crossfaded editing and a number of powerful sound morphing tools. The Sample Editor is where the sounds created by the **Image Synth** are loaded, and the displayed waveform is what the **Effects** and **Filter Palettes**

modify. This sound can, in turn, be used as an input source for the **Image Synth** or saved as sound file.

The Sample Editor features unique sound morphing capabilities that are accessed through its **Transform** and **Morph** menus. The available commands include: **Pan Envelope**, **Pitch Envelope**, **Convolve**, **Cross Convolve**, **OSC Bank PhaseVocoder**, **Wave Shaping** and more. These commands are described in the **Transform Menu** and **Morph Menu** chapters of this manual.

In addition to sounds generated by the Image Synth, any 44.1 kHz Sound Designer II or AIFF sound file can be opened and transformed with the Sample Editor's tools and menu commands and/or made available as an input source for the Image Synth. You can also click the record button to record new sounds using any available Sound Manager input device.

The Sample Editor is memory-based which makes it very fast; however, this can limit the length of the sounds that can be opened. To work with long sounds, you should configure MetaSynth's memory partition (using the Macintosh Finder's Get Info window) to be as large as possible.

Using the Sample Editor

Press the Enter key (or click the Sample Editor**'s Play** icon) to hear the currently loaded sample. When MetaSynth is launched by double-clicking its icon in the Finder, a simple waveform is automatically loaded. This waveform is suitable as an input source for the **Image Synth** or for further manipulation using the Morph menu's **Wave Shaping** command.

Morph the currently loaded sound with the **Effects** and **Filter Palettes** or any of the spectacular sound morphing functions available from the **Transform** and **Morph** menus described later in this manual. Most of menus in the menubar at the top of the screen belong to the **Sample Editor**.

Edit the sound using the commands available in the **Edit** menu: **Cut**, **Copy**, **Paste**, **Clear**, **Insert**, **Merge**.

The Sample Editor has two toolbars. The left-hand toolbar contains buttons for the most commonly performed functions, such as **Play**, **Loop, Normalize**, **Open** and **Save**. The upper toolbar consists of selection and zoom tools.

Clicking and dragging the displayed waveform scrolls it. Scrolling is inertial, allowing you to scroll by dragging and throwing the waveform to the left or right. The mouse velocity determines the velocity at which the waveform travels. Click the mouse button to stop the waveform.

Selections are made by pressing and holding the command key while dragging across region to be selected. The selected region is highlighted in blue. Extending and reducing selections is accomplished by using modifier keys. The selection commands are:

- Command-drag: select new region (selects command-dragged region)
- Command-shift-drag: extend selection (from beginning or end)
- Command-option-drag: reduce selection **from end**
- Command-option-shift-drag: reduce selection **from beginning**

Zooming is inertial and accomplished by option dragging the mouse. Option-drag centers the zoomed region about the initial click location.

All edits are automatically crossfaded to ensure clickless edits. The crossfade length can be set using the **File** menu's **Preferences** command.

Opening/Loading Sounds

Sounds are loaded into the Sample Editor one of two ways: by computing a sound in the Image Synth palette, or by opening a sound file. Sound files may be opened using the **Open** command in the **File** menu or by dropping one or more sound files on the MetaSynth icon in the Macintosh Finder. While only one sound can be open at a time, dropping a number of files on the MetaSynth icon will add each sound file to the list of sound in the **Sounds** menu. This technique is useful when you want to work with a number of sounds during your MetaSynth session and want quick access to the files with which you will be working. Only the last of the "dropped" sounds is actually loaded into memory.

The **Sample Editor** can open any 44.1 kHz. AIFF or Sound Designer II file. The "native" format used when saving files is Sound Designer II (split stereo) though the export commands can be used to export sounds as AIFF or interleaved Sound Designer II files.

Upper Toolbar

Fit to Screen

Click here to zoom the selected region to fill the Sample Display Area. If there is no selection, fit the entire sound to fit the screen width.

Move to Start

Click here to scroll the selection start to the left edge of the Sample Display Area. This tool is useful for regaining your bearings if the selection start has been scrolled out of view.

Move to End

Click here to scroll the selection end to the right edge of the Sample Display Area. This tool is useful for regaining your bearings if the selection end has been scrolled out of view.

Zoom Sample View

Click and drag left or right to zoom the sample display in or out. When there is a selection, the zoom is centered around it.

Double-clicking the tool zooms out to display the entire waveform.

Shortcut: Option-drag the waveform directly to zoom in and out. The visible region will be centered about the initial click location. Option-drag is inertial (while dragging the zoom tool is not).

Sample/Selection Duration Display

Information about the sound's duration or the selection start and end points is displayed to the right of the **Zoom Sample View** tool. When there is no selection, the sound's duration is displayed. The selection start and end times are displayed when a portion of the waveform is selected.

Tips Display

At the right edge of the upper toolbar is the **Tips Display**. When the mouse is over the waveform, the time corresponding to the mouse location is displayed. When the mouse is over a tool, the tool's name is displayed. When MetaSynth is involved in a time-consuming calculation, progress info is displayed here. You can cancel any process by clicking in the menubar.

Left-Hand Toolbar

Open Sound

Open any 16-bit, 44.1 kHz. Sound Designer II or AIFF sound file. The file becomes the currently loaded sound whose waveform is displayed in the **Sample Display Area,** and the file's name is added to the **Sounds** menu along with the names of the other sounds that have been opened during the current MetaSynth session.

The **Open Sound Dialog** contains a preview area with a **Play** button. SoundDesigner II files may be previewed by highlighting their name and pressing the **Play** button. Currently, AIFF files cannot be previewed.

If the opened file ends with a '.L' extension, MetaSynth will look for the matching '.R' file, and open the file pair as a stereo sound.

MetaTip *To edit the left and right channels of split stereo pairs independently, use this trick. To edit the left channel, open the sound and use the* ***Mono/Stereo Toggle*** *to switch to*

*mono mode (which discards the right channel). To edit the right channel, open the '.R' file with the **Open Sound** command.*

This tool is equivalent to choosing **Open** from the **File** menu.

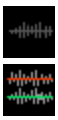
Note *MetaSynth will not prevent you from opening sounds created at other sample rates, but they will be played back as if they were 44.1 kHz sounds which will result in pitch and time shift.*

Save Sound

Save the currently opened sound to a new Sound Designer II format file. This tool is equivalent to choosing **Save As** from the File menu. Stereo sounds are saved as split stereo (also called dual mono) file pairs with the left and right channels labeled '.L' and '.R' extensions respectively.

Option-Save. Option-clicking this tool saves only the active selection.

Warning: Any loop data from the original file is lost.



Mono/Stereo Toggle

Click here to convert the sound from stereo to mono or vice versa. The tool's icon indicates the current sound type (mono or stereo). When converting a mono sound to stereo, duplicate copies of the sound data are placed in the left and right channels. Stereo to mono conversion keeps the left channel and discards the right. To merge channels, use the **Transform** menu's **Pan Envelope** command.

MetaSynth automatically switches to stereo mode when synthesizing (computing) a color picture in the Image Synth or when opening a stereo sound file.

Play [All] (Enter Key)

Play the currently loaded sound. The shortcut key is the enter key. To stop playback, click anywhere.

Play Selection (Command-B)

Play the selected portion of the current sound. To stop playback, click anywhere.

Loop Play (Command-L)

Loop play the selected portion of the current sound (or the entire sound if there is no selection). To stop playback, click anywhere.

Option-enter may also be used as a shortcut.

Record Sound

Record sound. Clicking on this tool brings up the **Record Sound** dialog box which lets you choose from the available Sound Manager input devices. Click on the

Options button to display the driver's record options dialog. Press the red **Record** button to commence recording. Press **Stop** to stop recording.

Clicking the cancel button exits the dialog without saving the recorded sound. Clicking the ok button loads the recorded sound into the Sample Editor.

The available recording time and sample rate are displayed in the dialog. While recording, MetaSynth draws an oscilloscope-like display which indicates the incoming sound level.

MetaTip *Recording is done directly to RAM. The available recording time is limited by the memory allocated to MetaSynth. To increase the available memory, use the Get Info window in the Finder.*

Normalize (Command-N)

Normalize the volume of the sample or the selection. Normalization scales the sound's volume upward so that the highest peak is 0 dB. Use this command to maximize the volume of the sample without changing its effective dynamic range.

Note *The left and right channels are normalized independently. If the two channels have markedly different peak amplitudes, the balance between the channels may be upset.*

This tool is equivalent to the **Transform** menu's **Normalize** command.

Fade In (Command-[)

Fade in the sample or selection using a linear fade across the selection range. This is a quick way to fade in a sound. For greater control over the fade contour, use the **Envelope** command in the **Transform** menu.

This tool is equivalent to the **Edit** menu's **Fade In** command.

Fade Out (Command-])

Fade out the sample or selection using a linear fade across the selection range. This is a quick way to fade out a sound. For greater control over the fade contour, use the **Envelope** command in the **Transform** menu.

This tool is equivalent to the **Edit** menu's **Fade Out** command.

Time Reverse Sound

Reverse the sound or selection. Time reverse has the effect of playing the sound backwards.

Auto CrossFade

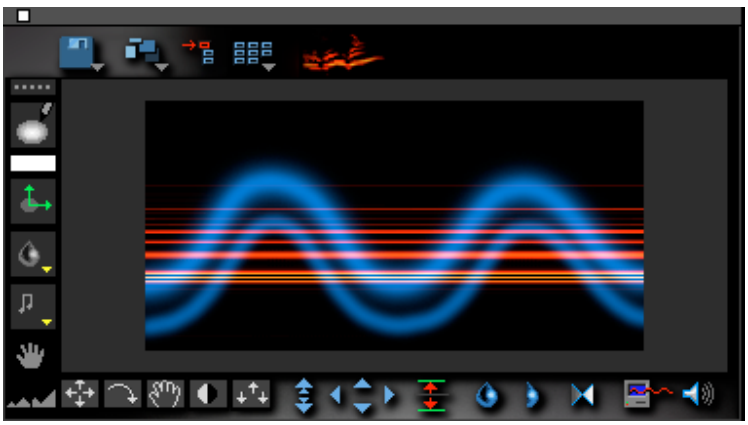
Blend a reversed copy of the sample or selection with the original.

Option-click the tool to perform the same crossfade as the Instruments Dialog Auto Crossfade command. (See the chapter **Instruments** for more information).

Repeat

Click here to insert a duplicate copy of the sample or selection. Repeat performs a ripple edit which inserts the data at the beginning of the selection (if there is one) or at the end of the sample if there is no selection

Filter Palette



About This Chapter

This chapter describes the features and tools which make up the Filter Palette. Familiarity with the features of the Image Synth and Sample Editor is helpful for getting the most out of this chapter. For more information about using the Filter Palette, see the **QuickStart** chapter of this manual and the tutorials provided on the MetaSynth CD. We encourage you to review the QuickStart chapter of this manual and the tutorials provided on the CD to get a sense of the amazing effects you can create.

The Filter Palette

The Filter Palette is a unique time-variant, subtractive 128-band filter which modifies the sound currently loaded in the Sample Editor. You can think of it as a 128 channel equalizer with 256 snapshot settings which are recalled as the sound plays. The Filter Palette's blue picture layer acts as a snapshot sequencer. The filter is highly responsive, customizable and capable of creating astounding effects you might not associate with filters such as sound morphing and vocoder-like effects. It can, of course, perform standard EQ tasks, filter effects and filter sweeps.

The Filter Palette has a canvas area and painting tools similar to the Image Synth's but the picture's meaning is quite different. It reshapes existing sounds rather than creating new ones. As with the Image Synth's canvas. the horizontal (x) axis represents time, and the vertical (y) axis represents pitch.

The Filter Palette has two color channels, only one of which is editable. Blue pixels allow signal to pass through the filter—the amount of signal being determined by the luminance of the blue pixels. Orange is the Filter Palette's comments channel whose sole purpose is to display the frequency content of the sound to be filtered. This mechanism makes it easy to visualize the effect the filter will have.

Using the Filter Palette

Paint on the filter canvas or choose a filter preset, and press the **Apply Filter** icon to apply the filter to the currently loaded sound.

One of the astounding capabilities of the Image Synth/Filter Palette combination is the ability to create Filter Palette filters from Image Synth pictures. Pictures can be copied and pasted between the Filter Palette and Image Synth. So, an Image Synth sound analysis can be copied and pasted into the Filter Palette. Applying such a filter to a rich sound can create dramatic sound morphing effects. Imagine analyzing a kicking drum groove and using its picture to filter Mozart—instant techno-Mozart! Or use an analysis of human speech to filter a string orchestra to create a singing orchestra. See the **QuickStart** to see how.

The Filter Palette can open any filter or presets library. The same filter library is shared by both the Filter Palette and the Image Synth. Remember, the filters function differently in the two palettes. In the Image Synth, filters are applied to the displayed image and influence the sound by modifying the picture. Filter Palette filters are applied directly to a sound. As with the Image Synth, any graphic image can be pasted to its canvas, and Macintosh PICT files can be opened.

MetaTip *It can be convenient to start with a blue canvas (which lets all frequencies pass) by clearing the canvas (delete key) pressing 'i' (Invert) to turn all the pixels of the filter layer on (blue).*

MetaTip *Control-click anywhere in the filter canvas to hear the pitch which corresponds to that pixel location.*

Filter Palette Resolution

The palette's frequency space is 128 pixels high with semitone per pixel frequency mapping, giving filter pictures a range of 27.56 Hz. to 42.28 kHz. The image width is fixed at 256 pixels, and the duration of the image is scaled to match the duration of the selected portion of the Sample Editor's currently loaded sound (or the entire sound if there is no selection).

MetaTip *When using filter pictures derived from an Image Synth frequency analysis, the duration of the sound to be filtered should be close to that of the analyzed sound*

(from which the filter was derived) if the time-related characteristics (such as tempo) are to be maintained.

MetaTip *The frequency space of the Image Synth and the Filter Palette are offset by one octave when the Image Synth's master tuning setting is at the default (A2). So, when pasting an image (as when analyzing a sound) from the Image Synth into the Filter Palette, the picture needs to be transposed up one octave by clicking the octave transpose arrow in order to maintain the original sound's frequency spectrum. You can avoid having to do this transposition by setting the Image Synth's Master Tuning setting to A3. Also, the Image Synth canvas should be set to the same height as the Filter Palette's (128 pixels high).*

MetaTip *Choose a filter from the Filter Selector pop-up to use as a starting point. Use the arrow keys or transpose tools to move the filter to overlap the sound as desired.*

Filter Palette Tools

The left-hand and bottom toolbars are identical to the Image Synth's and the upper toolbar is very similar. For brevity's sake, they are not re-described here. For information about them, see the **Image Synth** chapter of this manual.

Note *There are a few menu commands found in the Image Synth's submenus which are missing from the Filter Palette's submenus since they do not apply. For example, there is no* ***Swap Red and Green*** *command, and there are no "blue channel" commands since there is only one editable color layer (blue).*

Analyze Current Sample

Press this tool to compute an overview of the current sound's frequency content over time. The analysis is created in the orange comments channel of the image. The analysis is similar to that performed in the Image Synth palette but provides a template only (blue pixels are the active ones in the Filter Palette). The analysis gives you a visual representation of the sound over which you can paint or overlay your filters. By seeing where the orange and blue pixels overlap you will get a sense of the final sound since the only sound which passes through the filter will be where these layers overlap.

MetaTip *To clear the frequency analysis, you must clear the currently loaded sound then perform another analysis.*

The orange layer cannot be copied. To use an analysis as a filter, perform the analysis in the Image Synth palette, and add the resulting picture to the filter library (by clicking the **Add Filter** tool), or copy the image and paste it into the Filter Palette's filter canvas.

Apply Filter

Press the **Apply Filter** icon to apply the filter to the selected portion of the currently loaded sound (or the entire sound if there is no selection). When computation is complete (this can take a while with long sounds or with complex filters), the filtered sound will play.

MetaTip *To restore the unfiltered sound, press command-Z or choose **Undo** from the **Edit** menu of the main menubar.*

Play Selection

Click the speaker icon to hear the selected portion of the currently loaded sound (or the entire sound if there is no selection). This is not a preview of the processed sound.

Tips

Perform an analysis of the sound you intend to filter by clicking the **Analysis tool**, before starting to paint your filter. This lets you see where to place your filter.

Use **Displacement Maps** with smoothing on to create analog synth-like filter sweeps.

Create vocoder-like effects by using the frequency analysis of vocal sounds as filters in the Image Synth. To do this, record spoken vowels or words with the Sample Editor's record function. Perform an analysis in the Image Synth (shortcut: 'n'). Copy the resulting image and paste it into the Filter Palette's canvas. Open a sample file (of sustained strings for example) and click the **Analysis Tool**. Nudge the filter picture to maximize overlap. Apply the filter by pressing the Apply Filter button.

Build a library of graphic filter presets based on the FFT analysis of unique sounds or your favorite music. Remember to transpose the filter (or use the arrow keys) so that it overlaps the source sound.

Use the frequency analysis of drum loops to filter orchestral and choral sounds to create rhythm orchestras!

When using frequency analyses (created in the Image Synth) as filters, it is a good idea to apply the filter to a sample roughly the same length as the original sound.

Advanced User Tip

Higher Resolution Filters

In most cases, the resolution of the Filter Palette strikes the ideal balance between resolution and computational intensity. In some cases, you may desire greater timing or

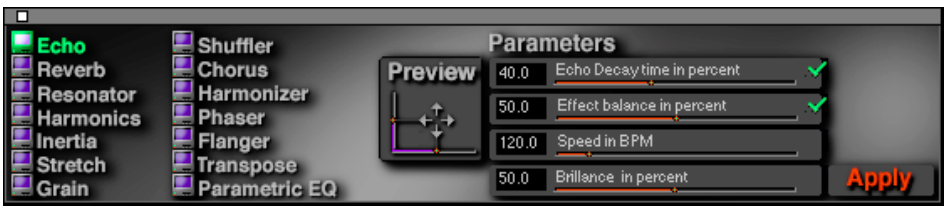
frequency resolution (more than 128 bands). In these cases, you can actually synthesize sound using the Image Synth then apply them as filters using commands found in the **Morph** menu.

If you need greater timing resolution than the Filter Palette provides, you can use the **Convolve** menu command with a sound synthesized in the Image Synth. In such cases, you might use a wide canvas with a small sample per pixel setting.

If you do not need a time-variant filter (filter envelope), you can use the **Spectrum Filter** command.

See **QuickStart** chapter of this manual and the tutorials provided on disk for examples of creative uses of the Filter Palette.

Effects Palette



About This Chapter

This chapter describes the operation of the Effects Palette. Familiarity with the operation of the Sample Editor is recommended for getting the most out of this chapter.

Effects Palette

The Effects Palette is a powerful effects rack for modifying the sound currently loaded in the Sample Editor. The available effects include both standard effects like Echo, Reverb and Flanger as well as unique granular synthesis and FFT-based effects such as Grain, Shuffler, Inertia and Harmonics.

Using Effects

Real-time effects previewing features simultaneous gestural control of two parameters. Click on an effect name to activate the effect. Click on the **Preview** button and drag the mouse up and down, left and right to hear the effect (in mono) as the parameters change. Click the **Apply** button to render the currently selected portion of the sound (or the entire sound if there is no selection) with the chosen effect. If you are unhappy with the result, choose **Undo** from the **Edit** menu to restore the sound to its original state. Gestural control of parameters can be turned on and off by clicking to the right of the parameter slider to toggle the green checkmark indicators on and off.

Preview

Press the **Preview** button and drag the mouse up and down, left and right to hear the effect applied in mono to the sound. In order to achieve real-time performance, the preview is mono. The parameter settings change as you move the mouse, and the changes

are reflected by the sound playback in real-time. The parameters affected by mouse movement are indicated by green checkmarks next to the parameter's slider.

Parameters

Each effect has its own set of up to 4 parameters. Two parameters can be selected for gestural control where horizontal mouse movements control one parameter and vertical movements the other. A parameter is active for control if there is a green checkmark to the right of its slider. Clicking in that space toggles the checkmarks on (green) and off (invisible).

When choosing parameters for gestural control, MetaSynth does not prevent you from turning on more parameters than it can actually control at once. Only two parameters can be controlled at once. Parameters are either X (horizontal) or Y (vertical) parameters. The order of the parameters in the list alternates X and Y parameters; hence, you can not control the first and third or second and forth parameters simultaneously.

Parameter values can be changed by any of these methods: gestural control, clicking on the numerical value and typing a new value, clicking on the parameter slider.

MetaTip *Constrain real-time parameter changes by using the shift key to horizontally constrain changes and shift-option for vertical constraint.*

MetaTip *Gestural control can be turned off by turning all the checkmarks off.*

Apply

Clicking **Apply** applies the effect to the selected portion of the sound loaded in the Sample Editor. Choosing **Undo** from the **Edit** menu restores the sound to its original state.

Granular Synthesis

Many of the effects are based on granular synthesis. Granular synthesis involves breaking up samples into time slices known as grains. By repeating, stretching, interpolating and shuffling these grains a number of interesting, unique effects can be achieved. With these effects, the results are somewhat less predictable than familiar effects like Echo and Reverb and are highly dependent on the source material.

We recommend that users interested in sound design spend time becoming familiar with the granular based effects. Almost any sound can be transformed into something strange and beautiful with these effects.

The Grain and Shuffler effects may be of special interest to composers of loop based music.

Effects

The following effects are available from the **Effects Palette**:

Echo

Digital delay, echo effect.

Echo Decay time in percent

This is a feedback or regeneration control which allows you to determine the number of echoes. Sets the percentage of the output signal fed back to the input. A setting of 100% results in full regeneration (multiple repeats) and 0% results in a single repeat.

Effect balance in percent

Adjusts the wet/dry mix. 100% only plays back the delayed signal. 0% plays back the unprocessed signal.

Speed in BPM

The echo/delay time expressed in beats per minute. BPM values can be entered with accuracy to one hundredth of a beat.

Brilliance in percent

Introduces a low-pass filter on the decay of the delayed signal. A setting of 100% passes the signal through unfiltered. Use Brilliance to emulate the decay of typical of natural spaces.

Reverb

A natural sounding reverb which emulates room ambience by simulating the way sound is absorbed and reflected off surfaces in different sized rooms of variable reflectivity.

Amount in percent

Adjusts the wet/dry mix. 100% only plays back the delayed signal. 0% plays back the unprocessed signal.

Room reflectance

Determines how much of the simulated wall surface is reflective. A setting of 100% results in a very live room where all of the signal is reflected (bounced) off the walls. 0% results in a dead room where most of the sound is absorbed by the walls.

Room size in percent

Adjusts the size of the room—100% being the largest room.

Brilliance in percent

The processed signal's decay is passed through a low-pass filter. This parameter controls the amount of filtering. A setting of 100% passes the signal through unfiltered. Brilliance determines whether the reverberant space is dark or bright.

Some preferred settings are:

	Amount	Reflectance	Room Size	Brilliance
Cathedral	50	80	30	0
Huge	60	98	29	50
Early Reflections	80	20	50	80
Room	45	50	15	20
Outer Space	60	90	80	30

Resonator

Add pitch or a pitched resonance to a sound. The effect is similar to the familiar doubling-effect achieved using digital delays with ultra-short echo times and large amounts of regeneration.

MetaTip *Especially intriguing results can be created by using this on noisy/unpitched sources, making them more suitable as input sources for the Image Synth.*

MetaTip *Selecting resonant combinations of fifths and/or octaves adds an interesting quality to human speech and other sound sources.*

MetaTip *Use this too emphasize particular harmonics of sounds with a known pitch. You can find the harmonics of the sound by using the Image Synth's* ***Analyze Current Sound*** *command.*

Amount in percent

Adjusts the wet/dry mix. 100% only plays back the resonated signal. 0% plays back the unprocessed signal.

Pitch in semitones

Set the resonant pitch in semitones.

Harmonics

Reshape the sound by convoluting it with the current Wave Table Palette waveform. Harmonics are derived based on the fundamental of the source sound and convoluting it with the Wave Table.

MetaTip *Experiment with different Wave Table settings and hearing how they impact the resulting sound.*

MetaTip *For subtle effects, use a sine wave in the Wave Table and use the Semitones parameter to tune the "second voice."*

Amount in percent

Adjusts the wet/dry mix. 100% only plays back new harmonics. 0% plays back the unprocessed signal.

Semitones

Adjusts the base pitch of the harmonics generator tunable to hundredths of a unit.

Inertia in Percent

Decay time of the regenerated harmonics. Larger values result in longer decay times. Experiment with this value to achieve the desired degree of "smoothness." Larger values often result in smoother "pads."

Inertia

An effect which simulates sympathetic vibrations. Just as singing inside a piano while holding down the sustain pedal excites the undampened piano strings and causes them to sustain and ring out, **Inertia** synthesizes the sustained sympathetic vibrations with variable decay.

Amount in Percent

Adjusts the wet/dry mix. 100% plays back only the processed signal. 0% plays back the unprocessed signal.

Decay Time in Percent

Adjusts the decay time of the synthesized vibrations. A setting of 100% sustains the vibrations for the maximum time.

Stretch

Expands or compresses a sound's duration using granular synthesis techniques. Large stretches may result in unnatural pulsation and coloration, however these artifacts are often interesting in themselves. Use this effect to create strange,

unnatural sounds. For more naturalistic time stretching, use the **Osc Bank Phase Vocoder** available from the **Morph** menu.

Stretch ratio in percent

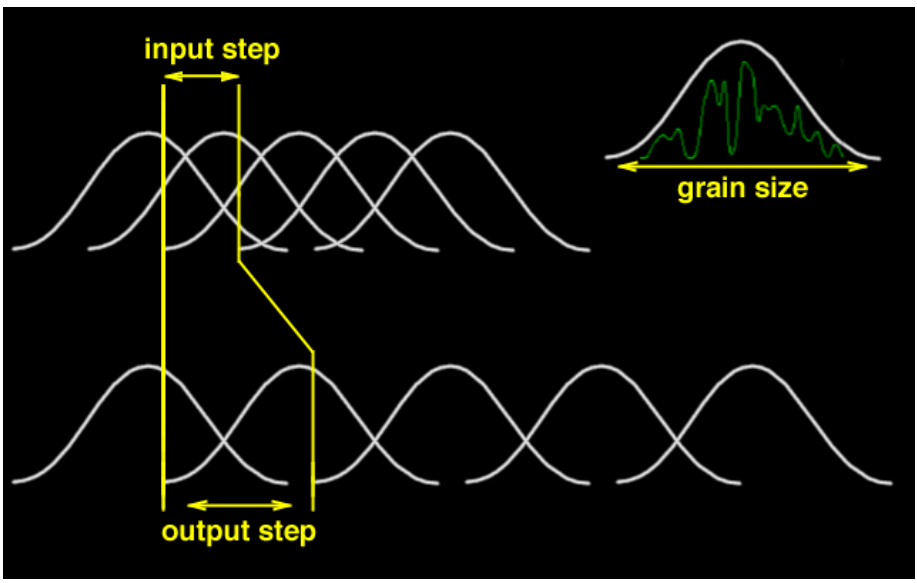
Adjust the amount of time expansion or compression applied to the original sample: 50% halves the duration, 200% doubles the duration, etc.

Average grain size in millisec

The size of the grains (or time slices) used to expand the sound. Large grain sizes may result in stuttering. echo-like effects. Small grains may emphasize particular harmonics and unnaturally colorize the sound (sometimes the effect you want but sometimes not). Very small grains will “pitch” the sound.

Grain

A granular synthesis effect that displaces and reorders time slices from the source sample. This effect is one of MetaSynth’s most powerful features and is capable of creating mind-boggling new sounds. You will find that a bit of experimentation is needed to find the settings that work best for a particular source sound or effect. Imagine being able to take a tape recording, slicing it up into arbitrarily small bits then rearranging them. That’s **Grain**!



Grains of duration grain size are fed into the **Grain** effect at a rate defined by the input step value. The **Grain** effect sends the grains out at a rate defined by the output step value. The order of the grains is determined by the randomization parameter. A high value for randomization results in grains taken out of order from the input sound. The left and right channel grains of stereo sounds are randomized independently. Subtle randomization produces beautiful, chorus-like stereo effects.

The variety of effects that can be created with **Grain** is astounding. **Grain** can turn a solo violin sample into a string section, a jackhammer, or a stuttering violin.

Load in a drum loop and tweak the settings to come up with new rhythms in real-time.

MetaTip *A good starting point for exploring grain is with the Input and Output steps set to 1/4 of the grain size.*

MetaTip *Explore the possibilities of **Grain** by using real-time preview with gestural control of the parameters. Change the parameters controlled by the mouse by clicking to the right of the parameter sliders. See how Input Step and Output Step affect the output, and explore the other parameter combinations as well.*

MetaTip *Try using **Grain** with settings that break up the sound into discrete particles then apply the **Harmonics** effect to expand the particles.*

MetaTip *You may want to attach a DAT machine or tape recorder to your computer's sound outputs of your machine as you play **Grain** in preview mode to capture the real-time interaction.*

Grain Size in millisecond

The size of the time slices rearranged by **Grain**. Generally, this value should be at least four times the size of the input and output steps though some nasty deconstruction can be created with grain sizes less than the input and output steps.

MetaTip *When working with drum loops, set the grain size to the length in milliseconds of a convenient beat division (such as a sixteenth note). To find the appropriate value, select a note in the Sample Editor and observe the selection length. Don't forget to deselect the selection (type command-d) so that the effect will be applied to the whole sample.*

Input step in millisecond

The rate at which grains are fed into the **Grain** engine. If the input and output steps are the same length, the resulting sound will have the same length as the original sound. With an input step larger than the output step, the duration will be compressed. If the input step value is smaller than the output step, the duration will be expanded.

MetaTip *A good starting point for exploration is with the input step and output step set to the same value. A value 1/4 of the grain size ensures smooth output.*

MetaTip *Use small input/output step values to artificially color the sound.*

Output step in millisecond

The rate at which grains are output by the **Grain** effect. Output steps smaller than the grain size ensure continuous output. Output steps larger than the grain size result in gaps between output grains. If the output and input steps are different sizes time modulation (stretching or expansion) occurs.

MetaTip *Use small input/output step values to artificially color the sound.*

Randomization in percent

The degree of randomization of grain order. A setting of 0% plays back the grains in the original order. A setting of 100% completely randomizes the grain order. The left and right channel grains are randomized independently, yielding wild, stereo effects.

Shuffler

A granular synthesis-based shuffler effect which breaks up the source sound into 16 slices and reorders them according to the parameter settings. This effect is great for reordering drum loops, to create new rhythms, or for creating rhythm loops from non-rhythmic material.

This effect is great for both discontinuous type sounds (like drum loops) or continuous sounds like string samples. When used with drum loops, the effect constructs a new pattern. With a sustained input source, the effect is like a tremolo.

Speed in BPM

Sets the grain (time slice) size in BPM (beats per minute).

MetaTip *When working with drum loops, set this value to a multiple of the drum loop's tempo. For example, to re-order the loop with sixteenth note feel, set the BPM value to 4 times the tempo of the original loop.*

Randomization in percent

The degree of randomization of grain order. A setting of 0% plays back the grains close to the original order. A setting of 100% completely randomizes the grain order.

Attack in percent

Adjusts the contour of the grains' amplitude envelopes. A setting of 100% results in a percussive envelope. 0% overlaps the envelopes for smoother transitions.

Chorus

Creates a familiar voice doubling effect by mixing in a frequency modulated copy of the source sound.

Chorus amount

Adjusts the wet/dry mix of the chorused and original signal. 100% plays back only the chorused signal.

Low Frequency Osc in BPM

Sets the rate of pitch modulation in BPM (beats per minute).

Harmonizer

Mix a pitch-shifted time-corrected version of the input sound with the original. The duration of the pitch shifted sound is unchanged. This effect uses granular synthesis techniques. For more naturalistic pitch shifting, use the **Osc Bank Phase Vocoder** available from the **Morph** menu. This effect can be used to thicken sounds.

Harmonizer Balance

Adjusts the wet/dry mix of the processed and unprocessed signals.

Transpose in semitones

Controls the amount of pitch shifting. The most natural pitch-shifting occurs within a range from -5 (down a fourth) to +7 (up a fifth).

Grain size in millisec

The size of the grain used to construct the pitch-shifted voice. Short grain sizes generally result in sharp attacks (but may introduce harmonic artifacts) and larger grain sizes generally yield smooth attacks.

Phaser

A digital implementation of the familiar analog phase shifter effect. The effect is similar to **Chorus** and **Flanger**. It is created by mixing the dry signal with a copy modulated by a sweeping parametric EQ.

Phaser amount in percent

Adjusts the wet/dry mix of the processed and unprocessed signals. 100% yields only the processed signal.

Freq amplitude in percent

Adjusts the gain of the EQ sweep. 100% yields the maximum sweep amplitude.

Low Frequency Osc in BPM

Sets the rate of the EQ sweep in beats per minute (BPM).

Flanger

A digital version of the familiar flanger effect—a variable delay run through a sweeping resonant filter and mixed with the source signal.

Flanger amount in percent

Adjusts the mix of the processed and unprocessed signal. 100% yields only the processed signal.

Semitones

Adjusts the frequency center of the resonant filter.

Low Frequency Osc in BPM

Sets the rate of the delay in beats per minute (BPM). Use low values for long sweeping effects.

Transpose

A pitch shift effect without time correction. Transpose works the same way as speeding up or slowing a tape recorder (or turntable). The effect has a range of plus or minus 24 (two octaves).

Transpose in semitones

Adjusts the amount of pitch shifting in semitones.

Parametric EQ

A single-band parametric equalizer. This effect is used to emphasize or de-emphasize a single frequency band whose width is determined by the band width parameter.

Amount in percent

The wet/dry mix of the processed and unprocessed signal.

Frequency

The center frequency of the filter. A setting of 100% is approximately 20 kHz. The values don't follow a linear scale. A setting of 5 corresponds to about 800 Hz. A value of 25 is approximately 3500 Hz.

MetaTip *To determine the frequencies affected by a particular setting, generate white noise using the **Sound** menu's **White Noise** command. Apply the **Parametric EQ** effect with the desired settings. With the **Image Synth Palette** in front, press 'n' to analyze the resulting sound. Mouse over the affected areas and observe the frequency range.*

To repeat this with different settings, type command-z to restore the original white noise, and follow the steps again.

Band width

The bandwidth, or Q, determines the width of the filter about the frequency center. 100% yields a broad band width.

Gain

The amount of gain or attenuation applied to the signal. The range is –200 to +200.

Some favorite settings are:

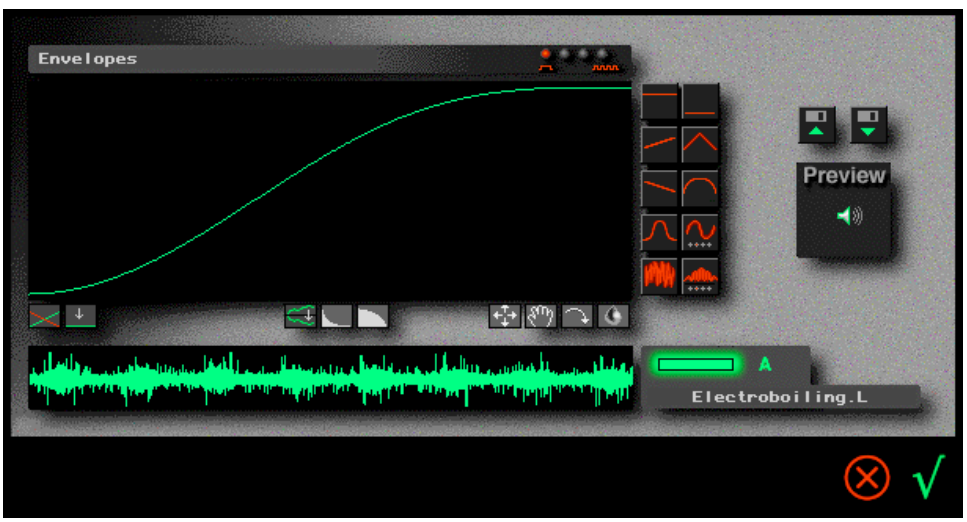
	Amount	Frequency	Band Width	Gain
Telephone	100	14	2	200
Cheap Radio	99	11	6	150
Enhance Highs	80	20	8	150
Enhance Mids	80	10	20	100

Envelope Editors

About This Chapter

This chapter describes the envelope editors which appear throughout MetaSynth.

Envelope Editors



MetaSynth uses envelope displays to control a number of very powerful processes. These envelopes are edited via MetaSynth's Envelope Editor interface which you will encounter throughout MetaSynth. The envelope editing interface is similar to the Wave Table Palette's. Envelopes are curves whose contours provide control points for processes like convolve and crossfade. Processes which use envelopes are:

- **Envelope**, **Pitch Envelope** and **Pan Envelope** which are available in the **Transform** menu,
- **Procedural Synth** available from the **Sounds** menu**,**
- **Cross Mix**, **Crossfade**, **Cross Convolve**, **Wave Shaping** from the **Morph** menu,

- **Remap Colors Dialog** available by double-clicking the C**ontrast & Luminance** tool in the **Image Synth Palette**.

While these processes are all very different, they share MetaSynth's unique envelope editing interface. The layout may differ slightly across different instances but the overall controls remain the same. This chapter describes the interface. See the appropriate chapter of the manual for descriptions of the processes themselves and the meaning of the envelope for that process.

Envelopes can be manipulated directly by clicking on any point of the curve and pulling it or by clicking on one of the shaping tools and dragging away from its icon.

At the beginning of this chapter is an image of the **Envelope** dialog box which features an envelope editor whose envelope controls the current sample's amplitude.

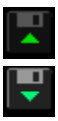
Multi-Envelope Editors

A number of processes make use of more than one envelope. In each of these dialogs, there will be a switch used to select the envelope to which the envelope shaping tools apply—as only one envelope can be shaped at a time. You will encounter multi-envelope editors when using the **Pan Envelope**, **Cross Convolve**, and **Color Remap** dialogs.

Unity/zero sum pairs

In some multi-envelope dialogs, such as the **Crossfade** dialog, a pair of envelopes are constrained to a constant sum (usually one or zero). In these cases, only one envelope can be manipulated directly. The other envelope is modulated automatically by MetaSynth to maintain the constant sum.

Envelope Tools



Open/Save Envelope Data

New in 2.5! Save the current envelope data and open previously saved envelope data. Envelopes can now be saved and reused. This feature is especially handy when creating complex color remapping curves and crossfades. Envelope data files use the same format as **Wave Table** data files so you can exchange shapes between envelopes and wave tables.

Envelope Canvas

The display area is a canvas where you can modify the envelope by clicking and dragging the curve into shape. The width of the mouse's influence is determined by the **Mouse Influence/Frequency Control**.

Mouse Influence/Frequency Control

This tool plays a dual role. It determines the width of the mouse's influence when directly manipulating the curve (by clicking and dragging the curve into shape) and it determines the frequency of the resulting waveform when using envelope tools, such as the **Sine Wave Tool**, that are marked by a row of dots at the icon's bottom.

When dragging the line with the control set to the leftmost value, a broader portion of the line will be pulled by the mouse than when the control is set to the right.

When dragging the **Sine Wave Tool**, the leftmost position results in a single cycle being drawn. With the control set to the rightmost position, four cycles are drawn.

Lower Toolbar

Default Envelope

Clicking this button sets the envelope to the default envelope for the process. The default curve varies from dialog to dialog.

Note *The default envelope is not necessarily the curve displayed when the envelope editor first appears.*

Minimum Envelope

Set the curve to the minimum or identity value depending upon the dialog box in which the envelope editor appears.

Flip Curve

Flip the envelope curve about the x-axis.

Square/Contract

Click on this tool to contract the waveform inward. The amplitude is multiplied by itself to achieve this effect (amplitudes being measured on a scale of 0 to 1).

Square Root/Expand

Click on this control to expand the waveform outward by taking the square root of amplitude values—which range from 0 to 1.

Scale Curve

Scale the curve horizontally. Drag to the left or right to contract or expand the curve horizontally.

Shift-option drag to scale the curve vertically which can be used to invert the curve.

Vertical Offset (hand tool)

Offset the curve vertically. Drag the hand tool up or down to move the curve in that direction.

Shift-drag to offset the envelope horizontally.

Rotate

Rotate the curve. Drag the mouse to the left or right to rotate the curve about the canvas area's center point.

Smoothing

Drag from this tool to smooth the curve. Drag all the way to the left to morph the envelope back to its original shape.

Option-drag for a more subtle smoothing effect.

Right-Hand Toolbar

The following shaping tools appear to the right of the canvas area. Each tool morphs the current curve to the shape displayed on the tool's icon. The original waveform is restored by dragging to the left.

Max Line

Drag the tool to the right to morph the envelope into a horizontal line with the maximum value.

Min Line

Drag the tool to the right to morph the envelope into a horizontal line with the minimum value.

Fade in

Drag the tool to the right to force the curve to a linear fade-in.

Fade in out (linear)

Drag the tool to the right to force the curve to a linear fade-in/fade-out.

Fade out

Drag the tool to the right to force the curve to a linear fade-out.

Fade in out (non-linear)

Drag the tool to the right to force the curve to a non-linear fade-in/fade-out.

Bell Curve

Drag the tool to the right to force the curve towards a bell curve.

Sine Wave

Drag the tool to the right to force the curve to a sine wave. The number of cycles from 1 to 4 is determined by the **Mouse Influence/Frequency Control**.

Randomize

Drag the tool to the right to randomize the curves values.

Cosmic

Drag the tool to the right to drag it to the “cosmic” curve, the product of a sine wave multiplied by a Gaussian curve.

The Menus

File Menu
Edit Menu
Sounds Menu
Transform Menu
Morph Menu
Instruments Menu
Windows Menu

File Menu

About this chapter

This chapter describes the File menu's commands. Familiarity with the Sample Editor chapter is helpful for getting the most out of this chapter.

File Menu

The **File** menu's commands, with the exception of the **Preferences** command, apply to the **Sample Editor**. The Image Synth and Filter Palette each have their own File submenus.

Open (Command-o)

Open any 16-bit, 44.1 kHz. Sound Designer II or AIFF sound file. The file becomes the currently loaded sound (its waveform displayed in the **Sample Display Area),** and the file's name is added to the **Sounds** menu along with the names of the other sounds that have been opened during the current MetaSynth session.

The **Open Sound Dialog** contains a preview area with a **Play** button. SoundDesigner II files may be previewed by highlighting their name and pressing the **Play** button. Currently, AIFF cannot be previewed.

This command is equivalent to the **Open Sound** tool in the Sample Editor toolbar.

Note *MetaSynth will not prevent you from opening sounds created at other sample rates, but they will be played back as if they were 44.1 kHz sounds which will result in pitch and time shift.*

Save... (Command-s)

Save the current sound file. This command is only available if the current sound was opened from a file. If the sound was created by pressing the Image Synth's **Synthesize** tool, this command is not available. To save a sound created by Image Synth synthesis, use the **Save As** command.

Warning: Any loop data from the original file is lost.

Save As...

Save the currently loaded sound to a new 44.1 kHz. sound file in Sound Designer II format. Stereo sounds are saved as split stereo (also called dual mono) Sound Designer II files with the suffix '.L' and '.R' added to the left and right channels respectively.

Option-Save As saves only the current selection.

When using this command for a sound synthesized from an Image Synth preset, MetaSynth proposes a default name *SoundNN* where *NN* is the preset number. This convention is provided for tight integration with **MetaTrack**, our upcoming audio mixing application. If you plan to use the sound file in a MetaTrack audio sequence, we recommend that you use the proposed name. Otherwise, you are free to rename the file as suits your liking.

MetaTip *To save the sound as an AIFF or interleaved stereo Sound Designer II file, use* ***Export AIFF*** *or* ***Export interleaved Sd2f****.*

This command is equivalent to the **Save Sound** tool on the **Sample Editor** toolbar.

Warning: Any loop data from the original file is lost.

Export AIFF...

Save the current sound as a44.1 kHz mono or stereo AIFF file.

Export interleaved Sd2f...

Save the current sound as a 44.1 kHz stereo interleaved Sound Designer II file.

Preferences (command-p)

Display the MetaSynth **Preferences** dialog. The preferences are:

Default Edition Auto-Crossfade

The number of samples used to crossfade edits made in the Sample Editor. Normally, MetaSynth crossfades the data at edit points to avoid clicks when deleting or inserting data. Entering a value of '0', turns off auto crossfading. The default value is 8000.

Display time in

Choose the units with which time/duration is displayed. The options are Milliseconds or Min:Sec:Frames. When using Min:Sec:Frames format, the frame rate is user-definable. The default frame rate is 1000 frames/second which is equivalent to milliseconds.

Show play position in pict

When this option is turned on, an orange dot rides above the canvas during Image Synth sound playback.

Include Wave Table with preset

When this option is turned on, MetaSynth stores the current Wave Table data when presets are added.

Brush grid size

This preference sets the Image Synth's Brush Grid interval. For a detailed description of this feature, see the **Image Synth** chapter of this manual.

Load instrument with preset

This setting determines whether MetaSynth prompts you to load the required instrument when selecting a sound picture preset that uses an Instrument or sample input source. If the file has not moved MetaSynth will locate and load it automatically; otherwise, it will prompt you to find the file.

Note *If the preset was saved with a MetaSynth version prior to 2.5, MetaSynth displays its Open dialog without a prompt as instrument and sample file names were not stored in older versions.*

Reserved memory for workspace

This setting allows you to control how much memory MetaSynth protects from the Sample Editor. At startup, MetaSynth splits its memory partition into two parts. One part is used only by the **Sample Editor**. The other part, called the workspace, is used for **Instruments**, the picture clipboard and canvas display.

The default value is a good choice for most users. Setting this preference to a large value makes it possible to load several large **Instruments** and have a large canvas but it may limit the length of the sounds that you can open and generate. If you do not plan on using Instruments at all, you can set this to **none** to maximize the space available for opening and generating sounds.

You must quit and restart MetaSynth for any change to this preference to take effect.

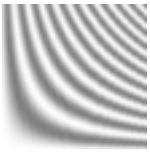
Free Memory (max block)

Displays the maximum free memory block in MetaSynth's memory space.

Quit (Command-q)

Quit MetaSynth.

NOTE! MetaSynth does not prompt you to save changes when **Quit** is chosen. Remember to save any pertinent data (sound files, presets, wave table data) before quitting.



Edit Menu

About this chapter

This chapter describes the Edit menu's commands. Familiarity with the Sample Editor chapter is helpful for getting the most out of this chapter.

Edit Menu

The following commands are found in the Edit menu and apply to the Sample Editor regardless of which palette is front-most. Clipboard actions apply to the sound clipboard maintained by the Sample Editor. The Image Synth and Filter Palette each have their own Edit submenus and their own clipboard.

Undo (Command-z)

Undo or redo the last change made in the Sample Editor. Use this command for "before/after" comparisons of sample changes.

Note! The Undo menu item operates somewhat differently in MetaSynth than in other applications. It is available even after choosing **Save** or **Save As**. This behavior makes it easy to restore/re-open a sound after having applied an effect and saving the modified sound. Or, it can be used to re-open a sound file after having computed a sound with the **Image Synth**.

Cut (Command-x)

Copy the selected sample data to the sound clipboard and delete it from the displayed waveform. **Cut** performs a butt-splice at the location where the material was deleted.

Copy (Command-c)

Copy the selected sample data to the sound clipboard.

Paste (Command-v)

Replace the selected sample data with the data stored in the sound clipboard. The pasted data is truncated at the selection boundary if the clipboard data exceeds the sample's duration. If there is no selection, the entire sample is replaced by the clipboard data.

Note *This function will not paste into an "empty" Sample Display; there must be a sample loaded in order for **Paste** to have an effect. In this case, use the **Insert** command.*

Clear

Delete the selected sample data. The data either side of the deletion are joined with a ripple edit.

Insert (Command-I)

Insert the sound clipboard data at the beginning of the selection. If there is no selection, the data is inserted *at the end* of the current sound.

MetaTip *Use this command to concatenate data from different sound files*

Merge...

Merge (mix) the sound clipboard data with the selected sound data using a user-defined mix envelope. The **Crossfade** dialog is opened for you to define the mix envelope. Data is merged at the sample beginning if there is no selection.

See the **Envelope Editor** chapter for information about envelope editing.

Crop (Command-G)

Delete the audio data outside of the selected region.

Select All (Command-a)

Select all of the currently loaded sound.

Select None (Command-d)

Deselect the selected region.

Silence (Command-y)

Replace the current selection with silence. The edges of the silenced areas are crossfaded. Replaces the entire sound if there is no selection.

Fade in (Command-[)

Fade in the sample or selection using a linear fade across the selection range. This is a quick and dirty fade in. For greater control over the fade contour, use the **Envelope** command in the **Transform** menu.

This command is identical to the **Fade In** tool on the **Sample Editor** toolbar.

Fade out (Command-])

Fade out the sample or selection using a linear fade across the selection range. This is a quick and dirty fade. For greater control over the fade contour, use the **Envelope** command in the **Transform** menu.

This command is identical to the **Fade Out** tool on the **Sample Editor** toolbar.

Fade In & Out (Command-j)

Perform a very short duration fade at the selection beginning and end to guarantee that a sound begins and ends at zero.

Sounds Menu

About This Chapter

This chapter describes the commands found in the **Sounds** menu. Familiarity with the **Sample Editor** chapter of this manual is recommended.

Sounds Menu

With the exception of the **Procedural Synth** command, the Sound menu's items apply only to the **Sample Editor**. The **Procedural Synth** command applies to both the **Sample Editor** and the **Image Synth**. The first three items control sound playback. The next group of menu items generates sound material which replaces the selected portion of the displayed waveform. The final group of items is a list of recently opened sound files.

Sound Playback Commands

Play Sound (Enter key)

Play the currently loaded sound. The shortcut key is the enter key. To stop playback, click anywhere.

Play Selection (Command-b)

Play the selected portion of the current sound. To stop playback, click anywhere.

Loop Selection (Command-l)

Loop play the selected portion of the current sound (or the entire sound if there is no selection). To stop playback, click anywhere.

Sound Generation Commands

White Noise

Generate pure white noise to fill the selected portion of the displayed waveform (or the entire sample if there is no selection). White noise is made up of frequencies with equal amplitude randomly distributed across the entire frequency spectrum. Filtered white noise can be used for creating sounds such as wind, surf, and snare drums and

can even be used to create interesting, metallic semi-pitched sounds by applying the Resonator and Harmonics effects.

MetaTip *Try this technique: generate white noise, use the **Filter Palette** to contour the noise, apply the **Effects Palette**'s **Resonator** effect to make the sound pitched.*

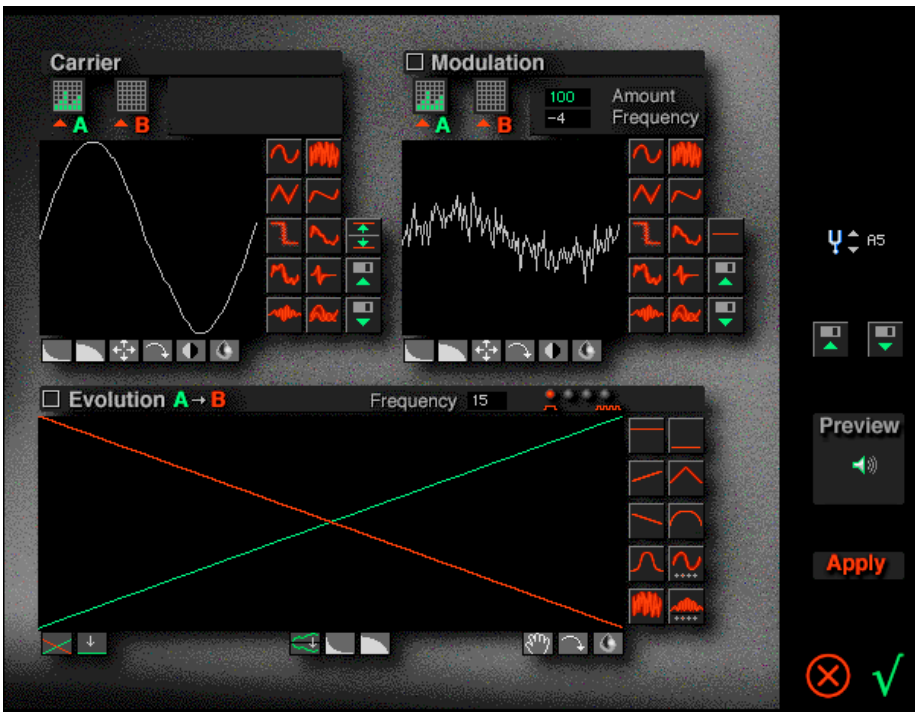
Narrow Noise

Generate "narrow" noise to fill the selected portion of the displayed waveform (or the entire sample if there is no selection). Narrow noise is made up of frequencies randomly generated within a narrower frequency range than white noise. It sounds much like static on a short-wave radio.

Fractal Noise

Generate "fractal" noise to fill the selected portion of the displayed waveform (or the entire sample if there is no selection). Fractal noise is similar to white noise, but the amplitude of the partials varies inversely with frequency (higher frequencies have increasingly lower amplitudes). It is a great starting point for room tone and other low rumbles.

Procedural Synth



The **Procedural Synth** is a simple 2-operator frequency modulation (FM) synthesizer featuring real-time preview. The Procedural Synth can be used to create samples to be used with samplers and MetaSynth's multi-sample Instruments, and it

can be used as an Image Synth input source. It falls within both the Sample Editor and Image Synth spheres of influence.

One operator acts as the carrier (the oscillator you actually hear), and the other is the modulator that modulates the pitch of the carrier. The frequency and amplitude of the modulator can both be determined by the user.

Each operator (oscillator) of the Procedural Synth can have up to two user-programmable waveforms called A and B (which comes into play if Evolution is turned on). The Procedural Synth fades the oscillators between their **A** settings and their **B** settings when the **Evolution** envelope—which defines the envelope for the transition—is turned on. The **B** state of the two oscillators are only played if **Evolution** is turned on. Both the carrier and the modulator have **A** and a **B** waveforms.

Using the Procedural Synth

Press the **Preview** button to start playing the Procedural Synth. Play with the waveform envelopes until you find a sound you like. Press the **Apply** button to replace the selected region of the current sound with sound generated by the procedural synth, ***or*** press the checkmark icon to make the current synth patch available for use as an **Image Synth** input source without affecting the currently loaded sample.

Complete "patches" that include all of the envelope, pitch and amplitude settings can be saved to or loaded from disk by pressing the **Save** and **Open** icon buttons at the dialog box's right edge. Additionally, each waveform and envelope displayed (Carrier and Modulation waveforms A and B and the Evolution envelope) can be saved to disk by using the **Save** and **Load** icon buttons found in the waveforms' envelope editors.

When generating sounds for the **Sample Editor**, you will probably want to provide additional shaping with the **Filter** or **Effects Palettes** or the **Envelope** menu command after computing the sound.

NOTE! When used as an Image Synth input source, the carrier wave's frequency is determined by the note's pitch in the Image Synth. The modulation frequency, however, does not change; hence, the relationship between the carrier and modulator changes with the pitch. In a sound picture whose pixels cover a relatively narrow frequency range, this is generally not a problem. Sometimes, this behavior may be undesirable. In such cases, it is best to press the **Apply** button in the **Procedural Synth Dialog** and use the generated sample as the input source. You may also want to consider creating an **Instrument** from a number of samples generated with different pitches.

A brief note about FM Synthesis

In FM Synthesis, one oscillator, the carrier, is the oscillator whose output is actually heard. The other oscillator, the modulator, varies the pitch of the carrier. If the frequency of the modulator is low, the carrier's pitch wavers audibly, creating a vibrato-like effect. If the modulation frequency is greater than about 20 cycles per second, overtones (harmonics/partials) called sidebands are generated in the carrier wave. These sidebands create rich, complex sounds not possible with subtractive synthesis (the type of synthesis employed by classic analog synthesizers).

While the Procedural Synth won't replace your DX7, the range of sounds that can be generated using this simple FM synthesizer is astonishing. With a bit of experimentation you can generate everything from clangorous metallic sounds to industrial buzzes. It is beyond the scope of this manual to describe how to produce particular effects. If you are interested in learning more about FM synthesis, there are a number of good books which describe guidelines for FM synthesis sound generation.

Carrier

This section of the dialog defines the carrier wave, the waveform whose output is actually heard. The waveform is shaped by clicking and dragging the waveform directly or by using any of the tools found below or to the right of the waveform display. The tools are similar to those available in the **Wave Table Palette**. For a complete description of the tools see the chapter **Wave Table Palette** of this manual.

The carrier wave can be faded between two different waveforms, A and B. Click on the A and B icons to toggle the display between the A and B waveforms. Waveform B is only heard if **Evolution** (see below) is turned on. The waveform settings can be saved to or loaded from disk by using the **Save** and **Open** icon buttons found in the Carrier area. The waveform data files are compatible with the Wave Table data written from the **Wave Table Palette**.

The carrier wave's base pitch (the pitch you hear) is determined by the Procedural Synth's **Master Tuning** setting (see below).

Pressing the arrowhead copies the displayed waveform to the oscillator's other display. I.e. copy A to B or B to A.

Master Tuning

Master Tuning determines the pitch of the generated sound. This control works the same as the Master Tuning button found in the Image Synth. This feature is especially helpful when building a MetaSynth Instrument to be used as an **Image Synth** input source.

MetaTip *When creating sounds to be used in an **Instrument**, generate samples with the same overall settings spaced a fifth or a flat fifth apart to minimize the artifacts introduced by pitch shifting.*

Modulation

This section of the dialog defines the modulator wave, the waveform which modifies the carrier's pitch. The waveform is shaped by clicking and dragging the waveform directly or by using any of the tools found below or to the right of the waveform display. The tools are similar to those available in the **Wave Table Palette**. For a complete description of the tools see the chapter **Wave Table Palette** of this manual.

The modulator can be faded between two different waveforms, A and B. Click on the A and B icons to toggle the display between the A and B waveforms. Waveform B is only heard if **Evolution** (see below) is turned on. The waveform settings can be saved to or loaded from disk by using the **Save** and **Open** icon buttons found in the Modulation area. The waveform data files are compatible with the Wave Table data written from the **Wave Table Palette**.

Pressing the arrowhead copies the displayed waveform to the oscillator's other display. I.e. copy A to B or B to A.

The frequency and amplitude of the modulator determine the overtones of the sound produced by the **Procedural Synth**.

Frequency

This setting determines the frequency of the modulator wave. The units are tenths of a semitone with 0 indicating A0 (55.12 Hz). The range is from –999 to +1200. Values about –600 and below result in vibrato-like modulation with overtones appearing at higher values. Every 120 steps (12 semitones) is an octave.

Amount

This setting determines the amplitude of the modulator waves expressed as a value from 0 to 100. A setting of 0 leaves the carrier wave unmodulated.

Evolution A->B

The **Evolution** envelope mixes the oscillators' **A** and **B** waveforms. It is activated by turning on the **Evolution A->B** checkbox; otherwise, it has no effect. The green envelope controls the waveform A's amplitude and the red envelope controls waveform B's.

Frequency—the evolution frequency is the frequency of the Evolution envelope in cycles per minute. A setting of 1 cycles the envelope once in a minute.

To shape the envelopes click on them and drag or use any of the available shaping tools. This section of the dialog box is a standard MetaSynth envelope editor. The two envelopes are constrained to unity gain in order to avoid clipping. A change to one envelope has an inverse effect on the other.

See the chapter **Envelope Editors** for more information about MetaSynth's envelope editing tools.

Open Synth Data

Click on the Open icon button found at the right edge of the dialog box to open a Procedural Synth patch that has been saved to disk.

Save Synth Data

Click on the Save icon button found at the right edge of the dialog box to save the current settings of the Procedural Synth to disk.

Preview

Audition the sound. Playback begins when the button is pressed and continues until it is pressed again.

Apply

Replace the selected region of the Sample Editor's displayed waveform with the sound generated by the **Procedural Synth**. Clicking this button does not close the dialog box. Enough data is generated to fill the selection.

MetaTip *You don't have to click **Apply** to use the Procedural Synth as an Image Synth input source.*

OK

Dismiss the dialog and keep the current settings.

MetaTip *Use this button (without first hitting apply) to use the **Procedural Synth** as an Image Synth input source.*

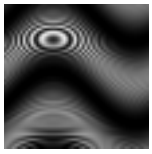
Cancel

Dismiss the dialog without remembering the current settings.

Recent Sounds

The last group of items, which only appears if sound files have been opened during the current work session, is a list of the sound files that have been opened during the session. Selecting a name reloads that sample into the **Sample Editor**. Any sound files dropped on the MetaSynth icon (in the Finder) are added to the list; although, only the last one will actually be opened.

MetaTip *If you are going to be working with a number of different sound files during your work session, drop their icons (or alias icons) on to the MetaSynth icon in the Finder to add them to the **Sounds** menu, making them instantly accessible.*



Transform Menu

About This Chapter

This chapter describes the commands found in the **Transform** menu. Familiarity with the **Sample Editor** chapter of this manual is recommended.

Transform Menu

The **Transform** menu provides utility functions for processing and cleaning up sound samples. Each of these processes is applied to the selected region of the sample loaded in the **Sample Editor** or to the entire sample if there is no selection.

Smooth (command-h)

Remove very high frequencies from the selected region of the current sample. **Smooth** differs from the **Remove Highs** command in that it removes only the very high frequency content of the sound (over about 18 kHz).

Smooth is useful for attenuating clicks, removing “buzziness” from a sound and for processing a sound before pitch shifting it upwards.

MetaTip *When removing clicks, select the area immediately surrounding the click and apply* ***Smooth****.*

Clean

A macro operation for cleaning up samples. **Clean** removes DC Offset, normalizes the sample, fades in the very beginning and fades out the very end (to remove possible clicks). This command is especially useful for working with samples that will be looped.

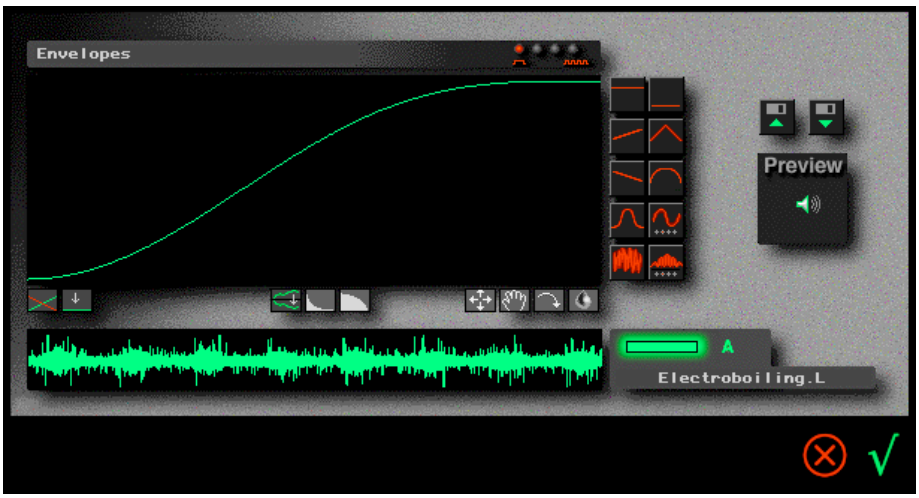
Normalize (command-n)

Normalize the volume of the sample or the selection. Normalization scales the sound’s volume upward so that the highest peak is 0 dB. Use this command to maximize the sample’s volume without changing its effective dynamic range.

Note *The left and right channels are normalized independently. If the two channels have markedly different peak amplitudes, the balance between the channels may be upset.*

This command is the same as the **Normalize** tool found on the **Sample Editor**'s left-hand toolbar.

Envelope... (command-e)



Shape the selection's amplitude envelope. The envelope's vertical axis signifies amplitude. The horizontal axis represents time. The envelope is scaled to the duration of the selected region of the sample. The sample's (or selection's) waveform is displayed below the envelope canvas to provide a guide while shaping the envelope. Click and drag the curve directly or use any of the provided envelope shaping tools. The tools are MetaSynth's standard envelope editing tools.

Use the **Preview** button to audition the envelope as applied to the sample or selection. You can achieve quite complex effects. Use this tool to create fades, adjust the sample volume, create tremolo effects and more. Click the OK icon button (the checkmark) to replace the selection with the processed sound.

MetaTip *Chaotic or rapidly changing envelopes, especially when applied over a short duration, can be used to generate overtones. This can be useful when you want to distort a sample. Select a short region (250 milliseconds or less) of the current sample. Choose* ***Envelope****. Use either of the bottom-most tools in the right-hand toolbar to shape the envelope.* ***Preview*** *the sound. When the sound has lots of overtones, click the OK icon button. Treat the sample further using the* ***Effects*** *or* ***Filter Palettes*** *then use it as an input source for a picture or as part of an Instrument.*

See the chapter **Envelope Editors** for a complete description of MetaSynth's envelope editing environment.

Pitch Envelope...

Modulate the sample's (or the selected region's) pitch over time using a pitch envelope. The envelope's vertical axis determines the degree of pitch shifting. The

horizontal axis represents time. The envelope is scaled to the duration of the selected region of the sample. The sample's (or selection's) waveform is displayed below the envelope canvas to provide a guide while shaping the envelope. Click and drag the curve directly or use any of the provided envelope shaping tools. The tools are MetaSynth's standard envelope editing tools.

The zero point (where no pitch shifting occurs) is the midpoint of the vertical axis.

The numerical field above the envelope display determines the pitch-shift range. The units are tenths of a semitone; hence, a pitch shift of one octave is equal to 120, and a shift of 10 is one semitone.

Use the **Preview** button to audition the envelope as applied to the sample or selection. Click the OK icon button (the checkmark) to replace the current selection with the processed sound.

Applications of this process include creating vibrato and glissando effects. You can generate new overtones or generally denature a sound by applying a chaotic or rapidly changing envelope to a short duration selection.

MetaTip *Use **Pitch Envelope** to do FM synthesis where your sample is the carrier. Open a sample file. Select a short region (250 milliseconds or less) of the current sample. Choose **Envelope**. Use either of the bottom-most tools in the right-hand toolbar to shape the envelope to have lots of rapid perturbation. **Preview** the sound. When the sound has lots of overtones, click the OK icon button. Treat the sample further using the **Effects** or **Filter Palettes** then use it as an input source for a picture or as part of an Instrument.*

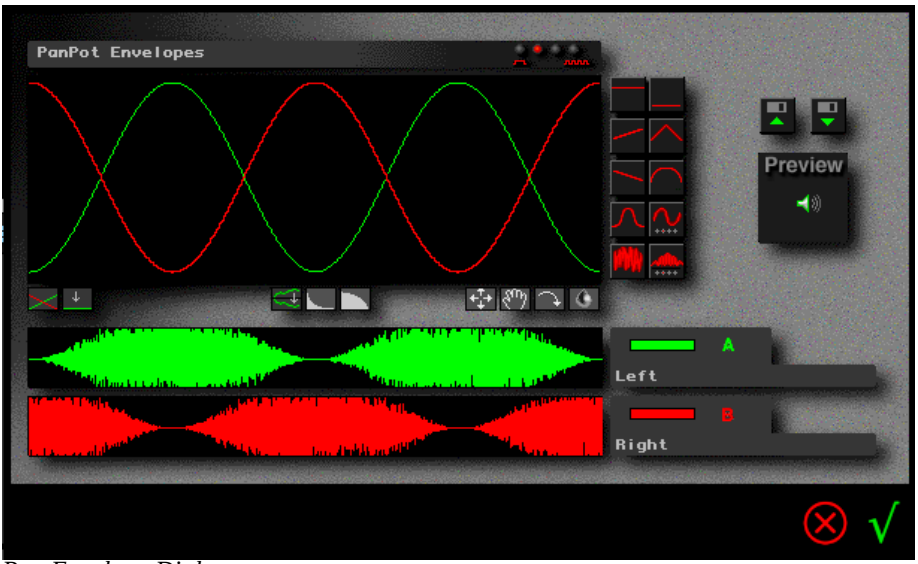
See the chapter **Envelope Editors** for a complete description of MetaSynth's envelope editing environment.

Pan Envelope...

Modulate stereo panning with envelopes for the left and right channels. This command can be used with mono or stereo sounds. When applied to a mono sound, the sound is made stereo. The green and red curves represent the right and left channels of the sound respectively. The vertical axis represents stereo placement. The vertical midpoint is panned to the center. The top of the canvas is leftmost and the bottom is rightmost.

If you start with a mono sound the green and red envelopes determine the volume of the right and left channels of the resulting sound. The illusion of movement can be created with a simple X (linear crossfade) envelope.

When applied to stereo sounds, **Pan Envelope** can be used to invert the channels (with an envelope that has a red horizontal line at the top of the envelope canvas and the green line at the bottom) or to de-emphasize stereo panning or to create a sense of spatial dynamism. With the lines centered, a stereo sound is essentially converted to mono.



Pan Envelope Dialog

Note *The two envelopes have a unity gain relationship. A change to one envelope has the inverse effect on the other thus maintaining the perceived volume of the original signal.*

Invert Phase

Invert the phase of the selection.

Derivate

Extract the high frequency content of the selection by computing the difference between every two consecutive samples. Use this effect to make a rich sample sound as if it were coming out of a cheap radio, or create 'tweeter burners' for that next techno hit.

MetaTip *You will often want to normalize the sound after applying this process as* ***Derivate*** *often results in low amplitude signals.*

MetaTip *Use* ***Derivate*** *temporarily to find clicks. Repeated application of this command will emphasize rapid transients, like clicks. Apply this process on a selection to find hard-to-find clicks then, once you have found them, Undo the derivation and remove the clicks.*

Compress

Compress the selection's dynamic range. This is a simple compressor with no settings. You may want to apply **Compress** several times in a row to achieve the desired amount of compression.

MetaTip *To raise the apparent volume of a sound, **Compress** the sample then **Normalize** it. Repeat the two steps until the desired volume has been attained.*

Limiter [and Expander]

Severely decrease high amplitudes and boost low amplitudes. Use this command to reduce volume spikes.

Option-select the menu command to ***expand*** the selection's dynamic range (increase the difference between the low and high amplitudes). You should Normalize after applying this effect as the overall amplitude may decrease—even though the overall dynamic range (difference between high and low amplitudes) increases.

Remove Lows

Attenuate frequencies below 400 Hz. This command provides a quick way of rolling off the low frequency content of a sample

Remove Highs

Attenuate frequencies above 600 Hz. The filter's slope starts gradually at 600 Hz and rolls off increasingly more after about 800 Hz.

Remove DC Offset

Readjust the vertical balance (about the zero point) of the sample. Imbalance (DC offset) can result in clicks and pops in the sound itself OR when the sound is processed. DC offset can occur when a large number of unbalanced signals are integrated. This sometimes happens when computing sounds in the **Image Synth** if the input source is a sample or waveform with some degree of imbalance.

Octave Down(command - minus)

Shift the selection's pitch down one octave. The transposition is not time corrected so the duration of the sample is doubled.

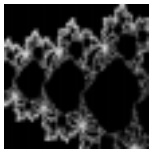
This command is often used to transpose a sample prior to its being used as an **Image Synth** input source.

Note *Higher-quality (and computationally more intensive), time-corrected pitch shifting is available using **OSC Bank Phase Vocoder** from the **Morph** menu.*

Octave Up(command - +)

Shift the selection's pitch up one octave. The transposition is not time corrected so the duration of the sample is cut in half. This command is often used to transpose a sample prior to its being used as an **Image Synth** input source.

Note *Higher-quality (and computationally more intensive), time-corrected pitch shifting is available using **OSC Bank Phase Vocoder** from the **Morph** menu.*



Morph Menu

About this chapter

This chapter describes the commands found in the **Morph** menu. Familiarity with the **Sample Editor** chapter of this manual is recommended.

Morph Menu

Morph or mix your sounds with the commands in this menu. All of the commands in this menu are applied to the sound loaded in the **Sample Editor**. The **Morph** menu provides some of MetaSynth's most powerful sound modification processes. Many of these processes use a sound file to modify the current sound. With these processes you can:

- Morph one sound into another
- Filter one sound with another
- Perform time corrected pitch shifting
- Completely reshape a sample
- Steal a sound's spectrum and re-synthesize it

Super *MetaTip*

We have found the following technique to be a great way of creating ear-boggling sounds. In the **Image Synth** render the same sound picture (or variations of a sound picture) with different input sources or frequency maps. Open one of the sounds. Use the commands in the **Morph** menu to recombine them or morph them with each other.

You can use this same technique to create super-realistic effects or super-psychedelic effects.

For realistic orchestral sounds render the sound picture with two different, but related, MetaSynth Instruments. For example, render a sound picture with a string orchestra instrument (set of samples) and save the result. Now, use a string orchestra or violin section instrument that uses a different set of samples. Finally, use the **Crossfade** to fade back and forth between the two sounds. This yields the sort of timbral variations you just can't get with a sampler.

For a psychedelic effect, render the picture with totally different instruments. Render the sound picture first with strings then with flutes or timpani. Now, **Crossfade** or **Cross Convolve** the two sounds. OUCH!

Mix 50%...(command-m)

Perform an equal power mix of the selection with another sound file. When you choose this command, MetaSynth prompts you to select the file to mix with the selection. The result's duration will be the length of the selection.

Mix is a quick but useful way of combining two sounds.

Cross Mix...

Mix the selection with another sound file using user-defined mix envelopes. The mix length is the duration of the shorter of the two sounds. MetaSynth presents a file selector dialog box for you to choose the other sound. The **Cross Mix** dialog box is then opened with an envelope editor for you to shape the mix envelopes of the two sounds. The mix envelopes can be shaped by direct manipulation (clicking and dragging the envelope curves) or using the envelope shaping tools.

The vertical axis of the envelope canvas represents amplitude (volume) and the horizontal axis represents time. The time axis is scaled to the duration of the shorter of the two sounds. The two envelopes are completely independent. The sounds' waveforms are displayed below the envelope canvas. The color bars to the right of the waveform displays allows you to select the envelope to shape.

To select an envelope for shaping, click on the color bar above the sound's name. The color bar becomes highlighted to show that it is the active envelope.

Note *The envelope curves are independent. Hence, distortion (clipping) can occur. Press **Preview** to audition the mix. If distortion is heard, lower the levels of one or both of the mix envelopes.*

Press the OK icon button (the checkmark) to execute the mix.

If you are unhappy with the mix, press command-z (or choose **Undo** from the **Edit** menu) to restore the original sound.

MetaTip ***Crossfade*** *(described below) is similar to **Cross Mix** but maintains unity gain between the two envelope curves and thus prevents clipping/distortion.*

The envelope editor is a standard MetaSynth Envelope Editor. For more information about envelope editing, see the **Envelope Editors** chapter of this manual.

Crossfade... (command-f)

Mix the selection with another sound file using mix envelopes that maintain unity gain thus preventing clipping (distortion). This command is similar to **Cross Mix** except that unity gain is maintained. MetaSynth prompts you for the other sound to mix then opens the **Crossfade** dialog box.

The vertical axis of the envelope canvas represents amplitude (volume) and the horizontal axis represents time. The time axis is scaled to the duration of the shorter of the two sounds. The sounds' waveforms are displayed below the envelope canvas.

Because the mix envelopes maintain unity gain only one envelope (the green envelope) is directly editable. The red envelope is automatically adjusted to maintain a unity gain between the two envelopes.

MetaTip *We frequently use this command to combine different renditions of the same sound picture. (See the Super **MetaTip** at the beginning of this chapter.)*

Cross Convolve...

Morph and mix two sounds together with user-definable mix and morph envelopes. MetaSynth prompts you for the other sound then opens the **Cross Convolve** dialog box. **Cross Convolve** provides three independent, user-definable envelopes for mixing three sounds:

- the morphed, convoluted sound, labeled **A Mul B** (the blue curve),
- the selection, labeled **A** (the green curve),
- the chosen sound file, labeled **B** (the red curve).

The envelope editor is a standard MetaSynth envelope editor. For more information about envelope editing, see the **Envelope Editors** chapter of this manual.

The blue curve

The blue envelope, labeled **A Mul B** (which stands for A multiplied by B) determines the amplitude of the morphed sound in the final mix. The sound is morphed by multiplying the two waveforms' frequency spectrums together. Technically speaking, FFT analysis of the two sounds is performed and the resulting spectrums multiplied together. This is similar to making Image Synth pictures (by performing frequency analysis) of both sounds and applying one picture as a filter to the other, but **Cross Convolve** provides a much higher quality (and computationally more intensive) convolution. The resulting sound contains only the frequencies in common between the two sounds. If the two sounds have no overlap in their frequency spectrums, the morphed sound will be silent.

Both sounds contribute equally to the "blue" (morphed/convoluted) sound.

Fourier Window pop-up menu

To the left of the **A Mul B** envelope selector is the **Fourier Window** pop-up. This determines the number of frequency bands used when the analysis is performed in preparation for convolution. Higher numbers for this value yield higher quality results than smaller values but the convolution takes longer to compute.

The red and green curves

The red and green envelopes are mix envelopes that allow you to mix the unconvoluted sounds with the 'blue curve' sound. They perform the same functions as in the **Cross Mix** dialog. In fact, if the blue curve is set to the minimum value, **Cross Convolve** yields the same results as **Cross Mix**.

Use these envelopes to mix in time varying amounts of the original signals to create complex morphing effects.

Preview

Preview auditions the cross mix of the red and green curves **but not** the blue curve. The blue, convolved component is too complex to be previewed in real-time. As a result, **Preview** is of limited use with this command.

MetaTip *Since unity gain is not enforced, it is possible to clip (distort) the signal. If this happens,* ***Undo*** *the convolution and lower the levels the of the envelopes when you re-invoke the* ***Cross Convolve****.*

MetaTip *You can create dynamic morphing effects by having the three curves achieve their maximums at different points in the sound. For example, try starting with the green curve at the maximum and ending at 0, the red curve starting at zero and gradually fading in then out and the blue curve starting anywhere and rising to the maximum. Another interesting effect is created by using red and green curves as described above but with the blue curve at the maximum throughout the sound.*

MetaTip *Since preview does not mix in the convoluted sound, it is often a good idea to perform* ***Cross Convolve*** *with a maximum blue curve and minimum red and green curves to hear the convolution result. You can then choose* ***Undo*** *to restore the original sound. Finally, choose* ***Cross Convolve*** *again and adjust the envelopes as desired.*

MetaTip *To produce the convoluted sound only, set the blue envelope to the maximum (a horizontal line across the top of the envelope canvas), and set the red and green envelopes to the minimum. This is the envelope you get when pressing the* ***Default*** *icon button in the envelope editor though it is not the envelope displayed initially.*

Fit Amplitude...

Steal the amplitude envelope from a sound file and apply it to the selection. The duration of the resulting sound is the length of the shorter of the two sounds. MetaSynth prompts you to choose a sound file, analyzes the amplitude (volume) contour of the sound and applies the contour to the selection.

Formants Filter...

Morph the selection by applying another sound file as a filter. This effect emphasizes the frequencies the two sounds have in common. The effect is very similar to what happens when you paste an Image Synth frequency analysis into the Filter Palette and use that picture to filter another sound. It is also similar to the convolution performed by **Cross Convolve**, but **Formants Filter** uses a fixed number of frequency bands (128) for the analysis which results in a smoother convolution.

When you choose this command, MetaSynth prompts you to select the sound file to apply as the filter.

MetaTip *For the best results, since common frequencies are emphasized, start with a rich sound, one with a broad frequency spectrum. You can achieve vocoder effects by recording speech and applying the speech sounds as filters to sounds such as violins, pianos, etc.*

MetaTip *If the two sounds, don't have a lot of frequencies in common, you can prepare the filter sound by pitch shifting it to a range which will increase the overlap and saving it. Then, open the sound to be filtered, and choose* ***Formants Filter****.*

Osc Bank PhaseVocoder...

High-quality FFT-based time-corrected pitch shifting, time expansion/compression and other FFT-based effects. **Osc Bank Phase Vocoder** is short for Oscillator Bank Phase Vocoder.

Use this tool to shift a sample's pitch without changing its duration or to change the sample duration without changing its pitch. You can, of course, change both the pitch and duration. Realism is maintained when small amounts of pitch shifting or time modulation are applied. Large time or pitch changes will yield less realistic results.

This process is valuable for preparing samples to be used as Image Synth input sources. Pretty far out effects can be generated by making use of the Filter/Effect options provided in the dialog box.

Time stretching is computationally very intensive and can take a long time, especially on slow machines or with long sounds.

Phase vocoding techniques involve FFT analysis applied to short-duration time slices. These grains are then used to re-synthesize the sound with a new pitch and/or duration. The results are sensitive to the settings used to perform the analysis. You may need to experiment to find the best parameter settings for each particular application.

The tab key can be used to cycle through the parameters. The parameters for this effect are:

Fundamental

Select the base pitch of the sample. This setting is important as MetaSynth centers its FFT analysis on this frequency.

Time Stretch (in percent or milliseconds)

The degree of time stretching can be set either by entering it as percentage of the original duration or by entering the desired duration of the computed sound. Values can be entered by either clicking on the field and typing or by clicking and dragging up or down. The original duration is displayed for information purposes and is read only.

When typing a value, press Return to enter the setting and deselect the field.

Pitch Shift

The desired amount of pitch shift. The units are tenths of a semitone. One semitone equals 10. 120 equals one octave. Values can be entered by either clicking on the field and typing or by clicking and dragging up or down. When typing, press Return to enter the value and deselect the field.

Filter/effect pop-up menu

Choose an effect to apply when processing the sound. The choices are:

- **None**—process the sound without additional filtering.
- **Noise Filter**—remove low amplitude data from the processed sound. This option usually adds a metallic character to the re-synthesized sound.
- **Harmonic Filter**—removes all frequencies that are not part of the harmonic series of the specified fundamental. Great for adding pitch to speech and other unpitched sounds. Creates a classic vocoder effect.
- **Odd Harmonics—** retain only harmonics that are common to the odd harmonics of the harmonic series of the specified fundamental. Great for adding pitch to speech and other unpitched sounds.
- **Octaves—** retain only harmonics that are common to the octave harmonics of the harmonic series of the specified fundamental. Great for adding pitch to speech and other unpitched sounds. Significantly reduces the overtones in the resulting sound.

- **FFT Amp Inertia**—average the amplitude of the original and re-synthesized grains. This process has a strange, metallic, reverb-like effect that slightly desynchronizes the frequency and amplitude of the original sound and tends to smooth rapid transients.
- **FFT Pitch Inertia**—averages the frequency of the old and new grains. Pitch inertia adds micro glissandos that smooth out rapid pitch changes. With this effect, exaggerated glissandi may appear at the beginning of the processed sound though they stabilize over time.
- **FFT Inertia**—applies both FFT Amp and FFT Pitch inertia. Vibrato is attenuated. Use this effect when stretching sounds that will be looped. As with pitch inertia, exaggerated glissandi may appear at the beginning of the processed sound though they stabilize over time.

MetaTip *The **Filter/effects** can be used to great effect by themselves without performing pitch shift or time modulation.*

MetaTip *Before applying these effects, it is often a good idea to perform a frequency analysis (the Image Synth's **Analyze Current Sound** command) to determine the fundamental pitch.*

Fourier Window pop-up menu

Set the granularity of the FFT analysis. This setting has a large impact on the character of the computed sound. A small window increases time resolution and decreases frequency resolution. Large windows have the opposite effect. Large windows tend to smooth rapid transients and small windows tend to decrease low frequency response.

Convolve... (command-k)

Morph the selection by using another sound file to shape its harmonic envelope. MetaSynth prompts you to select a file from which the harmonic envelope is taken. The resulting sound is the length of the shorter of the two sounds. Unlike **Cross Convolve**, this process is asymmetrical. The phase and pitch of the selection are preserved but its harmonic envelope is shaped by the chosen sound file.

Convolve performs higher resolution (2048 band FFT) convolution than **Formants Filter** (128 bands). Also, the convolution is unsmoothed which allows for transient effects not possible with **Formants Filter** which performs a "smoothed" convolution. You may want to try both effects to determine which yields the desired results.

MetaTip *For terrific results, open a sustained, melodic sound file in the **Sample Editor,** or synthesize one with the **Image Synth**. Choose **Convolve,** and select a sound file with speech or percussive sounds (like a drum loop).*

Wave Shaping...

Remap the selected portion of the displayed waveform. MetaSynth presents an envelope editor that remaps the sample's amplitude values. The y-axis represents amplitude values of the source waveform, and the x-axis represents the remapped values. Positive and negative values are changed symmetrically. A line with a 45 degree slope results in a waveform identical to the source.

Real-time preview is provided as you change the envelope (either by clicking and dragging the envelope directly or by using the envelope shaping tools). You can also press the **Preview** button to hear the remapped waveform.

Wave Shaping can radically alter the sample's harmonic spectrum. It tends to have a clipping, distorting, denaturing effect on rich, high amplitude sounds. The effect is often more subtle with low amplitude or simple waveforms where the addition of arbitrary harmonics can generate pleasing electronic sounds.

MetaTip *To create synthesizer-like sounds to use as **Image Synth** input sounds or to load into your sampler, use **Wave Shaping** with simple waveforms to enrich them then use the **Filter Palette** to provide a harmonic envelope. See the tutorials provided on disk for a step by step lesson on using this technique.*

Note *Care should be taken to keep the leftmost value of the envelope at zero, otherwise DC offset or overly strong distortion may occur.*

Instant Spectrum...

Capture the instantaneous frequency content of a sound region. **Instant Spectrum** generates a spectrum file which encapsulates the harmonic spectrum of the first 2048 samples of the selection. When you choose this command, MetaSynth prompts you for a name with which to save the file. This command is used in conjunction with **Synthesize Spectrum** which synthesizes a new sound based on the spectrum. The spectrum is a high-quality short-time FFT (Fast Fourier Transform). Spectrum files are much more compact than the corresponding sound files and can be a convenient way to share sound sources via e-mail.

MetaTip *Spectrum files can be used as Custom Scales in the Image Synth! Choose **Custom Scale** from the **Frequency Map** selector and option-click the **Import Scale** icon button. This option is a great way to create exciting new sounds. See the Image Synth chapter of this manual for information about this exciting new feature.*

See **Synthesize Spectrum** and **Filter Spectrum** below for more information about spectrum files and their uses.

Synthesize Spectrum...

Synthesize a sound from data in a spectrum file (see **Instant Spectrum** above). The sound has steady, unvarying harmonic content based on the frequency content of the sound from which the spectrum file was created. The duration of the synthesized sound is equal to that of the selection's (or the entire sound's if there is no selection).

This command provides a mechanism by which you can create rich new waveforms and samples for use as Image Synth input sources or in commercial MIDI samplers.

When you choose this command, MetaSynth prompts you for a reference pitch for the synthesis. This pitch is relative to A2. If you choose A2, the resulting sound will have the same pitch as the original sound. (It will only actually be A2 if the original pitch was A2.) If you are planning to use the sound as an Image Synth input source, you may want to synthesize the sound with several different reference pitches and build an **Instrument** from the samples to avoid extreme pitch shifting of the sound.

Generally, after using Synthesize Spectrum, you will use the **Filter Palette**, **Envelope** command, or **Convolve** command to give the sound shape, to vary it over time.

Spectrum Filter...

Apply a spectrum file as a filter to the current selection. This process yields similar results to the **Convolve** command but uses a spectrum file to provide the convolution data rather than a sound file. Since a spectrum file is unchanging over time, this process does not change the harmonic envelope of the sound the way that **Convolve** does.

Use this command when you want to use another sound file to reshape the harmonic content of the sound without imposing its harmonic envelope. For example, you might want to give a vocal timbre to a recording of a string or horn section without changing the recording's overall contour (envelope). Spectrum filtering would be

perfect for this job whereas **Convolve** would impose the voice's harmonic and amplitude contours.

Instruments Menu

See the **Instruments** chapter earlier in this manual for a complete description of MetaSynth instruments and the **Instruments Menu**.

New Instrument…

Create a new Instrument. An empty Instrument Dialog is opened with the empty sample slots spaced an octave apart. Load individual samples manually by pressing the **Load Sample** icon buttons. Assign the base pitch for the sample using the **pitch** and **octave** pop-up menus.

Important! If you would like to use the Instrument in future MetaSynth sessions, you must press the Save button.

Open Instrument…

Open an Instrument file. MetaSynth presents an open file dialog box to select the Instrument then presents the Instrument dialog for the Instrument. Press the OK icon button to confirm loading or press the Cancel icon button to cancel loading.

If any of the Instrument's samples are not found, you will be prompted to find them. If there is not enough memory available, you will be alerted and only some of the samples will be loaded.

Build Instrument…

Automatically create and map a new instrument with "related" samples. MetaSynth presents an open file dialog for you to choose a sample file. If other related sample files are found in the same directory they are automatically added to the instrument and mapped with to the pitch and octave suggested by their names. To be "related", the files must share the same base name which is the file's name minus the pitch designation. For example, *Guitar A2*, *Guitar C2*, and *Guitar E2* are related. But, *Guitar A2* and *Eric Guitar C2*. The '.L' and '.R' extensions of split stereo/dual mono file pairs is ignored when determining the base name.

Many commercial SampleCell sample libraries follow this naming convention.

(Opened Instruments List)

Every time you open or create an Instrument during a work session, its name is added to the Instrument menu. Selecting a name from this list re-invokes the Instrument dialog for that instrument.

Option-select an item from this list to delete its name and free the memory it occupied.

Windows Menu

About This Chapter

This chapter describes the items found in the **Windows** menu.

Windows Menu

The items in this menu hide, show and bring to the front MetaSynth's windows and palettes. Clicking a palette's "close" box just hides the palette without affecting the its contents. Also, **command-w** merely hides the Sample Editor; the open sound file is not closed.

Image Synth (command-1)

Bring the **Image Synth** palette to the front, and make it visible if it was previously hidden.

Wave Table (command-2)

Bring the **Wave Table** palette to the front, and make it visible if it was previously hidden.

Effects Palette (command-3)

Bring the **Effects** palette to the front, and make it visible if it was previously hidden.

Filter Palette (command-4)

Bring the **Filter** palette to the front, and make it visible if it was previously hidden.

Hide/Show Sample Editor (command-w)

Hide the **Sample Editor** if it is visible. Show the **Sample Editor** if it is hidden.

When the **Sample Editor** is visible, it occupies the entire screen and obscures the Macintosh Desktop. MetaSynth's black background is actually the Sample Editor's background. Hide it to make the windows of other applications visible.

Hide/Show Palettes

Hide or show all palettes (excluding the **Sample Editor** whose visibility is toggled by the menu command **Hide/Show Sample Editor**).

Tutorials Summary

The table below summarizes the seven tutorials provided in the Tutorials folder on the MetaSynth CD:

Tutorial	Sections	Features Used
Wave Shaping	(Tutorial 1)	
Create a rich analog synth-type sound from scratch	Computing a Simple Waveform to Transform	synthesize tool
	Set Fundamental	master tuning
	Add Second Harmonic	option-transpose
	Give the second harmonic an envelope	selection tool apply filter picture
	Set Tempo	tempo/duration tool
	Apply Wave Shaping	wave shaping command
	Applying a Filter Envelope	filter palette filter palette analysis crossfaded sample mode
Create Instruments Using Master Tuning	(Tutorial 2)	
Build an Instrument from synthesized sounds	Compute Samples	synthesize tool master tuning
	Building the Instrument	Build Instrument command
	Using the Instrument	select preset set input source
Creating Slammin' Filter Sweeps with Displacement Maps	(Tutorial 3)	
Use displacement maps to simulate analog synth-type filter sweeps	Build the filter	displacement dialog, choose filter

		apply displacement map
	Use the Filter	open sound filter palette analyze
Creating Rhythm Grooves	(Tutorial 4)	
Learn some techniques for entering notes directly in the Image Synth	Loading the Instrument	open instrument input source selector
	Setting the Tempo, Grid, and Picture Size	channel mode tempo/duration dialog box pixels per beat & tempo picture size
	Using Grid & Repeat to Paint the Kick and Snare	line mode brush grid interval brush size control-click to audition, repeat hot filter
	Using the Repeat Brush to Paint the Hi-Hat	repeat brush mode brush grid brush grid interval
	Painting with the Note Brush	brush mode brush palette note brush marquee tool apply filter picture
Transfer Modes and Displacement Maps	(Tutorial 5)	
Explore transfer modes to create beautiful Moiré patterns	Getting Started	choose preset choose displacement map
	Warping the Image	apply displacement
	Creating the Moiré Pattern	copy picture insert pict differences transfer mode
Processed Analysis: Discovering Rhythmic Patterns with Quantize	(Tutorial 6)	

Useful techniques for polishing Image Synth sound analysis and using it to create new sounds.	Image Synth Analysis	open sound fit duration to current sample (Tempo/Duration Dialog) perform analysis
	Preparing the picture	brightness/contrast tool option-quantize
	Quantizing the Image	quantize hot filter option-shorten
	Adjusting the Harmonic Mapping and Tempo	custom scales tempo/duration tool
Stereo Effects with Displacement Maps	(Tutorial 7)	
Process the red and green channels separately to create rich stereo effects	Mono Preset to Stereo	mono/stereo toggle
	Applying Displacement to Individual Channels	channel edit modes choose & apply displacement maps

Index

D

E

F

G

H

I

L

M

N

O

P

Q

R

S

T

U

V

W

X

Z