Video Toaster Manual

VIDEO TOASTER

NEWTEK

T.M.

NewTek
INCORPORATED

Corporate Acknowledgments

NewTek wishes to express its appreciation to the following organizations for their participation in the release of System 2.0 of the Video Toaster software.

Kara Computer Graphics provided two Color ToasterFonts for system 2.0. These fonts are examples for the quality of Color Toasterfonts produced by Kara Computer Graphics. Kara Computer Graphics offers a variety of Color ToasterFonts packages for sale. For more information contact Kara Computer Graphics at the number/address listed below.

- ChromaBronze.65
- ChromaMirror.65

Kara Computer Graphics
2554 Lincoln Boulevard, Suite 1010
Marina Del Rey, CA
90291
Phone   310/578-9177

ViewPoint, Inc., provided twelve 3D objects in the 3D Objects directory. For additional objects, contact ViewPoint, Inc., at the number/address listed below.

- 1976 Chevy Camaro
- Beethoven
- Bell Ranger Helicopter
- Cow
- MackTruck
- Foot Bones
- Honda ATC
- Low-top (Tennis Shoe)
- P-51 Mustang airplane
- Porsche 911SC
- Galleon
- Triceratops

ViewPoint, Inc.
140 South Mountainway #1
Orem, Utah
84058
Phone   800/748-4170
Phone   801/224-2222
FAX   801/224-2272

Virtual Image Labs provided a 3D object in the 3D Objects directory. For additional objects, contact Virtual Image Labs at the number/address listed below.

- DC-10

Virtual Image Labs, Inc.
4925 Edgewood Road
College Park, MD
20740
Phone   301/220-0072
FAX   301/220-0081

Individual Acknowledgments

NewTek wishes to express its appreciation to the following individuals for their participation in the release of System 2.0 of the Video Toaster software.

Tim Doherty provided 3D objects in the 3D Objects directory. For additional objects, contact TKD Animation, at the number/address listed below.

- Workstation
- Keyboard
- Mouse
- MousePad
- RGB Monitor
- NTSC Monitor

TKD Animation
P.O. Box 242
La Mesa, CA 91944
Phone   619/589-6540

Larry Mitchell provided a 3D font in the 3D Objects Fonts directory. For additional objects, contact Larry Mitchell and Associates, at the number/address listed below.

- Chancery Font

Larry Mitchell and Associates
1764D Americana Boulevard
Orlando, FL
32839
Phone   407/856-2946
FAX   407/381-2946

Richard Payne provided a 3D object in the 3D Objects directory. For additional objects, contact Richard Payne Computer Graphics, at the number/address listed below.

- Camcorder

Richard Payne Computer Graphics
1965 Ascot Drive #7
Moraga, CA 94556
Phone   510/631-7898

Ron Thornton
Visual Effects Designer Ron Thornton (whose credits range from the *Dr. Who* television show to the films *Terminator 2* and *The Addams Family*) has provided two complete animation scenes for the Video Toaster System 2.0: FightersApproach and SpaceshipAttack. If your Video Toaster is equipped with more than 5 megabytes of memory, you should be able to view both scenes. If not, you may only be able to view the second scene, which uses less memory.

Note that both scenes were created on a very large scale. If after you load them into LightWave you enter the Layout screen to preview the scene, you will notice that your point of view seems very far away. Check the Grid Size using the button of the same name. If necessary, reset its value to 10 or even 1. This will place you closer to the action, rather than outside of it.

FightersApproach is an animation that includes seven space ships, a planet, stars, and several texture maps. It is an excellent example of texture mapping, motion paths, and hierarchical motion. If you wish to render only one image from this animation, set the First Frame value to 130 and render that frame for the greatest effect. If you render the entire animation, note that the first frames are quite dark. This is by design, as the action and illumination intensify over the course of the animation.

SpaceFighters is a smaller scene that includes two space ships.

What's New For System 2.0?

The number of improvements, enhancements, and features in System 2.0 will stagger you. System 2.0 brings so many new features to the original hardware that NewTek refers to it as a "hardware upgrade on disk." Over a year in development, System 2.0 is an amazing 30 megabytes in size, making it one of the largest software products ever created.

If you're new to the Video Toaster, you may skip this section and start with the Read Me First section that follows. You'll find out just where to go from there.

If you're an "old hand" with the Video Toaster, take a moment to read about the features added to System 2.0. Then turn to the Appendix titled "Installing System 2.0" in the appendix section.

Switcher

New Effects Grids
An entirely new Project containing more than two new banks full of effects. The new Switcher also features a total of 6 effects banks.

OrganicFX
Organic effects that emulate natural movement such as fire, water, pouring liquid, breaking glass, and smoke.

WarpFX
Video wrapped around cubes, spheres, and other shapes as it flies on and off the screen.

ActionFX
Totally unique and eye-catching sports effects with real-world movement, from basketball to football, and even golf.

KikiFX
Another Toaster first, you'll have to see these to believe them. Effects starring the 'queen of desktop video' herself.

Positionable Effects
Special effects that allow you to position a key location at one point. In combination with partial-screen fades you can dissolve video sources in and out at the location of your choice.

Fade Partial Transitions
Now you can fade in (or out) partially completed effects. Set up a split-screen and dissolve one half of the image in and out.

Compressed File Size
Save more images on your hard drive because the Toaster compresses files wherever possible.

Faster Frame Store Loading
Images now load faster from your hard drive.

Field and Frame Processing
Remove motion from framegrabbed images with field- or frame-based image processing.

Field and Frame Save
Save 4-field, 2-field, or single-field images for full resolution and rock-steady framegrabs.

Memory Savers
Deactivate any of the Toaster's applications from the Switcher to devote more memory to your operations.

Extreme Overscan Handling
Improved handling of effect and image edges in extreme overscan areas.

Better Hue and Luminance Matching
Better matching of hue and luminance between digital and analog video.

Instant Auto
Double-click any effect to execute it immediately.

S-Curve Fade
New, more natural S-Curve dissolves for a clean, professional look.

Other...
Improved menu requesters, faster response, better memory handling.

Overlay Genlock Control
New Genlock Utility allows you to control video takes and dissolves, including computer graphics dissolves from outside the Switcher.

CG

Render Text Directly to Framestores
Render CG-quality text directly over 24-bit images, and save the results as a Framestore.

Faster Page Rendering.
ToasterCG now renders pages nearly twice as fast as before.

Page Buffering for Faster Loading.
Pre-render pages to the Framestore directory for fast loading (retaining clean linear keys and semi-transparent shadows as well).

Shadow and Border for Scroll and Crawl Pages.
Text Scroll and Crawl pages can now have outlines and shadows.

Over 100 Text Styles
34 separate font families in several sizes. More styles for more uses than ever before. Great new color Toasterfonts.

Load Text Files
Load ASCII text files directly into a CG page while maintaining existing formatting.

New Scroll Page Speed
New, slower speed setting for 5 total scroll speeds.

Fast Scrolling Font List
Scroll through available fonts more quickly and efficiently.

LightWave 3D Renderer

Over 150 changes to this popular 3D pacakge.

Ray Tracing!
Ray trace reflections, refraction and shadows on an object-by-object basis. Now the legendary speed of LightWave with the power of ray tracing. Add sparkling clarity and realism to your 3D images and animations.

Sample Surfaces
Includes sample image maps, texture maps, and bump maps for you to use and study.

Ultra-high Resolution
Render images for film or print in 3008 x 1920 resolution.

Improved Rendering Speed
Internal optimizations have increased the speed of rendering dramatically.

Automatic Sizing of Image Maps
How do you make 3D image-mapping simpler? Autosize will automatically determine the optimum size for your projection mapped images, meaning no trial-and-error delays.

Multiple Object Morphing
Metamorphosize through 16 different shapes.

Separate Surface Files
Surface descriptions can now be saved as distinct files that you can apply to any surface as easily as loading a file.

Now Loads FrameStore Images
LightWave can now load Video Toaster Framestores.

New Rendering Order
If you've seen LightWave render before, you're in for a surprise. LightWave now renders objects before it renders the background. This saves valuable rendering time.

Load New Object Formats
LightWave can now load Wavefront, Swivel 3D, AutoCAD DXF, and Sculpt object files.

Spline Controls
Advanced animation controls that let you fine-tune object motion for realistic 3D motions such as acceleration and deceleration.

Save All Objects
Save all objects with the click of a button. Extremely useful when designing complex scenes.

Key Foreground Images
Luminance key foreground images over the rendered scene with adjustable clip levels.

Non-Linear Fog
Render more realistic fog with this new option.

New Texture Maps
Underwater Ripples and Dots.

New Bump Maps
Planar, Cylindrical, and Spherical Bump Mapping with adjustable amplitude for subtle or steep bump mapping.

Keyboard Shortcuts
Keyboard commands for the most common options have been added to the Layout screen.

Clear Objects, Images, or Light Sources Individually
Now you can remove any single item without affecting others. An invaluable time-saver.

Higher Point/Polygon Capacity
LightWave can now accept up to 65000 points/polygons for complex scenes. Twice its original capacity!

Antialiased Image Mapping
Softens unwanted patterning on TV monitors when using texture maps.

Pixel Blending
Blend pixels to lessen the mosaic appearance when image maps are near the camera.

Double-Sided Toggle
Correct improperly-facing polygons from other modeling programs by rendering all as double-sided.

Surface and Texture Examples
Samples for every kind of surface and texture LightWave offers.

LightWave 3D Modeler

New Modify Tools
Magnet, Shear, Twist, Taper, and Bend.

New Multiply Tools
Skin and Morph.

New Polygon Tools
Add/Remove Points, Split, Merge, Triple, and Align Polygons.

New Objects
From a complete locomotive to a ship, all the way to a cow and a rhino, these new objects will blow you away.

Perspective Selection
Select points and polygons from the 3D perspective view.

Polygon Move
Now you can move polygons without having to select points.

Improved Menu Requesters
New Parent button allows you to move through object directories quickly and easily.

New Preview Mode
Solid allows you to see objects with hidden line removal for more accurate object portrayal.

ToasterPaint

Improved Auto-scrolling
Smoother auto-scrolling for greater control over mouse and screen movement.

Share Images
Share Images as backgrounds with CG

Framebuffer Grab
Grab 4-field, 2-field, or single-field images from the framebuffers.

ChromaF/X

Color Cycling
Loop Cycle or Bounce Cycle ChromaF/X. Colors cycle even during Switcher wipes.

Over 50 New Default Effects
Sepia-Tone, Line-Art, Infra-Red, Ocean Filter, Charcoal, Fire, Gold, and more.

Transition Color Effects from Switcher
Attach preselected ChromaF/X to special icons on the Switcher.

Combine Switcher and ChromaFX
Now wipe on color effects or use them with OrganicFX to 'pour in' color.

Faster Rendering
Render color effects with greater speed.

Process Still Images
Now you can perform ChromaF/X effects on still images in framebuffer DV2.

Completely New Manual

New Tutorials

New tutorials, based on user requests, with integrated lessons that span several applications.

Comprehensive Index

A thorough index cross-referenced to every section of the manual.

More Illustrations

More graphics for better understanding.

Entry-Level Background Courses

Computer 101, Video 101, and 3D 101 will give novices the background they need to tackle new areas.

Tips and Tricks

Tips and Tricks sections for greater insight into the Video Toaster.
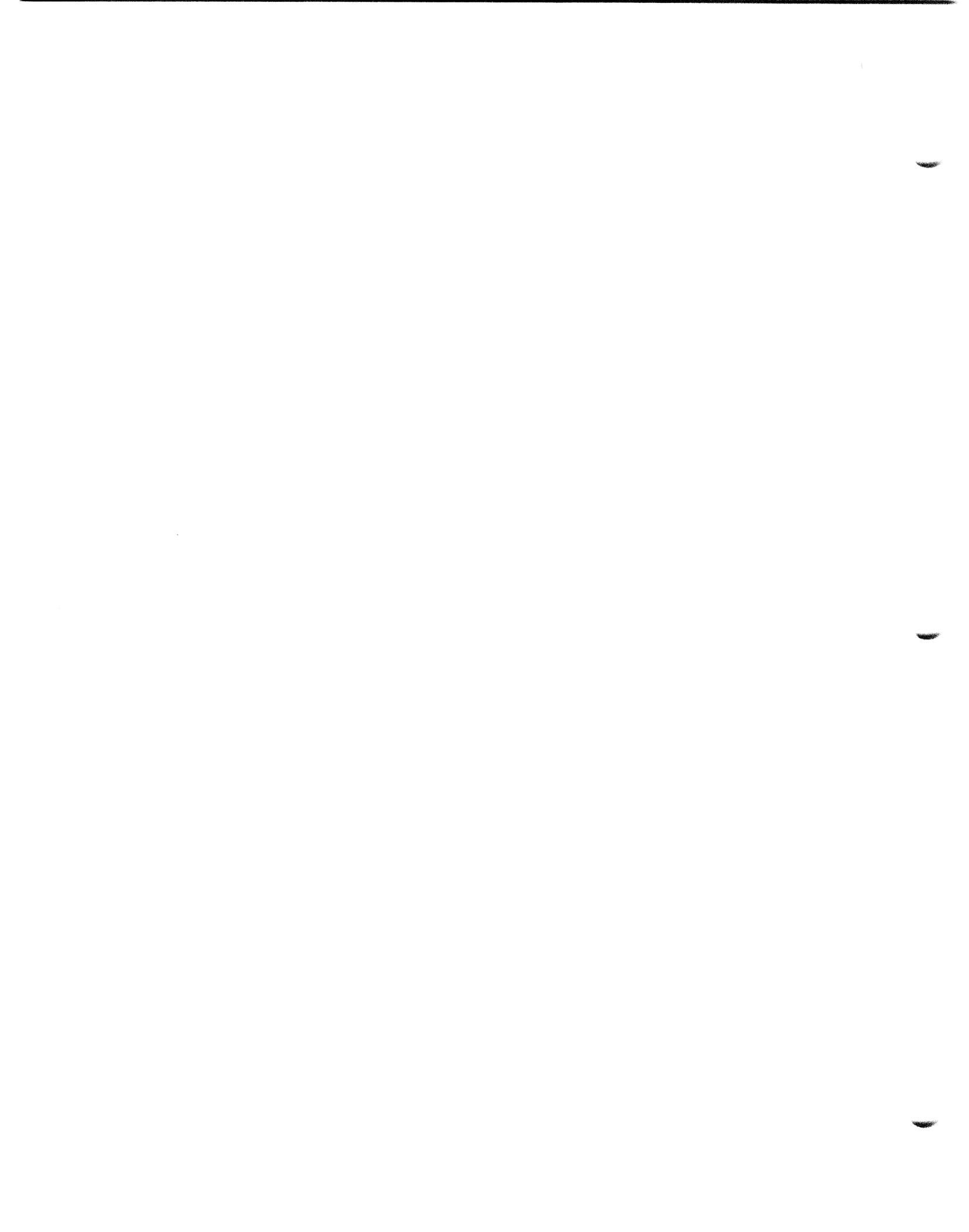
Video Toaster™
System 2.0 Software & Manual

Warning: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Part 15 of the FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer when this computer is operated in a residential environment. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

Instructions to User: This equipment has been tested and found to comply with the limits for Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antennae.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Consult the dealer or an experienced radio-TV technician for help.

Note: Changes or modifications not expressly approved by the party responsible for compliance could void the user's right to operate this equipment.

Peripherals used in conjunction with this equipment must be connected via shielded interface cables. Use of unshielded interface cables may result in interference to radio and TV reception, and may void the user's right to operate this equipment.

Documentation Team for System 2.0

Writer/Editor
James M. Hebert

Tutorials
Written by Lee Stranahan
Edited by Kathy Stranahan

Design & Layout
Mark Porter & Mark Schraad

Read Me First

Using this Book

This manual contains the information you'll need to create professional, broadcast-quality video with the Video Toaster™. There are separate manuals for each of the Video Toaster's applications, so you can turn directly to the section that interests you most. You'll also find tutorial and reference sections, a glossary of terms you should know, and an extensive index.

What You Need to Know

The Toaster™ is the world's first computer designed for video production. As such, the Toaster borrows some terms and ideas from both the television and computer worlds, so if you're not passingly familiar with either one, then turn to the Appendices at the back of this manual. There you'll find the introductory sections, "Video 101" and "Computer 101." These non-technical introductions will provide you with the information you need to more fully understand the Video Toaster and its powerful functions. By all means turn to them if you enter unfamiliar territory in the main manual.

Where to Find What You Want

This Table of Contents has been separated into several sections to speed your search for information. At the beginning of the manual, there is a general Table of Contents. At the beginning of every section marked by a tab, there is a much more specific Table of Contents. At the end of every section, there is a list of keyboard shortcuts.

Section 1 – Introduction
Introduction, Table of Contents, Unpacking, How to Reach Us, Technical Support, How to use the Manual, Toaster Conventions, Toaster Terminology.

Section 2 – Tutorials
In-depth tutorials will take you from setup, to simple one-application operations, to advanced multi-application procedures.

Section 3 – The Switcher
This is the heart of the Video Toaster, featuring a dizzying array of digital effects, two framebuffers, a luminance keyer, and more. You can access all sections of the Toaster from the Switcher.

Section 4 – ChromaF/X
ChromaF/X is a unique color processing engine for special color effects such as negative video, line art video, solarized video, pastel video, and more.

Section 5 – ToasterPaint
A true 24-bit paint program that lets you touch up, combine, and re-color any image the Toaster can capture and display. Even if you're not an artist, you'll find you can create seamless composite artwork easily.

Section 6 – ToasterCG
The Toaster Character Generator features linear keys, transparent shadows, adjustable outlining, textfile loading, and smooth scrolls, all in 16.8 million colors.

Section 7 – Lightwave 3D (Modeler and Renderer)
Lightwave is the Video Toaster's modeling and rendering system for creating professional stills or animations with stunning realism.

Section 8 – Appendices, Glossary
Additional information about Installing a Video Toaster Card, Video 101, Computer 101, 3D 101, Expanding the Toaster, and more. All those video, computer, and Toaster terms that may be new to you.

Section 9 – Index
A comprehensive listing, cross-indexed to span all Toaster applications.

Keyboard equivalents within the Video Toaster Manual are noted by a small triangle symbol (▲) followed by the keyboard button to press. Here's an example: ▲ Alt-f.

Introduction

The Video Toaster™ is the world's foremost video computer. The Toaster provides an array of features that have traditionally been available to broadcasters at a cost of many thousands of dollars. With the Video Toaster, you can perform real-time digital video effects, broadcast-quality titling, crystal-clear freeze frames, luminance-based color processing, and stunning 3D graphics.

The heart of the Video Toaster is its custom chip design. Because of its computer heritage the Video Toaster's future is boundless, with even more advanced capabilities yet to come. Most of the interface is mouse-driven, so you don't really need to know how computers work to use the Video Toaster. All you really need to learn is how to point and click with a mouse, which you'll pick up in the first few minutes.

The original Video Toaster, now known as the Video Toaster Card, took a personal computer and turned it into the heart of a desktop broadcast studio. Now the Video Toaster Workstation provides this capability in one integrated device, right out of the box, and even offers optional compatibility with Macintosh and PC computers.

About This Manual
The ambition of the Video Toaster Manual is to be both instructional and informational— without getting technical. Often, in order to understand a function, you only need to understand the concept behind its operation, and not the elaborate inner workings that go into making that function occur. You need to understand what synchronization means, for example, not how a sync generator works.

Each section of the Toaster manual begins with its own, more detailed Table of Contents, followed by a handy Screen Guide, then the Reference Section. In the back of each section, where you can turn to it immediately, is a list of Keyboard Shortcuts.

In the next few pages you'll find step-by-step tutorials that cover the Toaster thoroughly, from program to program. These have been designed based on real applications, the kinds of purposes Toaster owners are undertaking. You'll find they introduce you to the Toaster efficiently and expertly. With a little time and effort, you'll be creating graphics you've only dreamed of.

How To Use This Manual

The Video Toaster Manual consists of several smaller manuals, one for each of the Toaster's functions. The good news is: you do *not* need to read the entire Toaster manual to master any specific part. If you prefer, you can turn directly to the section that interests you most.

This section contains an overall Table of Contents, with general headings for the manuals that follow. Each section begins with its own, more detailed Table of Contents, followed by a handy Screen Guide, then the Reference Section. In the back of each section, where you can turn to it immediately, is a list of Keyboard Shortcuts.

How to use the Tutorials
The tutorials will provide with you an operating knowledge of the Video Toaster. The first tutorial instructs you on how to set up the Video Toaster. Instructions are numbered in steps, indicating each action for you to take. Additional material between steps is general background information that explains the procedure in greater detail.

Unpacking

If You've Purchased the Video Toaster Card
You'll need to install the Video Toaster Card and Video Toaster software inside your computer. Make sure you received the items listed below, then turn to the Appendix labelled "Installing the Video Toaster Hardware" before continuing.

The Video Toaster Card packaging contains the following items:

- One Video Toaster™ board (consisting of 3 interconnected PC boards)
- "Revolution," the Video Toaster demonstration tape (VHS)
- A set of 3.5" Floppy Diskettes containing the Video Toaster software
- One Video Toaster Users Manual
- Program, Preview, Interface, and Toaster Input/Output Stickers
- Three BNC-to-RCA adaptors
- One Video Toaster Registration Card. Fill out and mail in the warranty card immediately

If You've Purchased the Video Toaster Workstation
Your Video Toaster System software is already installed and the hardware is ready for use right out of the box. Make sure you received the items listed below before continuing.

The Video Toaster Workstation contains the following items:

- One Video Toaster™ Workstation
- "Revolution," the Video Toaster demonstration tape (VHS)
- One Video Toaster Users Manual
- Program, Preview, Interface, and Toaster Input/Output Stickers
- One RGB Terminator Plug
- Three BNC-to-RCA adaptors
- One Video Toaster Registration Card. Fill out and mail in the warranty card immediately.

If your packaging is missing any of these items, call NewTek.

How To Reach Us

Main Business Office (9:00am – 6:00pm Central Time)
To develop products for use with the Video Toaster, or to ask about other business, contact our main business office.

By Voice
In US & Canada:	1-800-847-6111
Outside US & Canada:	1-913-231-0100

By Fax
In US & Canada:	1-800-854-7111
Outside US & Canada:	1-913-231-0101

By Mail

> NewTek Incorporated
> 215 E. 8th Street
> Topeka, KS 66603

Technical Support:

- Double-check that the problem exists. Is it repeatable? Power down and try again.
- Check to see if the manual addresses the problem.
- Jot down some notes about the problem so you can explain it clearly.
- Call from a telephone near the system, in case the Support Specialist asks you to repeat your steps.
- Have the Toaster software running, and the manual nearby.
- Be prepared to provide your name, company, and/or serial number to the Support Specialist.
- Please have patience. Technical support wants to help everyone, and other customers may have questions that take time.

By Telephone (9:00am – 6:00pm Central Time)
In US & Canada:	1-800-527-3334
Outside US & Canada:	1-913-231-0150

By Fax (24 hours)
In US & Canada:	1-800-525-5311
Outside US & Canada:	1-800-231-0151

By Mail

> Video Toaster Technical Support
> NewTek Incorporated
> 215 E. 8th Street
> Topeka, KS 66603

Repair/Replacement Procedures
If a Support Specialist determines that a problem may exist in your Toaster, they may ask that you return it to NewTek for immediate repair or replacement. They will give you an RMA (Returned Materials Authorization) number, which informs the shipping department to expect your shipment and route it quickly to a technician. This number must appear in the first line of the address to NewTek, as follows: NewTek, Inc. RMA# 123456.

NewTek cannot ship a replacement unit until the defective unit has been returned. NewTek understands that you rely on your Toaster, so we'll make every effort to repair or replace your unit as soon as possible. Make certain you send only the items that the Support Specialist instructs you to return. These terms are subject to change without notice.

Toaster Conventions

Using the Keyboard

Even if you are new to operating a computer-based system like the Toaster, the keyboard is probably a familiar sight. You see it on typewriters, computers, and other devices in everyday use.

The Toaster keyboard is divided into two distinct portions – the *keyboard* and the *keypad* (sometimes called the *numeric keypad*). The main set of keys is the keyboard, while the smaller set off to the right is the keypad. You should be aware that certain functions are specific to certain keys only, and that a key on the keyboard will not have the same function as its twin on the keypad.

For example: While on the Switcher screen, the Return key (on the keyboard) and the Enter key (on the keypad) perform two very different functions. Pressing the wrong key at the wrong moment may lead to the Toaster performing the incorrect action. Make certain you are pressing the correct key.

Operating the Mouse
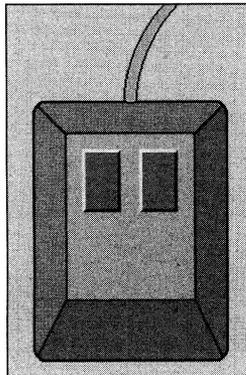
The mouse is the tool you use to move the onscreen pointer. As you move the mouse forward or backward, and left or right, the pointer moves correspondingly up, down, left, or right. Take some time now to get used to the feel of moving the mouse.

Buttons on the mouse allow you to activate or select the things you can point to. If you've never used a mouse before, it's going to feel clumsy at first, especially when you need to press the right or left button and your fingers aren't cooperating. The left mouse button and the right mouse button perform different activities. In the beginning stages, be sure you click the correct button. Mouse related functions include the following: clicking, double-clicking, dragging, shift-clicking, and pulling down a menu. These functions are explained below in Toaster Terminology.

Watching the Control Panel

The main monitor you use to view the Toaster's main screens is known as the control panel. Each of the Toaster's programs has a main screen made up of distinct parts: panels, buttons, windows, and menus.
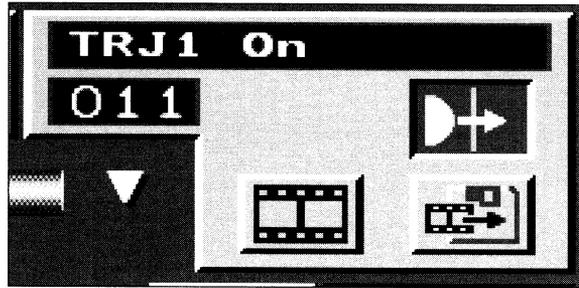
A **panel** looks like a raised surface that contains a number of buttons and windows.

A **button** actually looks like a button. When selected, or clicked on, it will appear depressed as if it were physically pushed in. Some buttons may be clicked once for one function, and twice for another function.

A **window** is a small gauge with numbers or text inside. Often, you can click in these and drag with the mouse to scroll through different settings or listings. In essence, you are looking through a window to read the entries within.
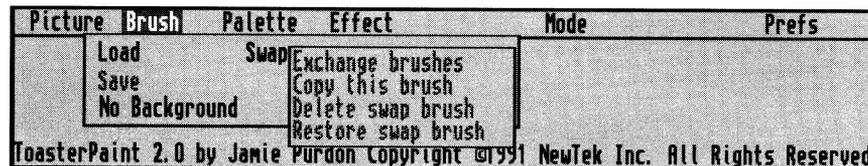
A **menu** is a list of choices, such as brush options in ToasterPaint, that you may select among.

Error Messages

Occasionally, depending on various conditions, the Video Toaster will be unable to perform a requested operation. In these cases, either the host computer or the Toaster will present you with an "error message" describing the problem. If you cannot determine a course of action to correct the problem, write down a note about what occurred (along with the message you received) and call Technical Support for assistance.

Screen Flashing

One of the first things you will notice about the Toaster is that the screens connected to it often flash during certain operations. Don't worry. This is entirely normal for the Video Toaster, and won't harm any of the equipment hooked up.

Toaster Terminology

Before you proceed, let's define a few terms used throughout this manual.

Click

Click means to press and then quickly release the left mouse button. Buttons and icons may change shape or color when clicked on in this manner. The word "select" may also be used for click (as in, "select the Load Frame button," which means for you to click on it). On occasion, you will click with the right mouse button; these instances will be clearly noted.

Double-click

Double-click means to press and then quickly release the left mouse button twice. In the Video Toaster, you double-click some buttons to activate their functions (as in, "double-click the Load Frame button to load a still frame").

Shift-click

Shift-click means to hold the shift key on the keyboard, then quickly press and release the left mouse button.

Drag (also Dragging)

Dragging is holding down the left mouse button and moving the mouse.

Pull Down a Menu

To pull down a menu in ToasterPaint, hold down the right mouse button and move the mouse to the menus that appear. Menu options that you can select will appear to "drop down" the pointer passes over them.

Return and Enter

These two keys are used for two distinct functions in the Video Toaster. Be aware that they will not perform the same actions. Generally, you use Return after typing text in order to restore the mouse pointer, while you use Enter to activate a function (as in, saving a Frame).

Select

A single click on an on screen button. This will highlight it, thus selecting it.

Video Toaster
Tutorials

Table of Contents

Tutorial 1 Switcher Installation & Startup

Getting Started

Setting up the Video Toaster involves a few simple steps. You should have clear space on your desk or table, several outlets (or a power strip), and ideally a video input source (a live camera, time-base corrected videotape, or laserdisc player). Also, you should have unpacked and checked that all the items you need are present.

1 Unwrap the power cord. Plug one end of the Toaster's power cord into the back of the Toaster. Plug the other end into a standard electrical outlet or power strip.

2 Unwrap the keyboard. Plug the keyboard connector into the round jack on the lower right on the front of the system.

3 Unwrap the mouse. Plug the mouse connector into the jack that is nearest the keyboard connector. This is the middle of the three jacks there.

The recommended setup for the Video Toaster is three monitors. The reason for this is a practical one: you need at least two screens to see the Interface and the Toaster's outgoing video signal. The Switcher, ChromaF/X, and ToasterCG programs all make extensive use of the Preview screen, and it is impractical to constantly switch cables or inputs.

Any combination of TV and/or RGB/TV monitors will suffice, as long as they have video inputs. (RGB/TV monitors are able to accept both video or RGB signals as inputs.) This setup tutorial assumes you are using three TV monitors. While the Video Toaster can work with two monitors, the preferred setup is three: Interface displays the Toaster controls, Preview displays the next-in-line video source, and Program displays the outgoing signal from the Toaster.

(If you use a two-monitor setup, connect only the Program and Preview monitors, and use the "two-monitor" setting on the Toaster. This will display a mix of the Interface and Preview video source on the Preview monitor, allowing you to see all three monitors' worth of screens. You will also need to terminate the RGB connection if you do not have an RGB monitor in place. See the Appendix "Troubleshooting" for more information.)

4 Connect the Toaster's Preview output (sixth connector from the top) to the video input of the TV you will use as the Preview monitor.

5 Connect the Toaster's Program output (fifth connector from the top) to the video input of the TV you will use as the Program monitor.

6 Connect the computer's Mono Video connection (located on the back of the system, in the middle) to the video input of the TV you will use as the Interface monitor. (If you are using an RGB monitor, connect it to the RGB output in place of the TV connected to the Mono Video output.)

7   Turn on all three TV monitors.

8   Turn on the Video Toaster.

- If you purchased the the Video Toaster Workstation, the Toaster will automatically start up when you switch on the power.

- If you purchased and installed the Video Toaster Card, you had the option of (A) setting the Toaster to automatically start up, or (B) starting it manually after the computer has started up.

  (A) If you installed the Video Toaster Software to autostart, simply switch on the power, and proceed to the AutoMatte step.

  (B) If you installed the software to start the Workbench, you should see icons for RAM DISK and the hard disk.

8a   Double-click on the hard disk icon. This will open a window showing the available drawers on the drive. One of these will be the newly installed Toaster drawer.

8b   Double-click on the drawer labeled Toaster to open it.

8c   Double-click on the icon labeled Switcher in the Toaster drawer.

At this point the software will load from the hard disk and the Toaster will sync to the system. The screen will flash several times. A menu box will appear with instructions for you to follow.
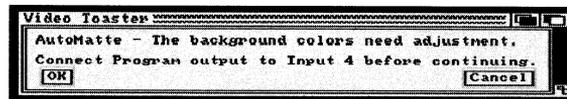
AutoMatte
AutoMatte adjusts the Video Toaster's matte generator so that the matte colors are correct. The matte colors are those that can be used for the BKG video source on the Switcher. This is a one-time adjustment. (If you do not wish to perform it now, click Cancel. If you do Cancel, you should know that AutoMatte will continue to pop up when you start the Toaster, until you perform the procedure.)

Input 1
Input2
Input 3
Input 4
Program Out
Preview Out
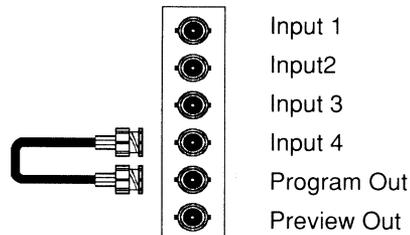
9   Connect the Program Output to Input 4.

10 Click OK.

The screen will flash again. A second menu box will appear with instructions for you to follow:

```
Video Toaster
AutoHue - Connect Input 1 to a video source and
connect Program output to Input 4 before continuing.
[OK]                                          [Cancel]
```
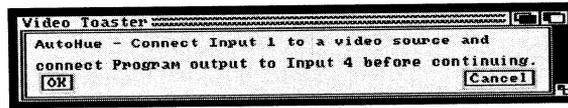
AutoHue
AutoHue adjusts the Video Toaster's internal video signal to match the incoming video signal. This is also a one-time adjustment. (If you do not wish to perform it now, click Cancel. If you do Cancel, AutoHue will remain silent during subsequent startups as long as there is no video input connected to Input 1. When you do have video connected at a later date, AutoHue will return upon startup to ask if you wish to run the procedure at that time.)

Input 1
Input2
Input 3
Input 4
Program Out
Preview Out
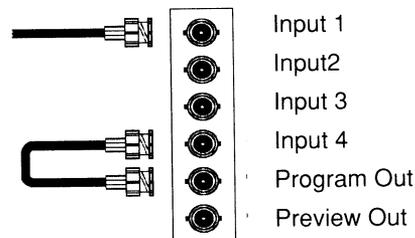
11 Connect the Program Output to Input 4.

12 Connect a video source to Input 1. This must be a live camera, time-base corrected videotape, or sync generator.

13 Click OK.

AutoHue and AutoMatte save the data they receive in a special file on the hard drive of the system. They use this data for all subsequent startups, and will continue to do so unless you rerun the AutoHue procedure. If for any reason you reinstall the Toaster software onto the hard drive, you will need to rerun both procedures to calibrate your Toaster. When the AutoHue procedure is finished, you will see the following Message:

```
Video Toaster
AutoHue completed. Please re-configure
Toaster Inputs/Outputs before continuing.
                                          [OK]
```
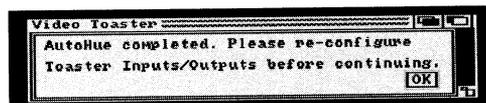
14 Re-configure the inputs and outputs for your studio hookup.

15 Click OK.

Do not be alarmed if you see distorted video and flashing lines. This is perfectly normal while the Toaster initializes itself. This process can take from 60-90 seconds the first time that you run the Toaster, so be patient. When the

software has finished loading, you will see the Video Toaster logo on the Program monitor and Color Bars on the Preview monitor.

If the Startup Procedure Fails
If you should receive the error message "Video Toaster not responding," don't worry. It's not uncommon for a fully functional Toaster to present this message occasionally. It occurs when the Toaster has difficulty while syncing up. There are number of possible explanations for this, most of them you can check for.

First, if you get this message, reset the system by turning the power off for approximately 30 seconds. Then turn the power back on. Try starting the Toaster with no video sources connected to the inputs.

Note: Never reset the system while the hard drive or floppy drive "active" light is on! Doing so may cause damage to the drive.

If the Toaster continues to be stubborn, turn to the Appendix entitled "Troubleshooting." There are only a few circumstances that can cause the Toaster not to start. However, there are quite a few external reasons that may actually be the culprit. Fortunately, they're in your power to correct quickly and easily.

16 At this point your Toaster should finish flashing and some screens ought to appear. On the Preview monitor you'll see color bars. On the Program monitor you'll see the Video Toaster logo. Finally, on the interface you'll see the Toaster Switcher Screen.

Follow these steps to ensure that all is functioning properly. Don't worry about making sense out of all three TV monitors and every single on screen button right away. You'll quickly learn where to look, what to press, and what it all means in the Tutorial and Reference sections.

A Quick Tour of the Toaster Screens

There are a lot of buttons here, and the temptation to start pushing them is immense. However, before you do, take a moment to orient yourself to the Toaster with this short screen tour. Its purpose is just to show you around a bit, so that you won't be confused if you go to one of these screens accidentally.

17 In the middle of the screen, on the left side, you'll see a row of five buttons. From left to right, they look like a disk with a question mark (Toaster Preferences), a prism (ChromaF/X), a paint brush (ToasterPaint), the letters CG (ToasterCG), and the letters 3D (LightWave 3D). Click on the Toaster Preferences button (the disk with the question mark).

The screen changes to a new one. This is Toaster Preferences, where you can make selections pertaining to special effects, the video hookup you use, and the files you choose to work with.

18 In the bottom right corner there is a button marked OK. Click on OK.

19 You have returned to the Switcher screen. Now click on the ChromaF/X button (the prism). If the button appears dim you'll need to pause a moment until the button turns solid. Once it is solid, click on it again.

20 You have entered ChromaF/X. ChromaF/X produces special color effects that you can use from the Switcher.

21 In the bottom right corner there is a button marked Switcher. Click on it now.

22 You have returned to the Switcher screen. Now hold down the Shift key (on the keyboard) and click on the solid ChromaF/X button. Notice how it returns to a dim state. This unloads the application from the system and leaves more memory for other applications. It's a good idea to shut down applications if you have no further plans for them during a work session.

23 Click on the ToasterPaint button (the paint brush). Again, If the button appears dim you'll need to pause a moment until it turns solid. Once solid, click on it again.

24 You've entered ToasterPaint. Looks a little different from the other screens, doesn't it? Your pointer is now the white dot on screen. To exit ToasterPaint back to the Switcher, hold down the right mouse button. The control panel becomes a menu. Move to the menu labeled "Picture," then move to the item "Quit." With Quit highlighted, let go of the mouse button.

You have returned to the Switcher screen. Notice the ToasterPaint button is already dimmed. Some Toaster applications have two "quit" options: one that keeps the application available, and one that unloads it at the same time. You've just used the second method for leaving ToasterPaint.

Step 26   Now click on the ToasterCG button (CG). (Reminder, If the button appears dim you'll need to pause a moment until it turns solid. Once solid, click on it again.)

Step 27   This is the Toaster character generator. There may or may not be text already on screen, depending whether the software was shipped with a premade CG Book. The CG does not use the mouse, so to return to the Switcher hold down the Shift key and press the Escape key (the "quit and unload" option for CG).

28 Once again you're back at the Switcher. You can probably tell by now that the Switcher is the main station, through which you access the other applications.

29 On to 3D. Click the 3D button. (If it's dim, you'll need to click it twice, remember.)

30 This is the main LightWave 3D screen, called Renderer. There are two other screens that you can go to from here, Modeler and Layout. Click on Layout now.

31 In the Layout screen you'll manipulate and place objects for 3D scenes and animations. Down in the lower left corner, click on the Exit Layout button.

32 Back at the Renderer screen, click on the Modeler button. Notice that it too is dimmed, like the application buttons in the Switcher. (Like those buttons, you can hold the Shift key and click on it to unload it from memory.) Click it a second time to enter the Modeler.

33 This is the application where you create or edit 3D objects. In the top left corner, click on the button that says Disk.

34 On the left side there is a button named Exit. Click it to return to Renderer.

35 In the lower left corner, click on Switcher. If you wish, use the Shift key and click on the 3D button to shut down LightWave 3D.

That's it! You've seen each of the interface screens that make up the Video Toaster. At this point you're a little more familiar with the Toaster, what it looks like, and how to get around. If you wish to poke around it bit, go ahead. If you prefer to get right into the Tutorials, make sure you've got some uninterrupted time, and turn to Tutorial #2.

Tutorial 2 Switcher
Using Toaster Preferences

What You'll Learn:

- Entering and exiting Toaster Preferences (Steps 1 and 2)

- Selecting BKG and Border Colors (Step 3)

- The Frame Store Directory (Step 4)

- Loading and saving Projects (Steps 5 and 6)

This tutorial should take about 20 minutes.

Toaster Preferences allows you to do many things. You can specify certain system settings, load and save Projects, load CG Books, and exit the Toaster to the computer's operating system.

1 To enter Toaster Preferences, you can do one of two things: click on the button with the question mark on the diskette (on the middle-left of the Switcher screen), or press the F10 button. Enter Toaster Preferences.

2 To exit back out to the Switcher, you can either press F10 again, or press the OK button on the bottom right of the Toaster Preferences screen. Exit back out to the Switcher. Practice entering and exiting Toaster Preferences, using the different methods described above.

Background and Border Color Controls

The Background and Border Color rows allow you to select both the color used for the BKG button on the busses, and the color for bordered wipe effects in the Switcher (for more details about such effects, refer to the Switcher Reference manual).

3 To select background or border colors, click on the respective box (the top row is the Background Color row; the next lower is the Border Color row). Choose a background color, and exit out to the Switcher. Click on BKG in the Preview bus, and execute an effect. Execute the effect again. Pretty neat, eh?

The Frame Store Directory

The Frame Store Directory is where you put any frames you'd like to store. There are several options as to where you can store these frames: DF0:, which is a floppy drive; and RAM:, which is a virtual disk drive, created from the computer's memory. Anything else that's in the Frame Store Directory is some kind of a hard drive.

4 Go back to the Toaster Preferences screen. In the middle-right of the screen is the Frame Store Directory. Try clicking on the various buttons. Notice the number next to the FREE message. These numbers refer to the number of framestores that partition can hold.

Loading and Saving Projects

The Project Control Panel directs Project operations. Among these operations are Loading and Saving, Renaming and Deleting Projects; Loading CG Books; and selection of storage devices for Projects. For detail not covered here, refer to the Switcher Reference manual.

5 The Project control panel allows you to load and save Projects, which are files that contain information about the current Toaster operations. (There are additional functions it can perform, which you do not need to concern yourself with at the moment.) Place the mouse pointer over the three-digit number window, click and drag up and down. You'll see different Projects scroll by. At this time, you can also use the + and − keys on numeric keypad to go through this list, or type a three-digit number in directly.

6   The button immediately beneath the three-digit window is the Load Project button. It looks like an arrow pointing at a disk. Use one of the methods described in Step 5 for displaying the different Project names, and locate the 003 Tutorials Project. Now double-click the Load Project button (you could also press Enter on the keypad).

There. You've just loaded the Tutorials Project, which you will be using for the graphics portion of these tutorials.

To save a Project, use the button immediately to the right of the Load Project button. It looks like an arrow pointing away from a disk. A shortcut for locating a blank number (an unused Project), press the period key on the numeric keypad. Notice the window next to the three-digit number window has a cursor in it. Type in a name for this Project, and press Return when done. Now double-click the Save Project button to save it (you could also press Enter on the keypad).

That's it for this tutorial. Just an introduction to the Preferences screen and its functions. If you want specifics about the buttons and their functions for this screen, see the Reference Manual for Switcher.

Tutorial 3 Switcher
Basic Switcher Effects

What you'll learn:

- Choosing and executing effects (steps 1-13)

- Program and Preview Busses (Steps 14-16)

- Using the Freeze button

- The Keypad Control Panel (Step 17)

- Selecting effects with the Select Effects button (Steps 18-20)

- Loading Framestores (Steps 21-22)

- Saving Framestores (Step 23-24)

This tutorial will require about 40 minutes.

Switcher Effects

When you first enter the Toaster, the Video Toaster logo will be on the Program Monitor, SMPTE color bars on the Preview monitor, and the Switcher control panel on the Interface monitor.

1 On the top of the interface screen are the Switcher effects. With the left mouse button, click an the effect on the top row.

2 Press the Spacebar. You've just completed your first effect.

3 On screen, click the Auto button. This is the mouse method for triggering an effect. The Spacebar is the keyboard shortcut for doing the same thing.

4 There's even another shortcut. Click a second time on the currently selected effect (it appears depressed on the effect bank above). Try it now. Pretty easy.

5 In order to trigger a new effect with this method, you need to first select one, then click it a second time. Click twice on the falling sheep icon. You may need to pause a moment before the second click (some of the more complex effects

take a moment to load before they can be used). Try experimenting a bit with this method on other effects.

6 On the bottom right of the control panel you'll see the speed buttons: S, M, and F. As you select different effects, notice which of these buttons is pressed. Choose different speeds and trigger effects a second or third time to see the difference.

7 There are also keyboard equivalents for the speed buttons: the comma (slow), the period (medium), and the slash (fast). Practice altering the speed of effects using these keys.

8 There is another method on the screen and keyboard for triggering effects. This is the manual method, and you activate it by placing the tip of the mouse pointer over the crosspiece of the T-bar and, holding down the left mouse button, pull the mouse toward yourself. This is called dragging with the mouse.

If you drag all the way to the bottom and let go the mouse, the effect will complete and the Switcher will reset itself. If you didn't, the effect will still be in mid-transition. The small triangular indicator beside the T-bar will flash during transitions, indicating this.

9 Depress the left mouse button and pull the T-bar completely down. Release the mouse, and the effect will complete. If you get confused at this point, you can always press the Spacebar to perform an Auto transition to complete the effect for you.

10 You can use a handy shortcut for dragging the T-bar no matter where your mouse is on screen by using the right mouse button. Try this now. Move the mouse anywhere on the screen, hold down the right mouse button, and drag downward.

11 Let's try something new. If you haven;t completed the last effect, do so now. Now use the right mouse button and transition the current effect only halfway. Stop and push the mouse upward, in the direction you came. In this manner, you can reverse the direction of certain effects. Choose other effects to see the effect of this.

12 There is one more way to transition between video sources. This is a straight cut, from one source to another. There is no speed setting for this effect. It is the most commonly used effect in television and film. and is known as the Take, or Cut. The keyboard uses the Return key to trigger a take. On screen, there is a button called Take as well.

There's one more thing you should know about Switcher effects. There are six banks full of effects, located under the effects buttons to the right center of the screen. Select one by clicking on the letter, A-F, with the mouse, or by pressing the shift key plus one of these letter on the keyboard.

13 With the left mouse button, choose the B bank. Try playing with these effects, the different speeds, and the different methods for triggering them. Change banks by pressing shift-c. Explore different effects. Don't worry if not all effect work as

you'd expect. There are some special effects that perform particular functions. You'll earn about some of them here, and others in the reference section.

A Quick Review

Let's review what we've gone over so far. There are three ways to execute an effect using the Auto function: press the Spacebar, click the Auto button, or double-click the effect icon. Manually control a transition using the mouse: drag the left mouse button on the T-bar itself, or drag the right mouse button anywhere on screen. Click on Take, or press Return, to trigger an instantaneous cut. Effects travel at three speeds (S, M, F): click on these buttons to select the speed, or use the three keyboard keys. Finally, there are six banks to choose from.

Using the Busses

So far we've been switching between the Program and Preview Busses. A bus is a row of buttons that contains seven video sources you can choose among. There is another Bus, called Overlay, which we won't use right away. It's used automatically by the Toaster for effects, so don't be surprised if you see buttons push in by themselves sometimes.

On each bus there are four video inputs, 1-4, the sources for which can be video cameras, laser disk players, playback VCRs, or any combination of these.

Note: You can use broadcast television or cable television feeds direct from your VCR. Connect the normal video out from the VCR to the Toaster. If the video is unstable, go to another channel. Networks and satellite feeds are the most stable. In this way, you can use a pretty neat video source to practice learning the Toaster, and study professional graphics along the way.

14 If you have anything hooked up to these inputs, click on them now. There are two ways to accomplish this: click on them with the mouse, or use the keyboard shortcut for those buttons.

Program Sources	Preview Sources
F1 = Input 1	1 = Input 1
F2 = Input 2	2 = Input 2
F3 = Input 3	3 = Input 3
F4 = Input 4	4 = Input 4
F5 = DV1	5 = DV1
F6 = DV2	6 = DV2
F7 = BKG	7 = BKG

15 Try switching between the sources you have using the keyboard. Use both the keyboard and mouse afterward. Mix different methods, and use the mouse and keyboard to trigger transitions as well. You'll find a number of comfortable ways to select sources and trigger effects.

The concept for moving between video sources is relatively simple, and it helps to see it happen. Choose the video that you want to see on the Program Bus, and that video source is displayed on the Program monitor. Choose the video you want next-in-line on the Preview Bus, and that video source is displayed on the Preview monitor. Transitions bring the Preview Source to the Program output in some manner (depending on the effect you use).

16 Do this now. Execute an effect and, as it's transitioning, watch the sources switch on the Interface screen.

There are also two digital framebuffers, DV1 and DV2, which can hold still images such as ToasterPaint pictures. Lastly, the BKG button is a solid color video source, useful for fading to black, or some other color that you can select (from another screen, called Toaster Preferences).

Freeze

This button allows you to framegrab images from video sources 1-4, whether they are live or pre-recorded. For greater detail on the Freeze button, refer to the Framgrabber tutorial.

The Keypad Control Panel

To the left of the T-bar you;ll see the Keypad control panel. This panel monitors activity between the effects banks, the CG, DV1 and DV2, and the Framestore (the storage location for still frames). Each of these functions has a button on the panel. These include Load CG Page, Select Effect, Load Frame, and Save Frame.

Note: the Load CG Page button may not be visible. It is only available when the CG itself has been activated, which you'll learn a little later on.

17 Take a look at the Keypad control panel. There should be three buttons there. Click once on the CG button in the middle of the screen. In a moment, it will turn solid, and the Load CG Page button will appear on the Keypad control panel. Here's a closer look at these buttons and their functions.

Load CG Page

18 There are two ways to activate the Load CG Page mode: click on the button itself, or press the left parenthesis key on the numeric keypad (on the right of the keyboard). Choose one of these methods and use it now. Notice that the text window now shows "Video Toaster," which is the first line of text on that CG Page. You can list other CG pages: either press the + or – keys on the keypad, drag the mouse pointer over the numeric window (next to the text window), or enter the two-digit number of a page (from 00-99) on the keypad. Flip through the CG pages using all three methods to get the feel of them.

To load a CG Page for display, you have two options: double-click on the Load CG Page button when the page you want is displayed in the Text window, or press Enter on the keypad. Note that this is not the same button as the Return key. For more information, refer to the CG tutorials.

Effects Selection

So far, you've learned several methods for selecting and executing special effects. Here are a few more.

19 To activate the Select Effects mode, either click on the Select Effects button on the screen, or press the right parenthesis key on the numeric keypad.

There are three ways to use the Keypad control panel to select effects. They are essentially exactly the same as those used to select CG Pages: drag the mouse over the numeric window (and double-click the Select Effects button), use the + or – keys on the numeric keypad (followed by Enter to select it), or type the two-digit number of the effect on the numeric keypad (followed by Enter to select it). Note that you can mix-and-match among these methods as well. Try selecting some effects now.

20 Try all three methods now. You may find one is more comfortable than the others. As you work with the Toaster, you'll develop habits with the methods you find most comfortable, or fastest.

Loading Framestores

The Load Frame button allows you to load still images from the Framestore directory.

21 To activate the Load Frame mode: click its button on the screen, or press the slash key on the numeric keypad. Try this now with either method. In fact, use the left and right parenthesis key and switch among these keys for practice.

22 There are three ways to use the Keypad control panel to load frames. They are essentially exactly the same as those used to select CG Pages and Select Effects: drag the mouse over the numeric window (and double-click the Load Frame button), use the + or − keys on the numeric keypad (followed by Enter to load it), or type the three-digit number of the effect on the numeric keypad (followed by Enter to load it). Note that you can mix-and-match among these methods as well. Try loading some frames now.

Notice which framebuffer the image loads into. Generally, frames load to the first available buffer that is not "on display" on the Program bus.

Saving Framestore Images

To save a frame that is in a framebuffer, use the Save Frame button.

23 To activate the Save Frame mode: click its button on the screen, or press the asterisk key on the numeric keypad. Try this now with either method. In fact, use the left and right parenthesis keys and slash key and switch among these keys for further practice.

24 Again, there are several methods for saving a frame. In fact, depending on other button combinations you can press at this time, this button can also Rename or Delete frames. (See the Switcher Reference for greater detail on these functions.) There is one quick and painless method for finding an available slot to save a frame into. Press the period key on the numeric keypad. This advances the framestore to the next available number slot in the numeric window and places the typing cursor in the text window. You can then type in a name, press Return, then press Enter to save the frame.

Tutorial 4 Switcher
Using the Framegrabber

What You'll Learn:

- Using the Freeze button (Steps 1 and 2)

- The DV1 and DV2 buttons (Steps 3 – 5)

- Motion removal (Steps 6 – 8)

This tutorial should take 5 minutes.

The Toaster's Framegrabber allows you to capture a frame from any video source you have connected to your Toaster. These images can have CG titles added to them, become the basis for a ToasterPaint graphic, or even be wrapped around objects in LightWave 3D.

1 Go to the main Switcher screen. Bring up a video source from any input on your program monitor.

2 Check the Freeze button to see if it is currently depressed. If it is, click on it to deselect it. The keyboard shortcut for this is the l key, for live video.

3 Click on either of the DV1 or DV2 buttons on the Preview bus (the keyboard shortcut is F5 or F6, respectively). Both of the DV1 and DV2 buttons will become selected. When both DV buttons are selected, whatever video is also selected is said to be 'in digital.'

4 To freeze the image that's on the monitor, either click on the Freeze button or hit the f key.

5 The Freeze button will become selected and either DV1 or DV2 will be highlighted on the Preview bus. Hit the Return key (to do a take) and you'll see the frozen image on your Program monitor.

6 If your image has any motion, you'll want to go to Motion Removal. To do this, go to Toaster Preferences, either by clicking on its button or hitting the F10 key.

7 Click on the Freeze button Frame Removal button (it looks like a TV screen with an arrow pointing to the number 2). Frame based motion removal gives the best quality, but sometimes (especially with poorly lit images) it doesn't remove all of the motion. If Frame doesn't give you the results you want, try Field.

8 When the motion is removed, save the frame by following the procedures outlined in the Switcher tutorials or Reference manual.

Hints for getting the best images:

- Although it's fairly obvious, remember that the better the quality of the camera you're using, the better your final framegrabs will look. If you don't own a high quality camera, you might want to borrow or rent one and then set aside a day to do your framegrabbing in bulk.

- As you also might guess, the less movement an image has, the better the final grab will look. Motion removal tends to degrade the image, and still images require no motion removal.

- If you are grabbing images from photographs or other printed material, having a good copy stand and proper lighting can make a big difference. For the best lighting results, turn off all room lighting, and use just one light source.

- If your TBC produces good looking field freezes, you can grab them and save them directly. This will avoid the Motion Removal process, although there is sometimes an unacceptable loss in quality.

Tutorial 5 Toaster Creating Graphics

Introduction

The Video Toaster is a powerful tool for creating video graphics – these tutorials will show you how to use those tools.

To understand the importance of graphics, you need only go as far as your television set. Graphics – text, images, and animation – are everywhere. They are particularly important when creating programming designed to convey information, such as a news program or training video. A graph, chart, picture or animation can often give viewers information better than a close up of the anchorperson alone.

Television is also a great teacher. If you want to create better graphics, sit down in front of the TV some night, turn down the volume, grab a remote control, and start really watching your television. Find out what you like, what you hate, and what makes the difference. Ask yourself, "Why use those colors, those elements, those fonts? Do they help to convey the message?"

The Toaster allows you to create professional looking, broadcast quality video graphics in your business or at home. In fact, Toaster generated images have already been seen by millions of people – from titles on weddings to special effects on network television.

The Toaster has four important tools for creating powerful images:

- The **Character Generator** (also known as the CG) lets you work with text. With the CG, you can create text that is superimposed over live video, scrolling text for credits, overlay text on other Toaster created images, and much more.

- The **Frame Grabber** lets you capture images from any video source you have connected to your Toaster. These high resolution, 16 million color images can then be stored on disk and recalled later for use in your productions.

- **ToasterPaint** lets you create and modify images using the Toaster's 16 million color palette. Since you can load frame-grabbed images into ToasterPaint, you create great looking graphics, even if you can't draw a straight line.

- **LightWave 3D** lets you create images and animations using three dimensional models stored inside of the computer. Using LightWave, anyone can create great looking, photorealistic graphics that rival those created on machines costing $100,000 or more.

Now that you know what the tools are, let's start learning how to use them.

About these Tutorials

In order to get the most out of these tutorials, there are a few things you should know.

First of all, these tutorials were meant to be done in the order they are presented here. There are a number of reasons for this, but the main one is that we don't want to be constantly explaining the same things over and over. If you want to skip around, that's fine. But, just like in the movies, if you walk in at the middle, don't be surprised if you don't understand everything that's happening.

That being said, if you spend a couple of hours a night on these tutorials, you should be through with them all in about two weeks. And it is much better to spend an hour or two every night on the Toaster than to try to cram everything in in one night. (Usually the night before a life-or-death project.) The Toaster is a fairly complex piece of equipment, and there are a number of different sections to it. Learning to use it is like that old riddle, though... how you do you eat an elephant? A bite at a time.

The best way to learn how to use the Toaster is to put in a few hours every day, at a time when you can concentrate and not have any distractions. Come into work a little earlier. Or stay a little later. Take the phone off the hook, and put a sign on the door. Eating a few meals with the Toaster isn't an uncommon practice for new Toaster owners. The key is that you need to be able to focus on the tutorials – there's nothing worse than reaching the end of a lesson and realizing that you have no idea what you've just learned.

To help you, each tutorial has a section called **What You'll Learn**, which also tells you at which step of the tutorial you'll learn it. When you've finished a tutorial, go back to this section and make sure you know what you're supposed to know. The back of this manual has reference sections for every part of the Toaster, so – if you need more information, you can find it there, as well.

We also tell you at the beginning of each tutorial how long it should take you. The time is there for you to plan your sessions accordingly – this isn't a race, so take all of the time that you need.

It couldn't hurt to go through the tutorials more than once. Many of the tutorials have sections called *Helpful Hints*, which contain information related to the tutorial, but not directly about it. If you are going to go through the tutorials twice, you might skip Hints the first time through.

When you're doing a tutorial, it's very important to do exactly what the tutorial says. This may sound easy, but it's actually very tempting sometimes to stop following directions, and just start exploring things. Exploration is good – but in its own time. Follow the manual exactly, finish it, and then play around all that you want to.

We mention all of this for one very good reason – we've had over a year's experience with people interacting with the Toaster. We've improved the manual based on that experience, but we also know that close to half of the calls to Technical Support would not occur if the person calling had read the manual. Almost 50%. And we know that being frustrated isn't your favorite pastime, either.

That's all for the introduction. Now let's learn how this thing works.

Part One – Still Graphics

When we use the term still graphics, we aren't being completely accurate. We're going to show you how to make CG (Character Generator) pages that scroll or crawl across your screen. And we'll also show you how to move images across your screen using the Switcher.

What this section really covers is graphics that are not animations. In other words, you can create all of the graphics in this section with the Toaster that's in front of you right now – without a single frame controller, without a frame-accurate VCR.

In this section you'll learn to use all four of the Toaster's graphics tools – the Character Generator, the Frame Grabber, ToasterPaint, and LightWave 3D. In section two, Creating Animation, we'll show you advanced techniques using LightWave 3D – though LightWave's basics are covered in this section.

Tutorial 6 ToasterCG
Creating a Key Page

For this tutorial, you'll want to have a camera connected to your Toaster, with its output visible on the Program monitor. We highly recommend a three-monitor setup, so that you may see the preview screen's color selectors.

What You'll Learn:

- Entering and exiting the CG (Steps 1 – 4)

- Basic CG concepts

- Shift and Alt menus (Steps 5 and 6)

- Framestore, Scroll, Crawl and Key Pages

- Creating a Key Page (Step 8)

- Use of the Help key

- Entering and deleting text (Steps 9 – 16)

- Kerning Text (Step 13)

- Rendering to the Preview monitor (Step 17)

- Rendering to the Program monitor (Step 18)

- Changing font styles (Steps 19 and 20)

- Changing font colors (Steps 21 – 29)

- Changing font shadows (Steps 30 – 35)

- Creating and applying a graphics separator (Step 37)

- Moving lines of text and graphics separators (Steps 40; 49 – 53)

- Changing justification (Steps 42 – 44)

- Changing color of graphics separators (Steps 45 and 46)

- Changing color, shadow and outline options, and fonts for a whole page (Steps 47 and 48)

- Copying Pages (Step 55)

This tutorial should take approximately 45 minutes to complete.

We'll start at the very beginning, loading the CG program. From the Switcher screen, check to see if the CG button is dimmed. A dimmed button is shown in shades of lighter gray, and indicates that the program is not currently loaded into memory. A solid button's lettering is in black, and tells you that the program is loaded into memory.

Another indication that the CG program is loaded is the "Load CG Page" button in the keypad window. If it is visible, then CG is loaded into memory.
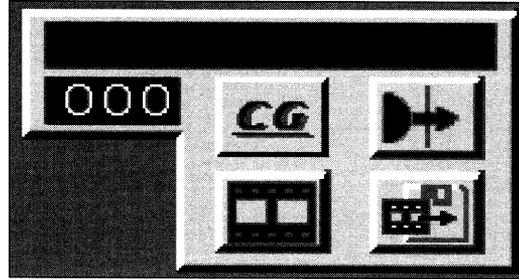
1   If the CG button is ghosted, click on it once. The pointer will change from an arrow to a "sleep" icon, indicating that the Toaster is loading the CG into memory. When the CG is done being loaded, the button will be solid.

2   If the CG is solid (and it should be now) then click on the button once. This will cause you to enter the CG.

Helpful Hint: You can also enter the CG from the Switcher by hitting the F9 key on the keyboard.
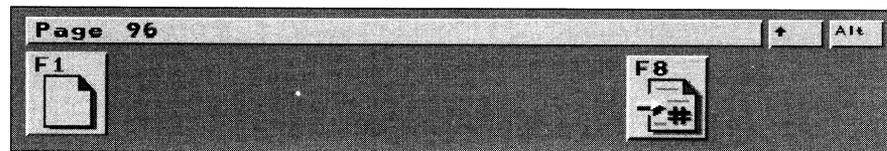
3   Now that's we've shown you how to get in, we'll show you how to get out. Press the Esc key to exit the CG.

4   Enter the CG again.

The CG is based on a simple, easy to understand metaphor: the book. Each CG book has 100 pages, and you can only have one book in memory at a time. Each book can use up to 20 different typefaces (or fonts, as we usually refer to typefaces). As we'll show you later, you can easily save as many books as you need – up to 1000 per hard drive.

Each CG title you create has its own page. The screen you're looking at is called the Blank Page. This screen allows you to move to other pages, copy the page, erase all of the pages in the current book, select which fonts the current book uses, and to select which type of CG page you want to create.

The 100 CG pages are numbered 00-99, and the current page number is shown in the menu bar. This menu bar appears in the CG almost all of the time. Below the menu bar are the option buttons – buttons that correspond to the function keys on your keyboard (the F1 – F10 keys). Next to the menu bar are two other indicators which show you whether the Shift or Alt key is currently depressed.

It's also important to note that the CG doesn't use the mouse. Everything is driven from the keyboard.

5 Press and hold down the Shift key on the keyboard. The Shift indicator will highlight, and the action keys below the menu bar will change. Release the key and watch the buttons toggle.

6 Now try the same thing with the Alt key. It works in the same way.

You'll be using the Shift and Alt keys quite often in the CG, which is why we're showing them to you now.

7 Let's tell the CG what kind of page we want to create. Press the F1 key. The menu bar will change, and the action buttons below will change as well. The menu bar is now instructing you to 'Choose page type, or Esc to preserve page.'
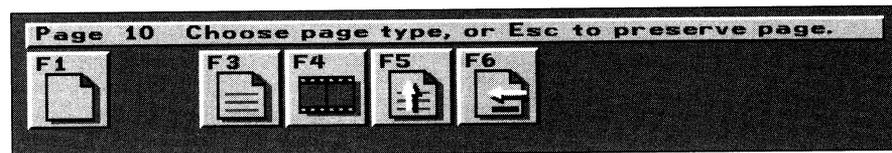
The F3 – F6 buttons shown here allow you to select the four different types of CG page. (You can also select F1 to leave this as a blank page.)

- The F3 key turns the page into a Key page. A Key page superimposes (or keys) a non-moving title over another source. This type of effect is often used to identify someone, such as a reporter on a television news broadcast.

- The F4 key turns the page into a Framestore page. This type of page puts text on its own background. It is not superimposed over another video source, it is the video source.

- The F5 key turns the page into a Scroll page. The titles on a Scroll page are superimposed over video and move from the bottom of the screen to the top. This is similar to the credits at the end of many TV shows or movies.

- The F6 key turns the page into a Crawl page. The text on this page is superimposed on video, and moves from the right side of the screen to the left, usually at the bottom of the screen. This is often seen showing stock prices, or giving news updates on television.

8 We want to create a Key Page. Press the F3 key to do so. The screen will change to the one shown below.
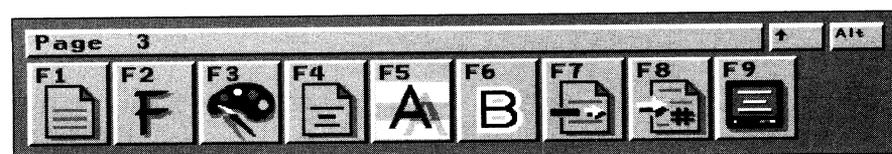
Important note: If for some reason, the menu bar disappears, press the Help button on the keyboard to bring it back. The Help button toggles between displaying and hiding the menu bar.

9 The short dark line at the top center of the screen is the cursor. It shows where text will be typed next. To see what we mean, type your name.

10 Press the Backspace key. This will erase the letter to the left of the cursor.

11 You can also use the arrow keys to move the cursor around the screen. Press the left arrow key a few times, and watch the cursor move under the letters. Try the right arrow key as well. Move the cursor under one of the letters in your name.

12 Now press the Del key. This erases the letter directly over the cursor.

There's one other important feature about text called kerning – the amount of space between individual letters. Toaster CG's kerning features let you easily adjust the amount of space between each letter. Let's try this now.

13 Move the cursor under one of the letters in your name. Don't use the first letter of either name, because kerning affects the space on the left side of the letter your cursor is under and the letter before it. Hold down the Alt key, and try hitting the left and right arrow keys. The left arrow moves letters closer together, the right arrow moves them further apart.

That's all there is to kerning. Hold down the Alt key and use the arrows to change the spacing. Kerning can also be used to change the spacing between words. Move the cursor under the first letter of the word, and kern away.

14 Move the cursor under the space between your first name and your last name.

15 Type your middle name (or just make up a nice sounding one).

16 You may need to create a space between your first and middle names so that they don't run together. To do this, just move the cursor (using the arrow keys) under the first letter of your middle name and press the space bar.

You can see how easy it is to enter, erase and modify text using the CG. These same basic principles apply to all of the different CG page types. The text that we see on the Control Panel isn't a true representation of what the page looks like, however. To see the way our title really looks, we need to render the text to the video screen.

17 Press the F9 key. This will render the page to the Preview monitor. Note that the menu bar tells you "Working..." When it's finished rendering, a new key will appear: the F10 key.

18 Press the F10 key. This will take the rendered page to the Program output. Your name is now superimposed ("supered") over the video source that was on Program when you started the CG. If you have no source, it will show over a black background.

Note that once you have rendered a page, the interface screen colors may change, and you may see ghostly remnants of the previous screen while you edit more text. This is perfectly normal and will not affect the next image you render.

This is the basic method for rendering text to the video display. You press the F9 key, wait for the page to render to

the Preview monitor, and then press the F10 key, which sends the page to the Program monitor.

Now we're going to show you all of the ways that we can change a line of text. We'll show you how to change font style, color, outline and shadow options for this text. These functions work the same anywhere you are in the CG. Learn them now and you're all set.

19 First, we want to show you how to change the font style. Make sure that your cursor is directly under your name. Press the F2 key. The typeface will change, and the menu bar will show you what typeface you're currently looking at.

In this case, the font style should be Newspaper.24. 'Newspaper' is the name of the font, and '24' tells you how tall the font is (in scanlines.)

20 Press the F2 key again. This will change the font again. Keep hitting the F2 and you'll cycle through all of the currently loaded fonts. Pick one you like and stop there. (If you accidentally go past one that you like, continue to press the F2 key to cycle back through the choices.)

Note – Many of the CG's buttons, like the F2 button, 'cycle'. They show you a number of choices, and eventually loop you back to where you started. Knowing this will help you to get used to selecting fonts.

Let's change the color of the text.

21 Press the F3 key. The page will disappear and a screen will appear that lets you select the color for the line of text that you're on.

The F1 key now functions as a switch that lets us choose whether our text will be gray scale or color. The F2 key lets us choose from six preset colors. The preview monitor will show you exactly the color you have selected. In this case, white.

The F1 also lets you toggle between gray scale (one slider) or color (three RGB sliders) modes. Since you can create gray scale with a combination of the RGB sliders, why would you ever use the gray scale mode? The reason is that gray scale text renders faster.

The menu bar also tells you that 'RETURN updates line, Esc preserves line.' In other words, if you ever accidently press the F3 key, you can exit without changing the line's color simply by hitting Esc.

22 While keeping an eye on your Preview monitor, press the F2 key. The white color will change to red. Press F2 again and the color changes to yellow. Pressing the F2 key repeatedly will cycle you through all of the colors, back to white.

As you cycle through the colors, notice that the value of the Red Grn Blu sliders changes depending on what color you have selected. You'll also notice that, when white is shown, the Red Grn Blu sliders are replaced by one marked Txt. The Shd slider that appears determines what shade of gray your shadows will be – in this case 0, or pure black.

If none of the preset colors appeal to you, you can create your own. Let's create the color purple.

**23** Cycle through the colors until you come to red.

Look at the sliders next to the color. Each slider lets you select how much of that color (red, green or blue) makes up the current color shown. Notice that there is an arrow next to the word Red.

24 Press and hold down the left arrow key. Three things happen: the position marker moves left, the Red number decreases, and the red value of the color visibly decreases.

25 If you're guessing that the right arrow will increase the red value, you're right. Change the Red value to 90.

We want purple. If you attended art school, you know that purple is a combination of blue and red. We've made the red value fairly dark already. Let's drop the green to 0 and set the blue value to the same as the red.

26 Press the down arrow key once. The arrow moves to Grn.

27 Move the arrow to the Grn slider and use the left and right arrow keys to set its value to 0.

28 Now set the Blu value to 90. There's our purple.

29 Since this is the color we want, press the Return key. Hitting the Return key saves whatever your current color choice is for this line of text, and you then head back to the page's main screen.

Note: If your text doesn't seem to have changed color don't worry. Nothing is wrong. Changes don't happen until you render the page to the screen. Let's render it out.

30 Render the page in the same way that we did before, by hitting the F9 key (and then the F10 key when it appears).

31 Let's change the type of shadows that our text uses. The F5 key toggles you through the different shadow options, and the image on the key changes each time you press it. The options are shown. Choose the opaque drop shadow.

32 Hold down the Shift key and the button will change. This new button lets you determine how far the shadows fall from the lettering. While keeping the Shift key depressed, press the F5 key to cycle through the choices.

33 The final attribute of shadows is the way in which shadows fall. Hold down the Alt key and press the F5 key to cycle through the choices. The white circle on the button represents the sun, and the direction of the shadows is clearly shown. Set this so that the shadows fall to the lower right.

That's all there is to setting shadows. You use a combination of the F5, Shift-F5, and Alt-F5 keys to set shadow type, distance, and direction.

34 Now we'll set the outline style. The F6 key will cycle you through the four outline sizes. Set this to thin.

35 Now hold down the Alt key and press the F6 key to cycle between the two outline options. One option outlines the letters and the shadows, and one outlines just the letters. Let's outline everything.

**36** Now render this page to the screen to see the changes that you've made.

You might want to take a few minutes and look at the effects of using different settings for fonts, shadows, outlines, and colors. Just press the keys to get to the settings that you want, and then render them to the page.

Now let's add some other elements to the page and learn some of the other tools in the CG.

37 Press the F7 key. This creates a graphics separator. Press the F7 key a few times to cycle through the four types of separators. There are two lengths, long and short, with two thicknesses each: thin and thick. Choose the thick, long separator.

38 The up and down arrows move the cursor up and down on the screen. Using them, move the cursor to the line below the graphic separator.

39 Type 'CG Expert'.

40 Our title is currently at the top of the page. Let's move the title to the center of the page by hitting the Alt-F4 key.

41 Quick and easy, eh? Render the new title to the page.

42 Now let's change the justification of the individual lines of text. Move the cursor under the top line (your name).

43 Press the F4 key. The image on the button will change, and the text will be left justified. Cycle through the four choices by hitting the F4 key. Left Justify, Right Justify, and Centered are very straight forward, while the fourth mode is No Justification.

44 By moving the cursor under the line that you want to affect and cycling through the F4 choices, set the text lines in the following way.

> Top line (your name) – justified left
> Graphic separator – centered
> Bottom line (CG Expert) – justified right

45 Notice that the graphic separator and the new line of text use the same color, border, and shadow options that you'd selected for the top line. Let's change the color of the separator. Move the cursor to the graphic separator line. Note that the cursor won't

appear directly underneath the separator, but off to the left.

46 Press the F3 key and select a new color for the line. Press Return when you're done, and render to the Program monitor. As you can see, changing the color of the graphic separator is just like changing the color of text.

Changing shadow and outline options works in just the same way. If you want to, try changing them now.

47 Now let's assume that we want just the opposite effect. In other words, we want all of the lines on our page to have the same color, shadow, outline, or font. This is very easy to do in the CG. Just press the Shifted version of the option that you want to change. To see what we mean, move the cursor under the top line of text.

48 Press and hold down the Shift key. Look at the F2, F3, F4, and F6 buttons. Notice the little page symbol in the upper left hand corner of each button – this means Copy To Page. For instance, Shift F2 would make every font on the page exactly the same as the font on the current line. The same thing would happen for justification, color, or shadow/outline options. (Note that shadow and outline options are changed at the same time.) Try changing the font on the current line and copying your choice to the page.

49 Move the cursor under the CG Expert line. While holding down the Shift key, press and hold down the Down arrow key. The line will move down the page.

50 While holding the Shift key down, press the Left arrow key. The entire line of text will move a little to the left. Now (still holding the Shift key) press the Right arrow key to move the line to the right. You can see how easy it is to move entire lines of text.

The combination of Shift keys and the arrow keys is the way to move lines of text (or graphics separators). You can move elements up, down, left or right.

51 You probably noticed that when you moved the line of text to the bottom of the screen, the menu bar and buttons vanished. This will happen anytime you are working at the bottom of the screen. You can always bring the menu bar back by hitting the Help key. (It will also reappear if you move the cursor up from the bottom of the screen.)

52 Move the cursor to the graphic separator line, and move it (using Shift/Down arrow) to the bottom of the screen. Notice that the separator will only go so far, it won't cover up the line below it.

53 Move your name to the bottom of the screen as well. Render this out.

This is what's known in the industry as a "lower third", a title that's shown on the lower one-third of the screen. If you want to create lower thirds, it's best to lay out your text and separators in the middle of the screen and then, when satisfied with the results, move the lines to the bottom of the page.

There are two reasons for this. First, as we've already shown, the menus vanish when you work at the bottom of the

screen. You can bring them back with the Help key, but they vanish when you change options, which makes it a little harder to work. Second, if you have a font at the bottom of the page and change the size of a font above it, the bottom line can get squeezed off of the page.

Let's assume that we're happy with our lower third and need to create a similar one for a program you're working on. This, of course, is fairly common. You want to identify people, and using a consistent look works much better than changing font styles from person to person. Let's copy this page.

54 Move the cursor up a few lines, until the menu comes back.

55 Press the Shift F8 key. The menu bar will tell you to 'Enter page to copy this page to.' Type 01. The CG needs you to enter all numbers as two digit numbers; just typing 1 won't do the trick.

56 The menu bar tells you that we're now on Page 1. Move the cursor to the line with your name. Press and hold down the Delete key to erase it.

57 Now type in the name of a friend of yours.

That's it. Once you've created a page, it's very easy to make a similar page by copying your 'prototype' page to another page number.

That's also it for this tutorial. There are some tutorials where we'll urge you to play around and explore on your own – this isn't one of them. In fact, we suggest that you review this tutorial now, making sure that you understand everything that you've just done. If you don't understand what we've done so far, the rest of this section won't be of any use to you. When you're sure that you do, please go straight to the next tutorial.

Tutorial 7 ToasterCG
Using the CG Book

You should be starting this tutorial on CG Page 1, which we created in the last tutorial.

As we mentioned before, there are 100 CG pages in a book. We'll start this lesson by showing you how to get around in the book.

What You'll Learn:

- Moving through CG pages (Steps 1 – 3)

- Erasing pages and books

- Adding and deleting fonts from the book (Steps 4 – 8)

- Saving your work (Steps 10 – 15)

This tutorial should average about 15 minutes.

1 We can easily move forward or backward one page at a time by using the + and − keys on the numeric keypad. Press the + key to advance to Page 2.

Since we haven't created anything on Page 2 yet, it is shown as a blank page. Try using the + and − keys to move between pages a little bit now.

2 You'll also find that holding down the + or − key moves you rapidly through the pages.

3 This works very well if we want to move between pages that are fairly close together. There's also a way to move quickly to any page, however. Press the F8 key. The CG will ask you to Enter Page Number. Just enter the two digit number of the page that you want to move to.

This is not the same as the Copy function (Shift-F8) that we learned in the last tutorial. The F8 key doesn't alter anything; it just moves you to another page. It's also important to note that you can access the Move To Page (F8) function from any page, including blank pages.

For future reference, we aren't going to erase anything as part of a tutorial. You can erase the entire book by hitting the Alt-F10 key. You can access this key from any page, including the blank page. When you press Alt-F10, a requester will ask you if you want to erase the book. Hitting the y key will erase the book, hitting n, Esc, or the Return key will exit the requester without erasing the book.

The Alt-F8 key works in exactly the same manner, but will only erase the current page. Since Alt-F8 needs an actual page to erase, it does not appear on the blank page. Each CG Book can have up to 20 fonts loaded into memory. You can change a book's fonts from any page (including the blank page) by pressing the Alt-F2 key.
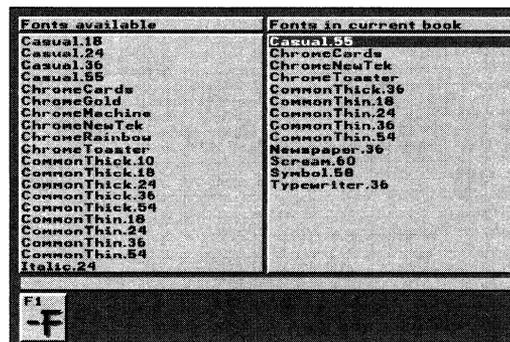
4 Press the Alt-F2 key now. The screen will vanish for a moment while it's looking for fonts, and the Add/Delete Fonts screen will appear.

5 Adding and deleting fonts is very simple. The column on the left shows you all of the available fonts, while the column on the right shows you all of the fonts in the current book. Press and hold down the down arrow to see the list of all of the available fonts. You can use the up arrow key to move back up through the list.

6 The highlight bar can be moved to the Fonts in current book window by pressing the right arrow key. It can then be moved back to the Fonts available window by hitting the left arrow key. Move the highlight bar to the Fonts available window.

7 To delete a font, you just move the highlight bar to the right hand window, select the font you want to delete and hit the F1 key. If you want to try deleting a font, do it now – just remember how to put it back, in case it's needed later in these tutorials.

8 When you are satisfied with your font choices, hit the Return key to exit Font Selection and return to the page you were previously on.

After you've created a few pages, you'll want to save your work. To do this, you'll need to save the entire 100-page CG book. Since each CG book is part of a Project, to save a CG book, you need to save the project.

9 Hit the Esc key to exit the CG. You'll be back at the main Switcher screen.
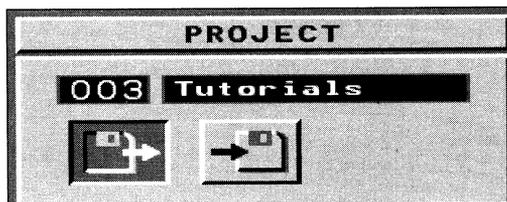
10 Enter Toaster Preferences either by clicking on its button or hitting the F10 key.

You should now be at the Toaster Preferences screen. We're going to resave our current project – 003 Tutorials. This will erase the project that was there before and replace it with our current one. That's one of the reasons we have created a tutorial project for you to use – it's safe.

11 The Current Project should be 003 Tutorials. If that isn't selected, enter 003 on the numeric keypad, and the Tutorials will come up in the Project windows.

12 Click on the Save Project button.
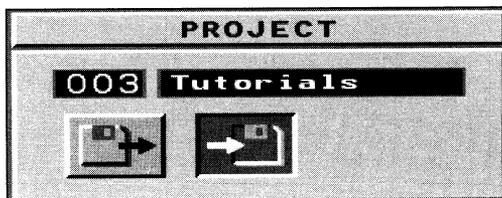
13 To save the project, either double click on the Save button or press the Enter key. A requester will appear, asking you if you want to overwrite the existing project. Overwriting the existing project will erase the old 003 Tutorials Project and replace it with what you currently have loaded.

Important Note: Be careful never to overwrite the System2.0, GetSmall, or Default1.0 projects. If you do, you may delete important effects. The only way to restore them will be to reinstall software.

14 Click on the Yes button to confirm and your project (and current CG book) will be saved.

If you had wanted to create a new project, Step 12 (above) would be different. Instead of entering 003, you would have to go to an unused project number and enter its number. Then, you would have to click in the name window, type in a name for the project, and hit the Enter key to confirm your name choice. The 'Overwrite' requester would not come up, as in Step 14.

If you had wanted to save the current CG book to a floppy diskette, you'd do the following (after Step 11): Insert a blank floppy disk into your Toaster's floppy disk drive. When you enter Preferences, click on the DF0: button on the Project panel. Then follow the steps beginning with Step 12.

For more information about Projects, please refer to the Reference section.

Please continue on to Tutorial Three now. In less than an hour, you'll know almost everything you'll ever need to know about using the CG.

Tutorial 8 ToasterCG
Creating a Framestore Page

What You'll Learn:

- The Framestore page (Steps 1 – 3)

- Using ToasterColorFonts (Steps 4 – 7)

- Creating a color background for a Framestore page (Steps 8 – 15)

This tutorial should take 15 minutes to complete.

1 Enter the CG and go to a blank page.

2 From the Choose page type menu (the F1 key), select F4 to create a Framestore page.

The Framestore page differs from other CG pages in that it is not keyed over a video source. A Framestore page has its own background, which can be either a solid color, a gradient color, or a ToasterPaint image.

3 Hit the Shift and Alt keys to look through the different buttons. You'll find that almost all of them are exactly the same as they are on the Key page.

4 Let's load some fonts into the current book. Hit the Alt-F2 key to enter the Add/Delete Fonts section. Using the procedure we outlined in the last tutorial, make sure the following fonts are in your current book: ChromaGold.65 and ChromaMirror.65.

Both of these fonts are a type that we haven't seen before – ColorToasterFonts. These don't allow you to adjust color, shadow, or border type, because that information is already built into the font. ColorToasterFonts can only be used on Key or Framestore pages.

5 Hit Return or Esc to return to the main screen.

6 Press the F2 key until ChromaGold.65 is your current font, and type in a line of text.

7 Hit F9 to render this to the Preview monitor, then hit the F10 key when it appears to render to Program.You can see how the Framestore page creates a color background, as well as seeing an example of how ToasterColorFonts look.

The Framestore page's buttons are very similar to the Key page's. All of the page layout functions are exactly the same for a Framestore page as they are for the Key page. There is now a new button that lets you control the background color.

8 Press the Alt-F3 key. This will bring up the background color panel.

This color panel may look very familiar. You select colors using the RGB sliders, just as you did on the Key Page.

9 Press the F2 key. This will toggle you through the 3 choices for the background: One Color, Gradient Color, or ToasterPaint background (Fig. 1). You need to know a little bit about ToasterPaint to use this last one, so we won't cover it in this tutorial. We will cover it later, however.

10 Select Gradient Fill by using the F2 key. You can tell that Gradient Fill is selected because F3 will be visible.

11 The F3 key lets you choose whether the color sliders affect the top of the screen or the bottom. Hit the F3 key a few times to toggle between these choices, and then select the top of the screen.

12 The F1 key does just what it does for font color selection – it toggles between greyscale and color sliders. Select a light shade of blue.

13 Hit the F3 key to choose the bottom of the screen, and then select a dark blue for it.

14 Hit Return to save your choices and return to the main screen. Render this page.

15 Hit the Alt-F3 key to re-enter the Background Color selector. Then press the F2 key twice to bring up the One Color background key. Select a color you'd like for the background, exit, and then render to the screen.

Experiment with a few different color combinations, and try a few different page layouts using the tools you learned about in the first tutorial.

Tutorial 9 ToasterCG Scroll and Crawl Pages

What You'll Learn:

- Creating a Scroll page (Steps 1 – 3)

- Adjusting Scroll attributes (Steps 4 – 6)

- Creating a Crawl page (Steps 7 – 10)

- Adjusting Crawl attributes (Steps 11 – 13)

This tutorial ought to take 30 minutes to complete.

Scroll and Crawl pages are very similar to Key pages. A Key page is a static page of text, which is keyed over a video source. Scroll pages are simply text pages which scroll up the page, and get keyed over a video source. Crawl pages, conversely, crawl from right to left and are keyed over a video source.

Creating A Scroll Page

This tutorial assumes that you know how to enter and exit the CG. It also assumes that you know how to create a Key page and change aspects of the page itself.

1 Enter the CG. Hit the F1 key to choose the kind of page that you'd like to create – in this case, a Scroll page. If you look at the F5 button, you'll notice the direction of text, indicating a Scroll page. Hit the F5 button (remember, the mouse is not used with the CG).

2 You'll notice that there are ten function keys at your disposal. You can also use these keys (as with a Key page) by cycling through them with both the Shift and Alt keys. Try this now.

There aren't many differences between a Key page and a Scroll page. The major difference is that you cannot use ToasterColorFonts with either of the Scroll or Crawl pages. You also are limited to solid drop shadows (no semi-transparent shadows). And, last but not least, you may choose only one color for your pages' fonts.

3 Entering and deleting text is the same as with the Key page. Pretend that you're the star of a TV show, and type in the following credits:

- Type: The Love Boat

- Press the down arrow key key eight times

- Type: starring

- Press the down arrow key key eight times

- Type: (your name)

- Press the down arrow key key eight times

- Type: guest starring

- Press the down arrow key key four times

- Type: (someone you know)

- Press the down arrow key key four times

You'll note what looks like a bracket on the left side of the screen. This tells you that you're at the end of the Scroll page.

3 Let's render this page out to see what we've created. With Scroll and Crawl pages, you don't need to hit the F9 key to key the page. It's keyed once you send it to the page. Hit the F10 key.

4 There are five speeds at which you can scroll the page. (If you find that the menu bar has disappeared, hit the Help key to bring it back.) Look at the F9 key. It's got what looks like a static speedometer. Try hitting the F9 key, and watch it change. Scroll the page at other speeds.

Helpful Hint: Pressing the right mouse button stops Scroll and Crawl pages in midstream.

As with a Key page, you can adjust the kerning, the color of your fonts, the shadows (again, no semi-transparent shadows), and the outline of your text. You can also use graphics separators.

5 Try changing some of your text's attributes. Unlike the Crawl page, the Scroll page allows you to change fonts with each line of text you have typed. Try changing each line and watching the results.

6 One last thing about Scroll pages. You can change the way the page scrolls by changing the scroll attributes. Hit the Shift-F9 key, and you'll notice three choices for the page: a one-time scroll, a continuous scroll, and a scroll that stops. Try each one.

Note that the stopped scroll page left the final text in the middle of the page. There was a reason for pressing the down arrow key four times after the last credit was typed in. This centered the last credit in case you wanted the scroll page to stop after it was played.

There – you've created a Scroll page, altered text attributes, and chosen a scroll mode. Saving a Scroll page is the same as with a Key page. If you don't want to lose the page you've just created, then save it.

Creating A Crawl Page

Creating a Crawl page is very much like that for a Scroll page, only the text you type goes in horizontally. Let's try it to see what we mean.

7 You select a Crawl page as you would for a Scroll page. Hit the F1 key to see the choices you've got for choosing a page type. Look at the F6 key – the text is moving horizontally, from right to left. Hit the F6 key.To interrupt or end the scroll, press the right mouse button once.

8 You'll notice that some of the function keys are different than the Scroll page's keys. Toggle back and forth (by hitting the F1 key again and choosing another page type) to see the similarities and differences between both the Scroll and Crawl pages. Also note the Key page's differences. (You might also notice other differences by depressing the Shift and Alt keys in each of these page types.)

9 Type in the following text: Attention! A warning for an unpredicted (natural disaster of your choice) has been issued! It looks to be heading towards (town of your choice), and there may not be enough time for an evacuation. Secure all valuables and seek appropriate shelter. Repeat...

Helpful Hint: Should you want to alter any of the text you've entered, there are several ways you can achieve this. The Home, End, Shift-left arrow and Shift-right arrow keys are there to assist you with this. Home takes you to the beginning of the text, End to (you guessed it) the end, the Shift-left arrow key moves you ten cursor spaces to the left, and the Shift-right arrow key moves you ten cursor spaces to the right. You could also move through the text by using just the left and right arrow keys.

10 Let's render this message to the screen. Hit the F10 key.

11 Did you notice that the text crawled along the middle of the page? Most crawling text is intended to do so along the bottom of the screen. Here's an easy fix to this situation. Hit the Alt-F4 key.

There. The text has now repositioned itself along the bottom. You'll also notice that the control panel has disappeared. Again, hitting the Help key returns the control panel to the screen.

12 If you hit the F9 key, you'll notice four speeds at which you can set the page to crawl. Try playing with them, and rendering them to the Program monitor.

13 As with the Scroll page, there are choices for your crawl mode. Press Shift-F9. Notice that you can either play the text once through, or you can loop it. Try both of these methods. Again – pressing the right mouse button will stop your page from crawling.To interrupt or end the scroll, press the right mouse button once.

Saving a Crawl page is the same as with a Key page.

Of Note: There are ways to save your pages to disk. You can also import ascii text from a disk for use in either Scroll or Crawl pages. For more information about these functions, refer to the CG Reference Manual.

Tutorial 10 ToasterPaint
Using ToasterPaint's Tools

This first tutorial is what we call a 'no-brainer.' That's not to insult anyone. It refers to the fundamentals that we need to cover first. We're not going to ask you to paint what you see outside of your window, or to try to create a masterpiece. We're going to show you the basics of ToasterPaint, and you won't have to show off your artistic ability at all. If you can doodle, and have taken an art class in first grade, you'll have no problems at all.

What You'll Learn:

- Entering and exiting ToasterPaint (Step 1)

- Elementary Painting (Steps 2 and 3)

- Rendering to the Program monitor (Step 4)

- Changing screen modes (Steps 5 and 6)

- Changing brush color (Step 7)

- Choosing palettes (Steps 8 – 12)

- Choosing brushes (Steps 14 and 15)

- Changing brush size (Step 15)

- Clearing the screen (Step 16)

- Freehand drawing (Step 17)

- Solid drawing (Step 18)

- Using the Fill tool (Steps 19 – 21)

- Drawing with the Polygon/Straight Line tool (Steps 22 – 27)

- Keyboard shortcuts for filled and non-filled tools (Step 27)

- Using the Rectangle tool (Steps 28 and 29)

- Using the Circle tool (Step 30)

- Using the Ellipse tool (Step 31)

- Using the Flood Fill tool (Steps 32 – 35)

- Using the Undo/Redo tools (Steps 36 – 38))

- Using the Magnify mode (Steps 39 – 43)

- Selecting custom brushes (Steps 44 – 47)

This tutorial should take 60 minutes or so.

Opening ToasterPaint

1   Enter ToasterPaint by clicking on the button with the paintbrush icon. The first click will load the program into memory; the second will enter ToasterPaint. If the program is already loaded into memory, you need only click on its button once..
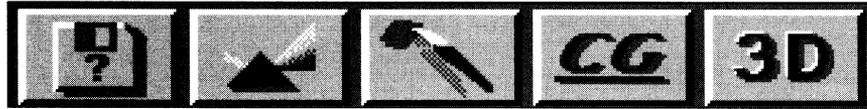
If you need to exit ToasterPaint, hit the Q (Shift q) key.

2   Move the mouse around, and you'll see that the white circle is your mouse pointer. The mouse acts as your paint brush, and when you open TPaint, your brush is this white circle. Also notice that the Freehand Draw button is selected.
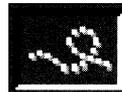
3   This is a paint program, so let's paint. Hold down the left mouse button, move the mouse to draw a little squiggle, and release the left mouse button.

If you happened to move close to one edge of the screen and it moved, don't worry. This is ToasterPaint's Auto Scrolling feature, which is in effect because ToasterPaint is working with a canvas that is larger than the screen. *Important Note: If the Tools menu at the bottom of the screen vanishes when you draw, don't worry – just hit the right mouse button and it will come right back. Clicking the right mouse button brings back the Tools menu.*

Not Picasso, but it's a start. Notice that the squiggle is on your Control Panel and Preview monitors, but not on the Program monitor. That's because ToasterPaint (like the CG and LightWave) doesn't directly send its output to the Program monitor. You need to tell the Toaster to render it there.

4 Hit the F10 key to render to the Program monitor. Note that this is the same key that you used in the CG. You can also click on the 'Render To Screen' button (which has the same graphic as the F10 key – a movie 'clapboard').

When you tell the Toaster to render, the Control Panel screen will begin flashing gray, and you'll see the image render a section at a time to the Program monitor.

One thing you'll notice right off the bat is that the squiggle on the Program monitor seems a lot smaller than the squiggle that you drew. That's because the ToasterPaint Control Panel you were drawing on was only showing about a quarter of the entire screen. ToasterPaint actually has two screen views: the quarter view we're using now (1x mode), and one that shows you almost the entire screen (2x mode).
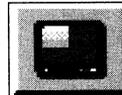
5 Let's look at the other view. Click the 1x button. The mouse pointer will turn into the 'sleep' icon, and the interface screen will redraw. The 1x button is a toggle between the 1x mode and the 2x mode.

Your Control Panel now shows a more accurate representation of the Program output. So – why don't we just use this mode all of the time? The reason is that ToasterPaint loses a number of capabilities when in the full screen mode. We'll get into more detail about this later, after you understand more.

6 Let's go back to the quarter view. Click on the 1x button again to get there. When the 'sleep' icon vanishes, you're ready to go back to work.

One other thing to realize about ToasterPaint – the Control Panel can only show you 4096 colors at once. ToasterPaint's images work from a palette of 16.8 million colors, and when you output it to the Program monitor, that's what you get. The Control Panel screen is really just a preview of the final output.

7 Let's change the color of our brush. Move the mouse pointer over ToasterPaint's Palette. The pointer will turn into an arrow. Click the left mouse button on one of the colors. Notice that the brush changes to the color that you've selected. Draw a little with that color, then try selecting another one. (Don't forget that you can render to the Program monitor anytime by hitting the F10 key.)

Important note: If you draw on the screen and the colors don't seem right, you may have entered the wrong mode accidentally. (We'll discuss more about modes later.) If the mode indicator says anything other than 'Normal') during this tutorial, hit the ` (open quotes) button at the top left of the keyboard. The open quote key does not toggle control panels, it only returns you to the Normal mode of drawing.
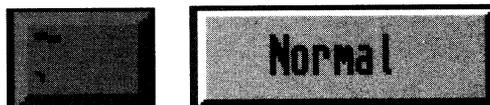
The palette only shows 16 colors, but there are thousands that you can choose from directly.

**8** Click on the Palette Button to open up the palette.
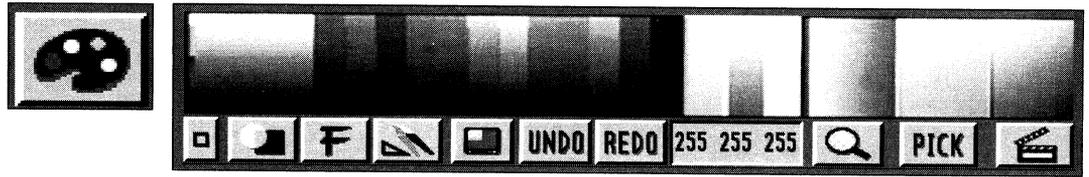
The palette menu will look like this. Below the 16 color palette is the Tone Selector, which shows you a range of colors based on the 16 color palette. You can select any color from this area just by clicking on it.

9 Try clicking on a few colors from the Tone Selector.

There are two other ways to select colors from the palette. Let's look at those now.
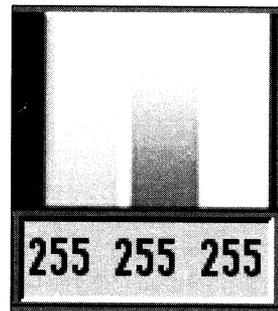
10 Move your mouse to the RGB sliders. Notice that there is a number below each slider, showing it's current value (from 0 to 255). Click on the slider on the far left (the red slider) and, while holding the mouse button down, move the mouse up and down. You'll see the value change, and the current color will change, as well. Try this with the other sliders.

You'll notice that sliders move in increments of 16 – in other words, as you move the slider, it goes to 0, 16, 32, 48, etc. This is because of the Control Panel's 4096 color limitation. Remember, however, that the program output is 16.8 million colors.

11 The other way to select colors from the Palette Menu is by using the Color Selectors, the three colored boxes to the right of the RGB sliders. By clicking and holding down the left mouse button and moving the mouse around in either of these three squares, you can interactively select any of ToasterPaint's 4096 colors. When you release the left mouse button, your current color will be whichever one you had selected. Try this now. Click in one of the boxes and move the mouse. When you find a color you like, release the button.

Notice that when you've clicked in the first box, the green and blue sliders move, but the red does not. The two other boxes work in the same way, except that they keep the green or blue sliders stationary.

12 There is one other way to select colors. Move the mouse pointer over the canvas and hit the , (comma) key. The pointer will turn into an arrow. You can now select any color from the screen you've drawn just by clicking on it, or by clicking and dragging until you find the color that you want. Try this now.

You now know five different ways to pick colors in ToasterPaint. Let's review them.

- Pick colors from the 16 color palette from the main toolbox.
- Pick a color from the screen by hitting the , (comma) key and then by clicking on the color in the image.
- Pick colors three ways from the Palette menu – by using the Tone Selector, the RGB slider, or the Color Selector.

Now that you know how to select colors, let's change the brush we're using.

13 Click on the Tools button to go back to the Tools menu.
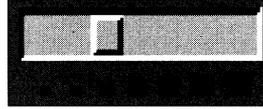
It looks like a small paintbrush above a triangle shape.

14 There are seven brush-shaped buttons. Your current brush is the Round brush – click on the Square brush to select it. Try drawing a little with it.

15 Now click on the Brush Size Selector and, while holding the mouse down, move the mouse left and right. Notice that the size of the brush changes. You can also change the size of the brush by hitting the + and – keys.

That's really all there is to it. Try selecting a few of the other brush shapes and changing their size. The Single Point brush (the brush shape on the far left) is the only one that cannot have its size changed. It is always a single pixel.

Now let's look at the drawing tools. So far we've been using just the Freehand Drawing tool, but ToasterPaint has a number of other tools for drawing perfect squares, ovals, and other shapes.

16 Your screen is probably getting a little messy. Let's clear it out. Hit the K (Shift-k) key. This stands for Clear screen. This will erase everything on the canvas and change your current color back to its default white. Note, however, that clearing the screen doesn't erase the Program output – you'll have to render to the screen (using the F10 key, of course) to change the Program output. Anytime you feel like clearing the screen during this demo, feel free to press the K key.

17 We have the Freehand Drawing tool selected. Draw another squiggle, moving the mouse fairly quickly. Notice that when you move the mouse quickly, the line you are drawing 'comes apart.'

18 Select the Solid Draw button, and try the same thing. No matter how fast you move the mouse, the line remains solid.
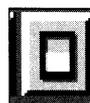
19 So far we've just drawn lines. Let's draw a filled shape. Click on the Fill button. Notice that the Drawing tools now look solid – this tells you that you're in the Fill mode. You might turn the Fill mode on and off a couple of times to see the difference.

20 Draw a circle on the screen. Notice that it fills in when you release the mouse button. Try playing a little bit with this tool.

21 Click on the Fill button again, to enter non-filled mode.

You can toggle between filled and non-filled modes for all of the Drawing tools except for Freehand Draw.

22 If you've tried drawing circles or straight lines with the mouse, you'll see that it's fairly difficult to get them perfect. ToasterPaint has other tools for doing that. Let's create some shapes using those tools, starting with straight lines. Click on the Polygon/Straight Line tool, or press the v key.

23 Click somewhere on the canvas with the left mouse button. You've just drawn the first point of a straight line or rectangle.

24 Move the mouse, and you'll see a line extending from the point where you clicked to your current mouse position. Move the pointer so that a straight line is drawn, and click the left mouse button.

25 Move the mouse again, and you'll see that the mouse pointer is now the third point between the two you've already drawn. Move the mouse so that it forms the third point of a triangle. When you've found the position that you want, click the right mouse button. The 'sleep' icon will come up and ToasterPaint will draw the triangle.

This is how you create shapes with the Polygon/Straight Line tool – the left mouse button selects the points for the edges, and the right mouse button tells ToasterPaint to connect them and finish the shape.

26 Let's draw a straight line. Click the left mouse where you want the line to start.

27 Now move the mouse to where you want the line to end. Click the right mouse button and the line will draw.

You can draw figures with any number of sides – just remember that the left mouse button sets the points, and the right button draws the shapes. You might want to try this now. You also might try drawing with the Fill option turned on.

Helpful hint: The keyboard shortcut for the 'fill' mode for any of the drawing tools is: Shift (key equivalent). For example, the keyboard shortcut for Polygon/Straight Line tool is v, the keyboard shortcut for Filled Polygon/Straight Line tool is V (Shift v).
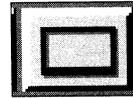
28 Next we'll use the Rectangle tool. Click on its button to select it , or press the r key.

29 Click on the canvas and, while holding the left mouse button down, drag out a rectangle. Release the mouse button when your rectangle looks the way you want it to.

Not exactly rocket science, is it? The first click sets one corner of the rectangle. You then drag out the size of the rectangle that you want. Just remember to hold down the mouse button as you drag the rectangle out. Creating circles and ellipses is just as easy.

30 Click on the Circle tool, or press the c key. Click on the canvas and keep the mouse button held down – this is the center of your circle. While keeping the button depressed, drag out the circle to the size you want.
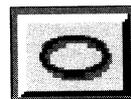
31 Creating an ellipse works almost the same as creating a circle. Click on the Ellipse tool, or press the e key. Click and hold down the mouse button somewhere on your canvas, and drag the mouse out. As you move the mouse, notice that you are changing not only the size of the ellipse, but also its shape.

That's it for the drawing tools. You might want to try the filled variations of Circles and Ellipses, or just play around with the Freehand, Continuous Freehand, Polygon/Straight Line, or Rectangle tools.

32 Now we'll look at the Flood Fill feature of ToasterPaint. This allows you to fill up an area with color. Select the Unfilled Rectangle tool, and draw out an unfilled rectangle.

33 Choose another color that you want to fill the rectangle with.
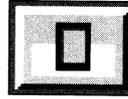
34 Click on the Flood Fill button . It will become highlighted, and Freehand Draw will become your selected tool.

35 Now, click inside of the rectangle. After a few seconds, your newly selected color will fill up the rectangle. The Flood Fill function fills up any adjacent area of colors. This means that, if you clicked outside of the rectangle in a black area of the screen, it would fill up all of the adjacent black areas.

There are really only three more elements of the Tools menu to cover, and then you've got it down cold. Let's start by looking at the Undo/Redo functions.

Since we've just been playing around with ToasterPaint, mistakes haven't been a big problem. They obviously can be of real concern in your day-to-day graphics creation, however. For that reason, ToasterPaint includes powerful and easy-to-use tools for fixing your mistakes.

36 Select the Filled Rectangle tool, select yellow as your current color, and draw a small rectangle on your screen.

37 Sorry, I changed my mind – I wanted a blue rectangle instead. With Undo/Redo, this isn't a problem. Click the Undo button, or press the u key. The yellow rectangle you just drew has vanished. That's what Undo does. Undo will even Undo itself, if you click it again.

38 Redo will let us redraw the rectangle in the same place with different options. Now, pick a shade of blue. Click the Redo button, or press the a key ('a' stands for again). Your rectangle will be redrawn, this time in blue.

ToasterPaint's Undo/Redo functions are very powerful and, if you're a human being, you'll probably be using them quite a bit.

39 Now we'll look at ToasterPaint's magnify mode. This lets you magnify an area of the picture for close-up work. Click on the magnifying glass or press the m key – this will open up the magnify window.

If you use the m key, you will magnify that part of the screen directly under the mouse. If you use the magnify button, you can move the mouse around the screen to find an area to work on, then click the left mouse to select it.

40 Click on the magnifying window's menu bar and drag it up the screen a little.

41 You can use the arrow keys to scroll around the magnifying window. Click in the window and hold down the arrow keys to see this.

42 You can use any of ToasterPaint's tools in the magnify mode. Try a few if you want.

43 To exit magnify mode, click on the magnify window's Close button at the left end of the magnify bar.

That's the magnify mode – very useful for doing detail work. Now let's look at the last tool in ToasterPaint's main Tools menu, and the one that's the most powerful – picking up custom brushes.

44 Select the Freehand Draw tool.

45 Click on the Scissors button, or press the b key. Your mouse pointer will change into a pair of scissors, which tells you that you're ready to select a brush.

46 Find an area of the screen that you'd like to pick up, click on the left mouse button, and draw around it. The area you've selected is now a brush.

47 Place your custom brush somewhere else on the screen by clicking the left mouse button.

You can use any of ToasterPaint's Drawing tools to pick up a brush. You might try using the Polygon/Straight Line or Rectangle tools to pick up a brush. Just select the drawing tool that you want to use, and then select the scissors.

This is where we'll end this tutorial – but that doesn't mean that you have to stop here. If you'd like to, play around and experiment. We've just started to touch on ToasterPaint's capabilities, but you'll be using the basic tools and concepts you've learned here in all of your work in ToasterPaint.

Tutorial 11 ToasterPaint
Making CG Backdrops

You should also be aware that, in this tutorial (and all future ToasterPaint tutorials), we don't constantly harangue you to render to screen. Just hit the F10 key to render your output to screen whenever you want to.

What You'll Learn:

- Using the Range mode (Steps 2 – 5)

- Use of Transparency/Warping controls (Steps 6 – 11)

- Using the Darken/Lighten modes (Steps 14 – 18)

- Creating a background for use in the CG (Steps 12 – 22)

- Using the background as a framestore in the CG (Steps 24 – 29)

This tutorial should take 30 minutes.

1 We'll want to start with a blank screen, so clear your screen. Press K (shift-k), and that's the last time we'll tell you...

The mode indicator probably tells you that you're in Normal mode. Check this now, and if you aren't in Normal, hit the ` (open quote) key at the upper left of the keyboard.

2 First, we need to select two different colors, the two colors that we're using to create a spread. Click on the Left Range Color box. This is the color that becomes the center of the range, when using filled shapes. The box will become highlighted with a light-colored square. Notice also that the mode indicator now says Range.

3 Select a color from the 16 color palette. You'll notice that the spread is now between the new color you've selected and the Right Range Color box. This is the color that becomes the outer edge of the range, when using filled shapes.

4 Now select the Right Range Color box. The left box will de-highlight and the right one will highlight.

5 Open up the palette for a wider color selection, and select a color for the right side.

That's it. We've now set our two range colors. You can change either one by clicking on the side you wish to change (so that it becomes highlighted) and selecting a color for that side. Now that we know which colors we're spreading, let's set how the gradient will be used.

6 Click on the Transparency/Warping button (it looks like a white ball with a semi-transparent square over it), or press the F1 key to go to the Transparency/Warping control panel. The F1 key is a toggle between the Tools menu and the Transparency/Warping menu.
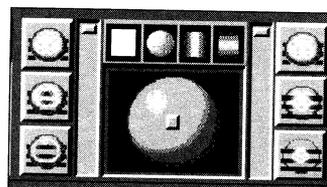
We're going to use the Transparency controls to set the gradient direction. Let's get a quick lesson in how the Transparency controls work. The two sliders on either side of the controls allow you to set the Edge Level or Center

Level. This is mainly for setting transparency, which we'll cover in the next tutorial. The Center Level is the set with the slider on the left, the Edge Level with the slider on the right. Gradient is the term used to describe the color blend between two colors. In this control panel, you can alter how the gradient is determined.
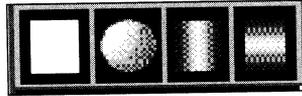
The Hotspot Selector buttons determine what kind of hotspot you have. You select these buttons by clicking on them. In the Range mode, the hotspot determines where the left (center) range color is.

- No Hotspot will mean no range in this mode.
- Point Hotspot will let you position the hotspot wherever you want.
- Vertical Hotspot will create a left/right gradient.
- Horizontal Hotspot will create an up/down gradient.

7 Let's create an up/down gradient by selecting the Horizontal Hotspot. A horizontal bar will appear in the hotspot locator.

8 Select the Filled Rectangle tool (press shift-r or go back to the Tools menu and click on the button). Draw a small square on your screen. Render it out to the program monitor, if you like. We're going to do a gradient pattern to the entire screen. Drawing a large pattern can take a while. For that reason, we're using a small rectangle to get the pattern setting correct. Then, when we're happy with those settings, we'll apply them to a larger area of the screen.

9 Let's try moving the hotspot locator and redrawing the gradient. Move the locator by clicking on it and dragging it to where you'd like it located. Hit the a (for Redo again) and the square will rerender with the new gradient pattern.

10 Now select the Point Hotspot mode by clicking on its button. The small square in the hotspot control area allows you to position the hotspot (or center level in this case).

11 Click on the small square in the hotspot control section and and drag it to the upper left hand corner. Hit the a key to redraw the rectangle with these new settings. If you're not happy with the colors that you've selected, you might change them now. You also might want to experiment with different hotspot settings. Just change your settings and hit the a key. Aside from learning about the Hotspot/Transparency controls, you can also get an idea of how to use the Redo function. It allows you to try a number of different settings quickly, without having to redraw.

When you have a gradient pattern that you're happy with, you'll use it on the entire screen. There are two ways to do this. The first would be to draw an enormous rectangle that covers the entire screen. The only problem with this method is that it's sometimes easy to miss part of the screen. There's a better way, though (hint).

12 Make sure that you're happy with the gradient pattern. Hit the w key. This stands for whole screen, and it affects the entire screen with whatever your current settings are. The pointer will turn into a 'sleep' icon, and ToasterPaint will draw the gradient on the entire screen. If you want to stop ToasterPaint from drawing, you can always stop any ToasterPaint operation by clicking the right mouse button during it. If any

part of the operation you stopped still remains, you can get rid of it by hitting the u (undo) key.

13 We've created a nice color background, and ToasterPaint can create gradients not possible with the CG. Let's add a few other features, though, like a box at the top of the page. It will be easy to do this while looking at the whole page, so click on the 1x button to go to the ToasterPaint Whole Page mode. The screen will flash and redraw. At this point you can also see that a number of options are missing in the Whole Page mode, including the Circle and Ellipse tools, and the scissors. The biggest drawback to this mode is that you can't use custom brushes.

Let's use a new mode – Darken. Move the mouse pointer over the panel, and click and hold down the right mouse button. You'll see ToasterPaint's pulldown menus. (If you aren't familiar with pulldown, see the terminology section of ToasterPaint's Reference section.)

14 Move your mouse over the Mode heading. You'll notice that Range has an asterisk (*) next to it that tells you that it's the current mode. Select Darken by moving the mouse over it, still holding the right mouse button down. It will be highlighted when it is selected. Release the mouse button and it will become your new mode.

We're going to use Darken to create a drop-shadow for a box at the top of the page.

15 Select the Square brush, and the Filled Rectangle tool. Drag out a rectangle at the top of the page.

There's our shadow effect. Let's say that we wanted a lighter shadow. We can adjust the level of darkness using the Transparency/Hotspot controls.

16 Go to the Transparency/HotSpot Control Panel and select No Hotspot. (When you have no hotspot selected, the edge and center sliders work in tandem. Otherwise, they move independently.)

17 Move the sliders down to halfway. A quick way of doing this is to click on the middle button in the Center or Edge Transparency buttons.

18 Undo and then Redo to see the new effect of the changed setting.

You might try a couple of different settings now. Just remember to Undo and Redo to see the new effect. As with all of ToasterPaint's modes, you can use any of the various drawing tools or brush types with the Darken mode. By the way, even though we don't cover it in these tutorials, the Lighten mode works in exactly the same manner as the Darken mode – the Transparency/Hotspot controls set the level.

19 Once you're happy with your shadow, let's create the box. Change back to the Range mode.

20 We'll need to select two range colors. You'll want to use the same basic color on both edge and center colors, but select a light variation of the color for the Center Range color and a darker version of the same color for the Edge Range color. You might, for instance, select a light blue for the Left Range color and a dark blue for the the Right Range color. The palette's Tone Selector can be helpful here.

21 Now go to the Transparency/HotSpot settings. First, make sure that you set both the edge and center sliders back to the top. Now, select the Horizontal Hotspot button, and set the hotspot indicator to the center.
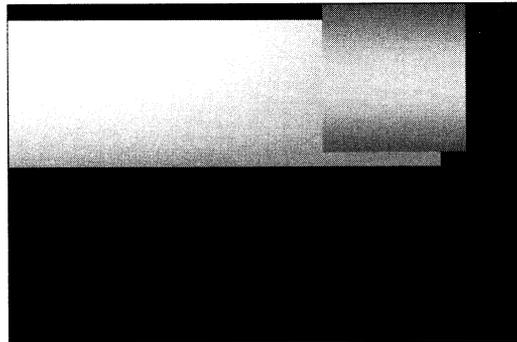
22 Check to make sure that the Filled Rectangle is still selected. Draw a box slightly above and to the right of the shadow we've created. Using Range mode in this manner gives a nice, slightly 3D look.

That's it for the background. Now we'll go into the CG and use this as a background for text.

23 Exit ToasterPaint, but don't shut down the program. (Now that you know about the right mouse button pull down menus, you may want to know that you can also exit ToasterPaint by using the Switcher command from the Picture menu.)

24 Enter the CG and move to a blank page. Turn the blank page into a FrameStore page. (F4 selects a Framestore Page)..

25 Type a line of text at the top of the page, using whatever font and color you'd like. You'll want to use Center Justification, and have your shadow type be Semi-Transparent Cast.

26 Hit Alt F3 to change the background color.

27 The Color requester will come up. Press the F2 key to toggle through the background choices until you get to the paint background icon (which also has no RGB sliders). Hit Return to confirm this choice.

28 Render this page to the screen.

You'll probably have to move the top line of text around a little to make it fit nicely inside of the box. You could also put text below the box. You can move and rerender freely here, because the text and background images are maintained separately until you save them as a single image.

This is the way in which you use images from ToasterPaint as backgrounds. Just create (or load) an image, exit ToasterPaint and enter the CG. Using a framestore page, select the Paint option from the Background Color menu. Whatever image is currently loaded into ToasterPaint will serve as the background for your CG page.

29 When the page is the way you'd like it, you can save it as a Buffered page by using the Alt F9 key.

Creating your backgrounds in ToasterPaint allows you to create CG Pages that are more sophisticated than those created with just the CG. Experiment with ToasterPaint's tools a little bit, and soon you'll come up with your own variations.

Tutorial 12 ToasterPaint Image Processing

What You'll Learn:

- Loading framestores (Steps 1 – 2)

- Using gray scale (Step 3)

- Using the Colorize mode (Steps 4 – 9)

- Using custom brushes (Steps 11 – 14)

- Using transparencies with custom brushes (Steps 15 – 18)

- Using texture mapping with custom brushes (Steps 19 – 24)

This tutorial should take around 25 minutes.

Let's start by loading in a framestore.

1   Pull down Load Frame from the Picture menu, or press the l (for Load) key.

2   Select the 000.FS.Kiki.VT image from the Framestore directory and load it by double-clicking on its file name (or by entering its number on the numeric keypad and pressing Return).

When the frame is done loading, you should render it out to the screen. You'll notice that it's a full-color image. Let's change it to black and white.

3   Select Colorize from the pull down Mode menu, or press the 4 key to enter Colorize mode.

4   Colorizing with any gray scale color value (or, in other words, one where R, G, and B values are all equal) will remove all color. Select white from the 16 color palette (it may already be defaulted to white).

5   Press the w key. This will cause your current settings to affect the entire page. In this case, it will change the image to gray scale. Render this so that you can see the difference.

6   Now that we've taken the color out, let's put some back in. We're already in Colorize mode, so let's select a good eye color for Kiki. Select a purple from the 16 color menu.

7   Select the single pixel brush (you can do this quickly by pressing the period key), and select the Filled Continuous Freehand tool by pressing the D (Shift-d) key.

8   Trace a circle around the part of Kiki's eye that would be colored. When you release the mouse button, the part that you drew around will become colorized.

9   There's probably too much color there. A blob, likely. Hit u to undo, and then go to the transparency controls sections and move the sliders down a bit, so they're about one-third of the way up from the bottom. Hit a to redo.

Colorize works in a very straightforward manner, and can be used with any of ToasterPaint's tools. Just remember that the Transparency controls set the amount of color. You might want to try adding flesh tones (there's a good flesh tone color in the default palette), or perhaps try doing Kiki's makeup.

10   When you're done experimenting, set the Transparency sliders back to the top and select No Hotspot.

11   Now we'll learn some more about custom brushes and the transparency controls. Start by making sure that you are in the 2x (non full-screen) mode,

because you cannot use custom brushes in the 1x mode. Also, make sure that you have the Continuous Freehand tool selected.

12 Go into Normal mode, either with the pull down menu or by hitting the ` (open quote) key.

13 We want to pick up a brush, so click the Scissors button (or hit the b key). Draw a circle around one of Kiki's eyes to pick it up as a brush. If you want to pick up another brush, just hit the b key again.

14 Now we'll create the Cyclops effect. Put the eye that you've just picked up down in the middle of Kiki's forehead. Render the screen to see how this looks.

It looks like someone picked up a picture of an eye and stuck it on her forehead, doesn't it? That's because the edge of the brush is clearly visible. Let's use the Transparency controls to change that.

15 Go to the Transparency/Warping control panel and select Point Hotspot. Move the hotspot to the middle (it may already be defaulted to the middle). Don't be daunted if you see an eye following your mouse pointer as you go to move the sliders. You can make changes to the Control Panel without affecting the brush, or having the brush affect any changes you've made.

16 Move the Edge slider (the one on the right) all the way down.

17 Undo and redo. When you render the screen, you'll see a big difference – since the edge is transparent, the eye now blends seamlessly with the backdrop.

18 Let's make the eye more ghostly. Bring the Center slider down halfway, then Undo and Redo.

Experiment a little on your own with the Transparency controls. The same methods we've used here can also be applied in your day-to-day graphics creation. You can use ToasterPaint's custom brushes and transparency features to do image compositing, create special effects, or to do photo-retouching types of effects.

Helpful Hint: One way to retouch easily is to pick up small sections of an image, and stamp the brush down (with Full Edge Transparency on) on the part of the picture that you want to change. Then pick up another small brush and repeat. This will create realistic looking areas without too much repeating of the images.

19 Now let's look at texture mapping. Reset your Transparency controls, and select the Filled Rectangle tool.

20 Select the Scissors tool to pick up a brush, and draw a rectangle around one of Kiki's eyes (you've got three to choose from now).

21 Using the pull down menus, select Swap from the Brush menu. This will open a submenu from which you can select Copy this brush. This will copy your current brush to memory.

22 There's now a new mode enabled from the Mode pull down menu: TxMap. Select this now.

23 Check to make sure that you're still using the Filled Rectangle tool, and draw rectangles of varying sizes on the screen. The brush that you picked up will be reproduced in the size and shape of the new rectangle that you draw.

Just remember the method for using texture maps: pick up a brush, perform a Copy this brush, and select TxMap mode. Any of ToasterPaint's various tools will work in TxMap mode.

24 If you want to preserve the original brush's proportions, hold down the Alt key while drawing the rectangle. This forces ToasterPaint to preserve the original aspect ratio.

Feel free to experiment with the things that you've learned here before you go on to the next tutorial.

Tutorial 13 LightWave
Getting Your Feet Wet

Introduction

Three-dimensional graphics are everywhere. Flying logos, music videos like Todd Rundgren's 'Change Myself', mind-blowing special effects on shows like Unsolved Mysteries. In fact, 3D graphics have quickly become the hottest area of image creation for television.

Why? Well, there are a few reasons. First of all, the technology has become more accessible. Three-dimensional graphics and animation used to require supercomputers costing literally millions of dollars. Then they became more accessible when the price fell to just a few hundred thousand dollars. The Video Toaster on your desk is the next step in this evolution, with broadcast quality 3D graphics for less money than ever before.

Another reason for the popularity of 3D graphics is versatility. Compare 3D graphics to traditional graphics. In traditional graphics, an artist may draw a company's logo. If the company says, "It looks great – now let's see it from the side," the artist must start from scratch and redraw it. In 3D graphics, the artist creates a 3D model in the computer. Once the model is created, the 3D artist can easily show it from any angle, and save the model for use later.

This can be very important in animation, where hundreds of frames are drawn. Having the computer do the work has obvious advantages. LightWave 3D is a powerful and flexible animation system (its animation features are covered in Part Two of this manual.) Animation requires additional equipment, however, such as single frame controllers and frame-accurate VCRs.

If you have those things, great. Read this section to learn the basics of LightWave, and then go on to the section on animation. If you don't have those things, you'll find that LightWave is a valuable tool for creating still images. In fact, LightWave is very useful for creating title sequences, graphics, and backgrounds for CG pages. In short, LightWave is useful for creating all sorts of graphics that you need on a day-to-day basis.

This tutorial jumps right in and introduces you to the most commonly used tools for 3D images. The second tutorial takes a step back to catch a breath and look around a little more at the tools and menus you've used.

What You'll Learn:

- Loading an object (Steps 2 – 7)

- Rendering (Steps 8 – 12)

- Moving the camera and object(s) in the Layout mode (Steps 13 – 30)

- Rotation of objects (Steps 19 and 20)

- Sizing and Stretching objects (Steps 22 – 25)

- The Reset button (Step 23)

- Moving and rotating the camera (Steps 27 – 30)

- Creating a Key Frame (Steps 31 – 34)

- Setting lighting (Steps 38 and 39)

This tutorial should take about 30 minutes.
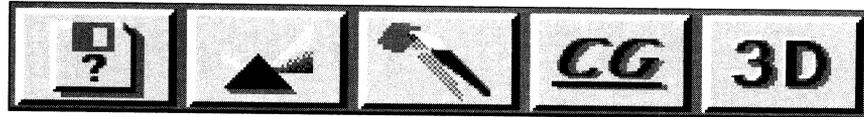
1 Load LightWave the way you'd load any other Toaster program, by clicking on its button. If the program is ghosted, you'll need to click on it twice – once to load it into memory, the second time to enter the program.

LightWave has a number of different menus, which are accessed by clicking on the main menu buttons located along the left side of the screen. The Scene Menu is selected when you first enter LightWave. To select a different menu, just click on its button.
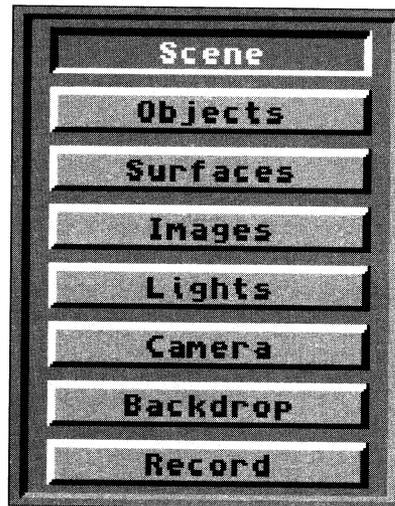
If you need to exit LightWave, click on the Switcher button in the lower left hand corner of the screen.

2 We'll start by loading an object. Click on the Objects Menu. The right side of the screen will change to show you the Objects Menu.
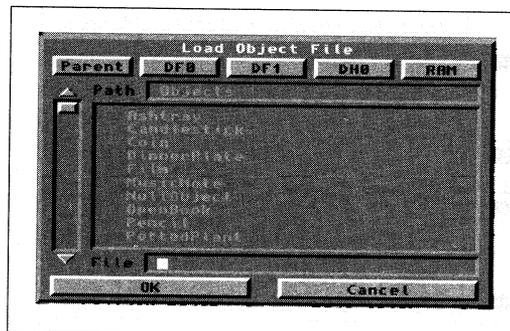
3 Click on the Load Object button. This will open the Load Object File selector.

4 The slider on the left side of the selector lets you move up and down to show files and directories that may be hidden. Move the slider to the bottom to find the Tutorials directory.

5   Click on Tutorials (dir) once. This will show you what's inside of the directory.

Helpful Hint: If you accidentally click on the wrong directory, you can use the Parent button at the top of the requester to move yourself back one directory.

6   Look for an object called NewTekLogo and click on it. When you do this, its name will appear in the File window at the bottom of the requester.

7   Click on OK.

This is the basic process for loading objects. Click on Load Object, find the file you wish, select it, and click on OK.

You'll notice that Current Object now reads NewTekLogo. Also, the object information window at the top of the screen tells you that there is one object loaded, with 144 points and 92 polygons.

8   Let's do a quick render to see how the object looks. We want a really quick render. Quality isn't that important to us at this time. Click on the Camera Menu.
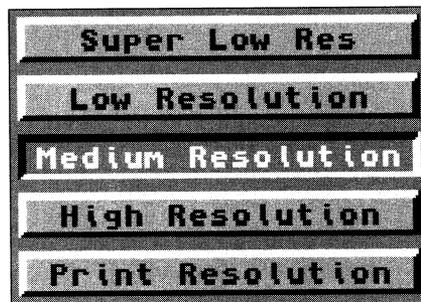
9   LightWave has five resolutions: from Super Low Res to Print. Let's select Super Low Res, for the quickest (but lowest quality) render. The window next to it will tell you that the current resolution will be 188x120.

10   Click on the Render! button, or hit the F10 key. (Again, the F10 key is also used to render in the CG and ToasterPaint.)

11   If you click on the Render! button, the Frame Advance menu will come up. Automatic is only used for creating animations, so the default Manual setting is what we want. Click on OK.

This will cause the menus to vanish, and the Control Panel screen will show a low resolution gray scale representation of the image as it renders. The Control Panel view is designed as a guide to show you how rendering is proceeding. When the image is rendered, it will be displayed on the Program monitor, and the Control Panel monitor will also tell you how long the image took to render.

12   To go back to the menu, hit the Esc key. Note that the image stays on your Program monitor.
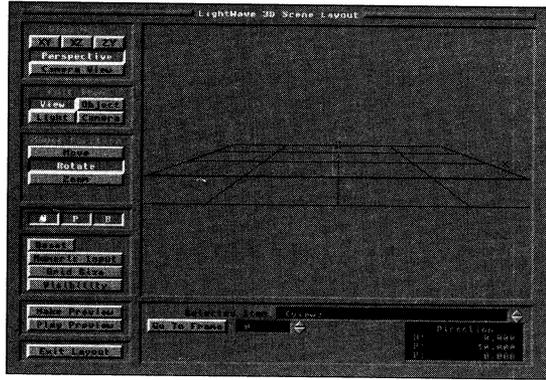
13 Let's look at things from a different angle by changing the position of LightWave's camera, light(s), and the object. We do this from the Layout window. Click on the Layout button. LightWave Renderer's main menu will disappear, and the Scene Layout window will come up.

Layout is where you position objects, lights, and your camera. This is usually done with the mouse, although you can use the keyboard for exact numeric input.
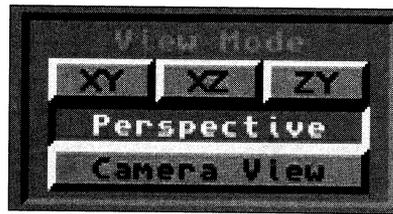
In setting up our scene, we have five views to choose from, listed in the View Mode window. You can select any of the five views by clicking on their button, or by hitting the keyboard shortcut F1 – F5 (shown below).

- XY (keyboard shortcut – F1) is a front view
- XZ (F2) is a top view
- ZY (F3) is a side view
- Perspective (F4) is a movable view that is used to give you a 'director's perspective.'
- Camera View (F5) is the most important view – whatever is shown in the Camera View is what will be rendered when you click on the Render! button. You might try flipping through the views.

14 Select the Camera View now. You'll see a wireframe representation of the scene you've rendered. The dark black area is the grid, which doesn't actually appear when you render, but shows you where the horizon line lies in the Layout scene.

The Edit Item menu lets you select which part of the scene you want to work on. There are four choices: View, Object, Light, and Camera.
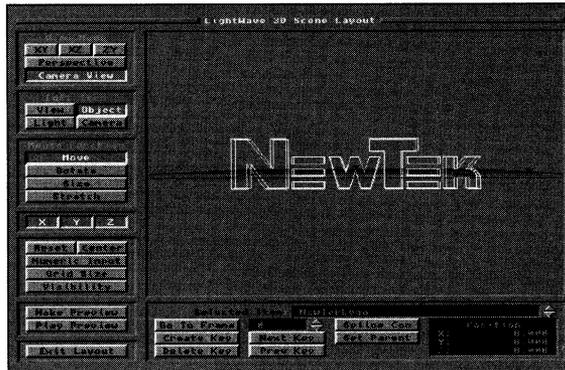
15 Select Object from the Edit View, or hit the o key as a keyboard shortcut. Notice that the logo becomes highlighted. Also notice that your Selected Item (in the Key frame Control window) is the NewTekLogo object..

The Mouse Function menu changes depending upon which Edit Item you have selected. In the case of objects, it lets you choose whether your mouse is used to move, rotate, size or stretch the selected object. Move is the default, so let's go with that.

16 Hold down the left mouse button and move the mouse up. The logo will move forward (away from you). Still holding down the left mouse button, try moving the object left, right, and back towards you.

17 Now hold down the right mouse button and move the mouse up. This will move the object up.

These are the three axes that the object can move on since mouse only works in two dimensions. The two mouse buttons move the object in different directions. Rotation works in the same way.
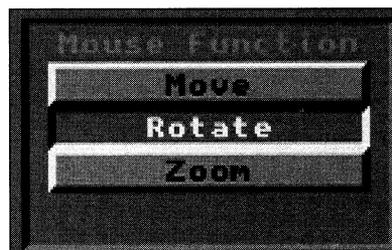
18 Select Rotate from the Mouse Function menu.

19 Hold down the left mouse button and move the mouse around a little. You'll find that moving the mouse left or right changes the Heading of the logo, while moving it up and down changes the Pitch.

20 Now – hold down the right mouse button and try the same thing. Moving the mouse left or right changes the Bank of the object.

21 Using the Move and Rotate functions, move the logo around your screen into a position you'd like to view it from. As you move the object, you'll notice that the Status window shows you the object's position or direction of rotation. The Status window is very useful for getting your positioning exactly right.
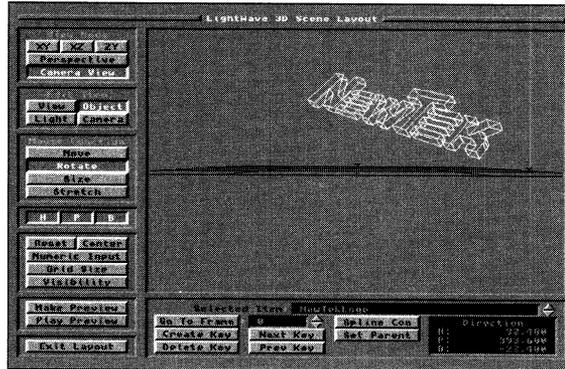
22 We can also Size or Stretch our object. Select Size from the Mouse Function menu. The Size function affects all three of an object's axes at the same time, so it doesn't make any difference whether you hold down the left or right mouse button. Moving the mouse to the left makes the object larger; right makes it smaller. Make the object very tiny.

23 There's a quick way to make the object the regular size again – hit the Reset button. The Reset button automatically resets whatever Mouse Function you have selected back to its default. Only the X, Y, Z (or H, P, B) buttons that are active are affected by the Reset button.
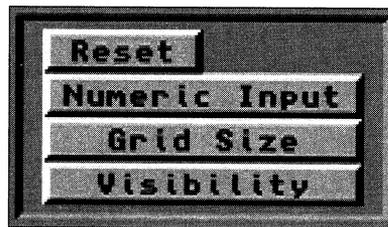
24 Now, select the Stretch button from the Mouse Function menu. Stretch works in a similar way to Size, except that it only affects one axis at a time.

25 Hold down the left mouse button and move the mouse a little. You'll find that left/right mouse movements size the objects along the X axis, while up/down mouse movements change the Z axis. Try the right mouse button. Up/down movement now affects the Y axis.

26 Reset your object's Stretch (using the Reset button, naturally).

Now let's move our camera. First, make sure that you are in the Camera View mode. You don't need to be in the Camera View mode to move the camera, but it does make the changes more obvious.

27 Select Camera from your Edit Item menu. Notice that the Mouse Function menu changes. The Camera only has Move and Rotation options.

28 Select Move from the Mouse Function menu (it may already be defaulted to this). Holding down a mouse button and moving the mouse will work in exactly the same way as it did when you were moving an object. The left mouse button moves the camera forward/backward or left/right; the right mouse button moves the camera up/down. Try this now.

29 Select Rotate now. Move the mouse using either the left or right mouse buttons. The effect of this becomes clear very quickly.

30 Using Move and Rotate, put the camera in a position you'd like to see the object from.

```
Go To Frame
Create Key
Delete Key
```
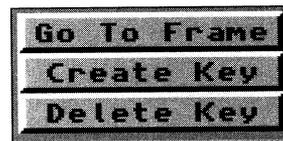
31 We want to render our scene now. But first, we need to tell LightWave that we want to save these positions for our camera and object. Click on the Create Key Frame button, or hit the Return key.

32 This will bring up the Create Key At Frame requester. Since we aren't creating an animation, we want to set our key at frame 0. That's already the default, so we don't need to change anything.

33 We want to set the position for the camera and our objects, so click on All Items.

34 Click on OK to confirm our choice.

Very Important Note: Always remember to create a key frame after you get objects into position. Failing to do this will mean that any changes you make to a scene will not be saved – possibly causing you to lose many minutes of work.

```
Exit Layout
```

35 Click on Exit Layout. This will bring you back to LightWave's main menu.

36 Now click on Render!. Since we didn't change our resolution, LightWave will do another super low-res render. When it's done, remember to hit the Esc key to get back to the main menu.

If you have an accelerated machine, you may want to use a higher resolution, such as low or medium resolution. To do this, go to the Camera menu and click on the resolution that you want to use. This will slow you down a little, but with an accelerated machine, the trade-off in image quality is often worth it.

Now let's go back into Layout and change the lighting.

37 Click on the Layout button.

38 Select Light from the Edit Item menu, or hit the l key. A light object (complete with barn doors to show you which direction it's facing) will appear. The Move and Rotate mouse functions will work just as you'd expect them to. You might want to try moving or rotating the light now.

A little about lights. LightWave can have up to 100 light sources, and each light can be one of three kinds – Distant, Point, or Spot. LightWave defaults to one Distant light, which is what we have here. This information is contained in the main screen's Lights menu.

It's important to understand the differences between the types of lights, and the Reference section of this manual covers lights in depth. The important thing to understand here is that the position of a Distant light is irrelevant. The only important thing about a Distant light is which direction it faces, in other words, its rotation.

39 Change the rotation of the light. Don't forget to create a key frame.

40 Exit Layout and re-render the picture. You should be able to see the difference between the two pictures. LightWave's realistic lighting features make many stunning effects possible.

That's it for the basics of Layout. You'll probably want to experiment a little with different object, light and camera positions. In the next tutorials, we'll show you how to lay out scenes with multiple objects.

Tutorial 14 LightWave
A Look at LightWave

In our first tutorial, we got you to load and render an object. We had you do that first because it's more fun than reading a bunch of dry descriptions. But you may have noticed that Lightwave has quite few buttons. A few descriptions are in order, though we'll try to avoid being too dry.

This stuff is very important, however, so please read and learn it now.

Let's go through LightWave's menus and give you a quick tour of the important buttons for you to know at this point. There are plenty of buttons we aren't going to cover here and now. They're all covered in the Reference section and they relate mostly to animation. It's also important to remember that you don't need to understand what every button does in ordering to produce absolutely stunning images. But, if you know the buttons we cover here, the other tutorials will be much easier to get through.

What You'll Learn:

- Scene elements (Step 1)

- Object(s) elements (Step 2)

- Image elements (Step 3)

- Lights elements (Step 4)

- Camera elements (Step 5)

- Backdrop elements (Step 6)

- Record elements (Step 7)

This tutorial will take about 20 minutes.

1   From LightWave's main screen, click on the Scene button to view its menu.

The most important buttons for you to know at this time are the Clear Scene, Load Scene, and Save Scene buttons. Their functions are obvious once you know what a scene is.

A scene is a collection of all of the information that makes up a still frame or animation. This includes which objects and images are loaded, how many lights are in a scene and what their settings are, any motions you may have created, at what resolution you last rendered the scene, and much more.

Clearing a scene will bring the program back to its default settings, and it will unload all objects and images from memory. If you haven't saved a scene, then it will be lost. Loading a scene will clear whatever scene you have currently in memory, and put the new one you are loading in its place.

The most important thing that is NOT saved as part of scene is any changes you may have made to the object's surfaces. Any changes you make to an object's surfaces will be lost if you don't save the object. (More on that in Step 2 of this tutorial.) In other words, if you load an object, spend an hour getting its surfaces just right, and then fail to save the object separately, all of your work on those surfaces will be lost. Don't say that we didn't warn you.

Clicking on the Load or Save Scene buttons brings up a file selector that is similar to the Load Object selector that we've already encountered. This type of file selector is fairly common in LightWave.

The About LightWave window tells you how many Objects, Surfaces, Images and Lights are in the current scene, which can be useful information. Clicking on the About button will tell you the current version of the program, which you may need to know if you ever need technical support.

2   Click on the Objects button to see its menu.

We've already loaded an object, so you're familiar with how that process works. Let's look at the other buttons.

The Clear All Objects button is a quick way of getting rid of all of the objects in a scene, but it only gets rid of objects. Everything else in the scene stays the same, including things like camera position, and lights. Save All Objects is a shorthand way of saving each object's current surface settings. Sort of an automatic save things the way they are now button.

The Current Object indicator shows the name of the currently selected object, and also lets you choose a different one (among the loaded objects). This is accomplished with the two small triangular buttons to the right of the window. These triangular buttons are all over LightWave. They let you move through a list of choices. The top one moves you forward through the list of options, the bottom one moves you backwards. Clicking on them moves you through the choices.

Save Object will save only the current object. As mentioned before, this is mainly used for saving new surface settings with an object. We'll cover Surfaces in a separate tutorial.

3   Click on the Images button.

Images are used for a number of things in LightWave, including mapping realistic surfaces and loading backdrops for scenes. Images are anything you can load into ToasterPaint, and can either be RGB format or Toaster Framestores.

This menu is used to load or clear images. The Current Image window works in a similar way to the Current Object window from the Objects menu, as do the Image clearing options.

4   Click on the Lights menu button.

This is where we add and modify the scene's lighting. The scene defaults to one light, and you add more by clicking on the Add Light button. You can also clear all lights or individual lights by clicking on the appropriate button. It should be noted, however, that clearing all lights will not black out the scene. LightWave always has one light loaded.

Ambient light in the scene is controlled with the Ambient Color and Ambient Intensity buttons. The ambient light determines how dark the unlit parts of an object are. The lower the intensity, the darker these unlit zones will be. Ambient light casts no shadows, as it is an overall soft fill lighting. Note that too much ambient light will "white out" colors in the scene.

As mentioned in the first tutorial, each light in the scene can be one of three types: Distant, Point or Spot. The Reference section of this manual contains an excellent and complete discussion of LightWave's lights, and those interested in experimenting with lighting would do well to read that section first.

5   Go to the Camera menu by clicking on its button.

LightWave can render a scene using either Wireframe, Quick Rendering, or Normal Rendering. The Wireframe and Quick Render modes are mainly used for quick tests of a scene or for special effects. Both of those modes are quicker than the Normal Rendering mode, though at the expense of detail. Wireframe renders the scene just as a wireframe image (no big shock there), while Quick Rendering mode renders the scene without using any surface attributes other than color.

The Trace Shadows, Trace Reflections and Trace Refractions buttons allow you to turn on LightWave's ray tracing options individually. Ray tracing is a complex method of rendering that can be much slower than LightWave's normal method of rendering, but can produce stunning, photorealistic effects.

By the way, one common confusion that beginning LightWave users run into when they start to experiment with the Trace Shadows options is that they expect objects to cast shadows on the Backdrop-created ground. This won't happen, because the ground color that you select in the Backdrop menu is just a color, not an actual object. This may be difficult to understand at first, but think of the Backdrop as a very distant wall in the back of the scene. Too far away to receive any shadows falling off of objects.

As we mentioned before, there are five resolutions. A LightWave artist working on a project may switch resolutions often, using Super Low and Low resolutions to make quick tests of scenes, and using Medium, High or Print resolutions for final output. For the best result on video, High Resolution is recommended. Print Resolution is much slower and has no real benefits for NTSC video viewing (NTSC actually cannot display the higher detail of this resolution), and Medium Resolution usually has too many jagged edges.

The Overscan and Letterbox buttons are on/off toggle buttons. Change their settings to change how much of the screen is rendered. (The Layout's Visibility options let you see what the visible, rendered area of the screen will be, with or without overscan or letterbox.) Aside from producing different aspect ratios or looks for your work, turning Overscan off or turning Letterbox on will also lower your rendering times, since there is less of the screen to render.

6   Select the Backdrop menu.

After loading an image, you can designate it to either be a Background or a Foreground image. While the foreground is used mainly for special effects like animated transitions (fade in a black foreground to produce a fade-to-black effect, for example) or complex image compositing, background image selection is often used to superimpose 3D graphics over framegrabbed images (such as a 3D jet over a cloudy sky). This allows LightWave to create Rotoscoping type effects.

The Zenith, Sky, Ground, and Nadir Colors let you determine the gradient spread that LightWave creates behind your

images. Click these buttons to open up a color selector with three RGB sliders. These sliders allow you to pick any of the Toaster's 16.8 million colors. Check the Reference section of this manual for a more complete description of how the Zenith, Sky, Ground and Nadir interact. Selecting Zenith Color Only will cause only the Zenith color to be rendered.

7   Click on the Record button to view its panel.

The Record menu allows you to save images as they are rendered. Clicking on either Save Images or Save Frames will open a requester that will ask you to enter a name for your rendered work. The picture will be saved after it is rendered.

If you forget to select one of these save options and render an image that you want to keep, don't worry. There's a way to save your picture as a framestore without using these options, because rendered images reside in a framebuffer. Simply exit LightWave and go back to the main Switcher screen. Save the picture using the Switcher's Save Frames function. (See the Switcher manual if you're not sure of how to do this.)

You should have a better grasp of a few of LightWave's basic concepts now. In the next tutorial, we'll learn a little more about Layout.

Tutorial 15 LightWave
Using Multiple Objects

What You'll Learn:

- How to load and arrange multiple objects in Layout (Steps 1 – 24)

- Using multiple views

- Using constraints with movement and rotation (Steps 9, 10, 23, 24)

- Parenting objects (Steps 11 – 14)

This tutorial should take about 30 minutes.

1 From the Phonebook's Furniture directory, load in the following objects: Desk, DeskLamp, FileCabinet, and OfficeChair.

2 Enter Layout.

What we have here is a bunch of furniture piled on top of each other. That's because LightWave loads all of the objects in at location 0, 0, 0, the center of the workspace. Let's start to move in an organized fashion.

3 Change your View Mode to ZY (the side view.)

4 Select Object from the Edit Item menu.

5 Look at your Selected Item listing. It will tell you which object you're currently working with. In our case it says Desk, and the Desk is highlighted. Depending upon the order you loaded things in, your Selected Item may be different.

6 The small triangles to the right of the Selected Item window lets you select which object you want to work with. Click on it until Office Chair is selected.

7   Move the chair away from the other objects.

You'll notice that the bounding box that appears when objects are moved takes a little longer to change back into the object's wireframe with a few objects loaded. This is normal.

We're using the Grid as our guide for where the floor should be, and you may notice that when you move the chair, you can move it through the floor. We don't want to do that. You can also take note of each object's position by looking at the X, Y, and Z coordinates in the lower right hand corner. The first thought is to be really careful where we move the chair, but there is another way.

The X, Y, Z buttons allow us to restrict movement along any of those axes. They are on/off buttons, allowing movement in that axis only when it is selected.

8   Click on the Reset button to move the chair back to its original position.

9   Now click on the Y constraint and move the chair again. You'll notice that it's only moving along the Z axis, which keeps it on the floor. Make sure that it's away from the other furniture.

10   Make your Selected Item the FileCabinet, and move that away from the Desk and DeskLamp, too. Notice that the Y constraint is still on.

Now that we can see things a little better, we want to put the lamp on top of the desk. We also know that however we arrange this office, we're going to want the lamp on top of the desk.

11   Make the lamp your selected item.

12   We're going to link the lamp to the desk using the parent function. In this manner, wherever we move the desk, the lamp will follow it. Click on the Set Parent button.

13   A selector will come up asking you what you want the Parent Object to be. Click through the choices until you get to Desk. Click on OK.

14   Make the desk your Selected Item and move it around a little. You'll see that the lamp follows it.

15   We don't exactly want the lamp under the table, though, and we're too far away to get a good look, so let's move our view in closer. Select View from the Edit Item menu.

16   Select Zoom from the Mouse Function menu. Moving the mouse right will zoom the view in, and that moving it left will zoom the view out. Watch the numeric indicator, and move the zoom in to about 10.0.

17   The zoom is okay, but we're a little low. Select Move from the Mouse Function menu to move the view around. Move it so that you can see the tabletop.

18 Select Object from the Edit Item menu, and then select the lamp again.

You want to move the lamp to the top of the table, which means you need to move it in the Y direction.

19 Click on the Y button again to remove that constraint. Now move the lamp so that it's on top of the desk. Use the right mouse button for Y movements.

20 Now let's arrange our furniture around the room. Change your view mode to the XZ (top view) mode.

21 We're zoomed in a little close, so go to View Edit Item and reset the zoom.

22 The top view only moves items in the X or Z axes, so we don't need to worry about the Y axis for now. Go back to Object mode, and the lamp should still be selected. We want to position the lamp on the table, so move it to where you'd like it to be.

23 Now rotate the lamp a little, but be careful. If you rotate the lamp by its Pitch or Bank, it will rotate into the lamp and will appear to be embedded when you render the image. Selected Rotate, and click on the P and B buttons so that you can rotate objects only along their Heading. Rotate the lamp.

24 The lamp is now set. Select the desk and move or rotate it into a position you like. You'll notice that the lamp will follow it, and still stay in the position you've given it on the desk.

Now you can arrange the furniture however you'd like, using move and rotate. The top view is a good view to do this from, since it's almost like working with a floor plan. Having constraints makes it much easier to move things without accidentally moving them in a direction that would be unrealistic.

25 When you have an arrangement that you're happy with, change to the Camera View, and move your camera into position for a good view of things.

26 Finally, create a key frame. In the selector that appears, remember to set the key frame at frame 0 for All Items.

Exit Layout and render the picture in whatever screen resolution you'd like. You might reenter Layout and move the camera to another angle, if you wish.

Knowing how to do this type of layout comes in handy if you're doing architectural renderings, exhibit design and layout, or even set design for your Toaster video productions. After you learn more about animation, you may want to come back to this tutorial and do a fly through of the scene.

Tutorial 16 LightWave
Assigning Surface Colors

When you first set out to create a surface, it helps to ask yourself a few questions about the real-world surface you're trying to emulate. What color is this surface? Is it shiny or dull? Smooth or bumpy?

What You'll Learn:

- Applying colors to an object's surface (Steps 3 – 5)

- Applying surface attributes (Specularity, Glossiness, and Diffusion) to create the effect of metal, clay, glass, etc. (Steps 6 – 10)

- Using texture elements to affect an object's surface (Steps 11 – 18)

This tutorial should take about 30 minutes.

1 Clear the Scene. Load the Urn object from the Tutorials directory.

2 Go to the Camera menu and select Low Resolution. We're going to be 'shopping for surfaces', and low res is usually a pretty good compromise between speed and quality for this job. Also, turn Overscan off and Letterbox on. This will cut down rendering time without cutting out any of the objects. Remember, we're not creating final work for a client. We're just trying to get an idea about surfaces.

3 Render the urn, and then go back to LightWave's main screen. Click on the Surfaces button to bring up the Surfaces panel.

4 Our current surface is listed at the top of screen. In this case, it should be UrnExterior.

5 One important part of a surface's appearance is color. Start by changing the urn's color. To do this, click on Surface Color, and its requester will come up. Use the sliders to select a light shade of green. Click on OK to confirm your choice. Render the urn using your new color.

You can use the Surface Color selector to choose any of the Toaster's 16.8 million colors. You might want to try experimenting a little bit now. Aside from using the sliders, you can also enter numbers directly.

Helpful Hint: When entering numbers into any of LightWave's requesters, you don't have to erase the value that's already entered. Just type in the new value in front of the old one, making sure to leave a space between the new value and the old one.

Other important elements in determining the look of a surface are Specularity, Glossiness and Diffusion. These, in essence, determine whether an object looks shiny or dull, and whether its shine is like that of plastic, of glass, of metal....

6 Click on the Specularity button and change its value to 0%. Render the urn. You'll notice that the urn now has a flat, dull look to it – as though it was made with clay and not glazed. You might want to try a few settings between 0 and 100% to see the effect.

7 Now's let see the effect of different Glossiness settings. Change your Specularity back to 100%. Set Glossiness to Low by clicking on the button and rendering. You'll notice that the hotspot is much bigger.

8 Let's try to create a silvery, metallic surface. Metal is usually shiny (High Specularity) and has a large hotspot, so the settings that we have are fine. Let's change the color, though. Set Surface Color to gray, where the R,G, and B values are all around 200.

9 To get a realistic metal, we'll want to set our Diffusion down to around 30%. Do this now. This will make the urn very shiny, and not much else. Try rendering this now.

10 Let's try one more thing. Click on the Color Highlights button. This will set your hotspot to a shade of your surface color, as opposed to plain white. Try rerendering.

You should try changing your settings a little bit now. For instance, try a few yellow Surface Color settings to create gold, or try to create a blue/green 'Rearden Metal' look. See what happens when you try changing the Diffusion or Specularity a little. Experiment.

11 Now we're going to use some of LightWave's texture features. Set both your Specularity and Diffusion settings to 100%. Glossiness should be set to High.

12 Click on Surface Color and select a deep shade of blue. Now click on Texture. This will open up a new set of menus: the Texture menus.

13 There are a number of different textures included with LightWave. You can click through them by using the triangular buttons next to the Current Surface requester. Find the Fractal Noise Surface.

Fractals are random patterns that closely resemble natural phenomenon. Fractals can be used to create things like realistic clouds, add dirt to an object's surface, or create beautiful color effects.

14 Let's start by setting the Texture Size. This will determine how large our fractal pattern will be. Our urn is about 300 mm high by 200 mm wide. (You can check the size of any object by loading it into Modeler.) Click on Texture Size and set X, Y, and Z to around .03.

Helpful Hint: LightWave is based on the metric system. (Remember the metric system? America was supposed to convert over to it around 1978...) Any of the requesters that deal with size or distance are based on the basic unit of 1.0 , which is 1 meter. Brushing up on our metric measurements, .001 is one millimeter. In step 14 (above), .03 is 30 millimeters or 3 centimeters. It helps to own a metric ruler...

15 Set Texture Color to medium bright green, and click on Render! (Note for 1.0 users: In the 1.0 version of LightWave, you would have had to click on Use Texture to exit this panel and render the image. Not so with System 2.0.)

The urn's surface is now a hazy mixture of blue and green. Let's change a few settings to see the difference.

16 Click on Contrast and change its value to 9. The contrast controls how sharp the edge is between the two colors (Surface Color and Texture Color) that you've chosen. Render this to see the effect of the new value. (By the way, 9 is a fairly extreme value. You would hardly ever enter a value higher than 10.)

Watch as the new urn renders. As the new version replaces the old one, you'll notice that this is the same pattern as before. This one just has a much sharper delineation between colors.

17 Now we'll change the Frequencies value to 3. (The useful range of values for frequencies is integers between 1 and 6.) The Frequencies value controls the amount of 'detail' in the fractal pattern. Render the urn to see this.

Again, we have the same basic pattern, this time with much greater detail.

18 Finally, let's change the Texture Size to .005 for X, Y, and Z. Render the urn to see the effect of the different size.

One other thing you'll notice when you go back to the Surfaces panel – the Surface Color numbers are now shown in italics. This lets you know that a Texture is currently being used. If you ever want to get rid of a texture, click on the Free Textures button.

Try experimenting with fractals a little bit now. Look at the effect of changing colors (either Surface or Texture), setting X, Y, or Z values differently, and changing frequencies and contrast. You also might want to try different settings for Specularity, Glossiness, or anything else we've covered. A good way to experiment is to change one value at time and render to see the results.

In the next tutorial, we'll cover other ways to change the surface appearance and create photorealistic images.

Tutorial 17 LightWave
Making Wood and Marble

Since the Toaster's release, one of the biggest questions asked by LightWave users has been, "How do I get great looking wood or marble?" They've tried using Wood and Marble menus, which are accessed by the Textures button under Surface Color (the same location as the fractal noise texture that we used in the last tutorial).

So how DO you get great looking wood or marble using those menus?

You don't. At least, not the way you're thinking.

The best way to get realistic surfaces is by using image mapping. In other words, you take a picture of wood and wrap it around your object. Luckily, LightWave's image mapping features are tremendously easy to use, and the Toaster has a built in framegrabber with a 24-bit paint package for capturing and retouching your images.

By the way, the Wood and Marble procedural textures do have some advantage over image mapping. You can animate them, for instance. Also, if you slice an object during an animation, the insides are mapped (this does not occur naturally in projection mapping). But, for realism as well as a slight speed advantage, image mapping is the way to go.

What You'll Learn:

•   Applying image maps to an object (Steps 1 – 7)

•   Planar Image Map (Step 3)

•   Automatic Sizing of image maps (Step 6)

This tutorial should take 20 minutes.

1 You should still have the urn loaded. Go to the Images menu and select Load Image. Load the VerdiPompeii image.

2 Go to the Surfaces menu, click on Surfaces and then click on Texture.

3 Use the triangular buttons to select Planar Image Map, which is located in the current Texture Type.

4 We need to select an image, so use the triangular buttons to make VerdiPompeii your current Texture Image.

5 We want our image to be wrapped around the object on the Z Axis, so click on that button. For a complete discussion of how selecting different axes affect texture mapping, see the reference section of the LightWave Manual.

6 An important element of good looking image maps is getting the map placed on the object correctly. LightWave has a powerful feature called Automatic Sizing that will do this for you automatically. Click on the Automatic Sizing button. A requester will warn you that the current values will be lost. As we haven't entered any values, click on OK.

If you want to see the values that LightWave selected, you can click on Texture Size and Texture Center. Don't change them, however. Also be aware that rendering images in higher resolutions can make a big difference. Try using medium or high resolution for the best results.

7 Render the picture.

That's how simple it is to get amazing looking pictures using Image Mapping. There are two other types of image mapping: Cylindrical and Spherical. Again, to learn more about the specific uses of these functions, read about them in the LightWave Reference manual. You'll find that they are very straightforward.

Also, you should be aware that Specularity, Diffusion, and all of the other surface settings that we've been using are still in effect.

You also might want to try loading a few of the other images included with Toaster System 2.0 to see how they look. To do this, load the image, go to the Planar Image Map menu, and make the image you want to use the Texture Image.

If you want to create your own image maps, read and learn the sections on the Toaster's Framegrabber. Images to grab can come from anywhere, but one good place to start is the hardware store. Small sections of rock, marble, wood or brick paneling look just as good as the real thing usually, and are much easier to move around.

Tutorial 18 LightWave
The Flying Logo

In this tutorial, we'll teach you the basics of LightWave's animation features with the most common 3D animation of them all: the flying logo.

For the following tutorials, we assume that you have read and understand the LightWave (and to a lesser extent, LightWave Modeler) tutorials. If you haven't read them, go back now and do that.

What You'll Learn:

* Setting up frames (Steps 1 – 7)

* Playing a preview (Steps 8 – 13)

* Camera movements (Steps 14 – 16)

This tutorial should take about 20 minutes to complete.

1 Enter LightWave and clear your scene, so that we're starting from scratch.

We're going to create a three second flying logo animation. The first step is to tell LightWave how many frames we want to use. Video runs at thirty frames a second, but, in order to save time, animation is sometimes created at ten or fifteen frames a second. We want to create a high-quality animation, however, so we'll use thirty frames per second. Thirty frames per second x three seconds means that we'll be creating ninety frames of animation.

2 Still in the Scene menu, click on the Last Frame button and enter a value of 90.

3 Go to the Objects menu and load the NewTekLogo Object from the Tutorials drawer.

4 Enter Layout and select Camera View.

LightWave 3D uses a keyframe animation system. You've created keyframes already – in order to animate, we simply create two or more keyframes, and LightWave will create the in-between frames.

5 We want the logo in the middle of the screen at the end of the animation – in other words, at frame 90. It's already right in the middle of the screen, so let's create a keyframe at frame 90 using the current position. Select Object from the Edit Item menu, so that the logo becomes highlighted.

6 Create the keyframe in the usual way – by either clicking on the Create Key button or hitting the Return key once. When the create key frame requestor appears, enter 90 for the Create Key At Frame value and leave the Selected Item highlighted. Click on OK.

7 We've created the last frame; now let's create the first keyframe. Move the logo so that it's above the horizon and off in the distance. When you find a position you're happy with, create a keyframe at frame 0.

8 You've just created the move for three seconds of animation. Let's take a look at it. Click on the Make Preview button, and click on OK. A wireframe preview of your animation will be created. Watch the numbers in the lower right hand corner of the view window to see its progress.

9 Let's watch the preview. Click on Play Preview, and a number of VCR-type buttons will appear. The 1 Frame buttons move you a frame at a time through the animation, or you can watch the preview forwards or backwards at 10, 15, or 30 frames per second. Watch the preview in a number of different ways. When you're done, click on End Playback.

It's not going to put Disney out of business, but there is a certain thrill in seeing your first wireframe animation. (Just wait until you see your first fully rendered animation – or your first check for creating an animation.)

10 Let's add a keyframe to our animation. Click on the Go To Frame button, and go to frame 30.

11 The Go To Frame button now reads 30 – this is how you can tell which frame you're working on. This is the way frame 30 currently looks. Let's change things a little bit. The logo should still be highlighted. Move it down below the horizon line.

12 Create a new keyframe at frame 30. You'll notice that the requestor defaults to frame 30. The requestor will always default to your current keyframe.

You've now created three keyframes. To see them, click on the Next Key or Prev Key buttons. You can step through all of the frames by clicking on the triangular buttons next to the Go To Frame button. By the way, you can tell if a frame is a keyframe because the Spline Con (spline control) button is only visible on keyframes.

13 Click on Make Preview. We want to see a quicker preview this time, so click on Bounding Box, and then click on OK. Play this preview a couple of times.You'll see that, while Bounding Box preview doesn't give you all of the detail of a wireframe preview, it does give a very good preview idea of the way the motion looks, which is sometimes all you'll need. And it is much quicker to create, especially when you have many objects loaded.

14 Let's add a camera move. Select Camera from Edit Item and go to frame 90. Create a keyframe for Selected Item (in this case, the camera) at frame 90.

15 Now go to frame 0 (the quickest way to get there is to hit the Next Key button). Move your camera up a little and to the right, and then angle it back towards the center using the Rotate function. Create a keyframe at 0 for the Selected Item.

Try clicking on the Next Key button a couple of times. You'll notice that there doesn't seem to be a keyframe at 30 anymore. There still is, however – just not for the camera, which is our current Selected Item. The Next and Prev key buttons only show you the keyframes *for the Selected Item,* and we only created two keys for the camera; one at frame 0 and one at frame 90.

16 Make and view the preview. If you aren't happy with any of the elements of your animation, go to the keyframe that seems to be the problem and change it. Just make sure that you create a new frame to replace the old one. Also remember that, if you move the camera and the object in the same frame, you'll need to either create two keyframes for the Selected Item (one for the camera, one for the object), or create one keyframe for all.

You can also delete any keyframe with the Delete Key button, which looks and acts just like the Create Key button. You'll find that you can't delete the keyframe at frame 0 – there always needs to be at least one keyframe in LightWave at frame 0.

Try creating a few of your own animated moves now, using the principles you've learned here. Try keyframing different rotations or sizes for your objects, create a different camera move, or move the light source as well.

If you want to, save this scene to work on in the future.

Tutorial 19 LightWave
Return of the Flying Logo

Now that you know the basics of animating with LightWave, we'll add some fancy moves and show you a few advanced features. We'll create another 3 second (90 frame) animation.

What You'll Learn:

- The NullObject (Step 1)

- Setting a target (Steps 2 – 6)

- Parenting the NullObject to an object (Steps 7 and 8)

- Parenting a light to an object (11)

- Creating an animation (12 – 14)

- Tips for parenting and targeting

This tutorial should take about 30 minutes.

1 Clear the Scene, set Last Frame to 90, and load the NullObject from the Objects directory, and the NewTek logo from the Tutorials directory. Enter Layout.

The NullObject is a single-pointed, invisible object. If you don't think that an invisible object will add anything to your animation, stick around.

2 Go to the Camera View, and select Camera from the Edit Item menu. Click on the Set Target button. This forces the camera to always aim at whatever object we choose. Select the NewTekLogo as our Target Object.

3 Now select Object from the Edit Item menu, and make sure that the logo is your selected object. Move the logo around a little bit and watch what happens. The camera tracks the logo wherever it goes. You can still move the camera, but you now only have control over the camera Bank rotation. Heading and Pitch are locked to follow the logo.

We've set our camera to always follow the logo. Now let's animate the light. We want the light to move across the Logo during the course of the animation. We could do this by just key framing the light at a position that we think looks good, and then test rendering to see if the light is hitting the object correctly. That would be a long trial-and-error process, however. There is another way. Use the NullObject.

4 Start by setting a target for the Light. Select Light as the Edit Item and click on Set Target. We'll also want to see the light as we work with it. Click on Visibility and turn Lights on.

5 We're going to make the NullObject the target for the light, so click on Set Target and select NullObject, then click on OK to exit.

6 Change your view to XZ (the top view). Move the Light so that it's a little bit in front of the logo, and directly centered on it. Create a key frame at 0 for the Selected Item (the light).

7 Select Object from the Edit Item menu. Make the NullObject your Selected Item.

8 First, Set Parent for the NullObject. We want the NullObject to follow the Logo wherever the Logo goes. Select NewTekLogo as the Parent Object.

9 Now, move the NullObject to the far left hand side of the logo. Notice that the Light tracks the NullObject. Create a key frame at frame 0 for the Selected Item (the NullObject).

10 Move the NullObject to the far right and create a key frame for Selected Item at frame 90. If you'd like, make a bounding box preview to see how the light will move across the object over the course of the animation.

11 Now let's parent the light to the logo. Select Light from the Edit Item menu and click on Set Parent. Select the NewTekLogo as the Parent Object. This means that wherever the Logo goes, the light will follow it.

12 Now that our objects are parented and targeted properly, we can create the animation simply by moving the logo. Go to Camera View, and select Object from the Edit Item menu. Make the logo your Selected Item.

13 Move the object up above the horizon and off into the distance a little. Create a key frame at frame 0.

14 Go to frame 90. Move the logo in so it's close to the camera and fills up most of the screen. Create a key frame at 90. Go ahead and preview your animation.

Take time to experiment a little bit with parenting and targeting. Here are a few general hints and tips.

- You might want to change your light type to spotlight in order to get a moving spotlight effect.

- It can often be useful to set a NullObject as a target for the camera. You can then aim the camera just by moving the NullObject.

- You can load multiple NullObjects. One use of this might be to set targets for a number of lights, or to have different targets for your lights and camera.

Tutorial 20 LightWave Tumbling Dice

In this tutorial, we'll give you some help in creating realistic motions easily. We'll create a two second animation of a die bouncing.

What You'll Learn:

- Creating an animation (Steps 1 – 9)

- Setting animation rotation (Steps 3 – 5)

- Creating a bounce with a falling object (Steps 6 – 9)

- Setting spline controls to give the object a "realistic" bounce (Step 10)

This tutorial should take you about 20 minutes.

1   Click clear scene and then OK.

2   In the scene menu, set the last frame buffer to go to 60 (for a two-second animation), and load the object VegasDie from the Games directory. Enter Layout.

To create a realistic motion, we want the die to come spinning on screen as it bounces off of the ground. The problem that many people have when creating an animation like this is that they try to do too much at once. They may try to set a key frame for object rotation, object position, their camera moves, and everything else all at one time. The best way to handle a complex motion is to take it a piece at a time.

3   We'll move our camera into position first. You'll want to move the camera up and back a little bit, and rotate it down so that it's facing the grid. Our camera is positioned at X : 0, Y : .035, Z : -.085, and our camera's Pitch rotation is 17 degrees. Create a key frame (for selected item) at frame 0.

4   Let's start to animate the die with rotation. Change your view to XY (front view). The die will be bouncing into view toward us, so it probably should be rotating toward us. Select object. Set the die's Pitch rotation to around -280. (You could set this numerically, but using the mouse lets you actually see the motion.) If you turn off the H&B buttons you will only affect the pitch when you move the mouse.

5   The tumbling die wouldn't just rotate in one direction, so let's add a little 'slop' to the motion. We've given our die a Heading rotation of -65 and a Bank rotation of 40. Set your rotations to around those levels. If you've turned off the heading and bank buttons, you will need to turn them back on.

6   Create a key frame (for Selected Item) at frame 60. The die's rotation will remain fairly constant throughout the animation, so setting the rotation for the entire animation makes sense. Make a Bounding Box Preview by selecting Make Preview, then Bounding Box, then OK. Play it a few times to see if you're happy with the move. If not, adjust the motion until you're satisfied. After playing Preview you must end playback before you can continue.

Now that your rotation is set, let's create the motion path. We'll set the 'bounce' at around the middle of the animation.

7   Go to frame 25 by selecting the Go To Frame and entering 25 in the requester that appears. Note that the die is partly rotated.

8   We don't want to change the rotation of the object (we're happy with that), we just want to move the die so that it's just touching the ground plane (i.e. the grid). For us, that's a Y Position of .015, but you'll want to eyeball this. Create a key frame for Selected Item at frame 25.

Note: If you accidently rotate an object instead of moving it, advance to the next frame by clicking the up arrow next to the frame number and then go back down to frame 25. Your object will be back in its original position and you can try again.

9 Go to frame 0, and change your view back to Camera. Let's move the die behind and above the grid. In our case, X : -.015, Y : .035, Z : .080. Create a key frame.

10 Now let's go to frame 60 and create the key frame there. We'll want the die to be up high and in front of the grid. Our settings are X : 0, Y : .045, Z : -.050. Create a key frame (for Selected Item) at frame 60.

Create a Bounding Box Preview and play it a couple of times. Not quite right, is it? The positions seem good, but the die is swooping in, not bouncing.

11 Spline controls come to the rescue. End the Playback and go to frame 25, bring up the Spline Control menu, either by clicking on its button or hitting the s key. Set Continuity to -1.

Create the preview and view it again – much better. One important use for Continuity control is to create realistic bounces. The spline control avoids complex key framing.

Tutorial 21 LightWave
The Flying Butterfly

What You'll Learn:

- Parenting objects (Steps 3 and 4)

- Creating parented motion (Steps 6 – 9)

- Looping motion files (Steps 10 and 11)

- Setting visibility for the scene (Steps 12 and 13)

- Setting the camera and light(s) (Steps 14 – 16)

- Creating a motion path for the object (Steps 17 – 20)

- Playing a preview of the scene (Step 21)

- Saving the scene (Step 22)

This tutorial will take about 45 minutes.

1 Click on Clear Scene. Next, click on Last Frame and enter 90. Load the following objects from the Tutorials directory: ButterflyBody, LeftButterflyWing, and RightButterflyWing.

2 Enter Layout. Select the XZ view. Though it appears that these separate objects are attached, they're not. That's our next step.

3 Click on Object from the Edit Item menu. Using the triangular arrows to the right of the Selected Item window, choose LeftButterflyWing. Now click on Set Parent. Again, using the triangular arrows, select ButterflyBody as the parent. Click on OK. We've just attached the left wing to the body.

4 Do the exact same procedure, only this time parent the RightButterflyWing to the ButterflyBody.

Now the butterfly has both of its wings attached to its body. Our next step is to create wing motion. Before we do that, we need to reposition the ButterflyBody.

5 Hit Reset to return the ButterflyBody to its original position. Click on XY from the View Mode to get a head-on view of the butterfly. Kind of looks like an airplane, doesn't it?

6 Select the LeftButterflyWing. Create a key frame at 0 for its current position. Now Go To Frame 5. Click on Rotate from the Mouse Function menu, and set the Bank to somewhere around -90° (a perfect 90° would be unnatural, as our attempt is to create fluid motion, so play with it until you're satisfied. We settled on 85°. Also note that you're setting the rotation to a negative number). Create a key frame. Go To Frame 10, and reset the wing back down to its original rotation (0°). Create a key frame.

7 Now we'll follow the motion through. Go To Frame 15, and set the Bank rotation to around 75° (positive 75°). Create a key frame. Go To Frame 20, and return the wing to its original rotation (0°). Create another key frame.

Let's do the exact reverse to the RightButterflyWing.

8 From the Selected Item window, select RightButterflyWing. Go To Frame 0, and create a key frame. Go To Frame 5, and set the Bank rotation to approximately 90° (that's positive 90°). Create a key frame. Go To Frame 10, and reset the wing to its original rotation (0°). Create a key frame.

9 Again, let's follow through with the wing's motion. Go To Frame 15, set the Bank rotation to around -75° (negative 75°), and create a key frame. Go To Frame 20, return the wing to its original rotation (0°), and create a key frame.

There. You've just completed the motion files for both wings. Now we'll set these motion files in a continuous loop.

10 Exit Layout, and click on Objects. Select the LeftButterflyWing as the Current Object. Click on Object Motion, and set the End Behavior to Repeat. Click on Use Motion.

We've just selected a loop for the left wing's motion file. Let's do the same for the right wing.

11 Select the RightButterflyWing as the Current Object. Click on Object Motion, and set the End Behavior to Repeat. Click on Use Motion.

There you go. Both wings have looped motion files. Now, on to the fun stuff. First, we'll create settings for both the Camera and the Light.

12 Click on Scene, and enter Layout. Click on Visibility. Select Grid, Objects, Camera and Lights from the Visible Items requester, and click on OK.

13 Change the View Mode to XZ, and click on View from the Edit Item menu. Set Zoom (from the Mouse Function menu) to 1.2.

For the moment, your scene will look really small.

14 Go To Frame 0, and select Camera from the Edit Item menu. Move the camera to the following settings: X : -0.267, Y : 0, Z : -0.205. Click on Rotate, and change the Heading to 50.

15 Create a key frame for the Camera at frame 0.

16 Select XY, and click on Light. Move the light to X : 0, Y : .2, Z : 0. Now, Rotate the light to a Heading of 60 and a Pitch of 90. Create a key frame for the Light at frame 0.

The Light and Camera are now in place. Let's create a motion path for the ButterflyBody. As we create this motion file, imagine that the butterfly is flying around in a field.

17 Click on XZ. Move the ButterflyBody to X : .23, Y : 0, Z : .14 (by now, we're making the assumption that you know the steps involved for doing this). Now, Rotate the ButterflyBody to a Heading of -45. Create a key frame.

We've just set the beginning position for all items in the animation.

18 Go To Frame 30. Move the ButterflyBody to X : -0.015, Y : -0.050, Z : .1. Create a key frame at frame 30 for the ButterflyBody.

We've now got the motion for the first second completed.

19 Go To Frame 60, and Move the ButterflyBody to X : 0.010, Y : 0.050, Z : -0.055. Rotate the ButterflyBody to a Heading of -180 (negative 180). Create a key frame at frame 60 for the ButterflyBody.

This completes the motion for the next 30 frames.

20 Go To Frame 90. Move the ButterflyBody to X : -0.219; Y : -0.014, Z : -0.162, and Rotate the ButterflyBody to a Heading of -130 (negative 130). Create a key frame for the ButterflyBody at frame 90.

Let's take a look at the motion we've created so far, by making a preview from within the Camera View mode.

21 Click on Camera View. Select Make Preview and choose Wireframe. After it has finished keying, click on Play Preview, trying various speeds. To stop previewing, click on End Playback.

Looks pretty much like a butterfly, flitting around a field. If you're not happy with any of the motion, try repositioning the Butterflybody and saving new keyframes. Play with this until you're satisfied with it.

We'll now save all of the work that you've done.

22 Exit Layout. In order to save the scene, you need to click on the Save Scene button, choose the disk you'd like to save it to, and enter a name for this scene. After you've done that, click on OK.

Tutorial 22 LW Modeler
Getting Your Feet Wet

Welcome to the model shop

Creating 3D graphics is somewhat like working with miniature models on a set. This is your model shop. LightWave's Modeler, however, is a lot less messy (no epoxy) and, because of the computer's ability to easily copy, cut and paste, it can be a lot simpler as well.

Before we get into actually making some models, let's have a brief overview of the process.

In traditional art, it's very rare that the artist works from memory. A painter who wants to capture a sunset goes where the sun is. A sculptor's studio is often filled with sketches, photographs, or models. The same is true for the 3D artist. The first part of creating a 3D model is to decide what you want to create, and then to do the research so that you know how to create it.

This research and design phase can take many different forms. If you're creating a real-world object, like a mug, you'd probably start by going into the kitchen and getting a mug. Then, you'd pull out your trusty metric ruler (LightWave uses the metric system, so you should, too) and start measuring things. How tall is the mug? How wide? You should also take this chance to really LOOK at the mug. We see mugs every day, but we don't really look at them critically that much. By carefully examining objects that you think you're familiar with, you'll pick up many small details that add realism to your models. Many of these same principles apply even if you're creating a space ship. While you can't go into the kitchen and grab a space ship (hopefully), you can watch movies or television shows, paying attention to the detail of models they used. You can also clip pictures from magazines, and keep an 'idea folder' that you can refer to for inspiration. You might also use traditional plastic or wooden models as the basis for your computer generated ones.

Now that you've done the research, it's time to start making your model. Modeling really is more art than science, and there are any number of ways to arrive at satisfying results. A good modeler will know the tools available, how to use them effectively, and, probably, a couple of tricks learned along the way.

Most models are created using just a few tools. The modeler typically starts either by using 'primitives' (basic shapes likes cubes, balls, and discs) or by drawing an object's points by hand. These drawn points are used in a high tech connect-the-dots, and edges are created. Then, the two dimensional object is turned into three dimensions, usually by either Extruding (which simply adds depth to an object) or by Lathing (which spins the 2D object around on its axis, almost like a potter's wheel).

Complex objects, such as cars, are usually put together a section at a time. You might start by creating one tire, for instance, rather than trying to create the whole car at once. The Modeler helps you to do this by allowing you to create objects piece by piece, and then paste the separate elements together. This is the Modeler's Layers function. As you create the different parts of your object, you might bring them into LightWave and view them from a few different angles. This is similar to a traditional artist creating 'studies' before diving into a complete work.

When your model is finished...well, it's finished. That doesn't mean that you'll never bring it back into Modeler, though. You may want to modify the object later, either to fix a problem or create a new object based on the old one. You may also want to bend, twist or stretch the object to make 'morph targets' for object metamorphing functions, like those in the film Terminator 2.

Good models are the basis for any effective 3D picture. Learn Modeler's tools, and you are many steps ahead of the game.

Tutorial One – Modeler Basics: Making A Box

What You'll Learn:

- Entering and exiting Modeler (Steps 1 and 2)

- Using Modeler's main menus (Step 2)

- Modeler's four "primitive" objects: Box, Ball, Disc and Cone (Step 3)

- Creating a box (Steps 4 – 11)

- Modeler's windows (Step 4)

- Previewing the object (Steps 12 -14)

This tutorial should take about 25 minutes.

1 From the Switcher screen, click on the 3D button to enter LightWave. To enter Modeler, click on the Enter Modeler button on the lower middle of the left side of LightWave's screen. You may need to click on the Modeler button twice – once to load Modeler and once to enter it.

2 Look at the top of the screen, and you'll see seven menus: Disk. Objects, Modify, Multiply, Polygon, Display, and Options. When you enter Modeler for the first time in a session, Objects is selected. Select menus by clicking on them with the left mouse button. If you want to exit Modeler, click on Disk, and, under its submenu, there's an Exit button you can click on. Click through the menus now, and you'll notice that many of the buttons on the left hand side of the screen change from menu to menu.

Helpful Hint: Many of the functions in Modeler have keyboard equivalents. These can be real time savers when you become more proficient with Modeler. These tutorials will give you key equivalents when appropriate. For a complete list of Modeler's keyboard equivalents, hit the Help key.

3 Click on Objects . This menu lets you create simple object shapes easily. These shapes (which are sometimes called "primitives") form the basis for more complex objects. The four basic shapes are listed on the left hand side of the screen: Box, Ball, Disc, and Cone.

4 We'll start by making a 2 meter x 2 meter box. Click on the Box button. Your mouse pointer will change from crosshairs to a wireframe cube.

Modeler's screen is split into four sections called Windows. The light gray cross bars separate them. The views are named in the lower right hand section of each window. They should read BACK, LEFT, and BOTTOM. The section without a name in the lower right hand corner is the Preview view.

5 Position the mouse pointer over the BACK view. Move your pointer around a little bit in the BACK view and look at the lower left hand corner of the screen. The black area has three coordinates: X, Y and Z. The number at the bottom of the screen, below where it says Grid, tells you how big each of the dotted-lined squares in the quadrants are. The dark, solid cross bars in each window show you where X : 0, Y : 0 is for that window. As you move the mouse in the BACK view, notice how the X and Y coordinates change to show the position of the mouse pointer. Move the pointer to position X : -1m, Y : 1m.
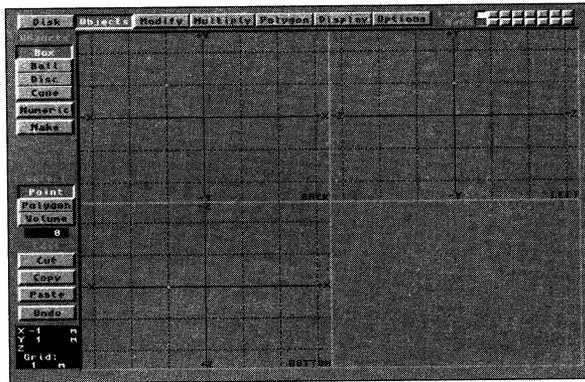
6   Click and drag the mouse to position X : 2m, Y : -2m. Release the mouse. This will drag out the outline of a box. It's important to note that we have NOT actually created the box yet, just an outline. The outline will be a white dotted line.
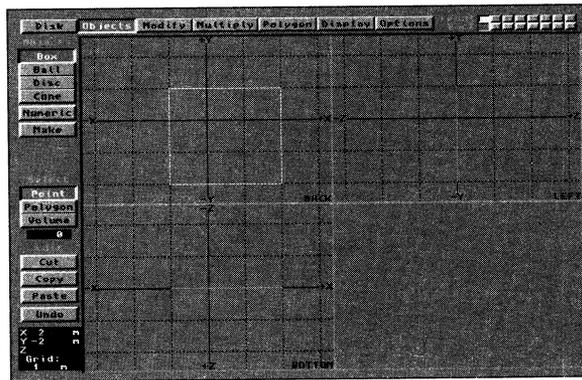
7   Oops – we've made the box too big. Remember, we wanted a 2m x 2m box. No problem. Simply click the mouse on the lower right hand corner of the box and drag it up to X : 1m, Y : -1m, as in Fig. 3.
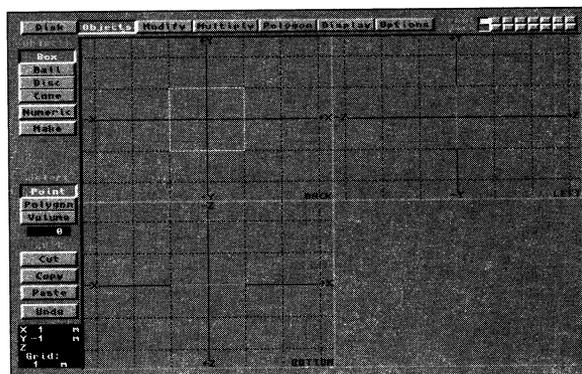
8   Now you've got the outline of a 2m x 2m box. There's only one problem: it's two dimensional. It won't hold very much as it is now. Let's give it a third dimension and make it a 2m x 2m x 4m box. Move your mouse pointer to the LEFT window and position it at Y : 1m, Z : -2m.

Note: There may be times when you want to create a two dimensional object. One example would be a flat ground surface.
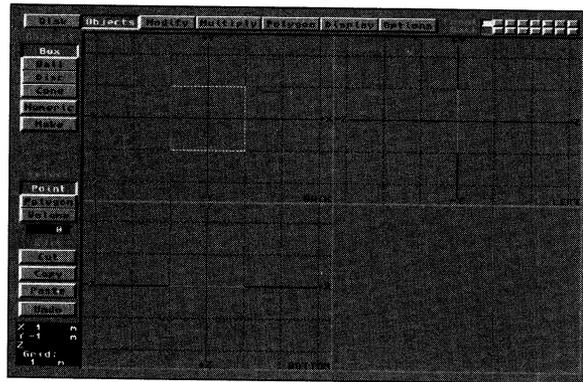
9 Click the left mouse button. This shows another method of setting outline corners: by clicking on the corner you want to move, and then clicking on the place on the screen you want to move that corner to. In other words, you don't need to drag the mouse.

10 We don't want you to get bored, so let's make the darn box. To do that, either click on the Make button or hit the Return key.

The white dotted outline has changed into solid black lines. It's a real box now. There are also white dots at each of the corners. These are called Points, and they are one of the basic building blocks of objects.
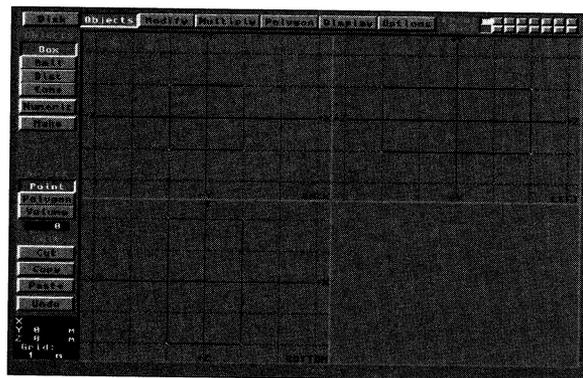
11 There still isn't anything in the window on the lower right hand corner (our Preview window). That's because Modeler defaults to a blank screen there. Let's get something up there. Go to the Options menu (which you'll remember is, like all menu selectors, at the top of the screen). When you click on Options, the lines of your box will change colors. Don't worry about that. It's normal, and we'll explain what it means later.

12 On the left hand side of the screen is the Preview selector, consisting of three buttons: None, Static and Moving. You'll notice that None is currently selected. Click on Moving.

13 Two things will happen: 1) The box will appear in the Preview window, rocking back and forth. 2) Two new buttons will appear under the Moving button: Wire (which is currently selected) and Solid. To see the difference, click on Solid.

Please proceed straight to the next tutorial, where we'll use the object that we've just created.

Tutorial 23 LW Modeler
Primitive Shapes

Now that you've made your first Modeler object, it's a good time to learn some basic 3D concepts. These concepts are pretty easy to learn, but they are very important. Understanding them will save you a LOT of time in the future.

What You'll Learn:

- Using points, edges and polygons

- Selecting polygons (Steps 1 – 3)

- "Ordering" polygons (Steps 4 and 5)

- Deselecting polygons (Steps 6 and 7)

- Selecting and deselecting several polygons simultaneously (Steps 8 – 11)

- Selecting and deselecting points

This tutorial should take about 15 minutes.

There are three basic building blocks for any LightWave object: Points, Edges, and Polygons.

A **Point** is a location in space. It has no dimension, and is not normally visible in the final rendered LightWave image. As mentioned before, a point is shown on the Modeler screen as a white dot. The box you created has eight points. There is also a special kind of point called a Vertex. A vertex is a point which is part of a polygon. The plural for vertex is vertices.

An **Edge** is the line that connects two points. Edges are shown on the Modeler screen as light gray lines. Edges are not normally visible in the final rendered LightWave image. The box you made has 12 edges.

A **Polygon** is an area bounded by three or more lines. Polygons are the only things that are visible in the final rendered image. Polygons are only shown on the Modeler screen when you select them. The box you made is made up of six polygons.

There are some important things to understand about polygons when you are creating objects to use with LightWave. Let's select the polygons that make up the box. We'll do this by using the Statistics button.

1 Go to the Objects menu, and, from the Select submenu on the left hand side of the screen, select the Polygon button. (Important Note: This is not the same as selecting the Polygon menu at the top of the screen.)

2 Hit the w key. (This is the same as selecting Stats from the Options menu.) This will bring up the Polygon Statistics requester.

Note: Press w to call up the Statistics menu for the currently selected item: points, polygons, or volume.

The Statistics menu lets you see how many polygons your object has and tells what kind of polygons they are. It also lets you select or deselect polygons.

The top line of the Statistics menu is the Total Polygons line. It tells you how many polygons your object has. In this case, your box has six polygons. We can select all of the polygons in the object by clicking on the + (plus) button to the left of the Total Polygons line.

3 Let's do that. Click on the + button and the requester will disappear. Your box will now have white dotted lines coming out of it in every direction. These dotted lines tell you whether or not a polygon is selected. All six of your polygons are now selected.

If you look at the black box under the Select, you'll also see that it says 6. That tells you that six polygons are selected.

Aside from telling you if a polygon is selected or not, these dotted lines extending from each polygon tell you something else very important: they show you which side of a polygon is visible.

It's obviously very important to know which side of a polygon is visible. This is known as 'ordering.' A practical example might help to illustrate the difference. Let's say that our box is a giant brick. We are only going to look at this brick from the outside. In other words, our camera will never actually go inside of the brick. In this case, our polygons are all facing the correct way.

But what if our box was a room? Then the camera would always be inside of the box, and our polygons would be facing the wrong way. We'll flip them to show you the difference.

4 Hit the f key. This is the same as selecting Flip from the Polygon menu at the top of the screen.

Note that the dotted lines are now facing inside of the object. Also, note the difference in the Preview window. The face closest to you actually vanishes.

5 Hit the f key a few more times to really note the difference between polygons facing inside of an object and polygons facing outside. When you are done experimenting, make sure that the polygons are flipped outside of the object.

6 We'll now deselect all of the polygons in the box, again using the Statistics requester. Hit the w key to bring the requester up.

7 On the Total Polygons line, click on the − (minus) button. The requester will vanish and your polygons will be deselected.

8 On the Total Polygons line, click on the − (minus) button. The requester will vanish and your polygons will be deselected.

Easy enough, right? We'll use more of the Statistics requester later, but now let's select polygons by using the mouse.

9 Move your mouse to the BOTTOM view window and, while holding down the left mouse button, drag the pointer from left to right over the middle of the box. Notice that every polygon you touch becomes selected. Release the mouse button.

You might also watch the black box under the Select submenu. It will tell you how many polygons are currently selected.

10 Now we'll deselect the polygons with the mouse. Keeping your pointer in the bottom window, click on a couple of the selected polygons. Again, as soon as you touch them, they become deselected. Make sure that at least one polygon is still selected.

11 Try clicking on a deselected polygon with the mouse. Notice that it doesn't select a polygon. In fact, clicking the mouse does nothing. There's another method for selecting polygons with the mouse after you've initially selected some.

12 While holding down the Shift key, click the mouse on some deselected polygons. They become selected.

Polygon Selection And Ordering, and Point Selection – A Review

This is important information, so let's review what we've gone over.

A) The ordering of polygons (the way that they're flipped) is a very important concept in LightWave. If objects render with holes, or appear to render inside/out, check which direction the polygons face.

B) To find out which way a polygon is flipped, select that polygon.

C) To select or deselect polygons using the mouse, click on the Select Polygon button (not the Polygon button at the top

of the screen), and then follow one of the steps below.

1 To select polygons, click the left mouse button on the desired polygon you wish to select, or click and drag the mouse over multiple polygons that you wish to select.

2 If any polygons are already selected and you want to select more, in addition to these, you need to hold down the Shift key on the keyboard and drag the mouse.

3 To deselect polygons, click or drag the left mouse button on any selected polygons that you wish to deselect.

D) Selecting points works in a similar way to selecting polygons. Click on the Select Points button, and then follow the steps outlined above. The click, drag and shift-click procedures are exactly the same.

E) You can also select points or polygons by using the Stats button (keyboard shortcut w). This allows you to select all points or polygons, as well as selecting polygons by the number of vertices they have, or by surface name.

Tutorial 24 LW Modeler
More Primitive Shapes

What You'll Learn:

- Working with layers (Steps 1 – 3)

- Making a ball (Steps 3 – 6)

- Increasing smoothness of the ball (Steps 8 – 10)

- Two types of balls: tesselated and globe (Steps 11 and 12)

- Making a disc (Steps 13 – 19)

- Making a cone (Steps 14; 20 – 22)

- Altering a 'primitive' (Steps 23 – 28)

This tutorial should take 30 minutes.

Let's create Modeler's other primitive shapes. You'll remember the simple procedure we used to create the box we made in Tutorial One: We selected Box from the Objects menu, dragged out the outline of a box, and then clicked on Make (or hit the Return key) to create the box. The procedure is very similar for Modeler's other primitives. Our objective is to learn how to use these different functions. This is for practice only. We'll start by creating a ball.

You should still have a box on the screen from the first two tutorials. We want to have a clear workspace, but in this case we don't want to delete the box. We'll use Modeler's Layers function, which gives us eight different work areas. Our box was created on our current layer, layer one. You can tell which layers you are on by looking at the layers buttons and seeing which is depressed.

1   Let's move to layer two. To do this, we either click on the top button (the Front row), second from the left, or hit the 2 key. Do this now. Our workspace is now clear.

2   The box is still in layer one, though. Changing layers doesn't erase anything. Let's check this now by either clicking on the first button, Front (top) row, or by pressing the 1 key. There's our box, just as we left it.

By the way, whenever we tell you 'go to layer x,' we always mean for you to click on the button in the Front row, which is the row of buttons on the top. It's also the layer in which you can edit. The Back row makes a layer visible, but you can't edit it. If we want you to click on the Back row, we'll say something like, "Make layer 3 the background layer."

3   Go to Layer 2. Go to the Objects menu and select Ball.

4   Click down in the BACK view and drag out an outline. We're not concerned with exact dimensions here. The square outline shown on your screen shows the outer boundaries of the ball.

5   Now drag out the view in the BOTTOM view to give your ball three dimensions. Try to make it more or less even.

6   Hit Return to create the ball.

What we've created is OK for an object in the background, but if the camera were close the ball would not appear very round at the edges. The way to fix this is to create an object with more polygons.

7   Hit the u key to Undo the last command (creating the ball).

8   Click on the Numeric button (or press the n key) to bring up the Numeric requester for the ball. The bottom part of the requester lets you enter values directly, so that you can make objects the exact sizes that you want them to be. The top section is used to determine what kind of ball we want to create, and how complex it will be.

We can increase the number of polygons by changing the value of Rings and Segments. As a rule, the number of Rings should be half the number of segments, plus one. That formula again is: R = (S/2)+1.

9 Let's change the number of segments to 20. That means we'll change rings to 11. Do this now.

10 Click on OK to exit the requester and hit Return to make the ball with these new settings. The ball now has more polygons, and will render more smoothly.

11 Let's look at the other kind of ball we can create. If you look at the ball on your screen, you'll notice that there are two poles. In other words, there is a clear top and bottom. Press u to Undo, and then hit n to reenter the Numeric requester.

12 Click on Tesselation. You'll notice that the Rings and Segments requesters have disappeared, and been replaced by Level. Enter 2 for a Level value. Click on OK and hit return to remake the globe.

The tesselated ball has no top or bottom poles, and its polygons are all three sided. Now that you've seen the tesselated globe, you might want to go back and change the ball's type or its options. One important note about tesselated Levels: each level is twice as large as the one before it, so you should not enter a value of five or greater without quite a bit of time on your hands. (Level four takes a fairly long time to create and contains over 5000 polygons. As it is, Level 2 has 1250 polygons.)

13 Let's create a disc now. Go to Layer 3 by hitting the 3 key or clicking on its button, and select Disc from the Objects menu.

The disc object is used to create objects like barrels, manhole covers, or tubes.

14 With the Disc object (and the Cone object that we'll cover next), the view that you click down in first is important. Click in the BACK view and drag out an outline to see this. You'll notice a cross in the middle of the outline. This shows where the 'top' of our barrel (the side that looks like a circle from the top) would be.

15 Go to the LEFT or BOTTOM views (for our purposes, it doesn't matter which) and drag out the depth of our disc. Hit the Return key to turn the outline into an object.

16 To make sure that you understand how this works, we'll create a disc in another direction. Hit the u key to Undo the disc we've created, and then press the / (lash) key to get rid of your disc outline.

17 This time start dragging out the outline in the LEFT window. Give it depth and then hit Return to create the disc. You can see the difference in orientation.

18 The disc, like the ball, also has Numeric options. (So, by the way, does the Box. All that they control, however, is where the corners of your box are.) Hit the u key to Undo, and then press the n key to bring up the Numeric requester.

19 Aside from letting you manually enter the dimensions for the disc, this requester lets you set how many Segments there are in your disc. The more segments it has, the rounder your object will appear to be from the top. 32 segments will give you a very smooth edge. Fewer segments create different (non-round) shapes. Three segments, for instance, will create triangular shapes. Try entering a few different values in the Segments requester, creating an object, then Undoing and reentering numeric values to see the different effects you can achieve.

20 Finally, we'll create a Cone. Move to layer 4 and select Cone from the Objects menu.

21 We'll assume that you're familiar with the process of dragging out an object outline by now. The cone is similar to the disc in that the window that you first click down in determines where the point of the cone is. Try dragging out and creating a cone.

22 The cone's Numeric requester is identical to the disc's. Try changing the number of segments.

These four primitive objects can be used as the basis for many complex objects. Let's move back to layer 2 (the layer with the ball) to see some of the ways you can alter a primitive.
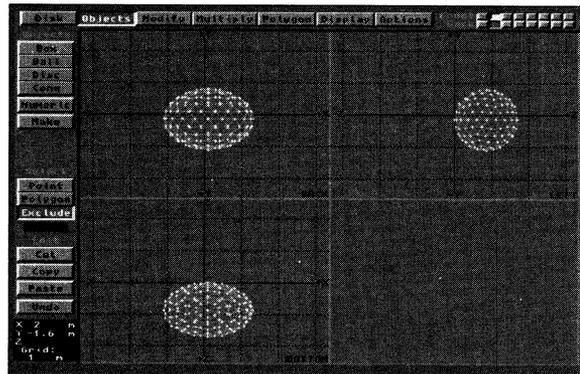
23 From the Select submenu, select Volume. The button will become selected, and the name of the button will change to Exclude.

The Select Volume control lets you affect an area of the object that you select with a 'rubber band'.

24 By clicking and dragging the mouse, draw a 'rubber band' outline box around the lower half of the ball. (Make sure the box is drawn around the ball in all three views.)

25 Now any functions you perform will be performed on the surrounded area. Select the Modify menu (at the top of the screen) and then select Move.

26 Move the mouse over one of the views, and click and drag the lower part of the ball down a little bit. Release the, hit u to Undo the move, and then try another one. You can see how just moving part of the ball can create different shapes. Undo the last move you did, so that the ball is back to its beginning position.

27 Click on the Volume button (which now reads Exclude) again, and it will change to the Include button.

28 Now press on the x key to cut the bottom of the ball off.

This gives you just a couple of ideas of how you can change the appearance of primitives using Modeler's tools. You might want to explore some of Modeler's other functions now, or try creating a few shapes of your own. You can't hurt anything by experimenting.

Tutorial 25 LW Modeler
Creating a Mug

What You'll Learn:

- The New button (Step 1)

- Changing the grid size (Step 3)

- Drawing points by hand and turning them into a polygon (Steps 4 and 5)

- Using the g key to make part of an object the center of a view (Step 6)

- Adding points (Steps 8 – 11)

- Using the a key to center an object in the view window (Step 14)

- Lathing an object (Steps 15 – 23)

- Using the layers functions (Steps 27 and 28)

This tutorial should take an hour or so to complete.

1 You should start this tutorial with a 'clean slate'. If you aren't entering Modeler for the first time, press the N (Shift-n) key, or go to the Disk menu and press the New button. This will bring up a requestor asking if you want to start a new project. If you click on OK, it will reset Modeler back to its defaults. If you don't want to lose any current work you might have going, click on Cancel and save your work.

2 Open the BACK window to nearly full screen size by clicking on the light grey cross bars that divide the views and dragging the window down and to the right. This gives us a little more room to work in.

3 We don't want a 12 meter tall mug, so let's change our Grid Size to 10 mm. From the Display menu, use the In button to make the grid smaller. If you make the grid too small, use the Out button. You can also use the . (period) and , (comma) keys to move in or out.

Helpful Hint: Using the > (Shift .) or < (Shift ,) keys will zoom you in (or out) twice as quickly.

Let's draw out the points of our object. In order to do this, you place the mouse pointer where you want to draw the point (noting its location in the lower left hand window), and click the left mouse button, followed by hitting the Return key. This creates a point. Since we're going to lathe our mug, we only need to draw half of a cross section.

4 From the Polygon menu, select Points and place, in the BACK window, the points shown in the picture below (in order). (90mm falls outside of the current grid; you'll need to enlarge your view to place these points.)
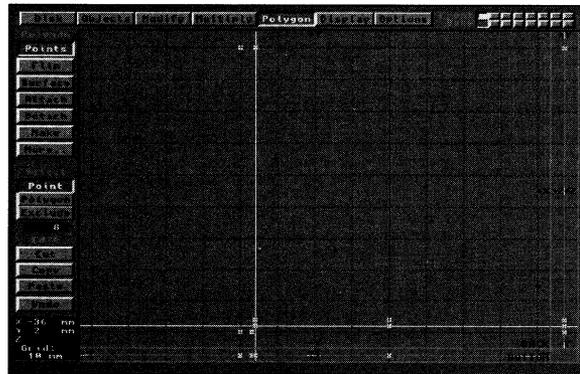
To draw a point, click the left mouse button on the spot you want the point to appear. When you are satisfied with the location of the point, click the right mouse (or return) button to create the point. The left mouse button does not create the point, it only positions the crosshairs.

- X : 0, Y : 2mm
- X : 0, Y : 4mm
- X : -36mm, Y : 4mm
- X : -36mm, Y : 90mm
- X : -40mm, Y : 90mm
- X : -40mm, Y : 0
- X : -37mm, Y : 0
- X : -36mm, Y : 2mm

Helpful Hint: When creating 'hollow' objects like urns or cups, you need to draw the interior points of the object first. If you don't, the object's polygons will face the wrong way when you render it.

5 Press the p key, or click on the Point button from the Select submenu and press Make to turn it into a polygon.

That's the basic shape. Again, we want to create half of a cross-section of the object. Now we have the basic shape of a coffee mug (without a handle). The lip of the cup is a little flat, however.
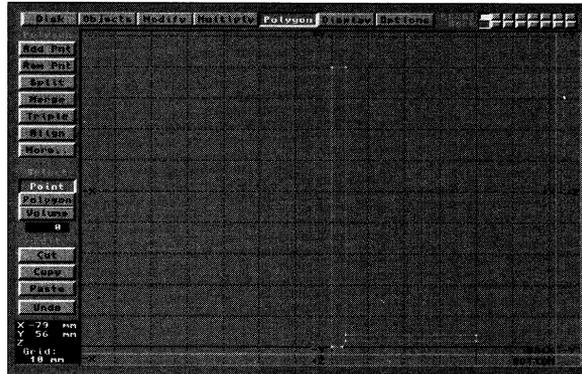
6 Let's add some detail to the lip of the mug by using the Add Points feature. Move the pointer to the top of the object in the BACK view and press the g key to center it. Hitting the g key moves whatever location the mouse is in to the center of your grid view.

7 Press the . (period) or > (Shift .) key several times to zoom in to a 1mm grid.

8 From the Select submenu, click on Points again and press the / (slash) key to deselect all points.

9 Place, in order, the following points:
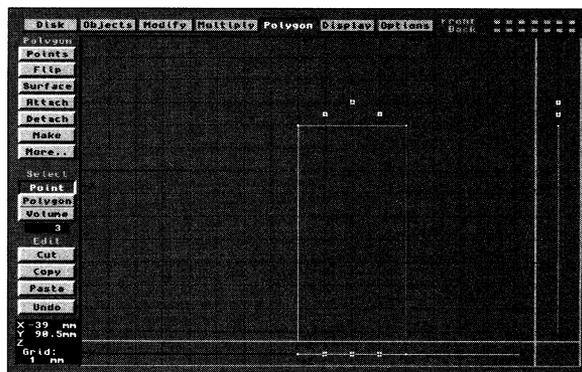
10 From the Polygon submenu, press More to get to the other menu. Select Add Points.
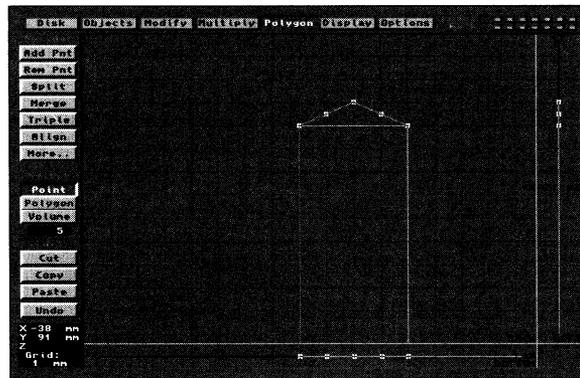
11 The pointer will change to the word To. Click on the horizontal vertex. This will add the points that you've created to the vertex.

12 This, currently, would cut someone's lip – the middle point is too high. Deselect the points by hitting the / (slash) key, and then reselect the top point.

13 From the Modify menu, select Move. Drag the point lower, to lessen the sharpness of the mug's lip, by clicking on the top point and pulling down with the mouse.

14 Press the a key to center the object in the view.

15 Let's lathe this puppy. From Multiply, select Lathe.

16 Click in the BACK window and align the white bar along the heavy black vertical line. This white bar sets the axes to which we're going to lathe the object.

17 Press the n key or click on Numeric to bring up the Numeric requestor.

18 In order to get a smooth mug, change Segments to 36. Check to make sure that your Axis is set to Y. Click on OK.

19 Press the Return key to lathe your object. Be ready for a not to pleasant surprise.

20 Didn't work, did it? A common mistake, and one you will probably make on your own. It lathed all right, but it lathed the points, not the polygon. Press the u key or click on Undo.

21 From the Select submenu, click on Polygon. The entire polygon will become highlighted.

22 Select Lathe and set the vertical bar. Press the n key to bring up the Numeric requestor. You'll see that it's kept the Segments setting to where you'd previously set it. Press OK to exit the requestor.

Helpful Hint: The numeric requestors remember their last settings. For this reason, it's often a good idea to check the Numeric requestor before performing some actions.

23 Press the Return key to lathe the object.

24 That's better. You can see the effect that lathing has had. Resize your windows and then press the a key to see the entire mug. Remember that the a key or Fit command resizes the object in each window; if one window is very small, it will resize the object to the smallest window.

25 Click on the Options menu and select, from the Preview submenu, Moving. Also select Solid. You can move your pointer to the view window in the lower right hand corner, and drag the object around to see it from different views.

You might want to make sure that your polygons are flipped the right way. If your mug doesn't seem like its polygons are facing the right way, go to the Statistics window and select all polygons, and then flip them.

26 Let's save our work so that we don't accidentally destroy what we've done. Either click on Save As from the Disk menu, or press the S (Shift s) key. When the requestor comes up, click in the File box and name the object something creative like Mug.

27 Now we'll create the mug's handle. We'll use the Modeler's Layers function so that we have some flexibility. Move to Layer 2 by clicking its top layer buttons, or press the 2 key.

28 Let's put the mug into a background layer – it will be visible, but we won't be able to alter it. Press the first bottom square, or hold down the Alt key and press the 1 key. The Mug will be visible in black outline.

We'll create our mug's handle by making a multi-segmented column that we can bend.

29 Select Disc from the objects menu, and click in the BOTTOM view. Drag out a disc by starting (approximately) at the points X : 15 mm, Z : -10 mm and dragging the box out to X : 25 mm, Z : 10mm. The disc should be flat, with no Y depth at all. Press the Return key to turn it into a polygon.

30 Select the disc's polygons and you'll notice a problem – the disc we created has two sides. This is a problem because we can't extrude more than one polygon. Selecting just one of the polygons is impossible to do by hand since they occupy exactly the same space. We'll use Modeler's Info command to deselect one of the

polygons. Make sure that the polygons are selected. Press the i key to bring up Info's requestor. The requestor gives you information about polygons, and it also lets us deselect a polygon easily. Do this now by clicking Deselect.

31 You'll notice that now only one polygon is selected. Press the x key to cut this and you'll be left with just one polygon.

32 From the Multiply menu, select Extrude. Click in the BOTTOM view and press the n key to bring up the Numeric requestor. Type .09 in the Extent requestor and set Segments to 10. Click on OK to exit, or press Return.

33 Press the Return key to extrude the handle. You might need to do a Fit; press the a key to see the entire object. (Fig. 5)
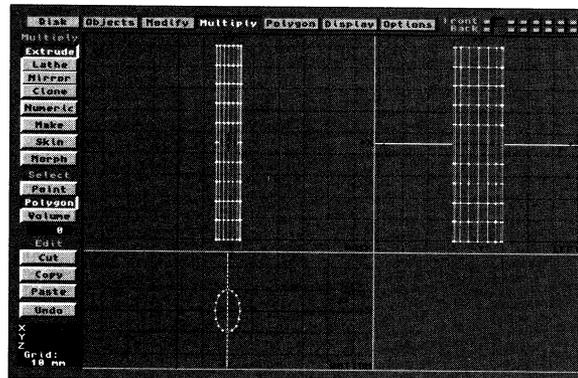
We now have what will eventually be the top half of the handle. The more segments we have, the smoother our handle will be when we bend it. Before we bend it, though, let's give it a flare at the top.

34 From the Modify menu, select More, and then select Taper1.

35 Move the pointer over the center of the handle in the BOTTOM view. Drag the pointer straight to the right, and the top of the handle will become larger. (Fig. 6)
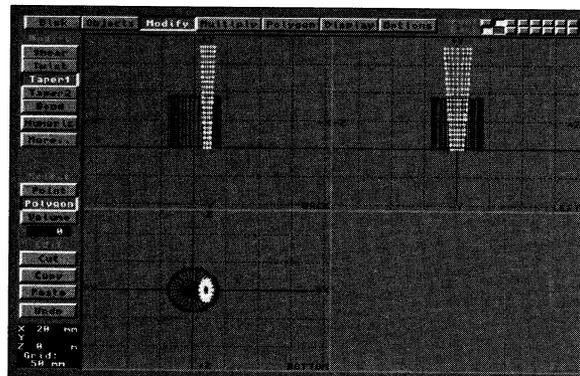
36 Select Bend from the same menu and again position the pointer in the BOTTOM window. Drag the mouse to the left until the handle is bent at about a 90° angle. You could also do this with the Numeric requestor, but seeing the object bend interactively gives you a better idea of how the Bend function works. (Fig. 7)
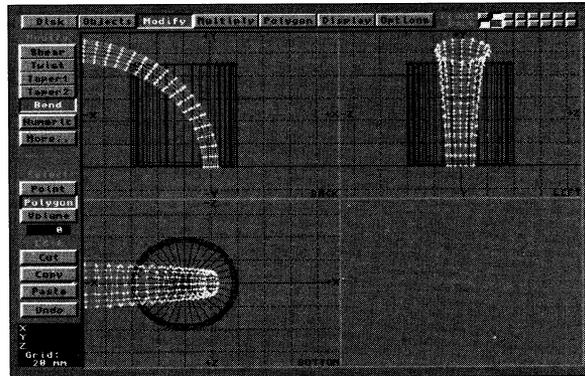
There's the top of our handle. We'll use Mirror to create the bottom half.

37 In the Multiply menu, select Mirror.

38 Click in the BACK view window, and line the white bar up so that it's aligned with the bottom edge of the handle (you may have to make the BACK view a little larger to do this easily).

39 Press the Return key and you'll create the bottom half of the handle. Press the a key to see the whole thing.

40 A bit big, isn't it? Go to the Modify menu and click More; select the Size button. Click in the BACK view window and drag the mouse to the left, but be careful not to release the mouse button. The handle will get smaller. Pick a good size for it and release the mouse button.

41 Just to make sure that we're working with the same object, press the u key to Undo the new size. The handle will go back to its regular (large) size. Now press the n key to bring up the Numeric requestor. Enter .5 for Factor and click on OK. This will make the handle 50% of its original size, which should be a pretty good fit. (Fig. 8)
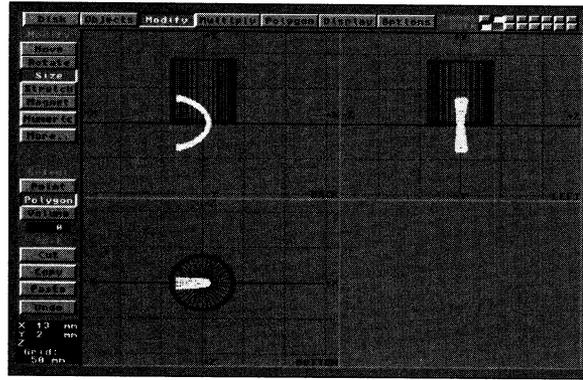
42 Not exactly in the right place though, is it? No problem. From the Modify menu, select Move. With the mouse in the BACK view window, position the handle onto the Mug by dragging it into place with the mouse.

43 When you've got it positioned, you might want to use the . (period) key to move in closer and make sure that the handle is actually attached. (Fig. 9)
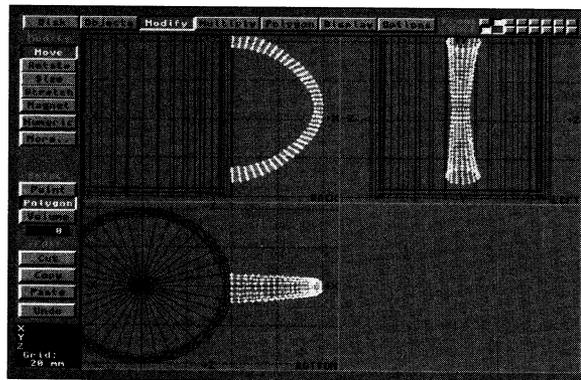
44 Press the S key to save the handle separately. Name it Handle.

45 Let's join the handle to the mug and save the darn thing. Either hold the shift key and click on the first two squares to select both layers, or, while holding down the Shift key, press the 1 key . Press the a key to see the entire object. The handle and the mug should both be highlighted.

Press the S key again and name the object CoffeeMug.

You may want to go out to LightWave and load this object. Try a few different surfaces on it.

Tutorial 26 LW Modeler
Modifying an Object's Shape

What You'll Learn:

- Loading an object (Step 1)

- Logo and Vehicle orientations (Step 2)

- Inclusive and Exclusive Volume modes (Steps 4 – 7)

- Stretching an object (Steps 8 – 10)

- Rotating an object (Steps 11 – 14)

- Resizing an object (Steps 15 – 17)

This tutorial should take 20 minutes to complete.

1 Load the Spaceship object from the 'Space' directory.

Since we're dealing with a vehicle, let's change from Logo orientation to Vehicle orientation.

2 Select Vehicle from the View option in the Display menu.

You'll now see that the spaceship is represented in the Vehicle orientation. Let's use Fit to center the object in every view. Let's also Widen out a little bit so that we can see more of the object and have a little more room to move around.

3 Select Fit from the Display menu (or hit the a key), and press the comma key on the keyboard.

You'll see that the object is now a little smaller. We haven't adjusted the actual size of the object, just the distance from which we're looking.

The first alteration we'll make is to elongate the nose of the spaceship. To do this, we'll use the Select Volume function to place a boundary around the part of the ship that we want to edit. Once we have the proper part of the ship enclosed, we'll use the Move tool to move it to a new position.

4 Click on the Volume button from the Select submenu.

The Select Volume button is actually three buttons in one. When you click on the Volume button, you'll see it replaced by a button that's labeled Exclude. If you click on it again, it'll change to a button labeled Include. In this manner, you can change from Exclusive to Inclusive mode at any time. The purpose of the two different Volume modes is to tell Modeler how you want the polygons to be included in the volume. When you enclose part of an object in a volume, you're bound to get some polygons that "cross" the boundary. By using Exclusive mode, the polygons have to be totally included in the boundary to be included in the operation. With Inclusive mode, polygons may be partially included in the volume and still be included in the operation. But for now, let's use Inclusive mode.

5 Position the pointer in the TOP view at the following coordinates: X : -2, Y : 0, Z: 4. Click on the left mouse button. Now, position the pointer at X : 2, Y: 0, Z : 8, and click on the left mouse button.

We now have the nose of the ship enclosed within an Inclusive boundary. You can tell that it's Inclusive because the boundary is a solid line; if it were a dotted line, you would be in Exclusive mode. If you find that you're in Exclusive mode, click on the Exclude button. It should now read Include (meaning that you're in the Inclusive mode).

Now we'll use the Move tool to drag out the front of the ship a bit.

6 Click on the Move tool under the Modify menu, and drag out the nose.

7 Click on the Select Volume button (which now displays the word Include), and click in the Blank Area to get rid of the boundary (or hit the / [slash] key).

Here's what happened. We selected the points and polygons that we wanted to act upon by enclosing them in the volume. We then selected the tool we wanted to use – in this case, the Move tool. When the mouse button was pressed, the Move tool took effect. We could have moved the items in the volume anywhere in the view just by moving

the mouse accordingly. When we released the mouse button, the points that had been enclosed in the volume were now fixed in a new position. Also, when the Move tool was activated, the coordinates window reset itself. When using the Move tool, the coordinates window will show you how much in any direction you are moving something from its original position. The Move tool also works in this same manner when you use the Select Point mode. It will not work with selected polygons because, in order to move polygons, you must also move points.

8 We want to use other applications, so let's Undo what we've done (either hit the u key or click on the Undo button from the Edit submenu).

Let's change the way the spaceship looks. First, we'll use Stretch to make the ship look a little more sleek.

9 Click on Stretch from the Modify menu. Move the pointer into the LEFT view and position it at the following coordinates: X : 0, Y : 0, Z : 3.

10 Initiate the Stretch tool by holding down the left mouse button and moving the mouse to the right. Keep stretching the ship until it is about 16 meters in length. Release the mouse button.

We used the Stretch tool to stretch the object in one dimension; in this case, along the Z axis. If we had moved the mouse up or down, we would have stretched the ship along the Y axis.The position of the pointer, when the operation was initiated, determined where the object either shrunk toward or stretched away from. Since we had the pointer in the approximate center of the total object, it is stretched somewhat uniformly. If we had positioned the pointer near one of the ends of the object, the relative position of the object would have been affected.

Now, let's use the Rotate tool to alter the tip of the ship. We want it to look a little more menacing, like a bird of prey. We'll use the Volume mode to enclose the tip of the ship.

11 Select Volume and, with an exclusive boundary, enclose the tip of the ship.

12 Click on the Rotate tool from the Modify menu.

As with Stretch, the position of the pointer determines the pivot point for the Rotate operation.

13 Position the pointer in the LEFT view at X : 0, Y : 0, Z : 2. Hold down the left mouse button and move the mouse to the right.

The word 'Angle' will appear in the Coordinates Window to let you know how much you've rotated the object.

14 Rotate the nose -10 degrees, and release the mouse button.

Finally, let's change the size of the entire ship. Right now, it could hold a pilot and a navigator. Let's make it a small, single pilot, attack fighter. We'll use the Size tool to change all of the dimensions of the ship at once. Since we're going to act on the entire object, let's clear all of the volumes.

15 Click on the Select Volume button, hit the / (slash) key, and click on the Size tool from the Modify menu.

16 Position the pointer in the TOP view at the following coordinates: X : 0, Y : 0, Z : -2.

Once again, the pointer position determines where the object will be sized towards or away from.

17 Hold down the left mouse button and move the mouse to the left. You'll notice, in the left window, the word 'Factor'. This means what you'd think it means: it tells you the number of times your object has increased (or decreased). The ship should decrease in size as you move the mouse to the left. Release the mouse button.

If we had moved the mouse to the right, the ship's size would have increased.

You might want to repeat this tutorial using Rotate, Size, and Stretch to alter the ship in different ways.

Tutorial 27 ChromaF/X
Using ChromaF/X

Since ChromaF/X functions on one of the four video inputs only, you will need at least one video source connected to Input 1 of the Toaster. A live source such as a camera is fine. Otherwise, a time-base corrected video source is required. This set of tutorials concentrates on ChromaF/X and the Switcher, since these are the only two portions of the Toaster that can utilize the ChromaF/X color processing.

What You'll Learn:

- Entering and exiting ChromaF/X

- Selecting an Effect

- Rendering an Effect

- T-bar and Filter Transitions

- Changing Input Sources

- Modifying an Effect, Pt I (the Color Strip)

- Modifying an Effect, Pt II (the Color Table)

- Creating an Effect

- Saving Your Effects

- Preparing and Using Effects with the Switcher

This multi-part tutorial should require about 1 hour.

1   Start the Toaster.

2   Select Input 1 on the Program Bus of the Switcher.

3   Click on the ChromaF/X icon to activate the program (if it is not already active).

4   Click a second time to enter ChromaF/X.

You are now ready to begin the tutorial section

Section #1 – Looking Around

Take a look at the ChromaF/X screen. It is divided into several large raised control panels, and a number of smaller panels that contain a few buttons each. Don't become too confused trying to figure out what everything does right away. It's best to look at things one panel at a time. Notice that some buttons have a twin on another panel. The twin performs a similar function, you can be sure, but in a slightly different manner. Try out these tutorials, and see the reference section for a thorough understanding of ChromaF/X.

The top panel is the Effects Selection control panel. Here you can select among the 53 preset ChromaF/X to use as color processors on video images. There are also 46 "blank" effects slots for you to design your own. You can select up to four effects and preset them to be used by the ChromaF/X icons on the Switcher for color transitions.

The upper middle panel is the Color Strip control panel. This panel contains the editing controls that modify two specific color palettes (that are displayed at the top and bottom of the Color Table itself, on the lower panel). You'll also find a posterization control here which affects both control panels.

The lower left panel is the Color Table control panel. The Color Table control panel contains controls that affect the color spreads between the top and bottom color palettes. This creates a full-screen color processor filter. You'll also find the buttons that choose which line, top or bottom, that you are editing in the Color Strip, above.

The Chroma control panel contains two buttons that either (a) add the color filter values to the incoming video signal, blending the two color schemes together, of (b) remove the color for the incoming video and add the color processor filter values to the remaining black-and-white images. Both buttons look like small prisms.

The Filter control panel contains two buttons. They look like the T-bar and a small TV. The T-bar button causes the T-bar to apply one color line at a time from the Color Table to the video signal. The TV button causes the entire Color Table to be treated as a full screen filter.

The Color Cycling control panel selects three different methods of transitioning the color scheme for the effect. There are also three selectable speeds.

The clapboard renders an effect.

The T-bar acts to either position a full screen filter, or adjust the color that is being applied line-by-line.

The Video Source buttons choose a video source to apply to the effect to.

The Switcher button returns to the Switcher.

Section #2 – Loading and Rendering ChromaF/X Effects

In the upper left-hand corner you will see the number **01** and the name **Solar Filter** in the windows. This indicates that the first effect, the Solar Filter, is currently selected and available.

1 In the upper panel, click the mouse and drag until you reach effect 14 Posterize. (Pressing the + or – keys on the numeric keypad, or directly typing in the two-digit number of the effect, followed by Enter, will also select effects.)

Whenever you select a new effect, the screen will flash and both the Color Strip and the Color Table will change displays.

2 Click once on the T-bar.

ChromaF/X will render the current effect, which will take a few moments. You may see the top and bottom portions of the screen flash during this time.

3 Drag the T-bar downward when the effect has finished rendering.

You will see the video on your Program monitor become more posterized as you pull the T-bar. Note the T-bar's position in relation to the Color Table. As the T-bar moves down, you are applying lower and lower lines of the Color Table to the video signal. As the lines grow more blocky and posterized, so does the video. Take a moment to work the T-bar up and down, and see the effect this has on the video.

4 In the upper panel, select effect 25 Fade To Neg (use whichever method you prefer, mouse or numeric keypad + Enter).

The Color Strip and the Color Table change to reflect the settings for the current effect.

4 Click once on the T-bar to render the effect.

5 When the effect has finished rendering, pull the T-bar downward to see how it applies to the video signal.

There are two ways to apply the color filter to the video signal. You've been using the T-bar transition. Next you'll use the Filter transition.

6 Click once on the Filter transition button.

7 Pull the T-bar downward to position the full screen filter.

With the Filter Transition button selected, the T-bar acts as a "positioner" for the rendered effect as if it were a full screen filter. The top line of the filter remains level with the T-bar handle as you drag it downward.

Now that you have loaded, rendered, and selected different effects, take a few moments to try out others. In the next section, you will make changes to existing effects using different screen tools.

Section #3 – Editing an Effect

This section continues with effect **25 Fade To Neg** selected for use. If you've taken a break or been interrupted, select this effect above and continue from here.

Important note: If you make a mistake, and cannot determine how to continue, click the Restore Original button on the top panel. It will restore the currently selected effect (the one listed in the window only) to its original settings. Then you can begin again.

Look at the Color Strip. Note the black-to-white gradation from left to right? This represents a normal luminance spread.

1 Click on the Bottom Line button on the Color Table control panel.

The bottom line of the Color Table appears in the Color Strip. Note the white-to-black gradation from right to left. This is the reverse of the top line of the Color Table, and represents a negative luminance spread.

2 Click on the T-bar to render the effect.

3 Select the T-bar in the filter control panel first. Then pull down the T-bar..

As you move downward, notice the effect on the Program monitor. The screen changes from normal video (with normal luminance) to solid gray with no detail (the center of the Color Filter, where all luminance is exactly the same) to negative video (reversed luminance).

This effect also converts the color video image to black and white. That's something we can also work with later.
Let's change this map.

4 Click on the Lightest Box at the far right of the Color Strip.

The Color Marker moves to the far right of the strip. You have just selected the color at that end of the strip.

5 On the center control panel, click on the RGB button.

This allows you to change color values based on their red, green, or blue amounts.

6 Drag the indicator for the blue value to the far right end (100%).

You have just changed the lightest color values from black to blue. Light colors will now be mapped with blue. However, we want to alter the map so that all luminance shades will be mapped blue.

7 Just below the Color Strip, click on the Horizontal Spectrum button.

The button will depress, indicating that one more step must be taken for it to perform a horizontal color gradation. You must define a second color to blend with.

8 Click on the Darkest Box at the far left of the Color Strip.

A range bar will momentarily appear on the Color Strip between the first color you selected and the second, and the screen will flash for a moment. ChromaF/X will calculate a spread of color between the two. Note the Color Filter has changed appearance. Also, the Horizontal Spread button will return to its raised position.

9 Click on the T-bar to render the new effect.

10 Pull the T-bar down.

As you move downward, notice the new effect on the Program monitor. The screen changes from normal video to negative blue video!

Now that you have used the RGB sliders, changed a color value on the Color Strip, and created a spread of color using one of the Color Range tool buttons, take some time to change other colors and create other kinds of color spreads. Render your alterations to see what kind of effect they have on the video image.

Section 4 – Recreating the Old Movie Look, Saving An Effect

Here's a tutorial that will show you how to create a grainy, black-and-white "film look" to your video footage.

1 On the Effects Selection control panel, drag the mouse over the numeric indicator and go to a blank effect slot.

2 Create a noise spread from black to white in the bottom line by first selecting the Bottom Line button in the lower control panel. Then click the Normal Video spread button. Click the Darkest Box. Select the Snow spread button, and click the Lightest Box.

3 On the Color Table control panel, select the horizontal spread button. This creates a horizontal spread from the top line, normal luminance, to the bottom line, snow.

4 Choose the Black-and-White button so that this is a black-and-white image.

5 Click on the clapboard.

6 Drag the T-bar downward and watch the Program monitor. You'll be able to introduce a certain amount of grain, as if the video footage is old and worn. You might try mixing this effect with some of the other effects processes to achieve different "looks" to the film style, such as sepia tone.

7 When you have an effect you like, you'll want to name it and save it. Click inside the Text Window on the Effects Selection panel. A white cursor appears there. Now type in a name, up to 12 characters long, and press Return.

8 To save this effect, press the Switcher button. The Video Toaster will automatically save your new effect with the pre made ChromaF/X effects when it returns to the Switcher. There is nothing more for you to do.

Note: The 53 pre-made effects are always retrievable to you. If you alter one of them, then save it, then return to ChromaF/X on another day and click this button, the original will be restored as it was.

Section 5 – Creating an Effective Filter Transition

This tutorial is an example of the Filter transition, where the entire Color Table is applied to the video signal. You will make a photographic sunset filter, tinting the video orange at the top and blue at the bottom. You should have completed the previous four tutorials so that you are familiar with ChromaF/X tools and functions.

Effect 02 of the pre-made effects is called Sunset Filter. When you have completed the lesson, compare your filter to this one. You may want to have a look at effect 02 before you start to get an idea of what you are aiming for. Start with an existing effect.

1 Go to effect 01.

2 Click on the Top Line button next to the top line of the Color Table.

The top line of the Color Table will appear in the Color Strip

3 Click on the Normal Video button below the Color Strip on the far left.

This will replace whatever was on the top line of the Color Table with normal video (a smooth spread from black to white).

4 Click on the Brightest Box at the right end of the Color Strip.

5 Click on the HSI button.

6 Drag the S slider to the far right of its range.

This sets the Saturation to its highest value, and the Current Color Window now shows bright red.

7 Drag the H slider slowly to the right, until the Current Color Window displays the appropriate shade of orange.

You've set the orange tint that will be added by the filter. Now to blend it into the normal luminance values of the screen at this point:

8 Click the Horizontal Spread button.

9 Click on the Darkest Box.

This smoothly spreads the colors from the first color, orange, at the light end of the Color Strip, to black at the dark end of the Color Strip. When this effect is applied the top of the video image will have an orange tint.

10 Click on the Bottom Line button next to the bottom line of the Color Table.

The bottom line of the Color Table will now appear in the Color Strip.

11 Click the Normal Video button.

12 Click on the Brightest Box.

13 Drag the S slider to the right edge of its range.

This sets the Saturation to its highest value, and the Current Color Window now shows bright red. However, we want blue.

14 Drag the H slider slowly to the right until the Current Color Window displays a shade of blue that you like.

You've set the blue tint that will be added by the filter. Now to blend it into the normal luminance values of the screen at this point:

15 Click the Horizontal Spread button.

16 Click in the Darkest Box.

This smoothly spreads the colors from the first color, blue, at the light end of the Color Strip, to black at the dark end of the Color Strip. When this effect is applied the bottom of the video image will have a bluish tint.

17 Click the Filter effect button.

Selecting this button allows you to apply the entire color table at one time to the video signal.

18 Click the Color button.

This button blends the original colors in the video signal with the effect.

19 Click the Clapboard button.

20 Drag the T-bar downward.

Note: this tutorial creates a fairly vivid sunset filter. To soften the bright orange or blue, use the S (saturation) slider after creating the color. Then use the Horizontal Spectrum button.

The effect will appear over the video on the Toaster's Program monitor, orange at the top and blue at the bottom. Where you position the T-bar will determine the exact positioning of the filter effect itself.

You now know how to create full screen Filter transition effects using the Top and Bottom Line buttons, the HSI color editing sliders, and the Color button.

Section 6 – Using Color Cycling Effects and Switcher Transitions

Color cycling is a process of rapidly shifting color positions, so rapidly that the eye sees only a gradual change in color. A familiar example of color cycling today can be seen on commercials where white text over a black background suddenly switches to black text over a white background and back again repeatedly. The message is unchanged, only the colors. The effect is that of a flashing screen. This is just color cycling between two colors, white and black. Using more colors, or using gradual blends of colors, color cycling can look very smooth. In this manner, a blue sky background can be made to turn orange-red as if the sun were setting using a blue to orange-red cycle. The gradual blend and slow application of the effect together can create an effective sunset illusion where none existed before. Color cycling mode is an automatic transition mode in ChromaF/X. Activating Cycle mode will apply successive lines of the color table to the video signal. You do not need to move the T-bar. Cycle mode has three "directions" – Down (top to bottom), Up (bottom to top), or Bounce (back and forth between top and bottom). To access a particular setting, click repeatedly on the Cycle button itself. These modes work at Slow, Medium, or Fast speeds.

1 Select effect 29 Fire.

2 Click on preset button 1.

You'll see the number 29 appear below the button, indicating that you have "loaded" this effect. Take a moment to look at the Color Strip, the Color Table, and the Color Cycling panels, to see how these elements were used to create this effect. You may want to use these, or alter them, in designing your own effects later. One of the best ways to learn is to study what's been done, then see what your changes bring about.

3 Click the T-bar to render the effect.

4 Select a video source, and watch how the effect color cycles.

5 Click the color cycling buttons to try different forms of cycling. Try turning cycling off to see what the filter itself looks like on video.

6 Return to color cycling mode.

7 Click the Switcher button.

The return will take a moment, since ChromaF/X must create and store the new preset that you have entered. Each time you change these, you will need to wait while the Toaster processes the new effect before you will be returned to the Switcher.

8 At the Switcher, load the Video Toaster logo framestore into DV2. Select Input 1 on the Program Bus.

Note: If you plan on working with ChromaF/X effects on Framestore images, you must load the Framestore image into DV2 before selecting the ChromaF/X icon.

9 Select Input 1 on the Preview Bus.

10 Select ChromaF/X icon number 1 on Bank F.

After a screen flash, you should see some amount of the Fire effect on the Preview Bus, along with the video source.

11 Click any other sources you may have on Preview, including DV2 and BKG if you wish. The ChromaF/X effect affects them as well. Reselect Input 1 on Preview.

Since this is a color cycling ChromaF/X effect, you cannot change how it is applied using the T-bar right now, as you would be able to with non-cycling effects. Color cycling runs through the entire Color Table itself, therefore the T-bar would have no different effect anyhow.

12 Now select an organic wipe effect, such as Fire, from the effects banks. Click the effect a second time to trigger it.

13 You'll see the effect pour onscreen, with color cycling active.

14 Just for fun, changes sources and effects and try different combinations. Note that digital effects may require the use of the framebuffers (which are also in use for the ChromaF/X effect) and you may lose the cycling effect. Try different effects to see which ones are most effective.

Wrap-Up

At this point you should have an understanding of the controls and their effects on the video signal. Take the time to look at the pre made effects, try them out on different video sources, or even on still images from DV2. And watch that television – you'll see a lot more possibilities for using color cycling, color effects, and special effects.

Switcher Manual

Table of Contents

Featuring four video inputs, two digital still framebuffers, nearly 200 special effects, and an adjustable luminance keyer, the Video Toaster Switcher is the center of the production studio. The Switcher also provides never-before-available integration of the sophisticated and powerful tools traditionally found only in high-level production studios.

Switcher Reference

Switcher Terminology

Effect
The six grids of buttons across the top of the Switcher screen are effects. They are arranged in six banks, A-F. The image on each button represents the manner in which a special effect transition will occur, to give you an idea of the effect's appearance.

Bus
The term Bus comes from television. In the Toaster, a Bus is a row of buttons. Each button represents a video source. Each Bus performs a different function: one selects the master video output for the Toaster, another selects the next-in-line source, and a third chooses a source for keying (or overlaying).

T-bar
Another term borrowed from the television industry. It is a manual method for controlling an effect from start to finish using a lever shaped like the letter T. With it, you can move effects slowly, stop them at any time, or even reverse them in mid-stream.

Preferences
Preferences refers to "your preferences," how you would prefer that certain functions should operate. Toaster Preferences allows you to select among certain features of the Toaster's operation. It also allows you to load and save certain files.

Key
"Key" is a television term for a special effect where a video switcher cuts a hole in one video source and replaces it with the video from a second source. The Toaster performs luminance keying, where the hole is defined by the brightness levels of the original video source used. You can adjust the intensity of this cut-off by setting the "clip level."

Toaster Terminology

Click
Click means to press and then quickly release the left mouse button. Buttons and icons may change shape or color when clicked on in this manner. The word "select" may also be used for click (as in, "select the Load Frame button," which means for you to click on it). On occasion, you will click with the right mouse button; these instances will be clearly noted.

Double-click
Double-click means to press and then quickly release the left mouse button twice. In the Video Toaster, you double-click some buttons to activate their functions (as in, double-click the Load Frame button to load a still frame).

Shift-click
Shift-click means to hold the shift key on the keyboard, then quickly press and release the left mouse button.

Drag (also Dragging)
Dragging is holding down the left mouse button and moving the mouse.

Pull Down a Menu
To pull down a menu in ToasterPaint, hold down the right mouse button and move the mouse to the menus that appear. Menu options that you can select will appear to "drop down" as the pointer passes over them.

Return and Enter
These two keys are used for two distinct functions in the Video Toaster. Be aware that they will not perform the same actions. Generally, you use Return after typing text in order to restore the mouse pointer, while you use Enter to activate a function (as in, saving a Frame).

Select
A single click on a button. This will highlight it, thus selecting it.

Getting Around the Screen

The Switcher Screen

The Switcher screen consists of several sections: the effects banks, switcher busses, luminance keyer, T-bar, and the keypad control panel.

Preferences
This button takes you to the Toaster Preferences screen.

The Toaster Application buttons
These four buttons provide links to the other Toaster programs: ChromaF/X, ToasterPaint, ToasterCG, Lightwave (Renderer and Modeler).

The Effects Banks
The effects banks fill the top half of the Switcher screen. Each bank contains 32 images that represent transitions.

The Bank Selection buttons (A-F)
These buttons select which effects bank is currently visible.
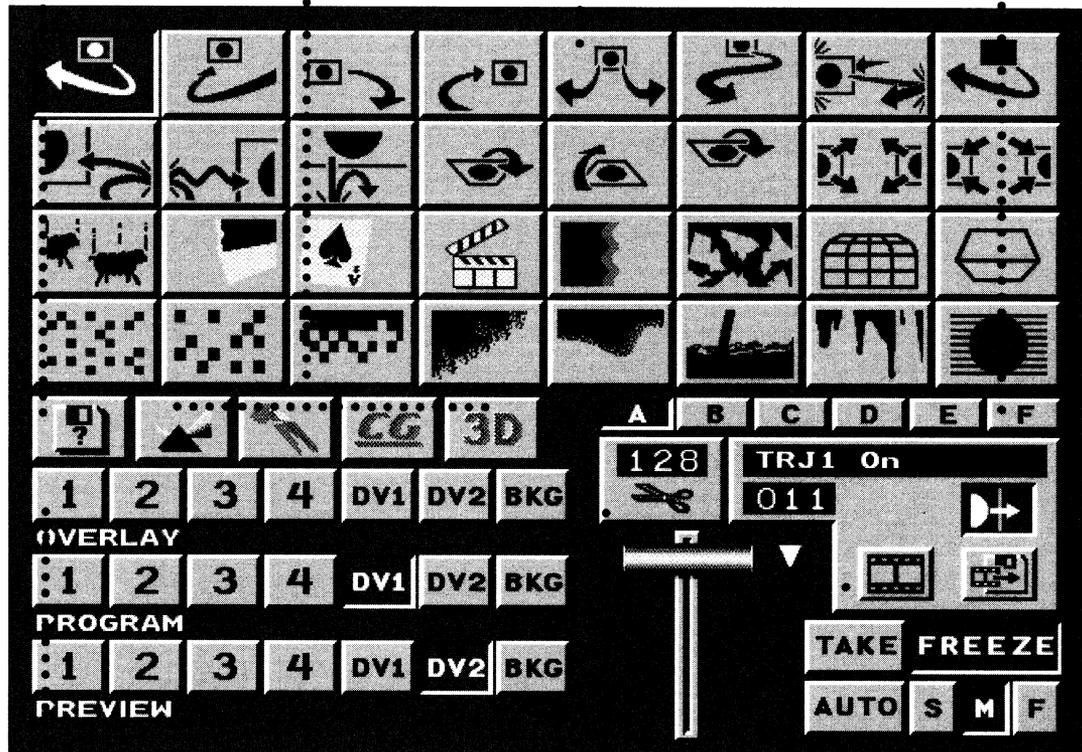
The Switcher Busses
(Overlay, Program, Preview)
The three Switcher busses work together to provide special effects transitions among video sources.

Luminance Key control panel
The luminance keyer allows you to selectively cut holes in the picture and replace them with another video source.

The T-bar
Use the T-bar to manually control a transition effect, just as if you were pulling down a lever.

The Keypad control panel
Tied in to the numeric keypad on the keyboard, this panel governs activity among the effects, banks, CG, framebuffers, and Framestore.

Take
This button performs an instantaneous switch between video sources.

Auto, S, M, F (Transition speeds)
Auto performs a transition effect at a steady rate. S, M, and F set the speed of the transition.

Freeze
The freeze button framegrabs live video.

The Preferences Screen

Color, Termination, and GPI Trigger control panel
This panels concerns the Toaster Switcher and your video setup. Here you select the Background and Border colors for special effects, the termination for your video inputs, and the GPI triggering characteristics for editing equipment.

Framestore Status control panel
This panel allows you to select the drive to store Framestores on. It also displays the number of additional Framestores that the drive can hold.
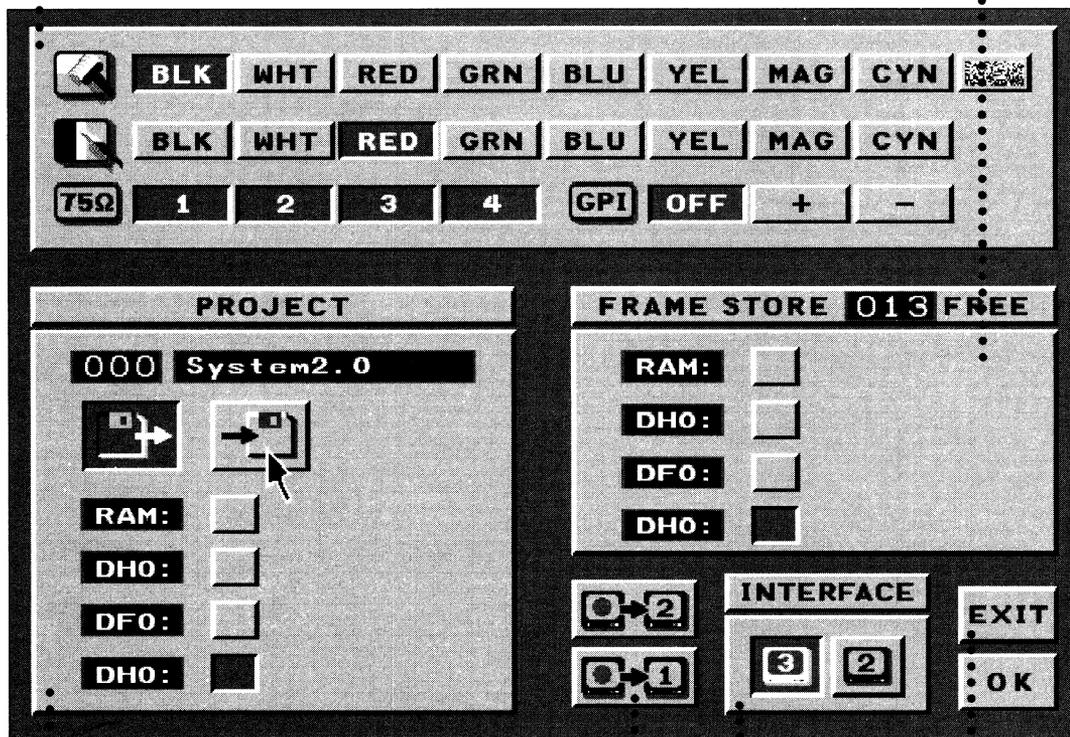
Project Status control panel
This panel allows you to load and save projects and CG books, as well as select the drive where you want these items stored.

Motion Removal button
These buttons processes jitter from framegrabbed images.

Interface button
This button selects a two- or three-monitor setup.

Exit
This button exits the Video Toaster and enables the overlay genlock.

OK
This button returns you to the Switcher screen.

Reference

Entering Switcher
Starting or running the Toaster actually enters the Switcher.

Exiting Switcher
There are two options for exiting Switcher. Both options return you to the Amiga's operating system, the Workbench. You can (a) shut down the Toaster altogether, or (b) "switch" to the Workbench directly, with the Toaster still active (and return as well).

- To shut down the Toaster (from the Switcher), click the icon that looks like a disk on the middle left of the screento go to the preferences screen. Click on the "Exit" button, and answer Yes to the confirmation box. (Alternately, you can hold Ctrl-Left Alt and press F10 while at the Switcher.)

- To switch to the Workbench, press the Ctrl key twice, followed by the left Alt key twice, in four successive taps: Ctrl-Ctrl-Alt-Alt. The same four keypresses will return you to the Switcher after you have completed your work on the Amiga.
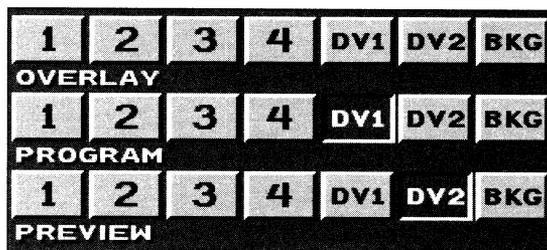
The Switcher Busses

Below the application buttons are the three busses: Overlay, Program, and Preview. Each bus contains seven buttons: Input 1, Input 2, Input 3, Input 4, DV1, DV2, and BKG. Input 1, Input 2, Input 3, and Input 4 can be video cameras, laser disk players, playback VTRs, or any combination of these (provided that all sources are time-base correct and synchronous). DV1 and DV2 are framebuffers which can hold digital still video images. Still images may be captured from one of the four inputs, created by ToasterPaint, ToasterCG, or Lightwave, or loaded from the Framestore. BKG is the background color. The color is selectable from the Preferences Screen.

- To choose an effect, move the the pointer over the desired effect and click once with the left mouse button.

Alternate method: On the keyboard press the shifted letters (A-F) of the effects bank. Then on the Keypad, press the right parenthesis key [)], followed by the row number (1-4) and column number (1-8) of the effect. Press Enter to choose the effect. Effect 41 is fourth row, first effect,.For xample, effect is fourth row, first effect, then enter.

- To trigger an effect at the automatic speed setting, click on its icon twice with the left mouse button. (Note: For some warp effects, you may need to pause for a second while the effect loads before you click a second time.)

Alternate methods: click the Auto button, or press the Space Bar.

- To engage an effect manually, click and drag with the right mouse button (while the mouse is anywhere on the Switcher screen.)

Transitions are engaged by: double-clicking on the effect; dragging with the right mouse button pressed; grabbing and dragging the T-bar with the left mouse button; or pressing the (space bar) on the Keyboard. There are numerous effects available on the Toaster's effects banks, from traditional wipes and fades to digital effects and organic effects. For information on the different types of Video Toaster effects, see the Appendix titled "The Naming of Effects."

The Overlay Bus   ▲ *q, w, e, r, t, y, u*
With the Overlay Bus you can merge two different images (live or frozen) on the Program output through a process called luminance keying. The Toaster creates an electronic hole in the Program signal, which it designates as background, then fills the hole with the Overlay signal, which it designates as foreground. With it, you can superimpose

live action over another video signal such as the weatherman over a meteorological map. The Overlay Bus is automatically used by the Toaster for certain transitions and digital effects. You invoke the Overlay Bus whenever you load CG key pages from the Switcher, or when you click on the Overlay source button.

The Program Bus ▲ *F1, F2, F3, F4, F5, F6, F7*
The Program Bus is the heart of the switcher. The source selected here will be the Program output to the recording VCR. The Preview and Overlay work with the Program Bus to provide transitions and special effects. To put any source on the Program output, click on that button on the Program Bus.

The Preview Bus ▲ *s 1, 2, 3, 4, 5, 6, 7*
The Preview Bus allows you to compose camera shots "offline" without affecting the program output, pre-load Framestore images, and select the next channel to go to Program. To send the Preview image to the Program output, you must "take it to Program."   You do this by using a transition effect, or by clicking the Take button.

Transition and Switching Controls
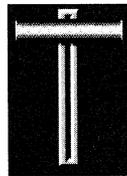
The T-bar   ▲ *Space Bar*
The T-bar, at the lower right part of the Switcher screen, provides manual control over the effects. There are two ways to manually control the T-bar:

- Position the pointer anywhere over the T-bar with the mouse. Click and drag downward, pulling the mouse toward you.

Drag the T-bar down to transition from Program to Preview. Drag it back up to transition back. (Note that some effects do not function in both directions on the T-bar.) If you release the mouse button while the T-bar is at the very bottom of its slider, it will — having completed the effect — automatically reset to the top.

- Alternate method: While the pointer is positioned anywhere on the switcher control panel, click the right mouse button and drag downward. This is the equivalent of clicking on the T-bar with the left mouse button.

Stop an effect at any point by releasing the button while partway along the transition. Depending on the selected effect, the resulting image will be some combination of the Program and Preview signals. Note that the small triangle to the right of the T-bar flashes, indicating that you are in the middle of a transition.

The T-bar provides the greatest amount of control over an effect. With the T-bar can you pause the effect at any point that you choose. Furthermore, you can make the effect take the exact amount of time that you require, depending on how long you take to move the T-bar through its range.
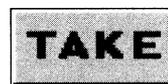
Take ▲ *Return*
The Take button performs a transition known as the cut. Take instantaneously switches the Preview source to the Program output. Some Toaster transitions, when manually operated and left partially on screen, leave the Switcher screen visible on your main monitor. Click Auto (or press the Spacebar) to complete the Transition. To bring the transition back to full screen without completing the transition, hold the Shift key and press the Spacebar.
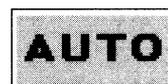
Auto ▲ Spacebar, Shift-Spacebar
The Auto button provides smooth automatic control over transitions. Click Auto to slide the T-bar through its range

automatically. The transition will occur in time with the T-bar's movement. Auto provides for smoother-looking effects than manual operation of the T-bar. Use the S, M, or F buttons to select speed for Auto transitions.

Some Toaster transitions, when manually operated and left partially on screen, leave the Switcher screen visible on your main monitor. Click Auto (or press the Spacebar) to complete the Transition. To bring the transition back to full screen without completing the transition, hold the Shift key and press the Spacebar.

S, M, F (Transition Speed buttons) ▲ *comma key (,), period key (.), slash key (/)*
The Transition Speed buttons set the speed for transitions triggered by the Auto button or Spacebar. These buttons do not represent a fixed rate of speed; rather, they are relative to one another for different effects. The buttons stand for Slow, Medium and Fast. To select a different speed, move the pointer over the appropriate button and click once.

Note: Each effect has its own preset speed when you first run the Toaster. If you change any of these speed settings with S, M, or F, then save the project, your changes will be remembered and used when you next start the system. This way you can "customize" the speed settings to those you like and use the most.

Incomplete Effect Indicator
This small triangular-shaped indicator flashes when a transition has not been completed. This means the T-bar is somewhere in the middle of its range. The indicator turns off whenever the T-bar returns to the top of its range. This indicator also appears in the upper corner of any effects icon at the top of the Switcher screen when you leave an effect incomplete, and click the Smooth Fade transition. At that time, you may fade in (or out) the partially transitioned part of the screen.

Freeze   ▲   *f (to freeze live video)*
                              l (to return to live video)
                              Alt + f (frame motion removal)
                              Alt + d (field motion removal)
Click the Freeze button to freeze frames of incoming video. To save a freeze, see the Save Frames button under the Keypad control panel. Repeated clicking will toggle between live video and frame-grabbed video. The Freeze button is also an indicator: it depresses during a digital effect to indicate that one or both framebuffers is in use, and it depresses when a frame is loaded into one or both buffers.

The Toaster grabs eight consecutive fields of video from Input 1, 2, 3, or 4, storing four in DV1 and four in DV2. It does this because of the way the NTSC video signal behaves: it takes four fields (1/15th of a second, called a 'color frame') before all of the color information in the signal can be displayed. A four-field grab is the only way to see the full color resolution of the NTSC signal. To view the effect of freezing and unfreezing video, select an analog input, then select a framebuffer on the Program Bus. Now click the Freeze button on and off and watch the video switch between live and frozen. Note that while you click the Freeze button, the buttons on the Program Bus alternate between one of the buffers or both DV1 and DV2 and the selected source.

Unless you are grabbing a frame in which nothing is moving, however, you will probably see some motion in the frozen image in the framebuffer. The Toaster has a way to deal with this motion without losing any of the color information in the image, called Motion Removal. For a detailed description of Motion Removal see the Preferences section of this reference. You can invoke Motion Removal from the keyboard, by pressing either Alt + f, Alt + d or, from the Toaster Preferences Screen, by clicking a Motion Removal button.

Why does the Freeze button sometimes depress on its own?
In certain instances the Toaster will change the status of the Freeze button in order to perform the desired operation. In such cases, the Freeze button is being activated automatically. These include loading a Framestore, rendering a CG page, entering LightWave 3D or ToasterPaint, and rendering an effect from ChromaF/X. The Freeze button is

deactivated (and the framebuffers cleared) when a digital effect between two analog sources is attempted, or certain effects selected. Be aware that when the Toaster must deactivate the Freeze button, it will clear both framebuffers. This will happen without warning, so be sure to save any Framestore images that you wish to keep before performing special effects with them.

Grabbing and Saving Eight Fields

The Toaster actually grabs eight fields at a time when it framegrabs, with four going into each framebuffer. When you grab, you will see four fields displayed in each buffer, (unless you have one of the effects icons selected below). To display all eight fields, follow the directions below.

1   Select Bank F of the System2.0 project.

2   Make sure the Freeze button is off. If it is not, click it to free it.

3   Select the source to be frozen on the Preview Bus by clicking on an input source (1-4) and then either DV1 or DV2 (on the same bus). This will turn on the source and both buffers simultaneously. All three buttons will be depressed.

4   Choose one of the following "eight-field" effects by clicking on its icon. These put the Toaster framebuffers in an eight-field mode.
-      Transporter
-      Trail on WHT
-      Trail on BLK
-      Decay Trails

5   Press the f key, or click the Freeze button, when you see the frame you want to grab.

You will see all eight fields of the grab displayed on the Preview monitor. There will be a looping, almost natural-looking motion present depending on how things in the frame were moving across the eight fields.

To save all eight fields, follow the normal instructions for saving a frame (see the Save Frame Button) with the following additions:

1   Do not choose another effect from an effects bank between grabbing the fields and attempting to save them.

2   The eight fields are actually saved to the Framestore as two consecutive frames, therefore two consecutive numbers must be available (e.g. 002 and 003) for the save to work. Make certain you have two consecutive numbers available.

3   The text name that you use is the name that will be saved for both buttons. You only have to label the first one, and the Toaster automatically names and saves the second. (For example, if you start with the number 002 and the name HotDog, press Enter, and the Toaster will save 002 HotDog and 003 HotDog.) This may require a minute or two.

When you want to load these frames back into the buffers and view them as an eight field display you must follow nearly the same procedure as you used to capture them.

1   Make sure the Freeze button is off.

2   Select the any analog source and then either DV1 or DV2 on the Preview Bus. This will turn on both the source and both buffers simultaneously.

3   Select Bank F.

4   Choose one of the following effects by clicking on it:

- Transporter
- Trail on WHT
- Trail on BLK
- Decay Trails

5   Click the Load Frame button in the Keypad control panel.

6   Drag the mouse over the Numeric Window to locate the first frame of the two.

It is essential that the first frame be selected. Make sure that you select the first of the two frames.

7   When the first frame is displayed press the Enter key.

The frames will be loaded into the framebuffers one after another and will appear in an eight field display when the loading is complete.

Note that none of these procedures will work (Grabbing, Saving, or Loading eight field Framestores) if you do not use one of the eight-field effects specified.

Note: Selecting the eight-field effect, plus Load Frame, will load two sequential frame numbers. If you select the second frame, and there is no frame number immediately following it, you will see the message "Frame Not Found." If you select the second frame, and there is another frame number immediately following it, you will load both frames, and the framebuffers will flash alternately. This may be useful for special effects, but is more often an eyesore.
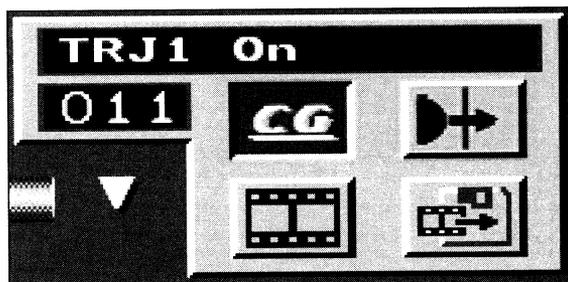
The Keypad Control Panel
The Keypad control panel, to the right of the T-bar, governs activity among the effects banks, CG, framebuffers, and the Framestore. The panel has four buttons that determine its four modes of operation: Load CG Page, Select Effect, Load Frame, and Save Frame. The Save Frame button may also be used to Rename and Delete Frames.

The Numeric Window and Text Window
These windows serve to:

- Display the numbers and names of frames that you have stored in your framestore (when the Load Frame button is highlighted).

- Display the pages in the current CG book (when the Load CG Page button is depressed). Pre-rendered, buffered CG Key and Framestore pages will display a small lightning bolt symbol in the Text Window, next to their names, to indicate this status.

- Display names and numbers of special effects from the current effects bank (when the Select Effect button is depressed).

Load CG Page button ▲ (*[left parenthesis key]*

The Load CG Page button allows you to load pages that were created in the CG. This button is not available unless the CG is active. If the CG button is neither selected nor highlighted, click on it once to activate it. The Load CG Page button will then appear on the Keypad control panel, and the Text and Numeric windows will display their names and numbers. Click on it, or press the ([left parenthesis] key on the numeric keypad to activate Load CG Page mode.

When the CG button is depressed, the number and name of the current page appear in the windows at the top of the Keypad control panel. There are three methods for cycling through available pages (00-99):

- Drag the pointer over the Numeric Window.

- Use the + and - keys on the keypad to ascend and descend one page at a time.

- Use the keypad and type the 2-digit number of the desired page.

And there are two methods for loading the selected CG page:

- Double-click on the Load CG Page button.

- Press Enter on the numeric keypad.

You can load the following page types (note that pre-rendered, buffered CG pages have a small lightning bolt symbol in their names) :

Key Pages - Key pages are rendered into DV1 or DV2 on the Overlay Bus. The buffer will flash, indicating that it is ready for display using the internal linear keyer. It can be brought to the program output by pressing the Auto or Take buttons, or by clicking directly on the flashing button in the Overlay Bus. Fade out using the right mouse button.

Note that Key and Framestore pages that have been pre-rendered and saved from within ToasterCG will often load much more quickly, since they have been saved as Framestores. (Key Pages saved in this manner will load as if they had just been rendered by the Switcher. That is, they will load to a framebuffer, which will appear flashing on the Overlay Bus, ready to be keyed.)

Scroll and **Crawl Pages** - Scroll and Crawl pages are rendered into DV1 or DV2 on the Overlay Bus. The buffer will flash, indicating that it is ready for display. It can be brought to the program output by pressing the Auto (to fade in) or Take buttons, or by clicking directly on the flashing button in the Overlay Bus. Fade out using the right mouse button (or Auto button).

Framestore Pages - Framestore pages are rendered into DV1 or DV2, and are accessible from any bus. *See the note under Key pages, above.*
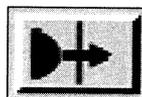
Select Effect button ▲) *[right parenthesis key]*

The Select Effect button allows you to locate and select transition effects from the six effects banks. To activate the select effects mode, click the Select Effect button, or press the) [right parenthesis] key on the numeric keypad.

When the Select Effects button is depressed, the number and name of the current effect appear in the windows at the top of the Keypad control panel. There are three methods for locating an effect:

- Drag the pointer over the Numeric Window.

- Use the + and - keys on the keypad to move one effect at a time through the current effects bank.

- Use the keypad and type the 2-digit number of the desired effect. The effect number consists of its row and column numbers. To select the transition on the first row, seventh column of Bank C: press C on the keyboard, then 1, 7, and Enter on the keypad.

As you run through effects, the Numeric Window displays the number of the effect while the Text Window displays the effect's name.

And there are two methods for selecting the effect for use:

- Double-click on the Select Effect button.

- Press Enter on the numeric keypad.
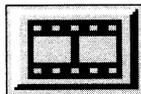
Load Frame button▲ / [slash key]
The Load Frame button allows you to load still images from the Framestore directory. (To change Framestore devices, you must go to the Preferences screen to select the new device.) To activate the load frames mode, click the Load Frame button or press the / [slash] key on the numeric keypad.

When the Load Frame button is depressed, the number and name of the current frame appear in the windows at the top of the Keypad control panel.

There are three methods for locating a frame:

- Drag the pointer over the Numeric Window.

- Use the + and - keys on the keypad to move one frame at a time through the current Framestore directory.

- Use the keypad and type the 3-digit number of the desired frame.

As you run through frames, the Numeric Window displays the frame number while the Text Window displays the first 12 characters of the frame's name. These numbers and comments are stored with the still frame when it was saved.
And there are two methods for loading the frame:

- Double-click on the Load Frames button.

- Press Enter on the numeric keypad.

When you load a still frame, it is loaded into one of the two framebuffers. Generally, the frame will be loaded into the buffer not currently selected on the Program Bus. If Program does not have any buffer selected, the Preview bus can select the destination buffer.
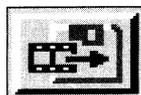
Save Frame Button (Save, Rename, or Delete Frame)   ▲ * [the asterisk key]
Depending on the keys you press after selecting the Save Frame button, you can save, rename, or delete still frames from the Framestore Directory.

To Save a Frame

To save a still frame, click the Save Frame key on the numeric keypad to activate the save frames mode. With the Save Frame button highlighted, the + and - keys cycle through stored still frames. Alternately, enter a new number directly by typing a 3-digit number on the numeric keypad; or by moving the pointer over the Numeric Window, dragging up or down to cycle through to an unused number.

You can tell if a number has already been allocated to a saved frame by looking at the Text Window. If a comment appears in the box, that frame number is already in use. (This is another good reason to enter a comment whenever you save a frame — having a comment in the Text Window helps avoid overwriting an existing frame.) Enter a comment by clicking in the Text Window and typing a short name followed by Return. Comments should be 12 characters or less.

Press the Enter key to save the current image. You have several options for the image when you save.

4-Field   Four-field saves a (4-field) image with the most color resolution. This is useful if (a) you are saving a LightWave rendered image, (b) the image you are saving has no motion jitter in it, (c) the image has motion jitter but you want to work with that as a special effect, or at a later time, and want to save the best possible image for now.

2-Field   Two-field processes with frame-type motion removal and save the resulting 2-field (1 frame) image. This is useful if you are saving an image with very little motion jitter displayed in the framebuffer.

1-Field   Single-field saves a single-field image. This option is extremely useful for saving a motion-free still out of a jittery framebuffer image. You should be aware that a single-field image has less resolution than a full frame image. This is the nature of the NTSC video signal.

Here's a shortcut for saving frames: Select the Save Frames button. Press the . [period] key on the numeric keypad. The Toaster will advance to the next unused number in the Numeric Window and place the cursor in the Text Comment Window. Type in a name. Then press Return and Enter to save the frame (or double-click on the Save Frame button).

If you receive a message asking "Overwrite Existing Frame?" you have selected the frame number of a previously saved frame. The Toaster is asking if you want to erase the old frame and save this one in its place. Click Yes if you wish to do so. If you do not want to erase the old frame, click No and select a new number to save for this frame.

Screen Blankers

Note: If you have difficulty saving/recalling frames, check that you are not running a Screen Blanker or Mouse Accelerator utility at the same time as the Toaster. Although many of these utilities do seem to work with the Toaster, they interfere with important timing information, and will cause problems if they activate during Toaster operations. This includes the Workbench 2.0 Commodity Screen Blanker as well.

To Rename a Frame

1   Click the Save Frame button in the Keypad control panel.

2   Use the + or - key on the numeric keypad to bring the frame you wish to rename to the Text Window and Numeric Window, or type the three digit number of the frame.

3   Click in the Text Window.

4   Use the <- (backspace) and/or Del (delete) key to clear the old name.

5   Type in a new name up to 12 characters long.

6 Press the Return key.

7 Hold down the stylized (A) key to the right of the space bar and press Enter.

A box will appear, asking Rename the Framestore entry?.

8 Click Yes to continue the operation, or No to cancel.

If you clicked Yes, the cursor will be activated in the Text Window.

This will cause the frame to be given a new name, while maintaining its old number.

To Delete a Frame
Note: The Delete Frames procedure has a built-in protection against deleting frames accidentally. When you instruct the Toaster to delete a frame, it will ask you for confirmation before erasing the frame first. This is your chance to change your mind about deleting the frame.

1 Click the Save Frame button in the Keypad control panel

2 Use the + or - key on the numeric keypad to bring the frame you wish to delete to the Text Window and Numeric Window or type the three digit number of the frame.

3 Hold down the Alt key and press the Enter key.

A box will come up asking Delete the Framestore entry?.

4 Click Yes to delete the frame or No to cancel the operation.

The frame will be deleted.
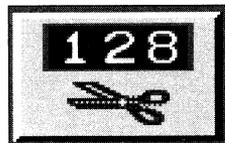
Luminance Key ControlPanel

Luminance keying is a video term that refers to the processing of two video sources, one that will be in front of another, called the *foreground* and *background*. *Luminance* refers to the brightness of the picture. *Keying* refers to the process of cutting out part of the foreground picture. Therefore, *luminance keying* means "cutting out a certain brightness (or luminance) value in one video signal and replacing it with another video signal."

The foreground image comes from the Overlay Bus. The background image comes from the Program Bus. Select black or white keying (cutting a hole based on blacker or whiter brightness levels) by clicking on the scissors repeatedly. The scissors icon is like a three-position switch: it switches back and forth between Off (no keying), White Keying, Off, and Black Keying.

Note: Since luminance keying uses brightness to determine the "hole," changing levels of brightness in the video can alter the shape of the keyhole in an unwanted fashion. Exercise careful lighting when using the luminance keyer to minimize this. Also, for more exacting control over the keyhole, see the section entitled "Special" Effects

Icons for information on using the Art Card effect.

To key one source over another:

1   Load the KiKi.VT image into DV2, then click DV2 on the Program Bus.

2   Load the VTLogo image into DV1.

3   Click DV1 on the Overlay Bus.

The luminance key scissors icon immediately begins flashing. *(Note that it flashes white or black depending on the keying type.)* On the program output, you'll see the Video Toaster logo screen being keyed over the KiKi image. It should look pretty ragged, as the logo screen was not really intended for keying.

4   Now click on the three-digit number above the scissors icon and drag the mouse up and down. Watch the program output.

As you move the mouse up or down, you raise or lower the "clip" level, or cutoff level for the luminance key. You'll see different parts of the image appear and disappear as you do this. You are adjusting the brightness cutoff, determining just how bright a color needs to be in order to be seen.

5   Now go to Bank A and select TRJ4 Off, and click Auto.

Certain digital effects work with the luminance keyer to "fly" images (or text) on and offscreen. Flying the key offscreen leaves the keyer active, with no overlay source selected, but with the key source on the Preview Bus ready to fly back onscreen. Select and work with various effects to learn how to work with the keyer.

Adjusting the Clip Level   ▲ *(up arrow to raise clip level, down arrow to lower clip level)*
The luminance value (called clip level) determines "how much brightness" is keyed by the keyer. Click once on the Clip Level Indicator and drag the pointer up or down. The numbers in the box will change, raising or lowering the clip level. Values range from 000 to 257. The clip level control works in the following ways:

Keying White   ▲ [*(right bracket key)*

000:      Nothing but the Overlay image

001-256:   A combination of the Overlay and Program images

257:      Nothing but the Program image

Setting the clip level to 1 keys out the very lightest parts of the Overlay image. As the number gets larger, darker and darker portions of the Overlay image are keyed out.

Keying Black   ▲] *(left bracket key)*

000:      Nothing but the Overlay image

001-256:   A combination of the Overlay and Program images

257:      Nothing but the Program image

Setting the clip level to 1 keys out the very darkest parts of the Overlay image. As the numbers get larger, lighter and lighter portions of the Overlay image are keyed out.

Note that there are two forms of Toaster Keying. If you key an analog input over a digital or analog source, the

*key will be very sharp and clean. If you key a digital source over a digital or analog source, the key may have a
slight edge on the right side of the Keypad image. This is the nature of the Toaster Keyer*

```
FRAME STORE  039 FREE
    DF0:  [  ]
    RAM:  [  ]
    DH1:  [  ]
    DH0:  [■]
```
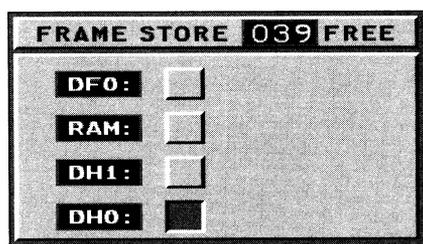
The Framebuffers and Framestore

A framebuffer is a storage area where you can load and display 24-bit images. The Video Toaster has two built-in
framebuffers called DV1 and DV2 ("DV" stands for digital video). They may be activated automatically to accomplish
digital switcher effects, and are used to capture and display single frames of live video, as well as CG pages. framebuffers
are only an *electronic* storage area, that is, they will "empty" when you turn off the the Toaster. The Framestore is used to
store images permanently.

When you first start up the Toaster, the Framestore is set to store frames on DH0:, the main hard drive. Depending on
your system, you may have other areas available in which to store frames, such as DF0: and RAM:. The Framestore
control panel on the Preferences screen displays up to eight storage areas, known to the Toaster as devices, that you may
choose among for frame storage.

*Note that only three characters are shown. If you have a hard drive with more than three characters in its name,
you may wish to rename it.*

Whichever device you decide to use, the procedure for loading and saving is the same. You only need to make sure to
designate *which device* is acting as the Framestore by first selecting it from the Preferences Screen. This setting is saved
with the Project. There are several kinds of storage devices that may be used as the Framestore:

Floppy Disk Drives (such df0:, df1:, etc.): Save images on floppy disks when you plan to transport them to another
Video Toaster system, or to save them for the future. Floppy disks provide permanent storage, but can store only one
frame per disk. Floppy drives are fairly slow compared to hard drives.

If you put an unformatted floppy disk into a floppy drive, and attempt to save something on it, a menu box will be
displayed, asking if you wish to format the floppy disk. If you choose Yes, then the Toaster will automatically format the
disk and save the appropriate file. (Formatting is the process of preparing a new diskette to hold files.)

RAM Memory (RAM:): This device provides temporary storage for a limited number of frames. The main advantage of
RAM storage is very quick access times.

Hard Disk Drives (such as dh0:, dh1, etc.): This device provides permanent storage for a large number of frames. A
typical 100 megabyte hard drive would be able to provide storage on the hard disk for approximately 136 frames. This is
likely where you will save most of your frames.

Other Hard Disk Drives (Removable Media or Optical Drives): These devices are a more versatile variation of
standard hard drives, as they allow for either interchangeable cartridges or very impressive storage capability. These
kinds of devices are likely to be preferred only if you do serious animation.

The Digital Source
If you have experimented with digital effects on live video, you may have noticed that sometimes the video appears to
"stutter" or "step back a frame" at the moment the effect is activated. The Toaster must, at the moment you trigger the
effect, convert the analog source on Program to a digital source before it can take the current video off screen in a digital
manner. Normal digital delay (1/15 of a second) is what causes the lag.

There is a rule that describes this situation, and a solution to it as well: Performing digital effects on live video requires
the use of both framebuffers simultaneously.

The solution to this situation is: activate the digital source on the Program Bus first, then perform the transition. This way the current Program output is already the digital source, therefore there will be no jump to the video. An important concept to grasp here is that of **the digital source**. A digital source may be any of the four Toaster inputs, plus both framebuffers, *with all three buttons simultaneously depressed on the same Bus.*

Here's an example of a digital effect on a non-digital source. We'll use a transition to and from the same source, in case you do not have two separate video sources to work with. Afterward, we'll demonstrate the solution:

1 Make sure the Freeze button is not depressed. Have a moving video source on Input 1. A busy street or sports footage will do.

2 Select Input 1 on both the Preview Bus and the Program Bus.

3 Select the Cube effect from Bank A.

4 Press the Auto button.

You should see a momentary jitter at the moment you trigger the Auto button. Here's how to set up the Switcher to avoid this jump:

1 Select Input 1 on the Program Bus.

2 Select Input 1 on the Preview Bus.

3 Select the Cube effect from Bank A.

4 If the Freeze button is depressed, click it to free it.

5 On the Program Bus, click on DV1 or DV2.

You have just routed the Program source through the Toaster's digital channel. The Program output is now a digital signal.

6 Press the Auto button to see the effect.

Watch the transition closely. The stutter will not be apparent this time. Note that you can only have one digital source active on any of the Busses at any one time - If digital 4 is selected on Preview, for example, then Program or Overlay cannot contain another digital source.

Here is some general information about the framebuffers.

Digital Effect "Off" Effects

Analog over analog	Jump cut results. Uses live digital video over analog.
Analog over live digital video	Jump cut results. Uses live digital video over analog.
Analog over frozen digital video	Altered effect results in wipe.
Live digital video over analog	OK.
Frozen digital video over analog	OK.

"Special" Effects Icons

Several effects icons on the effects banks allow you to perform additional special effects. (The examples that follow assume that you are already familiar with the Switcher's controls. If you are not, you may wish to read further for additional information about the Switcher's operation before attempting these examples.) You will find most of these effects on Bank F of the Video Toaster System_2.0 project. See the Load Project Button under Toaster Preferences, later in the Switcher Reference, for information on how to load these projects.

These effects are:

•	Transporter	*See the "Freeze"*
•	Trail on WHT	*button for details*
•	Trail on BLK	*on the uses of these*
•	Decay Trails	*effects buttons.*
•	Art Card	See below.
•	Smooth Fade	See below.
•	The ChromaF/X icons	See below.
•	The Positioner Effects	See below.
•	The Organic Effects	See below.
•	Color Bars	See below.

The Art Card
The Art Card effect allows you to design specific "holes" or cutouts in one video image, and fill the hole with anothervideo source. This is achieved using the Toaster's luminance keyer, and a source from all three Busses (one to show video, one to define the cutout hole, and one to fill the hole). The benefit of the Art Card is that you can control the shape of the key hole by designing it, in ToasterPaint for example. You can even use a live video source for some some wild effects.

The Program Bus contains the main video source. The Preview Bus contains the "filler" video source. The Overlay Bus contains the "cutout shape." Here's an example using a CG page:

1 Use the System2.0 Project and activate the CG by clicking it once (do not enter the CG).

2 Click the Load CG Page button. Note that Page 00 appears in the Numeric Window.

3 Click DV2 on the Program Bus.

4 Render page 00 to DV1 by double-clicking the Load CG Page button.

The DV1 button will flash on the Overlay Bus. Note that no effects icon is selected on the effects bank.

5 Click on any effect from the effects bank (any effect will do).

This clears the CG's linear keyer and allows us to work with this key page as a solid page of text with a black background.

6 Click DV1 on the Program Bus.

7 Load the KiKi.VT image.

Since DV1 is selected on the Program bus, the frame will be loaded into DV2.

8 Go to Preferences, and select snow (digital noise) as the background color. Return to the Switcher.

We're going to use the shape of the text from the CG page to be the hole in the KiKi.VT image. The snow from the BKG source will be used to fill the hole.

9 Click BKG on the Preview Bus.

10 Click DV2 on the Program Bus.

11 Click the Art Card effect from Bank F.

12 Click DV1 on the Overlay Bus.

13 Use the T-bar to adjust the clip level. Both the T-bar and the Numeric Window in the Luminance Keyer will adjust clip level for the Art Card.

Remember, that any of the Toaster's seven video sources can be used for the main image, the key hole, or the filler. Usually, its works best to use live video for the background or the filler, keeping the key hole itself to a static image. The key hole works best if the hole itself (or the outer part) is a solid color, with a brightness level that is not close to any other parts of the image. This example would be effective if you used video footage of flames from a fire to fill the text key hole.
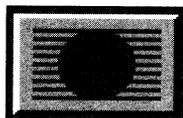
The Smooth Fade
The Smooth Fade effect performs three distinct functions in the Video Toaster. The first is the effect's normal operation, a smooth cross-fade between two sources. The second is the key fade, followed by an example. The third is the partial effect fade, also followed by an example.

• Operating from one full video source to another, normally it will dissolve between the two sources.

• Operating in conjunction with the luminance keyer, it will dissolve in and out CG or ToasterPaint screens that you intend to key (such as dissolving in an over-the-shoulder graphic during a newscast). This is called a key fade.

The steps for this: design the graphic element to be keyed, load it to one of the framebuffers, select that buffer on the Overlay Bus, adjust the clip level for that graphic, select Smooth Fade, and you can manually or automatically fade the element on and off screen. This works for CG Pages, ToasterPaint graphics, LightWave 3D images, and live video sources.

- Operating on a partially-completed transition, where two sources are currently visible, Smooth Fade will fade one source in and out. Here's an example of this powerful feature:

1 Use the System2.0 project.

2 Load a different framestore image into each buffer. Click DV1 on Program and DV2 on Preview.

3 Select TRJ Wipe (bank A) and, dragging with the right mouse button, engage the effect until it fills half to two-thirds of the screen. Let go of the button.

4 The control panel screen will now appear faded, and the colors pastel, indicating it is in mid-effect. The Incomplete Effect Indicator triangle flashes. Click on the Smooth Fade effect. Immediately, the Incomplete Effect Indicator jumps to the icon button for the previously selected effect on the effects bank.

5 At this point, you can:

- Manually drag the T-bar to control the speed of the fade in or out.

- Click again on the Smooth Fade effect to automatically fade the Overlay video source (both in and out).

- Click the Auto button to automatically fade the Overlay video source (both in and out).

- Select different sources on the Overlay and Program busses by clicking on them.

- Reselect the effect and adjust it further.

This allows you to set up split-screen and other special effects ahead of time, and then dissolve them on screen in a professional manner. Try this with any of the Toaster effects that, when partially completed, return the Switcher screen to the monitor. (Certain effects, such as the organic effects like liquid and fire, will not work with this feature, since you cannot pause them halfway and still have access to the Switcher screen.)
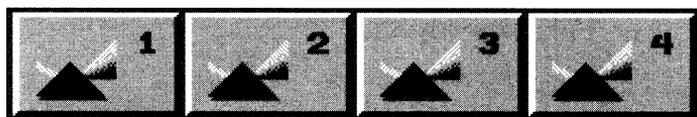
The ChromaF/X Icons
The ChromaF/X icons allow you to add ChromaF/X color processing to Toaster effects transitions. Using the same video source on both Busses, you can transition from normal video to ChromaF/X video with wipes. (This is used in the "Revolution" demonstration tape, when the narrator states "Set your videos on fire....") Or, go from a normal source to a different source that is displaying the ChromaF/X effect. The possibilities are endless. ChromaF/X effects will also work with partially-completed transitions and the Smooth Fade effect, as described above.

Note that some digital effects will not function with ChromaF/X at the same time.

There are a number of steps to this example. Take the time to follow them all, and read the text in between each step for further explanation. This feature of the Toaster is powerful, and may seem complex at first. You'll find that once you understand it, it isn't. It simply takes longer to describe it than it does to perform it.

1 Use the Systen2.0 project.

2 Enter ChromaF/X (you may need to click its icon twice, in case it is not already active).

3 Select the ChromaF/X effect that you may wish to use by listing its name in the Text Window and clicking on a preset button to the right. For now, select the Chrome effect and click on preset 1.

4 Click the Switcher button to return to the Switcher.

5 If you have a video source on Input 1, select input 1 on Program. Also, load a Framestore image into DV2. (If you do not have a video source, just load a Framestore image into DV2.) Select DV2 on Program.

6 Go to effects bank F and select the ChromaF/X icon 1 with the preset Chrome effect (the icon looks like a prism with the number 1 by it).

Several changes will immediately occur, although not all will be visible yet. The DV1 button on all Busses will be unselectable, since it is now being used internally by the Toaster. The Preview Bus becomes the "ChromaF/X Bus," rather than a standard video Bus. Any video source you select on Preview will be affected by the preselected ChromaF/X effect.

7 Click on Input 1, DV2, BKG, or the other inputs on the Preview Bus to see this. Notice that DV1 will not depress.

If you do not immediately see the effect, it may be due to the type of ChromaF/X effect chosen (some need to be "adjusted, which you'll do next). Don't worry.

8 Drag the T-Bar and watch the Preview source.

While the ChromaF/X icon is depressed, the T-bar will act just like the T-bar on the ChromaF/X screen: dragging it up or down will alter how ChromaF/X is affecting the selected Preview source.

Very Important Note: *When depressed, ChromaF/X icons **always** use the DV1 framebuffer as an effects channel. This is the only exception to the Toaster's rule: The Toaster always protects the Program output. If you have DV1 selected on the Program Bus when you select a ChromaF/X icon, your Program output will experience a jump cut. This is the only Toaster feature that cannot maintain the Program output if DV1 is selected.*

9 When the ChromaF/X effect is adjusted to your liking, go to Bank A and select TRJ Wipe.

You should immediately notice that the ChromaF/X icon changed. It now has the blinking Incomplete Effect triangle flashing on it. This indicates that the ChromaF/X icon is in a state of "partial transition," while the next effect you selected is ready to be used.

10 Click Auto.

11 The Preview Bus source will transition on screen, with the Chrome effect on it.

The Program Bus is now the "ChromaF/X Bus," and any source you select on Program (except DV1) will show the Chrome effect. The Preview Bus reverts to a normal video bus.

12 Click on the ChromaF/X icon 1 again, and use the T-bar to readjust the level of Chrome on the Program Bus.

As stated earlier, any time the ChromaF/X icon is depressed, you can use the Switcher's T-bar to adjust the level of the effect, whether that source is "on the air" (Program) or next-in-line (Preview).

13 Click on Wipe-L on Bank D, and manually transition it to approximately the halfway point by dragging with the right mouse button.

As stated earlier, any time the ChromaF/X icon is depressed, you can use the Switcher's T-bar to adjust the level of the effect, whether that source is "on the air" (Program) or next-in-line (Preview).

13 Click on Wipe-L on Bank D, and manually transition it to approximately the halfway point by dragging with the right mouse button.

You should have half normal video, and half ChromaF/X video on the Program monitor.

14 Click on the Smooth Fade icon.

Wow. Now the ChromaF/X icon and the effect you previously selected **both** have the flashing Incompleted Effect triangle. (Click from Bank to Bank to see this.) Both icons are, in fact, partially active. The flashing triangle indicates this state.

15 Drag the T-bar up and down to fade one of the two video sources.

This is the special function of the Smooth Fade effect that was demonstrated above. It is fading in (or out) one half of a partially completed transition. It can be combined with the ChromaF/X icons to transition a ChromaF/X video source.

Take some time to experiment with the ChromaF/X icons, the effects, and the Smooth Fade effect.
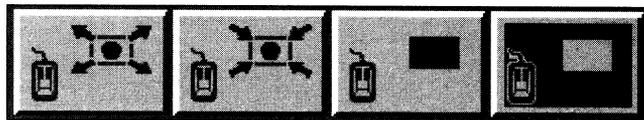
The Positioner Effects

There are four effects whose positions you can adjust. These are actually transitions. However, you have the ability to position each effect at one point in its path of travel. (A straight line proceeding from the center of the full-screen image through the point you indicate will determine the actual direction of that path.)

1 Select a positioner effect.

2 Manually engage the transition, and let go the mouse button when the size of the effect is to your liking. You now have four methods for "setting" this effect in place. Each method treats the transition differently.

2a Right Mouse Button. Once in place, hold down the right mouse button and drag downward so that the effect shrinks to where you can no longer see it. Let go the mouse button. The control panel screen returns. Click on Auto at this time to compress the video out to that location.

2b Left Mouse Button. Once in place, click the left mouse button once. The control panel screen returns. Now Click on Auto to compress or move the full screen video through the point you set for the complete transition. If you plan on positioning an effect far off screen, use the left mouse button to set the key frame position.

2c Spacebar. Once in place, press the Spacebar to do an Auto. The frame shrinks and/or moves to complete the transition. Click on Auto at this time to to compress/move the full screen video to the key frame position and stop. Click Auto again to complete the transition (or use the T-bar). Since this counts as a partially-complete transition effect, you can also use the right mouse button to further re-size the frame, or dissolve the frame on and off screen.

2d Return Key. Once in positon, press the Return key to do a Take (there may be a small change in placement when you do this). The control panel screen returns.

PositionerFX Tip #1. The positioner effects are transitions. The location where you position the effect is used to define the straight-line path that it follows when the Auto button is clicked. This way, you can use positioner effects as transitions whose paths you can direct.

PositionerFX Tip #2. The settings for PositionerFX that you create are saved with each effect when you save a Project.

PositionerFX Tip #3. If after fading a positioner effect on screen, you click on the positioner effect icon, you can manually or automatically complete the transition path. For example, after positioning the square wipe in the upper corner corner, you might fade in an over-the-shoulder shot, then complete the wipe transition to full screen.

Note: At this stage, you may re-size the effect using the right mouse button, even to full size, for full-screen pulls if you wish.

Some Toaster transitions, when manually operated and left partially on screen, leave the Switcher screen visible on your main monitor. Click Auto (or press the Spacebar) to complete the Transition. To bring the transition back to full screen without completing the transition, hold the Shift key and press the Spacebar.

The OrganicFX
For the Toaster's organic effects you may select the actual background color by choosing a BKG color in the Toaster Preferences screen. Organic effects are preset for a certain background color, which you may change to a color of your choice if you desire.

Color Bars
The Color Bars icon is a special "effect" icon that loads the SMPTE color bar pattern into a framebuffer. The color bar pattern is used to calibrate color monitors. Ideally, a waveform and vectorscope provide the video engineer with exact data from the color bar pattern. However, you can use these bars to adjust your monitors visually for a consistent display.

To load the bars into an available framebuffer, click twice on the color bars icon. You can also select the icon with one click, and load the image by pressing the Spacebar (or clicking Auto).
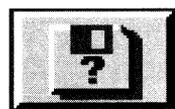
Toaster Preferences

The Toaster Preferences screen lets you specify certain system settings, load and save Projects, Load CG Books, and Exit the Toaster to the computer's operating system (and overlay genlock mode).

Within Preferences you have the ability to customize portions of the Toaster and save these settings in a file known as a Project. Projects keep track of which applications are loaded, which effects were in the Effects Banks, their speed settings, and what Preferences settings were selected.
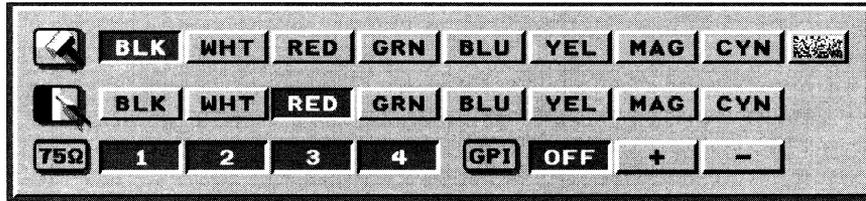
Color, Termination, and GPI Trigger control panel
This control panel contains three rows of buttons for Background Color control, Border Color control, Termination control, and GPI Trigger control.

Background and Border Color controls
The Background and Border Color Control rows allow you to select the color used for the BKG button and the color for bordered wipe effects on the Switcher. The border colors are used on certain transitions as bands of solid color around the edge of the video that is being affected. To select a background or border color, click the box in the corresponding row.

Note that the BKG row has one additional button, at the right hand edge. By selecting this button, you can use video noise or "snow" as the background. That way, when you make a transition from a background screen to a video image, the image will appear from a field of snow.

Termination controls
The Termination control buttons are used to set video signal termination at the Toaster's inputs. If you run a video signal directly from one device to the Toaster, then the signal should be terminated at the Toaster. That input would have its termination button pressed in. If you need to see that video signal on a monitor, and run it to the Toaster, connected to a "T" connector that continues the signal on to the monitor itself, then that input would have its termination off. The termination on the monitor would be turned on. (Remember, termination is always on at the final device in a chain of video equipment.) These buttons are on (and terminating) when they appear depressed.

GPI Trigger Adjustment
The GPI (General Purpose Interface) adjustment is used to adjust the manner in which the Toaster responds to an external trigger signal (from a cable connected to the Toaster's second mouse port) from a video editor.
The three different buttons have the following effect:

- + The Toaster is triggered by the trailing edge of the GPI pulse (when the signal goes high to low).
- - The Toaster is triggered by the leading edge of the GPI pulse (when the signal goes low to high).
- 0 The Toaster is not triggered by external GPI pulses.

When using GPI, the device sending the trigger signal may need an adjustable delay to help synchronize the effect with the video.
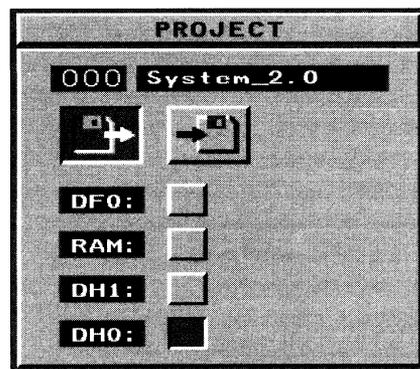
The Project Status Control Panel
A Project is a file containing information about the current effects, applications, CG book, Positioner Effects, and settings currently active. The Project control panel is used to govern Project operations (such as Load, Rename, Delete,

and Save) to select the storage device where Projects may be saved, and to load CG books. Since CG Books are part of Projects, they are automatically Renamed, Deleted, and Saved with the corresponding Project.

For all Project control panel buttons, the following controls are the same for selecting projects:

- Dragging the pointer over the numeric window.

- Using the + and - keys on the numeric keypad.

- Typing in a 3-digit number on the numeric keypad.

The Video Toaster ships with four pre-made Projects:

- **000 System2.0** is a standard project containing six banks of effects, with no applications active.

- **001 GetSmall** is a special project containing no special effects, with no applications active. As such, GetSmall requires less memory when it is loaded, and is ideal for when you plan to work within one of the Toaster's applications and won't be using the effects during that work session. GetSmall is also useful if you run into problems due to not enough memory.

- **002 Default1.0** is the original project from Video Toaster system 1.0, containing the original four banks of effects, with no applications active.

- **003 Tutorials** includes the normal System 2.0 effects with a specially-prepared CG book for the Toaster Tutorial Section.

At the top of the control panel are two windows. The Numeric Window contains the three-digit project number, and the Text Window contains the Project name.

The Load Project button
The Load Project button allows you to load Projects from the selected device. To load a Project, first click the Load Project button. When the Load Project button is depressed, the number and name of the current Project appear.

- Select a project (using one of the three methods above).

As you run through Projects, the Numeric Window displays the number of the Project while the Text Window displays its name.

Load the Project:
- Double-click on the Load Project button, or press Enter on the numeric keypad.
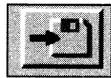
The Save Project button
To save a project use the Save Project button. When the Save Project button is depressed, the number and name of the current Project appear. To save a new Project, with a new name:

1   Click the Save Project Button.

2   Press the period key (.) on the numeric keypad. The Toaster will advance to the next unused number in the Numeric Window and place the cursor in the Text Window.

3 Type in the project name.

4 Press Return.

5 Press Enter to confirm the new name and number, and save the project.

This saves a new Project. In this manner, you can create custom projects. For example, if you work primarily in CG and Paint, you can create a special Project for them. First, load the GetSmall Project. Second, activate both the CG and Paint applications. Third, return to Preferences and save a new project, say "Paint-CG." Then exit the Toaster. The next time you start the Toaster, Paint-CG will be the Project that loads, ready for your work.

To save a project over an old one:

1 Click the Save Project Button.

2 Select the Project to save over (using one of the three methods above).

3 Press Enter to confirm the new name and number, and save the Project.

4 A menu requester will appear, asking "Overwrite existing Project?" Click Yes to do so, click No to cancel.

To Rename Projects

1 Click the Save Project button.

2 Use the + or - key on the numeric keypad to bring the project you wish to rename to the Text Window and Frame Number Window, type the three digit number of the Project, or drag the mouse over the numeric window.

3 Click in the Text Window.

4 Use the <- (backspace) and/or Del (delete) key to clear the old name.

5 Type in a new name up to 12 characters long.

6 Press the Return key.

7 Hold down the stylized (A) key to the right of the space bar and press Enter.

A box will appear, asking "Rename Project (name) to (name)?"

8 Click Yes to continue the operation, or No to cancel.

If you clicked Yes, the cursor will be activated in the Text Window.

This will cause the Project (and Book, if any) to be given a new name, while maintaining its old number.

To Delete Projects
Note: The Delete Project procedure has a built-in protection against deleting projects accidentally. When you instruct the Toaster to delete a Project, it will ask you for confirmation before erasing the project first. This is your chance to change your mind about deleting the Project.

1   Click the Save Project button.

2   Use the + or - key on the numeric keypad to bring the project you wish to delete to the Text Window and Numeric Window or type the three digit number of the Project, or drag the mouse over the numeric window.

3   Hold down the Alt key and press the Enter key.

A box will come up asking "Delete the Project?"

4   Click Yes to delete the project or No to cancel the operation.

The Project will be deleted.

Formatting New Diskettes
If you put an unformatted floppy disk into a floppy drive, and attempt to save something on it, a requester will come up and ask if you wish to format the floppy disk. Choose Yes if you want the Toaster to format the disk and save the appropriate file, choose No if you do not want to do so.
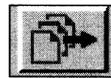
The Load CG Book button
Although CG Books may only be saved as part of Projects, you may load CG Books separately, independently of their main Project file. Be aware that doing so will erase the contents of the current book, however. So be certain to save your work before loading in new Books or Projects.

To load a Book when CG is active:

1   Go to Toaster Preferences.

2   Select the project containing the Book to load (using one of the three methods above, under the Project control panel).

3   Click the Load CG Book button. The Book will load.

To load a Book when CG is not active:

1   Go to Toaster Preferences.

2   Select the project containing the Book to load (using one of the three methods above, under the Project control panel).

3   Click OK to return to Switcher.

4   Activate CG by clicking on its button. The CG will be loaded, and its Book will be loaded as well.

To save Books as part of a Project:

If all you need to do is create CG Pages for later use, we recommend that you load the GetSmall Project first and then create the necessary pages, so that when you save the Project containing the Book, it is not as large a file on your hard drive. Also, since you will only be using the Book from that Project later, there is no need to save the additional data.

1   Load the GetSmall Project.

2   Create the pages you need in CG.

3   Exit CG using the escape key. This leaves CG active, and the contents of its pages in memory.

4   Go to Toaster Preferences.

5   Follow the steps for saving a Project, as outlined above (under the Save Project button).

The Device buttons

The buttons on the lower part of the Project control panel represent up to eight available storage devices. You can load or save Projects from any device listed here. There are always at least three device buttons here: the DF0: button represents the floppy drive, RAM: is the system's RAM storage and DH0: is the hard drive. To save to or load from a different device, click the appropriate device button.

Framestore Status Control Panel
The Framestore control panel lets you specify the device for saving and loading video frames from the Switcher. A total of eight buttons may appear here, depending on the number of devices connected. To specify a device, click the appropriate button.

The Framestores Available Window
This window displays the space available for Framestores on the selected device. The above window shows space for 39 more frames.

The Device buttons
The buttons on the lower part of the Framestore Status control panel represent up to eight available storage devices.
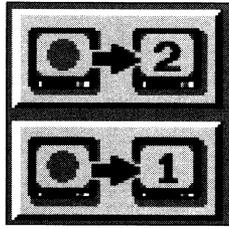
Motion Removal (Frame - above top and Field - above bottom)

Motion can occur in frame-grabbed images because the Toaster grabs four consecutive fields of video. (For an explanation why this is so, see the section on the Freeze button.) There are two methods for performing Motion Removal: Frame and Field. Frame scans the fields that make up the video image, processing out motion to create a stable frame. Field uses one field to calculate a stable frame.

Both processes use the data from one framebuffer and put the results in the other framebuffer. These represent two different methods for extracting a stable image from a moving one. Experiment with the same framegrab to see the different results.

To use Motion Removal:

1 Make sure that the frame you wish to process is selected in a framebuffer on the Preview Bus.

2 Go to Toaster Preferences.

3 Select the type of Motion Removal you prefer: Frame or Field.

From the Switcher screen, you can use either method for Motion Removal directly:

1 Make sure that the frame you wish to process is selected in a framebuffer on the Preview Bus.

2 Hold the Alt key and press the letter d for Field (Alt-d) or f for Frame (Alt-f).

The control panel will disappear and the screen will begin to flash. When Motion Removal is finished, you will see the frame (minus the motion) being rendered back over itself on the Preview monitor. The control panel will reappear.

After the motion has been removed from the image, it can be treated like any other frame. It can be stored on the Framestore or used in transitions. The process of Motion Removal takes about 60 seconds (depending on the speed of the your system) so don't click this button unless you are sure that you want to process the image.
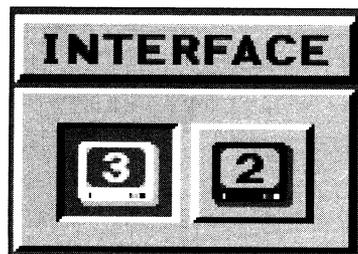
Interface

The Interface buttons governs the Switcher Screen display. Click the three monitor button if you are using three monitors, or the two monitor button if you are using two composite monitors. Another effect of toggling this button is that certain RGB control panel screens may change to a gray scale, rather than the faint pastels of the Toaster's original screens.

With a two-monitor configuration, a color Preview monitor can do double duty, showing both the Preview image and the Toaster control panel. With this configuration, the Toaster control panel is overlaid onto the Preview image.

With a three-monitor configuration, one of the monitors is dedicated to the Toaster control panel, while the other two monitors show the Program and the Preview images.

Shortcut: *From both the Preferences and the Switcher Screens, you can toggle between a 2- and 3-monitor setting by pressing the Help key.*

[**O K**]
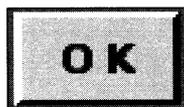
OK

When you are ready to leave the Toaster Preferences module and go back to the Switcher screen, click the OK button. This accepts the settings in the Toaster Preferences window and takes you back to the Switcher screen.

If you are using the system only for Toaster functions (if your computer autoboots into the Toaster environment) you can go ahead and turn the machine off at this point.

[**EXIT**]

Exit

If you are using the system as a general purpose computer, select Exit, and answer Yes to the box that asks Shut down and exit Video Toaster? This will turn on the Overlay genlock and take you to the operating system.

What is shown on the Toaster output after exiting?

• Amiga computer graphics (as a video signal) on last selected Program output.

• Non-keyed Amiga graphics (as a video signal) on Preview output.

Note: If you plan to use non-keyed Amiga graphics output only, we recommend you select BKG on Program when you exit the Toaster. This routes the non-keyed Amiga graphics through the Program output. In this case, the Program output will deliver a higher image quality signal than the Preview output.

Switcher Keyboard Commands

Keyboard Shortcuts

This is a complete list of all of the keyboard commands provided for the Switcher screen. Using any one of these commands is the same as of clicking on the button with the mouse on the switcher screen.

Switcher

Key	Function
F1	Input 1 on the Program Bus.
F2	Input 2 on the Program Bus.
F3	Input 3 on the Program Bus.
F4	Input 4 on the Program Bus.
F5	DV1 on the Program Bus.
F6	DV2 on the Program Bus.
F7	BKG on the Program Bus.
1	Input 1 on the Preview Bus.
2	Input 2 on the Preview Bus.
3	Input 3 on the Preview Bus.
4	Input 4 on the Preview Bus.
5	DV1 on the Preview Bus.
6	DV2 on the Preview Bus.
7	BKG on the Preview Bus.
q	Input 1 on the Overlay Bus.
w	Input 2 on the Overlay Bus.
e	Input 3 on the Overlay Bus.
r	Input 4 on the Overlay Bus.
t	DV1 on the Overlay Bus.
y	DV2 on the Overlay Bus.
u	BKG on the Overlay Bus.
Shift + a	Effect Bank A
Shift + b	Effect Bank B
Shift + c	Effect Bank C
Shift + d	Effect Bank D
Shift + e	Effect Bank E
Shift + f	Effect Bank F
F9	Activate CG (first press), Enter CG (second press)
F10	Go to/Return from Toaster Preferences Screen

Transition

Key	Function
Return	Take
Space Bar	Auto
,	S (Slow)
.	M (Medium)
/	F (Fast)

Luminance Keyer

Key	Function
o	Luminance Key off
[	Key on black
]	Key on white
down arrow	increase clip level (useful for fine adjustment)
up arrow	decrease clip level (useful for fine adjustment)

Keypad

Key	Function
(	Load CG Pages button.
)	Select Effects button.
/	Load Frame button.
*	Save Frame button.
Return	Terminate comment.
Enter	Load selected Frame / Page / Effect; Save frame.
Alt-Enter	Delete current frame (only when Save Frame button is selected).
Right (A)-Enter	Rename current frame (only when Save Frame button is selected).

Keypad and Preferences Screen

Key	Function
-	Scroll up list of Frames/Pages/Effects (move toward top of list)
+	Scroll down list of Frames/Pages/Effects (move toward bottom of list)
.	Select the next available number (only when Save Frame button is selected)
Return	End Text Entry.
Enter	Load selected Frame / Page / Effect; Save frame.
Alt-Enter	Delete current frame (only when Save Frame button is selected).
Right (A)-Enter	Rename current frame (only when Save Frame button is selected).

Miscellaneous

Key	Function
f	Freeze (turn on frozen video)
l	Live (turn on live video)
Alt-d	Field Motion Removal
Alt-f	Frame Motion Removal
Help	Toggle 2/3 monitor setup
Ctrl-Ctrl-Alt-Alt	Access Amiga operating system (Workbench); the same key combination will return to the Toaster Switcher.
Ctrl-Left Alt-F10	Exit Video Toaster

ChromaF/X Manual

Table of contents

A sophisticated color processor, ChromaF/X empowers you with complete control over brightness, contrast, saturation, and more. Alter live video with sepia tone, line art, solarization, and negative video effects. Send these effects to the Video Toaster Switcher for flying color effects, organic cycling transitions, and dissolve effects.

How ChromaF/X Works - Luminance Mapping

All ChromaF/X effects have one thing in common: they apply new colors to the incoming video image based on brightness levels. This process, called luminance mapping, is the fundamental concept upon which ChromaF/X is built.

A composite color video signal contains two important parts: the luminance signal, which contains all brightness information within the picture, and the chrominance signal, which contains all color information within the picture.

The luminance portion of the signal is what you would see on a black-and-white video monitor, or on a color TV with the color turned all the way down. ChromaF/X divides this luminance information into 96 levels and lets you modify the color on any level. You have the choice of leaving the chrominance portion of the video signal in place or removing it before you apply the effect.

Here's a simple example. Suppose you had a camera aimed at a card with three bars across it: black, gray, and white. There are three different luminance levels for this card. Using the editing tools within ChromaF/X, you create a luminance map where the brightest part of the image is left normal, the mid-brights are colored red, and the darkest parts are colored blue. Applied to the video image, this filter would turn black to blue, gray to red, and leave white alone. The resulting picture would be red, white, and blue, instead of gray, white, and black.

The following diagram shows where the different parts of a particular picture will fall on the ChromaF/X Color Strip. The Editor is read from left to right, with the darkest values falling on the left and brightest values falling on the right.

Here's a description of the luminance map for the accompanying picture.

• The brightest part of the image is the sun. Therefore, the portion of the Color Strip that will affect the sun is at the far right (the end that represents the brightest parts of the scene).

• The darkest part of the image is in the shadow areas. Therefore, the portion of the Color Strip that will affect shadow areas is at the far left (the end that represents the darkest parts of the image).

• All other brightness values fall between the brightest and the darkest values, so their position, on the Color Strip fall between the two ends.

To change a particular part of the picture, you must change the corresponding part of the Color Strip. If you want to make the sun green and not affect the rest of the picture, then you must put green on the far right end of the map and leave the rest of the map unaffected.

Similarly, if you wanted to make the darker parts of the picture brighter, you could replace the left end of the map with a dark gray instead of black. This would serve to make the shadow and the bark brighter, without affecting the rest of the image (the equivalent of turning down the contrast on a video monitor).

ChromaF/X Terminology

Effects Selection
The Effects Selection control panel lets you select different effects to render and apply to the video signal. You can also name, rename, and pre-load effects (for use from the Switcher).

Color Strip
The Color Strip is the long, thin horizontal bar that stretches across the Color Strip control panel. Here, you edit color spreads from left to right, which creates a palette. Edit the top and bottom palette, then select a type of blend between the two lines, and you create full-screen filters that can be applied to the video signal.

Color Table
The Color Table control panel is used to create a blend between the top and bottom lines of the screen. Modify the top and bottom lines using the Color Strip (above), then use the Color Table to create a smoothly blended filter between the two lines. This filter is then applied to the video signal.

Luminance, Brightness
These terms refer to the black-and-white portion of the video signal. On your television, if you turn the color all the way down, you are looking at the luminance portion of the signal.

Chrominance, Chroma
These terms refer to the color portion of the video signal.

Toaster Terminology

Click
Click means to press and then quickly release the left mouse button. Buttons and icons may change shape or color when clicked on in this manner. The word select may also be used for click (as in, "select the Load Frame button," which means for you to click it).

Double-click
Double-click means to press then quickly release the left mouse button twice. In the Video Toaster, you double-click some buttons to activate their functions (as in, double-click the Load Frame button to load a still frame).

Shift-click
Shift-click means to hold the shift key on the keyboard, then quickly press and release the left mouse button.

Drag (also Dragging)
Dragging is holding down the left mouse button and moving the mouse.

Pull Down a Menu
To pull down a menu in ToasterPaint, hold down the right mouse button and move the mouse to the menus that appear. Menu options that you can select will appear to "drop down" as the pointer passes over them.

Return and Enter
These two keys are used for two distinct functions in the Video Toaster. Be aware that they will not perform the same actions. Generally, you use Return after typing text in order to restore the mouse pointer, while you use Enter to activate a function (as in, saving a Frame).

Select
A single click on an on-screen button. This will highlight it, thus selecting it.

Getting Around the Screen

ChromaF/X

The ChromaF/X screen consists of three main control panels and several smaller multi-button panels.

The Effects Selection Control Panel
Use this panel to load, name, rename, and prepare pre-set effects.

The Color Strip Control Panel
Use this panel to edit either the top or bottom line of the Color Table.

The Filter Control Panel
Use these buttons to select the manner in which the ChromaF/X effect is applied to the video signal.

The Chroma Control Panel
Use these buttons to select between leaving or removing the color from the original video signal.
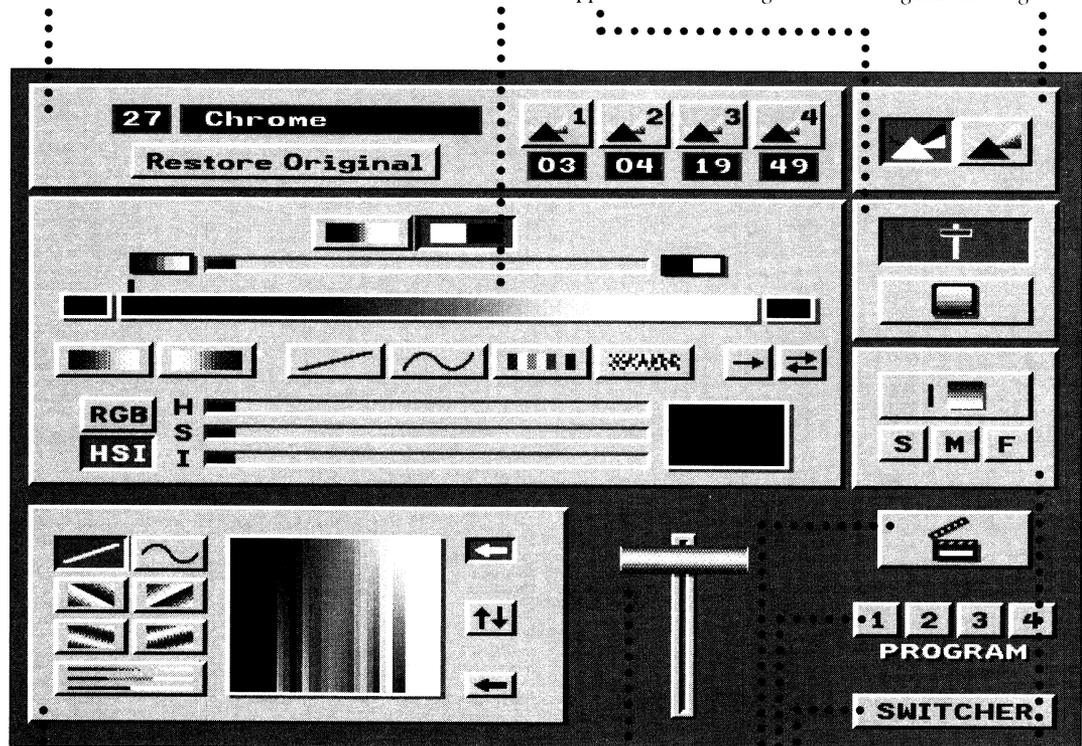
The Color Table Control Panel
Use the Color Table to create blends from the top line to the bottom line.

The T-Bar
Use this button to (a) render an effect to a frame buffer, and (b) apply a rendered effect to the video signal.

The ClapBoard
Use this button to render an effect to a frame buffer.

The Video Source Buttons
Use these buttons to see how the rendered effect looks on any of the four video sources.

The Switcher Button
Click this button to return to the Switcher.

The Color Cycling Control Panel
Use these buttons to select the type of color cycling to apply to the video signal.

Reference
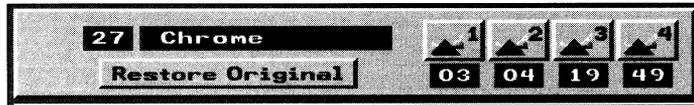
The Effects Selection Control Panel

This control panel allows you to select, restore, and preset ChromaF/X effects.

Numeric Window

The Numeric window displays the number of the current effect. Change the current effect by typing its number directly on the numeric keypad, or by clicking the enter key, or by clicking on this window and dragging the mouse.

Text window

This window displays the name of the current effect. To change name of an effect, click inside this window, use the Delete (Del) and Backspace (<—) keys to erase the old name, type in the new name, and press Return. Names are limited to 12 characters.

Restore Original

This button will restore the original ChromaF/X effect for the current effect only. If the current effect is one of the original ChromaF/X effects, its settings will be restored. If it is one of the open user slots, it will be restored to a blank effect.
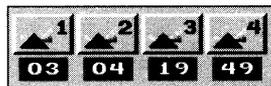
Effects Preset buttons

These four buttons are used in conjunction with four similar buttons found in the Switcher Banks. They allow you to store up to four effects, one per button, and then access them from the Switcher. See the Switcher Manual ("Special" Effect Icons) for details on how to use ChromaF/X with transition effects.

Presets may be set to Transition, Filter, or any of the three Cycle modes of operation.
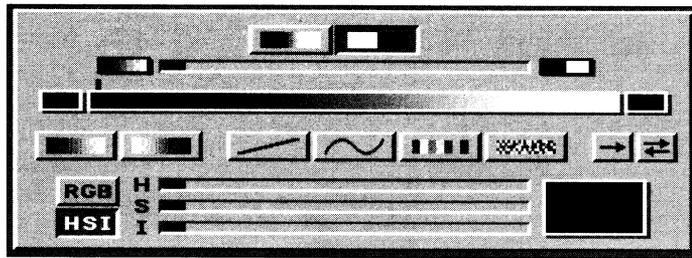
The Color Strip Control Panel

This control panel contains controls to edit the top or bottom color palettes of the screen. These are edited in a horizontal fashion.

Blurred Transitions button

This button causes the transitions between one luminance band and the next to be blended smoothly. This button has no effect when the Posterization slider is in its left-most position.

Sharp Transitions button

This button causes the transitions between one luminance band and the next to be very distinct, as opposed to gradual blending. One luminance band begins immediately where the last left off. The Sharp Transition button has no effect when the Posterization slider is in its left-most position.

Posterization Slider

This slider controls the amount of quantizing (posterization) that appears in the Color Strip. At its left-most position, there is no posterization. At its right-most position, there is full posterization. Colors in the map break up into bands as the slider reaches the maximum amount of posterization.

Note that this slider is used both for horizontal posterization (here in the Color Strip) and vertical posterization (in the Color Table, when the vertical posterization button is depressed). This slider affects luminance resolution. Instead of the normal 96 divisions, posterization reduces the luminance resolution anywhere from 96 divisions to just two. When this happens, colors in the picture are reduced, and the image takes on a blocky, pixelized appearance.

Color Strip

The Color Strip is the central workplace of ChromaF/X. The Color Strip displays the luminance map of the current line (either the top or bottom) from the Color Table. At either end of the Color Strip is a box representing the brightest or darkest part of the map. Above the Color Strip is a marker, indicating the current color location being edited.

Darkest Box

The Darkest Box is at the far left end of the color strip. It displays the color that will be added to the darkest parts of the picture. The name of the Darkest Box has nothing to do with any color it might contain. It refers only to the darkest parts of the video image.

In a map of a normal unaffected video this box will contain black. When you click the pointer inside this box, the palette marker moves to the end of the Color Map Editor nearest the Darkest Box. The Darkest Box is just an expanded view of the darkest end of the map, so that you can more conveniently select it.

Brightest Box

The Lightest Box is at the far right end of the color strip. It displays the color that will be added to the very lightest parts of the picture. The name of the Lightest Box has nothing to do with any color it might contain. It refers only to the lightest parts of the video image.

In a map of a normal unaffected video this box will contain white. When you click the pointer inside this box, the Edit Marker moves to the end of the Color Strip nearest the Lightest Box. The Lightest Box is just an expanded view of the lightest end of the map, so that you can more conveniently select it.
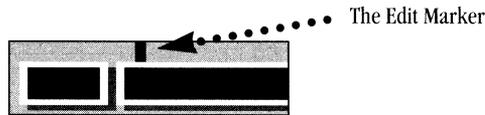
The Edit Marker

Edit Marker

The Edit Marker serves two purposes:

- It indicates the position on the Color Strip where you are currently located. It also indicates the color that will be copied or swapped when you use the Copy Color or Swap Color buttons.

- It marks one end of the range that will be affected when you use the Horizontal Spread, Horizontal Spectrum, Random Color or Snow buttons. The other end is set to by the next point you click on in the Color Strip.

To move the Edit Marker to a specific point on the Color Strip, click anywhere on the strip itself (you may also click on the Strip and drag the mouse to the left or right). The Marker will move directly to where you click, and the Current Color Window will display the color at that position. To select a color on the Color Strip, click anywhere on the strip itself.

To move the Edit Marker to either end of the map, click in the Brightest or Darkest Box. The Marker will move directly to that end of the Color Strip. The color directly below the Edit Marker appears in the Current Color Window.
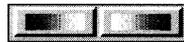
Automatic Palette Tools (Horizontal Transition Tools)

These buttons are used to edit the top or bottom line from the Color Table that appears in the Color Strip. They function automatically: click on either one to fill the Color Strip with a black-to-white or white-to-black luminance map.

Normal Video (above left) Clicking this button replaces the contents of the Color Strip with a "Normal Video" luminance map: a smooth spread from black to white. A Color Strip line containing this "Normal Video" map will leave the image unaffected.

Negative Video (above right) Clicking this button replaces the contents of the Color Strip with a "Negative Video" luminance map: a smooth spread from white to black. A Color Strip line containing this "Negative Video" map will convert the image to a negative.

Horizontal Spectrum   Snow

Horizontal Spread   Random Color
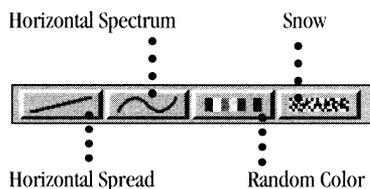
Range Palette Tools

These buttons are used to edit the Color Table line (either top or bottom) that appears in the Color Strip. They function on a range of colors, specified by the locations you click with the mouse. These tools function in the following manner:

- Click on a color position on the Color Strip.

- Click on one of the Palette Tool buttons (Horizontal Spread, Horizontal Spectrum, Random Color, Snow)

- Click elsewhere on the Color Strip.

A feature of the Color Strip, when used with the Range Palette Tools, is that you can drag the mouse along the strip to locate the second color. After selecting the first color, select the Range Tool, then hold the left mouse button and drag the mouse along the Color Strip. You'll see a small range indicator appear in place of the Edit Marker, following the mouse. When you locate the color for the end of the range, let go of the mouse button. This can be of great assistance in locating specific colors.

Note that any colors on the Color Strip between the two selected colors will be affected by the type of spread chosen. In other words, a spread from red to blue will cause all colors between red and blue to be erased by the gradual blend of the range tool selected. Colors in between will be lost.

Horizontal Spread This tool makes a smooth spread of color from the Edit Marker's current location to where you next click on the Color Strip.

Horizontal Spectrum This tool makes a smooth spread of color from the Edit Marker's current location to where you next click on the Color Strip.

The Horizontal Spectrum tool cycles through all of the available hue (H) values between the two colors at the ends of the range. If the colors at the ends of the range have the same Saturation (S) and Intensity (I), the S and I values of the entire spectrum will remain constant. Placing the same color at both ends of the range will allow the Horizontal Spectrum tool to cycle through all hue values and produce a spectrum with the most colors.

For example, if the Current Color Window contains yellow, and you click on blue in the Color Strip, then the colors on the Color Strip between yellow and blue will be replaced with all the colors of the rainbow that fall between yellow and blue.

Random Color This inserts random bars of color from the Edit Marker's current location to where you next click on the Color Strip. Unlike the Horizontal Spread and Horizontal Spectrum tools, the Random Color tool is unaffected by the color at either end of the desired range. It always inserts random colors into the map.

Snow This inserts narrow, alternating bars of black and white noise from the Edit Marker's current location to where you next click on the Color Strip. Like the Random Color tool, the Snow tool is unaffected by the color at either end of the desired range. It always inserts snow into the map.
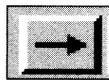
The Copy Button
Use the Copy button to copy a color from one location on the Color Strip to another location. In the Color Strip click on the color you want to copy. If you don't click right on it, you can click and drag the cursor along the length of the Color Strip until you locate it. Click on the Copy button. It will depress. Now click anywhere else on the Color Strip to place a copy of the color at that location. When the operation is complete, the Copy button will appear raised again.
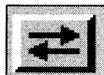
The Swap Button
Use the Swap button to cause two colors to change places on the Color Strip. In the Color Strip click on one of the colors you want to swap. If you don't click right on it, you can click and drag the cursor along the length of the Color Strip until you locate it. Click on the Swap button. It will depress. Now click on the other color, the one you want to change places with. When the operation is complete, the Swap button will appear raised again.

• Vertical Spread, Vertical Spectrum

Shift Left, Shift Right

• • • • Top Line Button

• • • • • Swap Lines Button

• • • • Color Table

• • • • Bottom Line Button

Rotate Left, Rotate Right

Vertical Posterization
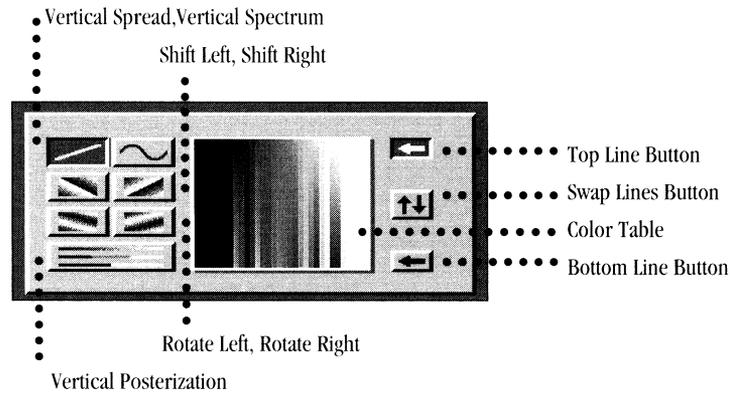
Color Table Control Panel

The Color Table displays the filter that will be applied to the video image. In the Color Strip, you edit horizontal lines representing luminance. In the Color Table, you edit vertical transitions between the top and bottom lines. The tools you use are Vertical Spread, Vertical Spectrum, Shift Left, Shift Right, Rotate Left, Rotate Right, Vertical Posterization, and Swap (Top and Bottom Lines). Here also are the Edit Top Line and Edit Bottom Line buttons that select the palette you are editing in the Color Strip.

Color Table

The Color Table is a collection of Color Strip strips stacked. The buttons to the left of the Color Table are used to select different transitions between the top and bottom lines.

The top and bottom lines of the Color Table are edited by the Color Strip (at the top of the screen). Select them by using the upper and lower arrow buttons to the right of the Color Table. As you make changes in the Color Strip, the Color Table will alter to show the changes.

Vertical Transition Tools

These tools provide the means to manipulate the colors between the top and bottom lines of the Color Table. These transitions occur vertically instead of horizontally.

Vertical Spread This tool makes a smooth spread of color from the top line of the Color Table to the bottom line.

Vertical Spectrum This tool creates a spectrum of color from the top line of the Color Table to the bottom line. It cycles through all of the hues available between the two colors to create this spectrum, following the same rules as the Horizontal Spectrum tool for the Color Strip.

For example, if a particular point on the top line contains red, and the point directly below this point on the bottom line also contains red, clicking the Vertical Spectrum button will replace the colors in the Color Table between the two with the entire spectrum of colors.

Shift Left This tool takes the entire top line and duplicates it in a downward fashion that shifts position to the left. This tool is useful for creating Transition effects where you want the colors in the image to "cycle."

Note: When this button is depressed, the bottom line of the Color Table is not used in the resulting filter. Also, the Exchange Lines button and Bottom Line button are unavailable.

Shift Right This tool takes the entire top line and duplicates it in a downward fashion that shifts position to the right. This tool is useful for creating Transition effects where you want the colors in the image to "cycle".

Note: When this button is depressed, the bottom line of the Color Table is not used in the resulting filter. Also, the Exchange Lines button and Bottom Line button are unavailable.

Rotate Left This tool takes the entire top line and replicates it down the Color Table, while rotating its position to the left and inverting the colors.

The Rotate tools create a much more radical shifting of the colors than the Shift tools. They are useful for creating Transition effects where you want the entire image to appear to have undergone a nuclear explosion (the Nuke effect).

Note: When this button is depressed, the bottom line of the Color Table is not used in the resulting filter. Also, the Exchange Lines button and Bottom Line button are unavailable.

Rotate Right This tool takes the entire top line and replicates it down the Color Table, while rotating its position to the right and inverting the colors. The Rotate tools create a much more radical shifting of the colors than the Shift tools, and are useful for creating Transition effects where you want the entire image to appear to have undergone a nuclear explosion (the Nuke effect).

Note: When this button is depressed, the bottom line of the Color Table is not used in the resulting filter. Also, the Exchange Lines button and Bottom Line button are unavailable.

Vertical Posterize Selecting this button adds posterization to the Color Table. Using the Posterization Slider (located just above the Color Strip strip), you can adjust the amount of posterization. At the left-most position, there is no posterization. At the right-most position, there is full posterization. Colors in the map break up into bands as the slider reaches the maximum amount of posterization.

This slider affects luminance resolution. Instead of the normal 96 divisions, posterization reduces the luminance resolution anywhere from 96 divisions to just two. When this happens, colors in the picture are reduced, and the image takes on a blocky, pixelized appearance.

Note: When this button is depressed, the bottom line of the Color Table is not used in the resulting filter. Also, the Exchange Lines button and Bottom Line button are unavailable.

Line Control
The line control buttons are used to select the top or bottom lines of the Color Table for editing in the Color Strip strip.

Top Line Click this button to display the top line of the Color Table in the Color Strip, where it can be modified.

Note: When the Shift (left or right) or Rotate (left or right) Color Table tools are used, the Top Line button is automatically selected and the other line control buttons disappear.

Swap Lines This button causes the top and bottom lines of the Color Table to change places, thus inverting the Color Table. The Swap Lines button has no effect on the line displayed in the Color Strip. The selected line changes instead so that the same information is still displayed in the Color strip to reflect the new line positions.

Bottom Line Click this button to display the bottom line of the Color Table in the Color Strip, where it can be modified.
Note: This button is not available when the Shift (left or right) or Rotate (left or right) tools are used.
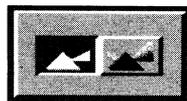
The Chroma Control Panel
Use the Chroma Button control panel to choose whether ChromaF/X should (a) add its color effects to the existing colors in the original video footage, or (b) remove all color from the original video footage and provide its own color effects.

The Black-and-White button
Click the left button to remove all color from the original video footage and provide your own color effects. This is useful for making more vibrant and radical effects.

The Color Button
Click the right button to add your color effects to the existing colors in the original video footage, in effect blending the two color schemes together. This is useful for applying a subtle tint or filter to the image.
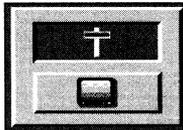
The Filter Control Panel

Use the Filter control panel to determine the manner in which the Color Table is applied to the video signal, either gradually (line-by-line, based on the position of the T-Bar) or as a full screen filter.

Transition (above)
Transition mode allows manual control of the colorization effect by applying one line from the Color Table at a time to the incoming video image. With the T-bar at the top of its range, the top line of the Color Table is applied. As the T-bar is dragged down, successively lower lines of the Color Table are applied to the image until the T-bar reaches the bottom.

Filter (below)
Filter mode applies the entire color palette to the incoming video signal in a direct 1:1 relationship. Think of the entire Color Table as a filter that you hold in place over the screen. To achieve the best filter effects, the Chroma Controls should be set to Add Color.
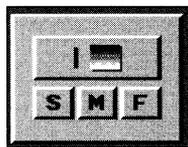
Cycling off
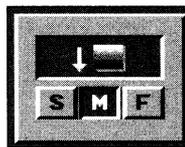
Down cycling
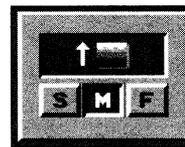
Upward cycling
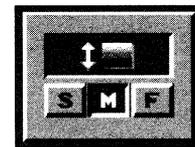
Bounce cycling

Color Cycling Control Panel

Click Cycle to apply successive lines of the color table to the video signal. The T-Bar is not used, since cycling is automatic once selected. Cycle applies successive lines of the color table to the video signal. Cycling works in three modes: top to bottom repeat, bottom to top repeat, or rebounding between top and bottom.

Cycle Direction
Access the four Cycle modes with the Cycle button. Successive clicks on the button rotates through the four settings: None, Down, Up, and Bounce Cycling.

> **Down** applies the top line of the Color Table to the incoming video image and continues downward with successively lower palette lines. When it reaches the bottom palette line, it starts over at the top.

> **Up** applies the bottom palette line of the Color Table to the incoming video image and continues upward with successively higher palette lines. When it reaches the top palette line, it starts over again at the bottom.
> **Bounce** applies the top palette line of the Color Table to the incoming video image and continues with successive palette lines. When it reaches the bottom palette line, it reverses the process, and so on.

S, M, F
Use the Slow, Medium, and Fast buttons to control the speed of Color Cycling.

Rendering and Transitioning Effects Effects

Once you are satisfied with the appearance of the Color Table and are ready to view the effect, you must render it to one of the frame buffers and apply it to the video image. The buttons used to do this are the T-bar and the Clapboard.
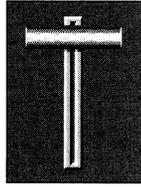
T–bar

The T-bar on the ChromaF/X editing menu performs two functions:

- If the effect has not been rendered: Click on it to render the effect to a frame buffer.

- If the effect has been rendered: Drag it downward to manually apply the effect to video.

The T-bar functions exactly as it does on the Switcher menu click directly on the bar itself to render or apply an effect.

Clapboard

The Clapboard button performs two functions:

- If the effect has not been rendered: Click on it to render the effect to a frame buffer.

- If the effect has been rendered: Click on it to trigger an auto transition.

Program Sources (1-4)

There are two methods for "testing" effects on the four incoming video sources:

- Function keys (F1, F2, F3, F4) correspond to the four external video inputs. Press a key to select that source.

- Click on any of the four program source buttons with the mouse.

Switcher (Exit)

To return to the Switcher, click this button. If you have preset effects in any of the preset buttons, they will be available for rendering through the ChromaF/X effects buttons on the effects banks. If you have modified or created effects of your own, they will automatically be saved when you exit the Toaster (through the Toaster Preferences screen).

Switcher Keyboard Commands

Keyboard Shortcuts

Escape ....Return to Switcher
F1 ....Select Program Input 1
F2 ....Select Program Input 2
F3 ....Select Program Input 3
F4 ....Select Program Input 4

Effects List

00	(blank)	14	Posterize	28	Gold	42	Green Neon
01	Solar Filter	15	Heavy Poster	29	Red Chrome	43	Neon Cycle
02	Sunset Filter	16	PosterBrite	30	Yellow Light	44	Stripe Cycle
03	Ocean Filter	17	B&W Poster	31	RedMids	45	Stripe Filter
04	Hue Filter	18	Red Poster	32	BlueDarks	46	Band Filter
05	Hue Bands	19	Fire	33	MidRangeTint	47	Zebra Stripe
06	Mars Filter	20	Solarize	34	Red-Grn-Blu	48	Color Bands
07	SepiaTone	21	Cycle Solar	35	Poster-Solar	49	ColorShade
08	Contrast	22	Nuke	36	Poster Cycle	50	RainboStripe
09	Brightness	23	Nuke Solar	37	Snow Mids	51	RainboBands
10	Line Art	24	Crazy Nuke	38	Snow Lights	52	Soft Rainbow
11	Charcoal	25	Fade to Neg	39	Snow Darks		
12	Pastel	26	Fade->PostNeg	40	Snow Cycle		
13	Light Poster	27	Chrome	41	Snow Bands		

ToasterPaint Manual

Table of Contents

ToasterPaint provides you with the power to mix and match freeze frames, ToasterCG text, LightWave3D images, and your own artwork with ease, creating seamless composite graphics in 16.8 million colors. Eleven drawing modes, redefinable Undo/Redo, variable transparency, and antialiased texture mapping place ToasterPaint in the front line of flexible, powerful graphics design packages.

ToasterPaint Reference

ToasterPaint Terminology

Highlight
ToasterPaint's menus appear whenever you click and hold the right mouse button. This is often referred to as "pulling down a menu." When you move the mouse over the available selections, they will highlight. Letting go of the mouse button with a selection highlighted will activate (or select) it.

Drag Out a Box
Click the left mouse button and while holding the button down drag the mouse. A box-shape will be drawn from the first point you click to the location of the pointer when you let go the button.

Default Values
This term is used to define the standard values that certain screen functions use every time you invoke them. For example, ToasterPaint's color palette contains a set of default colors every time ToasterPaint is run.

Pulldown Menu
A pulldown menu is a menu that appears to "drop down" from a portion of the screen when you click the right mouse button and move near it.

Toaster Terminology

Click
The act of positioning the pointer over an object on the screen and pressing the left mouse button once. Buttons and icons may change shape or color when selected in this manner. Therefore, the word select may also be used for click.

Double-click
Clicking the left mouse button twice in rapid succession.

Drag
Clicking with the left mouse button *and holding it down while you move the pointer.*

Shift-Click
The act of holding down the shift key while clicking with the left mouse button.

Pull down a menu
Hold down the right mouse button to display the Menu Bar, move the pointer over the designated menu, then move the pointer downward until the desired command is highlighted, then release the mouse button.

Return and Enter
These *two different keys* perform *two distinct functions* in the Video Toaster. Make sure that you do not get the two confused. When the manual instructs you, be certain you press the proper key.

Select
A single click on a button. This will highlight it, thus selecting it.

ToasterPaint

Entering ToasterPaint

- Start up the Toaster.

- From the Switcher Control Panel click on the ToasterPaint application button. The ToasterPaint button is dimmed before you click on it. The first time you click the button you are loading the program into RAM. Click on it a second time in order to enter ToasterPaint.

- Click on the ToasterPaint button again to bring up ToasterPaint's opening screen.

Exiting ToasterPaint

There are two methods for exiting ToasterPaint.

- To exit and shut down ToasterPaint: hold the right mouse button down to display the menu. Move to the Picture menu. Highlight Quit and let go the button. Note that this method will "clear" whatever image may be on ToasterPaint's screen permanently. Save any work in progress before using this option.

- To exit, yet leave ToasterPaint active and loaded in memory: hold the right mouse button down to display the menu. Move to the Picture menu. Highlight Switcher and let go the button. Note that any image that may be on the ToasterPaint screen will remain when you reenter ToasterPaint.

The ToasterPaint Monitors

You will be using two monitors while you work in ToasterPaint: either Preview and Program, or Control Panel and Program.

- The Preview monitor will display a 4096-color representation of the Toaster's 16.8-million color output in either a close-up or near-full-screen mode, along with the control panels.

- The Program monitor will display the full 16-million color output of the Toaster framebuffer when the image is rendered to it.

- If you are using an RGB monitor, it will show the same display as the Preview monitor.

Special Functions

The Mouse

Beside the normal functions of pointing, clicking, and menu selection, the right and left mouse buttons have some special functions in ToasterPaint.

Left Mouse Button

- Clicking in either the Current Color Box or the range color bar (between the left and right range colors) gives you the Pick Color pointer. Continue to hold the left button, move onto the canvas. You can select any color and make it your current color.

- Hold the Shift key and drag the left mouse button to attach the picture to the pointer and you will be able to move the canvas by dragging the mouse. The current brush will not apply any paint to the canvas until the Shift key is released.

Right Mouse Button

- Click the right mouse button at any time there is a wait pointer (the cloud of Z's) on the screen to cancel the operation in progress. This includes the repainting of brush strokes, loading files, or listing directories. If the pointer is a "wait" cloud without z's, the operation cannot be cancelled with the right mouse button.

- Click the right mouse button after selecting magnify, but before locking down the view, to close the magnify window.

- Click the right mouse button in a file requester to close it and return to the Tool Box and menu screen.

- Click the right button when the control panel is hidden to display the tools (instead of the menu bar).

The Screen
The ToasterPaint canvas can display either a close-up (of about 25%) of the screen, or a near-full (about 90%) display. The near-full display (1x mode) is discussed in greater detail later in this text. The close-up mode necessitates some method for moving around the image when you need to access other parts of the picture. Hence, auto-scrolling.

Auto-Scrolling. To use the auto-scrolling feature move the mouse to one of the edges of the screen. If there is more of the image offscreen in that direction, pushing the pointer against the edge of the screen will reveal it. When you reach the true edge of the image itself, scrolling will stop.

The canvas and its borders share the same color. Therefore, you will not be able to see the canvas moving unless there is something drawn on it. If the canvas is all one color, turn on coordinates to keep track of the cursor's position. The easiest way to do this is to press the g key, while looking at the Tools section of the control panel. The box on the lower right side (which normally displays the current drawing mode) will then display the x and y coordinates of the pointer.

"Picking-up" the Canvas. Sometimes it is convenient to "attach" the canvas to the pointer so that you can move it around with the mouse. This helps you get to offscreen parts of the image, even in the middle of a drawing operation. To do so, press the shift key while you still have the left mouse button pressed. At this point, it is as if the pointer is a tack pushed through a piece of paper. You move the mouse and the canvas moves. When you release the shift key, your pointer returns to drawing mode and allows you to resume drawing from the exact point where you left off.

Auto-Scrolling and the Arrow Keys. The mouse is not the only way to scroll the canvas: you may also use the four arrow keys. The arrow keys cause the canvas to move slowly in the selected direction. Use the shift key with the arrow keys to move the screen in steps of 32 pixels (instead of 1 at a time). If you need to move the canvas while you are drawing, however, it is generally better to use the shift key + left mouse button.

Disabling Auto-Scrolling. Often, when you are doing a lot of detail work in a small area, it can be advantageous to turn off auto-scrolling so that if you accidentally move the pointer to one of the edges of the screen, the canvas remains locked in place. Press the Help key to lock the canvas down. Press Help again to enable auto-scrolling. Scrolling with the arrow keys is not affected by the Help key.

The Control Panel

ToasterPaint's main control panel consists of two sections: the color strip and four distinct panels. These panels appear by clicking on the appropriate buttons: Tools (the default panel), Palette, Text Rendering, and Transparency/Warping. When you first load ToasterPaint, the Tools panel is present and the other three are hidden.

◄──────── 16-color palette ────────► Current Color ◄─── Range Colors ───►
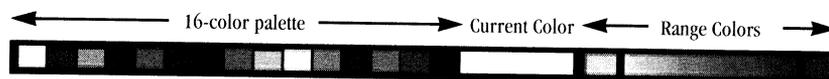
The Color Strip
The Color Strip is at the top of the control panel no matter what Command Section is underneath. From left to right: the Color Strip, displaying 16 ready-to-use colors; the Current Color Box, showing the color currently selected for use; the Range Colors, displaying the two Range Colors on either side of the Range Color Box.

Current Color Box. This box, in the middle of the Color Strip, shows the current color selected for use. This can be any one of the 4096 available preview colors. If you drag the mouse on the Current Color Box to display the Palette temporarily, the Pick Color function activates. Continue to hold the left mouse button, move the pointer over any color on the screen, let go the button, and you will select that color.

Range Colors. This section of the Color Strip sets the range of colors used for the Range drawing mode. The left-hand color is the Hotspot of the Range effect. The right-hand color is the edge of the Range effect . Between these two colors is the range of colors used by ToasterPaint for the Range Mode drawing.

To set colors in the range, click on either Range Color Box. A white highlight will surround it. Then click on one of the 16 colors in the 16 Color Palette, or select any color from the screen (using the Pick color function). When you release the mouse button, the new color replaces the selected Range Color. Deselect the Range Color Box by clicking it again.

Note that if you do not turn off the Range Color Box by deselecting it, the next color you select afterward will appear in it, and you will lose the color you just picked. Make sure to urn off the range color box when done.

The Range Colors are not used unless Range Mode is selected from the Mode menu, or a Range Color Box is active. When Range Mode is, the Current Color is ignored and the Range Colors are used. The Transparency controls can be used to change the balance and distribution of the Range Colors in the drawing. (See Transparency controls for an explanation of how to control the Hotspot.)

The Palette
The Palette is located at the left of the Color Strip. To select a color, click on a color box. The Current Color Box changes to indicate the color you select. To change one of the 16 colors, see the CopyColor command. Any of the Toaster's 4096 preview colors can be used in the 16 Color Palette.
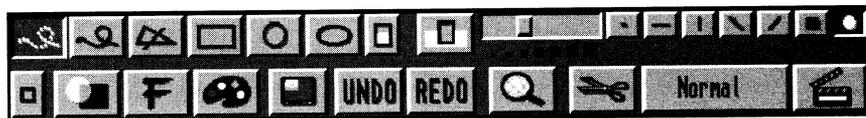
The Tools Control Panel ▲ F1 - toggles Tools and Transparency/Warping panels
This panel contains the basic tools for applying paint to the ToasterPaint canvas. The upper row holds various shape tools and the brush shapes. The shape tools consist of Freehand, the Freehand Continuous, the Polygon/Straight Line, the Rectangle, the Circle, the Ellipse and the Flood Fill tools. The Fill Button, just to the right of the Ellipse, causes the shapes drawn with these tools to be filled with the current color (or current draw mode). Select a shape tool by clicking it, and it will depress. When the Fill button is on, the shape tools are shown with a filled button. Press and hold the left mouse button as you move the brush in the desired shape. Release the button when you are satisfied with the shape you've drawn.

Freehand ▲ *s*
This tool creates a line using the current brush, the current color, and whichever Drawing Mode is in effect. This button is not available when the Fill button is activated. If you move the mouse very fast, the line won't be continuous.

Freehand Continuous ▲ *d - unfilled;*
D - filled

This tool creates a line using the current brush, the current color, and whichever Drawing Mode is in effect. When the Fill Button is activated, this Tool draws irregular shapes that are then filled with the current color according to the Drawing Mode in effect (make sure that your starting and ending points meet so you have a closed shape to fill). If you draw very swiftly, the brush may fall behind your movements, but it catches up with 100% accuracy, remembering exactly where you've been.

Polygon/Straight Line ▲ *v - unfilled*
V - filled

This tool creates polygons of any shape and size using the current brush and color, or it can be used to draw a straight line. To draw a straight line, click anywhere in the Canvas to establish one end point. As you move the pointer, a straight line is drawn out. Move the pointer until the line is the distance and direction you want, then click the right mouse button and the line is drawn.

To create a polygon, click anywhere in the Canvas to establish the first corner of the polygon. Drag out a straight line, in any direction and length, then click the left mouse button to create another corner. Continue creating corners in this manner until you have completed the next-to-last corner. Then put the pointer where you want the last corner to appear and click the right mouse button. The polygon is completed, with straight lines connecting all corners. With complex polygons, it is best to actually complete the polygon before clicking the right button, to make sure that the polygon is drawn as you want.

When the Fill Button is activated, the polygon is filled with the current color according to the Drawing Mode in effect (make sure that your starting and ending points meet so you have a closed shape to fill).
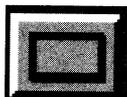
Rectangle ▲ *r - unfilled*
R - Filled

This tool draws rectangles of any size using the current brush and color. To create a rectangle, click anywhere in the Canvas to establish the first corner of the rectangle. Then drag the rectangle outline out to the desired size and release the mouse button to complete the rectangle. When the Fill Button is activated, the rectangle is filled with the current color according to the Drawing Mode in effect.
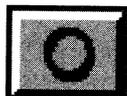
Circle ▲ *c - unfilled*
C - filled

This tool draws a perfect circle of any size. To create a circle, click anywhere in the Canvas and drag the circle outward to the desired size, then release the mouse button to complete the circle. The point where you click first is the center of the circle. When the Fill Button is activated, the circle is filled with the current color according to the Drawing Mode in effect.
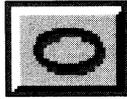
Ellipse   ▲ *e -unfilled*
                    E - filled

This tool draws an ellipse of any size. To create an ellipse, click anywhere in the Canvas and drag the ellipse outward to the desired size, then release the mouse button to complete the ellipse. The ellipse can be elongated vertically by moving the mouse pointer up or down, or elongated horizontally by moving the mouse pointer left or right. The point where you click first is the center of the ellipse. When the Fill Button is activated, the ellipse is filled with the current color according to the Drawing Mode.

Fill   ▲ *f - off*
                    F - on

When this button is activated, any shape drawn with the shape tools is filled with the current color according to the Drawing Mode in effect. When the Fill Button is highlighted, it is activated, and the Freehand Curve tool disappears. The Shape Tool buttons appear as "solid" shapes to show that the Fill button is active. If Fill is turned on and the Redo function is used, the repeated brush stroke will be filled.
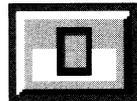
Flood Fill   ▲ *W - Flood Fill toggle*

This button causes contiguous pixels of the "same" color to be changed to a new color according to the painting mode selected. The current drawing mode, brush size and shape and Fill feature are all ignored when the Flood Fill button is pressed.

Flood Fill is an extremely powerful tool because it is works with whatever paint mode is selected and the current level of transparency.

There are two methods of selecting the colors to be affected by flood fill:

- **Click once** - Move the pointer over the color and area that you wish to change and click the left mouse button once.

This method will change the pixel directly under the brush, and all the ones of the same color (according to the color tolerance; see below) adjacent to it, to the new color and paint mode.

A good time to use this method is when compositing images. Let's say that you have a statue on a black background on the active screen, and a picture of a park in the swap screen. Select the Flood Fill button, select RubThru from the Mode menu, and click somewhere on the black background. The image in the swap screen will replace all of the black pixels that are adjacent to the one you clicked on, in this case entirely removing the background and leaving you with the statue in place in the park.

- **Click and Drag** - Select the Freehand Continuous tool and click the left mouse button while the pointer is over a color that you wish to change and drag the pointer over other colors that you wish to change. Release the left mouse button when you have covered all of the colors that you wish to change.

This method will change all of the pixels directly under the line you draw, and all pixels of the same color (according to the color tolerance; see below) adjacent to it, to the new color and paint mode.

This method is useful for changing a wide range of colors in an object. For example, let's say that you don't like the colors in the Range-painted sphere. Simply select Range from the Mode menu, and choose new colors for the range, say green to blue. Select the Freehand Continuous tool, and the Flood Fill button. Move the pointer to the center of the sphere and click the left mouse button and drag the pointer to the edge of the sphere. All of the colors that your pointer passes over will be changed to the new range colors.

Color Tolerance. There is a tolerance of plus or minus 16 rgb values for the purposes of determining which colors are the same. For example, if you have a field of dark gray (r032, g032, b032), which you want to fill with another color, any pixel in that field that has two of its three RGB values of 032, and the third between 016 and 048 , would be changed to the new color, any color with *any* one component's value outside of this range, will not be - r032, g027, b032 would be changed, as would r032 g032 b048. R032, g032, b011 would not be changed, nor would r051 g032 b 051.
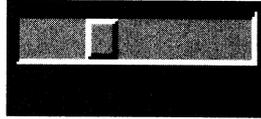
Brush Size Selector   ▲ *Smaller brush (-) hyphen key*
                                   Larger brush (=) equals key

The built-in brush shapes are available in seven different sizes. Sizes are selected by clicking on one of the seven brush size buttons. The leftmost button is the largest and the rightmost button is the smallest. The size change affects all of the built-in brush shapes save for the one-pixel brush, which always remains one pixel in size.

By pressing and holding the left mouse button while the pointer is over the Brush Size Selector, the current brush size is displayed. Move the mouse to the left to increase the size of the brush, and move it to the right to decrease the size of the brush. This shows you precisely the size of the brush before you select it.

Brush Shapes   ▲ *Shape toggle (/) slash key*
                           One-pixel brush (.) period key

There are seven built-in brush shapes available in ToasterPaint; select any of the brushes by clicking on its button. The first is the one-pixel brush; this brush is not affected by the Brush Size Selector. Next are the horizontal line brush, the vertical line brush, the left slant brush, the right slant brush, the square brush and the round brush. The slant brushes are particularly useful for calligraphy-type effects.
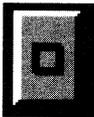
Close Box ▲ *Esc - toggles control panel Open/Closed*

Clicking this button (or pressing the Esc key) closes the Control panel, leaving the Canvas unobstructed. Clicking the right mouse button or pressing the Esc key brings back the Control panel.

Transparency & Warping ▲ *F1 - toggles Tools and Transparency/Warping panels*

Click this button to go to the Transparency & Warping panel.
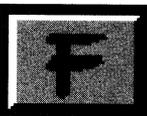
Text Rendering ▲ *F2 - toggles Tools and Text panels*

Click this button to go to the Text Rendering panel.
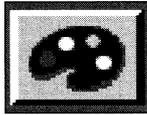
Palette   ▲ *F3 - toggles Tools and Palette panels*
Click this button to go to the Palette panel.
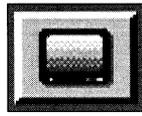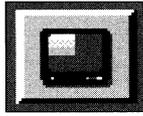
Screen Size (1x and 2x Modes)
The normal screen display in ToasterPaint is 2x mode, where you are working on an approximate 25% close-up of the full screen image. At times you may wish to view the entire ToasterPaint canvas at once. For this purpose ToasterPaint offers a 1x viewing mode. The 1x mode displays almost the entire canvas at once rather than the 1/4 canvas usually visible.

1x Mode. Clicking this button puts ToasterPaint in the 1x viewing mode, which allows you to view the entire canvas at once, instead of the normal 2x viewing mode in which only 1/4 of the canvas is visible at once.

1x mode is most useful when you want to do operations over large areas of the screen. Colorizing, making Range-painted backgrounds, and Lightening and Darkening large areas are good examples of the kind of operations that are best done in this mode. Click the 1x button. The canvas is redisplayed (un-magnified) after a brief pause. The control panel in 1x mode is basically the same as for 2x mode, with the following differences.

Limitations of the 1x Mode. 1x mode displays the entire image at once by skipping every other pixel. For this reason, some of ToasterPaint's features would cause results that would be blocky and unacceptable when rendered. These features have been disabled to prevent this from occurring.

The basic limitation in 1x mode is that no custom brushes (those that are made with the scissors) are allowed. This means that the following features are disabled as well:

- Scissors (the button has been removed).
- TxMap mode is unavailable.
- Text Rendering (because text is rendered as a custom brush).
- The Swap screen is unavailable.
- The pull-down menus Brush, Effect, and the Swap sub-menu (under Picture) appear, but are inoperative.
- RubThru mode (also dependent on the Swap screen).
- Filled and un-Filled Circle and Ellipse tools are unavailable.

If you have a brush or a swap screen when you try to enter the 1x mode a requester asking you whether you wish to delete the swap brush will appear. If you answer yes, then the brush or swap screen will be deleted and you will enter the 1x mode. If you answer no, then the operation is cancelled, and you are returned to the normal 2x mode.

The Tools control panel limitations
- Drawing tools - there are only five: Freehand, Freehand Continuous and Filled Freehand Continuous, and Rectangle and Filled Rectangle. Both filled and non-filled drawing tools appear on the screen at the same time and there is no Fill button.

- There is no Scissors button. You cannot cut out brushes.

- The 2x button replaces the 1x button. This button will return you to the normal 2x view mode.

Transparency/Warping control panel limitations
- This Control Panel looks the same as its normal 2x mode counterpart, save that the button to go to the 1x mode is replaced by the button for going to the 2x mode. Since TxMap mode is not available in 1x mode, the warping, smoothing and tiling controls are inoperative.

Text control panel limitations
- This section is not available in 1x mode.

The Palette control panel limitations
- The same as its 2x counterpart, save for the 2x button in place of the 1x button.

Pull-down Menu limitations
- All pull-down menus remain the same; some features are not available.
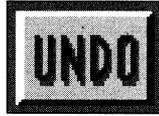
Undo ▲ *u (also F4)*
This extremely powerful function reverses the effect of the last drawing operation performed with the following exceptions:

- Directly after a file or brush load or save operation
- Directly after a swap screen operation
- Directly after a text to brush operation

You can only Undo since the last time you clicked the mouse button in the Canvas. The Undo button will not work on the CopyColor command from the Palette menu; you must use the Undo from the Palette menu to reverse that operation. You can Undo an Undo operation by clicking the button again.

Redo ▲ *a (also F5)*
Activate this button to redo the last drawing action on the screen. This may not sound very useful until you realize that you can change colors or activate different shading features and use the Redo function to place the new colors or shading effects in exactly the same place as your last drawing action. Just like Undo, this feature only works on the actions since your last mouse click in the Canvas.
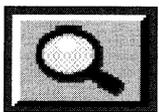
Magnify ▲ *m - toggles Magnify mode on and off*
Clicking this button changes the pointer to a Magnifying Glass and activates the Magnify screen. As you move the Magnifying Glass over the Canvas, the area under the Magnifying Glass is displayed in the Magnify window at 16x magnification (in the normal 2x mode; 8x in the 1x mode). Bring the Magnifying Glass to the area on the screen you want to see close up and click the left mouse button. The area selected is fixed in the Magnify window.

Display the Control panel in the Magnify window by pressing the right mouse button.

All of the Tools work normally in the magnified area. You can scroll around in the magnified area by moving the pointer over the magnify screen and using the arrow keys on the keyboard.

Return to the normal Canvas by clicking on the Magnify button again, by clicking the Close button in the upper left corner of the Magnify window, or by pressing the Esc key.

Scissors ▲ *b*

The Scissors are used to create custom brushes, which can be any shape, size, or number of colors. These custom brushes can then be pasted down anywhere in the Canvas using the current Drawing Mode.

The Scissors work in conjunction with the current Shape Tool selected. You can have a freehand selection, a circular, ellipse or rectangular selection, or a polygon selection. Click on the Shape Tool you want to use, then click the Scissors to activate them. Then draw around the area you want as a custom brush and release the mouse button. The area you've defined becomes a custom brush attached to the pointer.

The shape tools cannot be used directly with this custom brush, but all of the features in the Mode Menu can be used for some rather startling effects. To remove the custom brush, click on one of the built-in brushes.

When cutting out brushes for later use as LightWave 3D image/texture maps, it's best to use the single dot brush and the rectangle tool (*key sequence: [.],[r],[b]*). Make sure that the brush image is an even multiple of 32 pixels wide. (The coordinates display will indicate the size of the brush that you're cutting.)
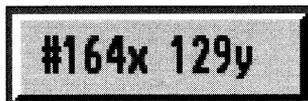
Grid & Mode Indicator/Coordinates ▲ *g - toggles drawing mode and coordinates displays (also indicates grid function active or inactive)*

This window displays a # symbol when you are using a grid. Furthermore, clicking inside this window will toggle the display between the x and y pixel coordinates and the current drawing mode.
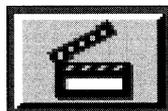
Render To Program ▲ *F10*

This button renders what is currently on the ToasterPaint canvas to the Program output (either DV1 or DV2) of the Toaster. The framebuffer to be rendered to can be selected with the F8 (DV1) and F9 (DV2) keys. You can instruct ToasterPaint to constantly update the selected framebuffer by pressing the Help key. Pressing the Help key again turns off the continuous update.

Text Rendering control panel ▲ *F2 - toggles Tools and Text panels*
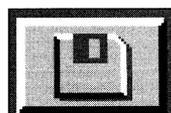
Fonts ▲ *i*

Click this button to bring up the Font File Requester, with which you can load in different fonts. Only one font can be loaded into ToasterPaint at a time. If you have already created a text brush before loading a new font, you must click the Text to Brush button in order to use the new font for the current text brush. ToasterPaint uses Amiga fonts only. It does not use ToasterFonts or color fonts.

Smoothing Off/On　　▲ *$ - toggle Smoothing on and off*

When the right half of this button is activated, the font is automatically 'smoothed' by horizontal compression of the text. When the left half of this button is activated, Smoothing is off and text appears as normal.

Style Selectors　　▲ *Bold (%) percent key (shift-5)*
　　　　　　　　　　　　Italics (^) carat key (shift-6)
　　　　　　　　　　　　Underline (&) ampersand key (shift-7)

These three buttons affect the style of the text; the styles (from left to right) are Bold, Italic, and Underline. Click on each one to activate it (when activated, the button is highlighted). Any or all of these Styles may be selected at one time.
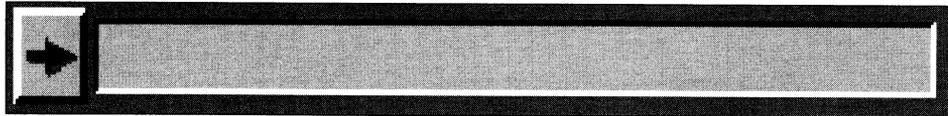
Text Entry Window

When you click in the Text Entry Window (pressing Return or Enter while the window is visible will also activate it) to enter text there, the keyboard commands are temporarily disabled. Any text you type is entered into this Text Entry Window. When you have the text you want, click on the Text to Brush button to the immediate left of the text window (or press the Return key) and the text is transformed into a custom brush on the pointer. Click anywhere in the screen to stamp the text down in the current color and according to the current Drawing Mode in effect. If the text you type is longer than the window, the text scrolls. Use the arrow keys or point and click to move the cursor to a new location in the text string.

Note that if you want to stamp the text down in a different color than the color you used when creating the custom brush, you must select that new color then click the Text to Brush button again to recreate the custom brush of the text with the new color. This is also true if you change drawing modes, alter the Transparency controls, or change other settings.
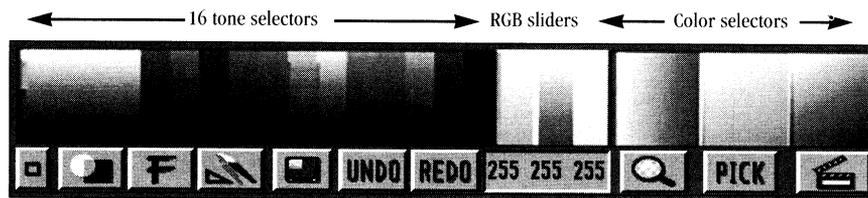
The Palette　　▲ *F3 -toggle Tools and Palette panels*

Tone Selector. Underneath the 16 Color Palette are a range of colors based on those colors at the top. They give a range of colors from the lightest to the darkest possible that includes the color at the top. These colors may be chosen as the current color merely by clicking on them. If you're looking for a shade just slightly different from one of the colors in the 16 Color Palette, it's often easiest to find it here.

RGB Sliders. These three sliders are located between the Tone Selector and the Color Selectors at the bottom of the Palette Controls. The sliders, from left to right, represent the Red, Green, and Blue values of the current color on a scale from 0 to 255 (which results in 16,777,216 different possible combinations or colors). These sliders change dynamically as the selected color changes. You can also move these sliders to alter the Current Color by pointing to them and holding down the left mouse button while you drag them up or down. This is another way to select a desired color.

The numbers under the sliders will change in increments of 16 - 000, 016, 032 etc., or in increments of one if you click the on the RGB number that you wish to change and while you are holding down the left mouse button move the mouse up or down.

Pick Color ▲ *Pick color (,) comma key*
Activate this button next to the Render to Program button to pick a color from the screen; this saves you the trouble of trying to figure out exactly what color you want by trying to use the Color Menus. Once the pointer appears, hold down the left mouse button as you move the pointer across the screen. You'll see the colors change in the Current Color Box and the RGB Sliders. Once you release the left mouse button, the selected color is chosen, and you can then use any of the brushes to draw in that color.

After you select Pick Color, you can close the Control panel by pressing the Esc key so that you can pick a color from anywhere on the screen.

Color Selectors
These three large squares at the right of the Palette Controls represent portions of the 4096 colors available on the ToasterPaint preview canvas. Since thousands of colors can't be shown in such a small area, these squares change dynamically as you move the pointer over them while holding down the left mouse button. As you move toward the color you want, the other squares show all possible shades of that color. When you move around the left-most square, the red value of the color stays constant while the blue and green components change. Similarly, the center square holds the Green component steady, and the rightmost square holds the Blue component steady. You can see the RGB Sliders move as you move around the Color Selector, and this can guide your color choice. When you release the mouse button, the last color selected appears in the Current Color Box.
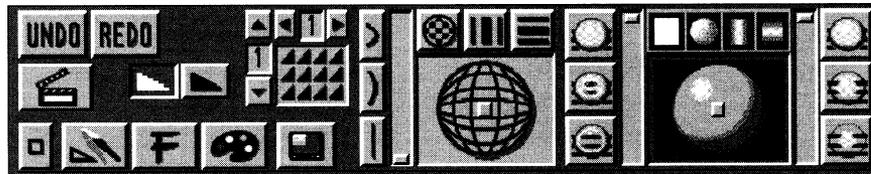
Transparency & Warping control panel ▲ *F1 - toggle Tools and Transparency/Warping panels*

Warping and Texture mapping in ToasterPaint (TxMap from the mode menu) offer tremendous power to warp images, re-size them, and create three dimensional effects. The controls provide a graphic representation of the warped brush (a wire frame sphere) and controls for the amount, type and location of the warping.

To enable the Warping controls on the panel, you must select the TxMap drawing mode from the pull-down Mode menu. ToasterPaint can re-map or warp any shape into any other. Add to this the fact that TxMap works with Transparency and the other modes, and you have a brush manipulation system that gives you control over every aspect of the final result.

Smoothing Off/On   ▲ *Off (/) slash key*
                            On (?) shift-slash key
There are two buttons that indicate whether Smoothing is active or inactive. You must be in the TxMap drawing mode to enable the Smoothing buttons. When Smoothing is activated it allows you to anti-alias the custom texture-mapped brush and eliminate the jaggies that would otherwise occur. The redrawn brush is automatically anti-aliased (by using 16x over-sampling and arranging to soften the edges) and given a much greater apparent resolution. Because redraw of the custom brush takes a little longer with Smoothing activated, it is best to leave it off until you have finished experimenting with the warp control settings and are sure that you have the final result. Smoothing affects all texture-mapping and tiling operations.
With Smoothing inactive, no anti-aliasing is used.
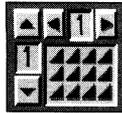
Tile Controls

Tiling allows you to texture-map multiple copies of the custom brush (up to 9 by 9, with the selected degree of Warping, if desired). Tiling is only active when TxMap Mode is on. First select a custom brush, then use the Copy This Brush command under the Swap menu in the pull-down Brush menu. This creates a copy of the custom brush (which you will not see), and enables TxMap in the Mode menu. Select TxMap from the Mode menu. Go to the Transparency & Warping panel. The Tile controls are now active.

Click the arrows beside the Tile indicator to increase or decrease the number of copies horizontally and/or vertically. Choose any Shape Tool from the Control panel, activate Fill, and draw a shape on the Canvas. The custom brush is drawn into that shape with the indicated number of copies. For instance, if you have 2 chosen for the horizontal copies and 3 for the vertical copies, you'll end up with six copies of the original custom brush within the new shape you've drawn.

The Smoothing button also affects the results of Tiled brushes.
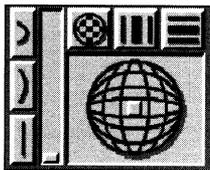
Enabling Warping

The Warp controls are only operative when TxMap (texture mapping) Mode is active. Select a custom brush using the Scissors (as described earlier) and make a copy of it (using the Copy This Brush command under the Swap menu in the pull-down Brush menu). Then select TxMap from the Mode Menu.

Warp Slider. The Warp Slider to the left of the Warp Controls determines the amount of warping in the resulting image, from none (at the bottom) to severe (at the top). The three buttons to the left of the slider are preset positions at 0%, 50%, and 100%. Click a button to move the slider to that position. Texture mapping with the Warp Amount set to 0 can be thought of as unlimited brush re-sizing and re-proportioning, depending on whether the brush retains its previous shape (although larger or smaller) or not.

Warp Locator. To the right of the Warp Slider is the Warp Locator, with three buttons above it. Those buttons are Point Warping, Horizontal Warping, and Vertical Warping. These buttons and the locator determine the location and kind of Warping present in your drawn shape or pasted brush or text.

Point Warping. The Point Warping button displays a small white square in the center of the Warp Locator. When Point Warping is active, drag it anywhere in the Locator. Point Warping means that both the horizontal and vertical lines in the brush are warped equally according to the setting of the Warp Amount Slider.

Horizontal and Vertical Warping. The Horizontal/Vertical Warping buttons display a white bar in the center of the Warp Locator. When the Horizontal/Vertical Warping is active, the bar can be dragged anywhere in the Locator. Horizontal (or Vertical) Warping means that all of the horizontal (or vertical) lines of the brush are warped to the degree specified by the Warp Amount Slider, around the vertical (or horizontal) axis specified within the Warp Locator.

Warp Direction. The Warp Direction controls across the top of the Warping Locator (the large area to the right of the Warping Slider) determine the position of the "warping point." That is, the point or axis along which the picture is warped. The button on the left is Point Warping, meaning that the image is warped both horizontally and vertically. The button in the middle is Horizontal Warping, and the button on the right is Vertical Warping. Choose any one of these and then move the resulting Warping Point in the Warping Locator.

When you have adjusted these controls to your satisfaction, click in the Canvas and drag out the outline of the current shape tool you've selected to any size and release the mouse button. The custom brush that you copied is then displayed with the warping determined by the TxMap controls.

When these controls are active, the Tiling Controls are also activated. The Smoothing button also affects the results of the Warping Controls and TxMap operations.

How Warp Affects the Brush Shape Tools Any Shape button can be used with TxMap, whether filled or unfilled. The warp amount and location chosen for texture mapping are very important in creating the best warping effects.

Freehand Continuous
Can be used for unusual shapes and to simulate more complex objects. Once you've placed an image, use other drawing modes (such as Darken or Transparency) to blend the image into the rest of the picture.

Polygon
This is usually the best tool to use for perspective effects. The trapezoid shape with warping set to 0 is the most common polygon for generating the most realistic 3D effects.

Rectangle
This is the most commonly used shape for straight brush re-sizing (with Warp Amount set to 0). The proportions of the original brush can be altered to a great degree without affecting the quality of the re-mapped brush.

Note: When using TxMap and filled rectangles, you can constrain the filled rectangle to the same aspect ratio as the swap brush by holding down either of the Alt keys when you are dragging it out.

Circle and Ellipse
Useful for creating spherical effects. The best settings for the warping controls are generally slight (10-25%) Warp Amount with Point Warping set in the center.
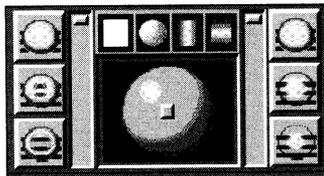
Transparency Controls
These controls determine the amount of transparency present when you draw or paste, as well as the placement of the "hotspot," where transparency is greatest. In addition, these controls affect the placement of Range Colors when the Range painting mode is active.

The Transparency controls are located on the far right of the Transparency & Warping panel. They consist of a graphic representation of the drawn shape or pasted brush (a shaded red sphere) with adjustments available for the transparency of the edge of object, transparency of the center (or "Hotspot"), and adjustments for the shape and kind of Hotspot.

Transparency Sliders. The two sets of three-button panels, and their accompanying sliders, govern the edge and center transparency settings.

Center Transparency. The left-hand vertical slider and the three buttons to its left control the Hotspot transparency. At the bottom of the slider the Hotspot is entirely transparent, and at the top of the slider the Hotspot is entirely solid. The three buttons to the left of the slider are preset positions at the bottom (100% transparent), middle (50% transparent), and top (opaque, or 0% transparent) of the slider. Click any one of these buttons to move the slider to that position. The right-hand vertical slider works the same way but controls the transparency of the edge of the drawn shape or pasted brush.

Edge Transparency. The right-hand slider and the three buttons to its right control the Edge Transparency. At the bottom of the slider the edge of any shape you draw (or custom brush you paste down) is entirely transparent, and at the top of the slider the edge is entirely solid. The three buttons to the right of the slider are preset positions at the bottom, middle, and top of the slider. Click any one of these buttons to move the slider to that position.

Hotspot Locator. In the middle of the Transparency controls is the Hotspot Locator, with four buttons above it. From left to right, those buttons are the Off button, the Point Hotspot, the Vertical Hotspot, and the Horizontal Hotspot. Once the Hotspot shape is selected, it can be positioned anywhere inside the locator by clicking on it with the left mouse button and dragging it to the desired location.

Point Transparency. The Point Hotspot button displays a small white square in the center of the Hotspot Locator. Click the Point Hotspot button again to turn off the Hotspot Locator. When the Point Hotspot is active, drag it anywhere in the Locator. This sets the position of the Hotspot, whose transparency is controlled by the Hotspot Transparency Slider. When using Range mode, the Hotspot controls the location of the left-hand color in the Range Colors.

Horizontal and Vertical Transparency. The Horizontal or Vertical Hotspot buttons display a white bar in the center of the Hotspot Locator. When the Horizontal/Vertical Hotspot is active, drag the bar anywhere in the Locator to set the position of the Hotspot.

Transparency and the Drawing Modes. Transparency can subtly or to a large degree alter any of ToasterPaint's 11 modes to create nearly limitless new ones. When you're using the Transparency controls to adjust the degree of a mode, the usual setting is to leave the Hotspot equal to the Edge, so that the Transparency affects the whole area equally. If you are using RubThru, and blending portions of two distinct images, then altering the Center and Edge Transparency can provide unique blending effects, "softening" the composite image.

The File Requester

ToasterPaint's file requester appears in 7 instances: RGB Loading and Saving, Frame Loading and Saving, Brush Loading and Saving, and Font Loading. The File Requester works identically in all of these instances, except as noted in the individual reference listings for these functions.

In the upper left corner of the File Requester is the Close Box; clicking here with the left mouse button closes the File Requester and returns you to the Control panel. Directly to the right of the close button are three device buttons — df0:, RAM:, and dh0: — referring to the first floppy disk drive, RAM (random access memory) storage and hard disk drives of your Toaster. Clicking any of these gives you a directory of files located in that device.

The files and drawers available on the disk appear in the area at the bottom of the File Requester. Volume names (which are followed by a colon) and file drawers appear at the top of this area; file names appear at the bottom. The name of the disk appears in the black window to the right of the device buttons.

Click on a drawer name with the left mouse button to open the drawer. The drawer name replaces the name of the disk in the black window. Click on the name of a file, and that filename appears in the black window to the right of the window where the disk or drawer name appears. If the file you've just selected is the one you want to open, then click on the words Open File with the left mouse button.

Other features of the File Requester:

- Clicking on the / (slash) button that's between the device buttons and the window where the disk name appears, moves you from the directory of the drawer that you're in back to the directory of the whole disk (or the next "higher" drawer, if you're using nested drawers).

- Click on the . (period) button to go to the top directory of the current selected volume.

- If there are more file names than the file name area can hold, the gray bar to the left of those names can be used to scroll the window showing the file names. Point to this gray bar and hold down the left mouse button, then drag it up or down to scroll the file names. (Nothing happens unless there are more file names than the window can show.)

- If you have already seen the file or directory that you want during the listing of a large directory, clicking the right mouse button or pressing the space bar will abort the rest of the listing.

- Double-clicking a file name will also cause it to open.
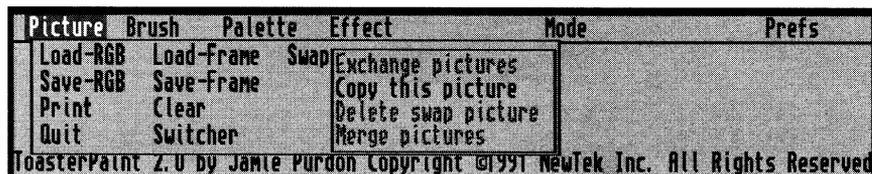
The Picture Menu

This menu controls various operations concerned with the picture, including loading, saving, printing, exiting.

Load RGB ▲ *p*
Activating this command brings up the File Requester with which you can call up picture files that have been created with any Amiga graphics program. ToasterPaint can load any Amiga IFF image, as well as PICT(2?) images.

Save RGB ▲ *P*
The Save RGB feature is used to store the work you've done in a file on disk, so that your work may be called up again by ToasterPaint. Type in a name for the file in the File Name Window by first clicking in that window with the left mouse button, then typing the name you want. Then press Return to save the file, or click the Save RGB button. If your disk is full and has no more room for files, ToasterPaint will warn you about this after you've tried to save the file.

Pictures saved as RGB files can not be loaded by the Toaster's Framestore. If you want to use the image in the Framestore, you must use the Save Frame option .

Print
To print the picture that's on your ToasterPaint screen, select this menu item from the Picture menu. Make sure your printer is already connected before using this feature. A requester appears that asks for the number of copies you want to print. Click on the arrows to change this number up or down. The number of copies can be changed at any time during the printing process. Click OK to print; click Cancel at any time to stop the printing process and return to the Control panel.

The Print feature uses a special feature of the Amiga's printer driver: 12-bit print. each of the 8-bit red, green and blue values (24 bits altogether) are dithered to 4 bits each (12 bits total) before being sent to the printer.

The printer must be set up from the Amiga environment; refer to the Amiga Users Manual if you have any questions about how to set up Preferences to work with your particular printer.

Quit   ▲ *(~) shift-tilde*
Select this menu item to exit ToasterPaint and return to the Toaster's Switcher menu. A message appears when you select Quit, asking if you really want to quit. Click Quit to quit; click Continue to return to the Control panel. CAUTION: If you haven't saved the file you've been working on, you'll lose that file when you quit.

When you exit ToasterPaint by selecting Quit, you go directly back to the switcher but you also instruct the Toaster to remove the ToasterPaint application from memory so that the RAM it was using can be put to use for another purpose, for example storing Framestore images in RAM for very rapid access, or using CG or LightWave 3D. If you need to come back to ToasterPaint after leaving it with Quit, then you will have to click the ToasterPaint application button twice, as if you had just started the Toaster software.

Load Frame ▲ /

This menu item, allows you to load Framestore images from the Toaster's Framestore directory into ToasterPaint. The file requester for loading and saving frames is slightly different than the other file requesters. There is a box with room for a three-digit number next to the box which contains the file name. This is because all frames are saved in the following format:

###.FS.*name*

where ### is the three-digit frame number (between 000-999), and *name* is the name of the frame. These frames can be accessed by typing in their number on the numeric keypad on the keyboard in exactly the same manner as they are from the Switcher, or the file name can be selected from the lower part of the file requester, and the Open Frame button clicked.

Save Frame ▲ L

This option brings up the Save Frame requester from which you can save frames in the Toaster's Framestore directory that can be directly viewed in the Toaster's framebuffers. Each frame has both a name and number as part of its label. When you see frames in the bottom of the requester that have already been saved, they will be in the format xxx.FS.name, where xxx is a number between 000-999 and name is the name of the file. When you want to save a frame you must specify a frame name and frame number in the following way:

• Type in a three-digit number (one that is not currently in use) using the numeric keypad.

• Click inside the file name window at the upper right of the requester.

• Type the name (up to 12 characters) under which you want the frame to be saved.

• Click the Save Frame button.

The frame will be saved and from then on will appear in the file requester in the ###.FS.*name* format (the FS stands for Framestore).

Clear

This command clears the Canvas to the current selected color. All drawing on the Canvas is lost (Undo will retrieve the image). The Swap Screen and the Swap Brush are unaffected by this command.

Switcher ▲ Q

This feature takes you from the ToasterPaint screen back to the Toaster's switcher menu. Choosing Switcher, unlike Quit, leaves the ToasterPaint program active in memory and anything you might have on your canvas will remain intact when you return from the switcher. If you have loaded an image into ToasterPaint with the intent of adding CG text to it, this option enables CG to render text on top of the RGB (paint image) buffer contents. See the CG manual for details on using this buffer. Note that CG will simply use this buffer for its background image...It does not change the buffer contents.

If you are running a system which has a limited amount of RAM, you may not be able to use the CG or LightWave 3D applications if ToasterPaint is still active in memory. If this is the case, return to ToasterPaint by clicking on the ToasterPaint application button (the image of the paint brush on the Switcher screen) and save any work you were doing, and then exit ToasterPaint with the Quit feature.

Note that this option deletes the swap screen, swap brush and current cut-out brush. Essentially, ToasterPaint only "saves" the current picture, and none of the other image buffers.

Swap ▲ j

This menu item controls the spare screen that ToasterPaint makes available to you. In essence, you can have two pictures present in ToasterPaint at the same time, one in "front" and one in "back." Rub-Thru uses the swap screen as the "paint color." The benefit of the swap screen is that the other screen is always exactly in the same position as the current screen. Therefore, if you want to transfer an element from one screen to the other, and position it in the exact same location, cut it out as a brush and just press j. You will jump to the exact same location on the spare screen. The Swap sub-menu gives you the following commands: Exchange pictures, Copy this picture, Delete swap picture, and Merge pictures.

- **Exchange pictures** will switch the front and back pictures.

- **Copy This Picture** is the only feature active on this menu when you start using ToasterPaint. Use this feature to copy whatever is in the current screen of ToasterPaint to the spare screen.

- **Delete swap picture** will remove the picture stored in the spare screen.

- **Merge pictures** will merge the front and back pictures using the operation chosen from the Mode Menu. With Merge, the whole back picture is the "paint."
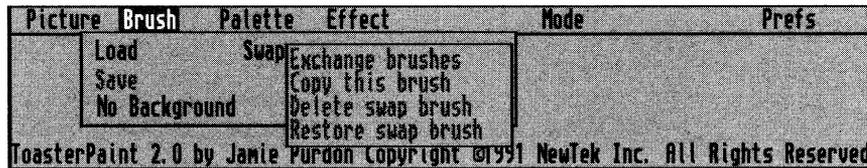
The Brush Menu

This menu controls various operations concerned with the brush, including loading, saving, and swapping.

Load ▲ *o*
Activating this command brings up the Load Brush File Requester, where you can call up custom brushes that you have saved on disk (or files that someone else created and saved on disk). The brush loads in from the disk and appears attached to your pointer. The brush can then be used just as any other custom Brush.

Save ▲ *O*
The Save command is used to store the custom brush you've created on disk, so that the brush can be called up again for use at any time. Type in a new name for the brush you want in the File Name Window by first clicking in that window with the left mouse button, then typing the name you want. Then press RETURN to save the brush, or click the Save Brush button.

ToasterPaint saves brushes in a 25 bit plane RGB file. 24 bit planes are used for the color and 1 bit plane is used for the mask.

NoBackground ▲ *t - off; T - on*
This command makes the background color (the default of which is r000 g000 b000) of the brush transparent when the brush is cut out. It is very useful when you have an unusual shape to cut out from a normal background (a doughnut shape, for example). You need not carefully trace the shape; just turn on NoBackground and cut it out roughly. Anywhere that color 0 occurs inside the area you cut becomes transparent. While it defaults to r000 g000 b000, the background (or brush-transparent) color is changeable: Select Copy Color from the Palette menu and then NoBackground from this Brush menu.

Swap ▲ *J*
This menu item controls the custom brush copy that ToasterPaint makes available to you. You can have two brushes present in ToasterPaint at the same time, one displayed and one saved. The swap brush is used as the texture image in TxMap mode. The Swap sub-menu gives you the following commands: Exchange Brush, Copy this Brush, and Delete Other Brush. These commands are only available when you have cut out a custom brush.

- **Exchange brush** switches the current and swap brushes.

- **Copy this brush** is the only feature active when you cut out a custom brush and have not yet used any of the Swap commands; use it to copy the current custom Brush to the "swap brush".

- **Delete swap brush** removes the brush stored as the swap brush.

- **Restore swap brush** displays the swap brush; the currently displayed brush is deleted.

Picture Brush Palette Effect Mode Prefs
CopyColor
Remap
Default B&W
UnDo
ToasterPaint 2.0 by Jamie Purdon Copyright ©1991 NewTek Inc. All Rights Reserved

The Palette Menu

These commands control changing colors in the 16 Color Palette.

Copy Color
This command is used to enter colors into the 16 Color Palette. To use CopyColor, first select the color that you want to put into the palette (use the Color Selector or the PickColor function). Select CopyColor from the Palette menu; the pointer changes to a pointer with a question mark . Click on the color in the 16 Color Palette that you want replaced. After a moment, the color is replaced in the palette. If you do this with an existing painting, this will generally mess up the picture somewhat (especially if the new color is very different from the old color). Use the Remap option to correct the colors on the Preview output or use the Undo command from the Palette menu to reverse this (copy color) choice.

To change the color that is considered transparent for the NoBackground function, make certain the color that is to be transparent is the current color. Then select CopyColor to get the pointer with the question mark. While the pointer is in this form, select NoBackground from the Brush menu and the color you selected will be transparent for the purpose of cutting out brushes.

Remap
This command can be used after you have changed one or more of the 16 Palette colors. Remap uses the new palette colors to try and recreate the original picture's colors. This feature is handy if you want to adjust the palette to include new colors while you keep the original picture intact. Remap is particularly important when working with bright, saturated colors. If you choose to put new colors into the palette, try to replace colors that are similar to other colors in the palette; when you Remap, the difference between the new picture and the original is minimized.

When you are scrolled away from the left edge of the canvas, you may notice some horizontal streaks of color that start at the left edge of the screen. These can be eliminated from the Preview output (they never appear in the file or on the Program output) by placing one or more different colors in the palette.

Default
This feature replaces the current 16 color palette with the default palette that ToasterPaint uses when the program is first entered. This is useful if you have altered the palette (using the Copy Color feature) significantly and in so doing, changed the picture on the canvas. You can bring back the previous palette by choosing the Undo feature from this Palette menu, not the Undo button that appears in the various sections of the Control panel.

Undo
This Undoes the effects of the CopyColor, B&W, Default or Remap operations.

B&W
This feature replaces the current 16 color palette with a palette containing 16 levels of gray ranging from black (r000, g000, b000) to white (r255, g255, b255). It can be removed and the previous palette brought back, by choosing the Undo feature from this same Palette menu.

```
 Picture  Brush    Palette  Effect                    Mode                    Prefs
                           Flip Horizontal
                           Flip Vertical
                           Rotate Counter   -90°
                                  Clockwise +90°
 ToasterPaint 2.0 by Jamie Purdon Copyright ©1991 NewTek Inc. All Rights Reserved
```
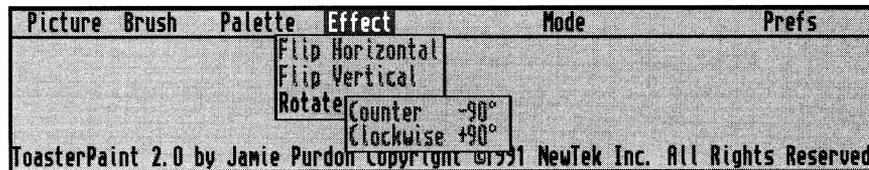
The Effect Menu

This menu affects the current custom brush. If no custom brush is selected, then none of these commands are available. Note that the Undo button has no effect after the features on this menu are used.

Flip Horizontal   ▲ *x*
This command flips the current custom brush around a vertical axis (a mirror-image flip from right to left).

Flip Vertical   ▲ *y*
This command flips the current custom brush around a horizontal axis (a mirror-image flip from top to bottom - makes the brush upside down).

Rotate 90 degrees   ▲ *z - clockwise; Z - counter-clockwise*
These commands rotate the current custom brush 90 degrees in the clockwise or counter-clockwise direction, depending on the sub-menu item you choose. If you want to flip a custom brush 180 degrees, it is faster to Flip Horizontal and then Flip Vertical.

```
 Picture  Brush    Palette  Effect                    Mode                    Prefs
                                   *Normal   Colorize  And
                                    Range    RubThru   Or
                                    Lighten  Blur      Xor
                                    Darken   Txmap
 ToasterPaint 2.0 by Jamie Purdon Copyright ©1991 NewTek Inc. All Rights Reserved
```
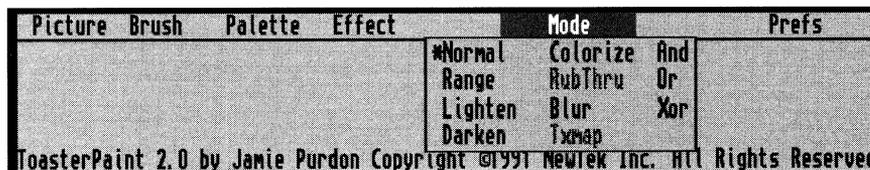
The Mode Menu

These painting modes offer very powerful ways to create and alter paintings. Their effect extends to all of the shape tools, Brushes (including custom brushes) and text. The current drawing mode is displayed in the Mode Indicator box present in the Tools and Text sections of the Control panel, in the lower right-hand corner. It's important to keep track of what drawing mode is in use; otherwise you could get unexpected results when you draw.

Most of the drawing modes are affected by the Dithering settings found in the Transparency & Warping panel of the Control panel; the exceptions are Normal, And, Or, and Xor drawing modes.

Normal   ▲ *(`) open quote (on the unshifted tilde key)*
This is the default painting mode, where the paint you apply to the Canvas is the current color you have selected. If you are using a custom brush, the custom brush is applied to the Canvas using all the colors in the custom brush. This mode, as are all others, is subject to the setting of the Transparency controls.

Range   ▲ *1*
This painting mode applies paint to the screen using the Range Colors on the Color Strip. While in this drawing mode, the Current Color is not used; only the Range Colors. Use the Transparency controls to change the location of the leftmost Range Color. The Point Hotspot in the Transparency controls is automatically turned on when you enter this drawing mode. If you turn off the Hotspot, then only the right-hand Range Color is used.

If you are using a custom brush, the Range Colors are stamped down in the shape of the custom brush (but using none of the colors of the custom brush).

This drawing mode can be used to create highlighting effects, backgrounds with graduated shades of multiple colors, or other lighting effects.

Lighten ▲ 2
This lightens the color of the screen in the area where you apply paint. This function is very useful with the Redo command, so that you can lighten an area you've just drawn.
If you are using a custom brush, Lighten uses only the shape of the custom brush (but none of the colors of the custom brush).

Darken ▲ 3
This darkens the color of the screen in the area where you apply paint. This function is very useful with the Redo command, so that you can darken an area you've just drawn.

If you are using a custom brush, Darken uses only the shape of the custom brush (but none of the colors of the custom brush).

Colorize ▲ 4
This mode changes color values (chrominance) on the screen without affecting their brightness (luminance). The new color has the same chrominance as your current color, but with the same luminance as the old color. This is a very powerful feature that can be used for such things as colorizing a black and white picture. Or you can use this to change the colors of an area on the Canvas.

If you are using a custom brush, Colorize uses only the shape of the custom brush (but none of the colors of the custom brush) with the Current Color.

RubThru ▲ 5
This mode is only active when you have a second picture in your Swap Screen. You must choose Copy this picture from the Swap sub-menu of the Picture menu in order to activate RubThru. RubThru brings portions of the "back" picture to the "front" screen (the one that you're looking at). Activate RubThru and then use any of the Transparency features, Fill, or any brush. The Transparency controls can be used with RubThru to create very misty montage effects.

If you are using a custom brush, RubThru uses only the shape of the custom brush (but none of the colors of the custom brush).

Blur ▲ 6
This Mode softens the edges of all color transitions, acting like a watercolor overlay on the painting. Using this effect repeatedly (by clicking the Redo key) creates a very watery effect. Note that the Transparency controls can reduce the amount of Blur being used in an area.

If you are using a custom brush, Blur uses only the shape of the custom brush (but none of the colors of the custom brush).

TxMap ▲ 7
This painting mode allows you warp or re-size any custom brush (including text brushes), and fit it into any shape you draw. In order to activate this mode, you must first select a custom brush . Then use the Copy this brush command from the Swap sub-menu on the Brush menu to create a copy of the custom brush. Now the TxMap command is available on the Mode menu. After you select TxMap, switch to the Transparency & Warping panel of the Control panel. There you will see that the Warping controls are available, as well as the Tile Pattern controls and the Smoothing controls. Remember that each time you use TxMap, it is operating on the copy of the original custom brush. If you cut out a new custom brush and then paste it down, then TxMap maps the original custom brush onto the shape of the new custom brush using the Warping Controls settings. The effects of this can get rather complicated, especially if you also have the Transparency controls turned on.

And ▲ 8
This painting mode is similar to using a colored filter (of the Current Color) on the area of the Canvas affected. If you are using a custom brush, And uses only the shape of the custom brush (but none of the colors of the custom brush) with the Current Color.

The effect of And is to push the affected colors in the direction of the paint you're using. And is also useful to remove other colors. For instance, if you And with Red 255 (Green & Blue at 000), the result will be the pure red separation of the picture. It works by comparing the rgb bits in each pixel of the screen under the brush

with those in the brush, and leaving only the bits that are 1 in both brush AND screen.

Or   ▲ *9*
This painting mode is similar to blending light sources (of the Current Color) on the area of the Canvas affected. If you are using a custom brush, Or uses only the shape of the custom brush (but none of the colors of the custom brush) with the Current Color.

The effect of Or is usually to add color. It works by leaving the bits that are 1 in either brush OR screen (or both).

Xor   ▲ *0*
This function (pronounced Ex-or, an "exclusive-or" operation) can reverse the colors of the area you act upon or create a negative effect (use pure white as the Current Color) on the area of the Canvas affected. Some very interesting false color effects can be created by Xor with other colors like red or blue. If you are using a custom brush, Xor uses only the shape of the custom brush (but none of the colors of the custom brush) with the Current Color. It works by leaving the bits that are 1 in either brush OR screen, but not both.

Picture Brush Palette Effect		Mode	Prefs
		Coordinates	*Frame->DV1
		Set Grid	Frame->DV2
		Use Grid	Grab <-DV1
			Grab <-DV2
ToasterPaint 2.0 by Jamie Purdon Copyright ©1991 NewTek Inc. All Rights Reserved			

Prefs Menu
The Prefs menu allows you to set specific tools into action to ease your work on the screen. Here also you will find new tools for importing images from the framebuffers.

Coordinates   ▲ *g - toggle coordinates or mode display*
This command activates or deactivates the coordinates, which appear in the Control panel window replacing the Mode Indicator (clicking the Mode Indicator also brings up the Coordinates). The coordinates show the distance in pixels from the upper left corner of the Canvas. When you begin to draw, the coordinates become relative to the starting point of the drawing. If the Control panel has disappeared as you draw, press the Esc key or right mouse button to bring it back so that you can see the coordinates.

Set Grid   ▲ *h - set Grid*
This option will allow you to set the size and aspect of the grid that ToasterPaint makes available to you. After you have chosen this option move the pointer back over the canvas and click and hold the left mouse button. You will see an array of points whose spacing you will be able to change by moving the mouse around while holding down the left button. When the grid spacing is at the desired size, release the button. The grid can be set so that the points (when connected) will form a square. To do this, make sure that the line goes down one pixel for every one that it goes over.

Use Grid   ▲ *G - toggle Grid on/off*
This option turns on ToasterPaint's grid (an asterisk appears next to the option when it is activated, and a # appears next to the current paint mode or Coordinates on the Tools panel of the Control panel). When the grid is on, the current shape tool is constrained to apply paint to the canvas only in the following ways:

- Freehand - Dots will appear only at the grid points. It is not possible to draw continuous lines with this mode when the grid is on.

- Freehand Continuous - This will allow you to draw continuous straight lines between adjacent grid points - horizontally, vertically or diagonally.

- Polygon/Straight Line - This tool allows you to connect any two grid points with a straight line or make a polygon with vertices at any grid point.

- Rectangle - This mode draws rectangles of any size whose corners appear only on grid points.

- Circle - This mode allows you to draw any circle whose center is located at any grid point and whose circumference passes through any grid point.
- Ellipse - This mode will allow you to draw any ellipse whose center is located at any grid point and with at least one point on the circumference passing through a grid point (see figure 19.14).

The current brush size and shape are unaffected by the grid.

Frame —>DV1   ▲ *F8*

Frame —>DV2   ▲ *F9*
These options determine where ToasterPaint will send its rendered output: to either DV1 or DV2, the Toaster's two framebuffers. The selected framebuffer will be displayed on the Toaster's Program output while you are using ToasterPaint, and you may freely switch between the two. In this manner it is possible to have two pictures that you have painted accessible from the switcher when you return to it, without having to load them from the Framestore directory. Be warned that when you instruct ToasterPaint to render to one of the framebuffers, whatever was in it beforehand will be erased.

Grab<—DV1

Grab<—DV2
These options grab a field or frame from one of the Toaster's 2 built in framebuffers.

4-Field Four-field grabs a (4-field) image with the most color resolution. This is useful if (a) you are grabbing a LightWave rendered image, (b) the image you are grabbing has no motion jitter in it, (c) the image has motion jitter but you want to work with that as a special effect, or at a later time, and want to grab the best possible image for now.

2-Field Two-field processes with frame-type motion removal and grab the resulting 2-field (1 frame) image. This is useful if you are grabbing an image with very little motion jitter displayed in the framebuffer.

1-Field Single-field grabs a single-field image. This option is extremely useful for saving a motion-free still out of a jittery framebuffer image. You should be aware that a single-field image has less resolution than a full frame image. This is the nature of the NTSC video signal.

ToasterPaint Tips and Tricks

Re-Sizing Full-sized Screens
Many graphics artists need to resize elements when creating graphics. Here's an effective method for resizing full-screen images easily.

Press the Tab key to reset all values. Turn on the coordinates (g on the keyboard). Load the image. Draw a filled rectangle of any size, starting at 0x, 0y, and (for over-the-shoulder graphics) go to about 294x, 188y). Press 7 on the keyboard (this turns on TxMap). Click Undo. Click Redo. ToasterPaint will use the "whole screen" as its source for the TxMap operation. Now cut out the resized image, clear the screen, and place it for your over-the-shoulder key graphic.

Important Notes: This will only work if there is no "swap brush" or current brush prior to the operation. Via ARexx, sizing may be adjusted in 1/16 increments, meaning you can slightly magnify (or crop the right and bottom sides) of the image.

Note: Since ToasterPaint centers your cursor on the brush after you've cut it out, try the following coordinates for a left- or right-oriented over-the-shoulder graphic: left - 552x, 138y; right - 200x, 138y.

Advanced Perspective
Redo a texture mapped perspective appearance using Darken mode with Transparency horizontally at the front to darken the rear edge of the brush and not the front edge. This reinforces the feeling of distance in the background.

Perspective Fill Screen
Use the Tiling Controls set to 9 by 9, use TxMap to draw a rectangle covering the bottom two-thirds of the screen, with Warp Amount set to high, and the Horizontal Warping at the bottom of the Warping Locator. This gives you the effect of the brush receding off into the distance.

Perspective Effects
Transparency and the other modes can help simulate different kinds of perspective:

- Using Blur with the transparency set to around 90% and painting over objects in the background of your picture will give the effect of great distance; the objects will blur slightly as if seen through a hazy atmosphere. You can increase the amount of blur by repeatedly clicking the Redo button.

- Colorizing background objects with blue and approximately 75 - 90% transparency will also give them the look of being at a great distance (aerial perspective) but without actually blurring them. Objects seen at a great distance through a clear atmosphere take on a blue tinge but remain sharp in detail.

Large Tiles
To get more than 9 copies of a brush in a Tile, use Tiling again on the brush. For example, if you want 12 copies of a brush vertically and horizontally, cut out the custom brush, copy it, then activate TxMap and set the Tiling Controls to 6 by 6. Then stamp down the brush, click Scissors and click Redo, then copy this new brush and select 2 by 2 Tiling, then stamp down the new brush.

Multiple Color Ranges
To create color gradations with more than two main colors (and their intermediate shades), use Range Colors in Range mode to draw part of what you want. Then set a new Range Color. For instance, if you want a range from red to yellow to blue in a rectangle, set a red to yellow range, draw half the rectangle, then set a yellow to blue range and draw the other half of the rectangle.

Reverse Range Text
This effect uses Range Colors to bring out text against a background of the same range. Select Range mode, then choose the Horizontal Hotspot and drag it to the bottom of the Hotspot Locator in the Transparency & Warping panel of the Tool Box. Go to the Text panel and type in the title you want (a large display font works the best; at least 24 point). When the text appears, select Copy This Brush from the Swap sub-menu in the Brush menu. Go to the Transparency & Warping and move the Horizontal Hotspot to the top of the Hotspot Locator. Now go to the Tools and select the Filled Rectangle tool and draw a rectangle about the size of the text you created (it can be larger or smaller, if you prefer). Now select TxMap mode from the mode menu and click Redo. If you like, turn on the Smoothing in the Transparency & Warping menu before doing this. You now have text against a background where the same color range goes in opposite directions.

Effects Using Transparency

Clouds and Mist
Making realistic clouds or mist is easy when you use Range mode with Transparency. Set up a range of white to light gray for sunny days or darker grays for a more overcast setting. The proper setting of the hotspot and transparency levels add the right degree of translucency to mist or fog.

Translucency
Objects can be made translucent with the correct application of Transparency. Using a semi-transparent light gray to draw an object is an excellent simulation of glass. A Range mode set up of white at the hotspot to gray at the edge with the correct placement of the hotspot in the locator can make a glass object with light-source reflections.

Montage
Using Edge Transparency when pasting down custom brushes helps to more effectively blend them into the picture. Try using various amounts of edge Transparency in the Montage tutorial when pasting down the lips. You'll notice that the transition is much smoother; another benefit is that you don't need to be as precise when cutting out the custom brush, because varying the Edge Transparency will blend out any unwanted details.

False Color
Using Transparency with ToasterPaint's logical modes (And, Or, and Xor) can yield some very interesting computerized false color effects; make Xor'ed halos of false color by setting Hotspot Transparency at 100% and Edge Transparency at 0% and drawing over the desired area.

Because there are so many different combinations and possible modes, there are usually subtle differences between seemingly identical modes, such as painting in Normal mode with 50% transparent white and painting using Lighten mode. To prove this to yourself, set the Transparency Controls to 50% with the Hotspot off. Select the color white from the 16 color palette. Using Normal mode, draw a filled rectangle over any portion of the 000.FS.Kiki.VT frame. Then choose Lighten from the Mode menu and click on Undo and then Redo. You will notice a definite difference between the two modes that would at first glance seem identical.

Interactive Transparency
The Transparency Controls are also interactive; that is, you can manipulate them while an object is being drawn to create unusual effects. If the Tool Box vanishes while drawing the object, click the right mouse button to halt the process, then click Undo and Redo. While the process is being repeated, move the Hotspot Locator or change the Transparency sliders. This works better on a large object, because with a small object there isn't much time.

Effects Using Texture Mapping

Severe Warping
More severe warping effects can be obtained by pasting down an image using TxMap mode and warping at maximum, then click Scissors and Redo. The image you just created is turned into a custom brush. Now choose Copy This Brush from the Swap sub-menu in the Brush menu. Select a shape tool and draw a new shape on the screen. The previously warped image is warped even further into the new shape, since the Warping control is still set to maximum. Try texture mapping text brushes into free-hand shapes. This is a good way to get some extremely unusual custom fonts.

Interactive Texture Mapping
The Warping Controls can work interactively (in real time) for unusual effects. Activate TxMap mode (remember, you must first cut out a custom brush and then copy it), then draw a new shape on the screen. The custom brush is texture mapped into that area with the Warping Control settings applied. Now click Undo, and then Redo. (If the Tool Box is not showing, immediately press the Esc key.) Grab the Warping Point in the Warping Locator and move it around while the image is being drawn. The warping effect moves around in the image as it is being drawn. Of course, this works best if the image being drawn is large, so that you have enough time to make these changes (turn on Smoothing to give you more time). Try using the Horizontal Warping bar and moving it up and down to create a wavy, rippling effect.

Miscellaneous Tips

If you're not getting what you expect when you draw, check to see what Drawing Mode you're in, or see if you've left the Transparency controls on. Press the Tab key to return ToasterPaint to its default settings.

The right mouse button cancels any operation in progress. Since ToasterPaint draws things from the top down, this feature can be used to draw only the top half of a brush or a shape.

Remember, with Merge Picture, the whole back picture is the paint that can act on the front picture with any of the Mode menu features. Try bringing a picture into the front using Transparency controls for a "soft-focus" effect.

When not in use with Range mode, the Range colors can be set up to hold a spread of colors that you'll be using often.

Files can be opened by double-clicking on the file name.

Using the keyboard shortcuts grabs time. When you find yourself reaching for the same button or menu item for the hundredth time, look at the keyboard shortcut list. Painting with two hands is faster than painting with one hand.

Freehand drawing works rapidly, but if you release the mouse button and draw again before the "Zz" cursor disappears, ToasterPaint considers that as part of the original brush stroke. A single Undo will remove all such paint from the screen. This can be used to sign your name on the screen with Freehand drawing, and then clear your name off the screen by clicking Undo.

When you hold down the right mouse button to display the menus, the program's copyright information is displayed at the bottom of the screen. More importantly, the current custom brush (if any) size, in pixels, is shown.

If you draw something on one screen, then Undo it and swap screens, the Redo button will re-draw it in the exact same location on the swap screen.

ToasterPaint Keyboard Commands

Tools

Key	Command
a	Redo
b	Scissors
c	Unfilled Circle
C	Filled Circle
d	Unfilled Continuous Freehand
D	Filled Continuous Freehand
e	Unfilled Ellipse
E	Filled Ellipse
f	Fill Off
F	Fill On
g	Coordinates/Mode toggle
G	Grid On/Off Toggle
h	Set Grid
m	Magnify mode toggle
r	Unfilled Rectangle
R	Filled Rectangle
s	Freehand tool
U	Undo
v	Unfilled Polygon
V	Filled Polygon
F1	Tool/Transparency & Warping toggle
F2	Tool/Text Controls toggle
F3	Tool/Palette toggle
F4	Undo
F5	Redo
-	Smaller brush size
=	Larger brush size
\	Brush shape toggle
.	One-pixel brush

Menu Commands

Key	Command
B	Restore Brush
H	Copy picture to Swap screen
N	Copy Brush to Swap
t	NoBackground off
T	NoBackground on
i	Font Requester
j	Swap screens
J	Exchange custom brushes
K	Clear screen to black, set current color to white
l	Load Frame
L	Save Frame
o	Load Brush
O	Save Brush
p	Load RGB
P	Save RGB
x	Flip brush horizontally
y	Flip brush vertically
z	Rotate brush 90 degrees clockwise
Z	Rotate brush 90 degrees counterclockwise

Painting Modes

Key	Command
`	Normal mode
1	Range mode
2	Lighten mode
3	Darken mode
4	Colorize mode
5	RubThru mode
6	Blur mode
7	TxMap mode
8	And mode
9	Or mode
0	Xor mode
<	Blur2 mode (not available from the menu)

Transparency & Warping

Key	Command
n	center hotspot in Warping Locator and Hotspot Locator
F6	100% Hotspot, 100% Edge
F7	50% Hotspot, 50% Edge
/	Texture Map Smoothing Off
?	Texture Map Smoothing On
!	Dithering Off - affects preview screen only
@	Pattern Dither - affects preview screen only
#	Random Dither - affects preview screen only (default)

Palette

Key	Command
,	Pick Color

Rendering

Key	Command
F8	Render frame to DV1
F9	Render frame to DV2
F10	Render to framebuffer toggle
Del	Auto-render toggle

Text

Key	Command
$	Text Smoothing toggle
%	Bold toggle
^	Italics toggle
&	Underline toggle

Miscellaneous

Key	Command
M	Toggles memory display on menu screen
Q	Return to Switcher
S	Snap mode toggle for 1x mode
w	Whole screen operation
~	Unload ToasterPaint from memory (super-quit)
Arrow keys	Scroll picture; scroll magnify window.
Alt	Preserve aspect in TxMap mode filled rectangles
Esc	Control panel open/close toggle; close magnify window
Help	Toggle auto-scrolling with mouse
Return	Activate string gadgets to enter strings; OK on requesters.
Space	Cancel operation in progress.
Tab	Default program settings (Transparency off, hotspot centered, Normal mode)

ToasterCG Manual

Table of contents

ToasterCG delivers 35ns resolution titles with the exceptional color, clarity, and sharpness that professionals demand. Featuring variable scroll and crawl, drop and cast shadows, and color gradient or freeze frame background images, ToasterCG provides you with complete control over both the medium and the message. Combine ToasterCG graphics with Video Toaster Switcher effects for sophisticated digital effects using 35 fonts in 16.8 million colors.

ToasterCG Terminology

Page
Graphics that appear on screen are created on pages. One screen of graphics is equal to one page. If you had ten different statistics to bring up, one at a time, you would create them on ten successive pages.

Key Page
The key Page is the most commonly used graphic page in television. The text that appears on the page will appear over the video, the way a news reporter's name appears at the bottom of the screen.

Framestore Page
The Framestore Page is a Key Page with a color background. Backgrounds may be solid color, two blended colors (a gradient), or any freeze frame image from ToasterPaint.

Kerning
Kerning refers to the spacing between letters. ToasterCG allows you to adjust kerning on a character-by-character basis.

Shadow
To help make lettering stand out against the video background, a shadow is added. There are essentially two types of shadows, cast and drop. A cast shadow is a distant shadow, unconnected to the letter. A drop shadow is a shadow that extends from the letter itself. ToasterCG shadows may be semi-transparent or solid color.

Toaster Terminology

Click
Click means to press and then quickly release the left mouse button. Buttons and icons may change shape or color when clicked on in this manner. The word select may also be used for click (as in, "select the Load Frame button," which means for you to click it).

Double-click
Double-click means to press and then quickly release the left mouse button twice. In the Video Toaster, you double-click some buttons to activate their functions (as in, double-click the Load Frame button to load a still frame).

Shift-click
Shift-click means to hold the shift key on the keyboard, then quickly press and release the left mouse button.

Drag (also Dragging)
Dragging is holding down the left mouse button and moving the mouse.

Pull Down a Menu
To pull down a menu in ToasterPaint, hold down the right mouse button and move the mouse to the menus that appear. Menu options that you can select will appear to "drop down" as the pointer passes over them.

Return and Enter
These two keys are used for two distinct functions in the Video Toaster. Be aware that they will not perform the same actions. Generally, you use Return after typing text in order to restore the mouse pointer, while you use Enter to activate a function (as in, saving a Frame).

Select
A single click on an on screen button. This will highlight it, thus selecting it.

Getting Around the Screen

Character Generator
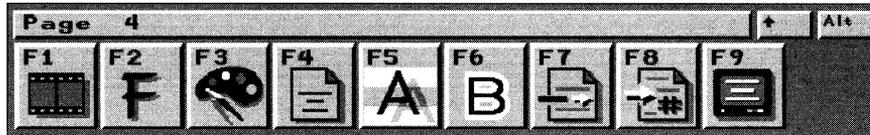
Edit Area - The Page
This comprises the majority of the screen. Here you will enter lines of text. In ToasterCG, this is known as a page. On the main monitor, this will be an image made up of shades of gray color. On the Preview monitor, when you are selecting colors for text, background, etc., you will see color boxes that show the color choices you can make. When you render lines or pages of text, they will appear in full color on the Preview monitor. When you take images to the program output, they will appear on the Program monitor.

Control Panel
This is a strip of buttons, numbered F1 through F10, that allows you to control different features of the screen's layout and appearance. Their functions change depending on the type of page you are editing. Each button has three states: normal Function Keys, Shift-Function keys, and Alt-Function keys. Each key may govern three different (though related) functions, depending on whether you hold the appropriate key when you press the function key.

Starting and Exiting CG
From the Switcher Screen, you can activate, de-activate, and enter the Toaster CG.

- **Activate** the CG by clicking once on the CG Application button.

- **Enter** the CG by clicking a second time on the activated CG Application button.

- **De-Activate** the CG by holding the Shift key and clicking the CG Application button.

When you have finished editing text and wish to return to the Switcher, you have two options:

- **Escape** to exit the CG and leave active (in memory). This allows you to call up CG pages from the Switcher.

- **Shift + Escape** to exit CG and shut down (deactivate)

By pressing Escape, you go directly back to the switcher, but leave ToasterCG loaded into memory. Use this option if you plan to return to editing text, or wish to load completed pages into the Switcher.

Hold down the Shift key + Escape to go directly to the Switcher and remove the ToasterCG from memory. The memory allotted for it is then available for other work. To return to ToasterCG, click the ToasterCG application button twice, as if you had just started the Toaster software.

The Building Blocks of ToasterCG: Page, Book and Project

In ToasterCG, the basic unit is the page. There are five different types of pages, covering all CG uses. When you first enter ToasterCG, and whenever you go to a new (blank) page, you must first choose the type of page you intend to work with. You should gain an early understanding of the five ToasterCG page types, because the controls that are available on each page change for each page type. Some controls are not available on all pages. This will become clear as you glance through the reference section.

Keys on the keyboard that have special functions are listed at the end of this reference section. If you wish, you may turn to them to become acquainted with their functions first.

The Blank Page

When you first enter ToasterCG, or go to an unused page, you are on a Blank Page. It lacks function, per se, other than to be a placeholder (until it is assigned one of the other page types) to help with file organization. There are very few buttons available on the Blank Page because it has not been assigned. You must select a page type for a Blank Page in order to edit text on it. The following chart shows the functions that are available when you go to a Blank Page. Descriptions for these functions follow in the reference section.

	Normal	With Shift Key	With Alt Key
F1	Choose page Type	————————	————————
F2	————————	————————	Select Fonts
F3	————————	————————	————————
F4	————————	————————	————————
F5	————————	————————	————————
F6	————————	————————	————————
F7	————————	————————	————————
F8	Jump to page	Copy this page to Another	————————
F9	————————	————————	————————
F10	————————	————————	Erase book
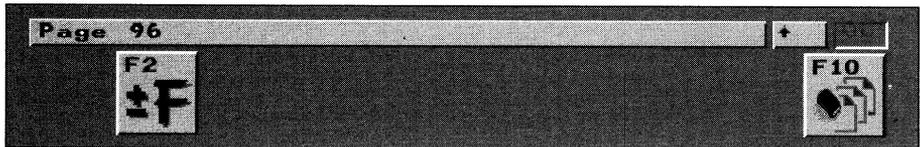
The Key Page

The Key Page is the most commonly used in television. The Key Page is a CG Page that overlays or "keys" text or graphics over the Program output on the Video Toaster. When the Key Page and video combine, the Program output shows through the entire page except the areas occupied by text or graphics. Its uses include titling on newscasts, prices in commercials, scores for sporting events, and more. The following chart shows the functions that are available when you create a Key Page. Descriptions for these functions follow in the reference section.

	Normal	**With Shift Key**	**With Alt Key**
F1	Choose page Type	Which Font	Load Text
F2	Next Font	Copy Font to page	Select Fonts
F3	Text Color	Copy Text Color to page	———————
F4	Justify Mode	Justify Mode to page	Horizontal Center page
F5	Shadow Type	Shadow Distance	Shadow Direction
F6	Outline Type	Copy Shadow & Outline to page	Shadow/Outline Priority
F7	Insert Graphic Separator	Insert Line	Delete Line
F8	Jump to page	Copy this page to Another	Erase this page
F9	Render page	Render Line	Save Rendered page
F10	Take to Program	———————————	Erase book
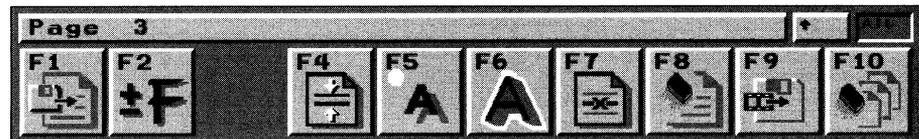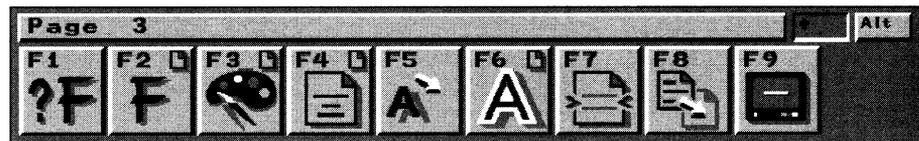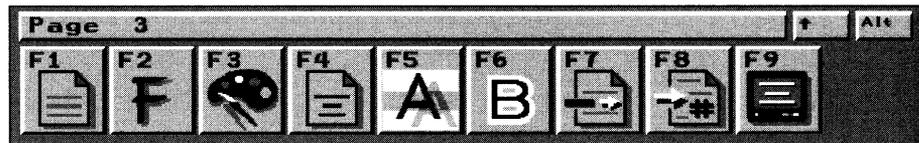
The Framestore Page

The Framestore Page places text or graphics on top of a color background generated by Toaster CG. The Toaster treats this page like any other Framestore image: it can be saved, loaded into a framebuffer, or manipulated with digital video effects. Framestore Pages are useful when you have a series of related graphics and wish to use a consistent background. The following chart shows the functions that are available when you create a Framestore Page. Descriptions for these functions follow in the reference section.

	Normal	With Shift Key	With Alt Key
F1	Choose page Type	Which Font	Load Text
F2	Next Font	Copy Font to page	Select Fonts
F3	Text Color	Copy Text Color to page	Background Color/Image
F4	Justify Mode	Justify Mode to page	Horizontal Center page
F5	Shadow Type	Shadow Distance	Shadow Direction
6	Outline Type	Copy Shadow & Outline to page	Shadow/Outline Priority
F7	Insert Graphic Separator	Insert Line	Delete Line
F8	Jump to page	Copy this page to Another	Erase this page
F9	Render page	Render Line	Save Rendered page
F10	Take to Program	——————————	Erase book
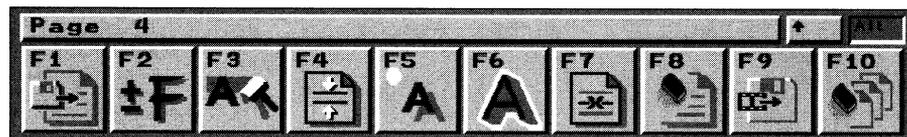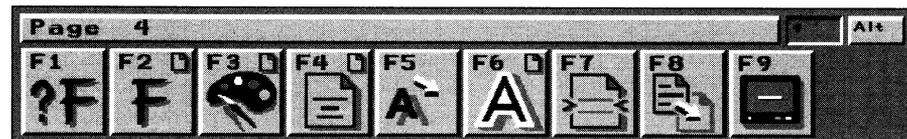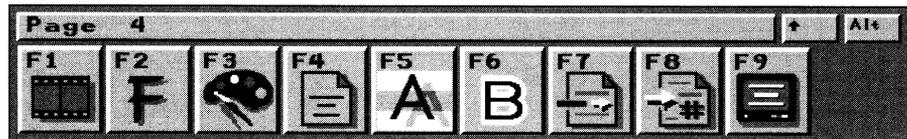
The Scroll Page (also called Roll)

The Scroll Page keys text moving from the bottom of the screen to the top, over the Program output of the Video Toaster. This is often called a Roll. The Scroll Page is widely used in television and film to roll credits at the end of a production. The following chart shows the functions that are available when you create a Scroll Page. Descriptions for these functions follow in the reference section.

	Normal	With Shift Key	With Alt Key
F1	Choose page Type	Which Font	Load Text
F2	Next Font	Copy Font to page	Select Fonts
F3	Text Color	————————	————————
F4	Justify Mode	Justify Mode to page	————————
F5	Shadow Type	Shadow Distance	Shadow Distance
F6	Outline Type	Copy Shadow & Outline to page	————————
F7	Insert GraphicSeparator	Insert Line	Delete Line
F8	Jump to page	Copy this page to Another	Erase this page
F9	Scroll Speed	Scroll Loop Mode	Save Rendered page
F10	Take to Program	————————	Erase book

Note the following features for Scroll pages:
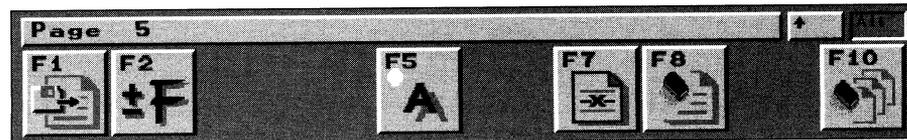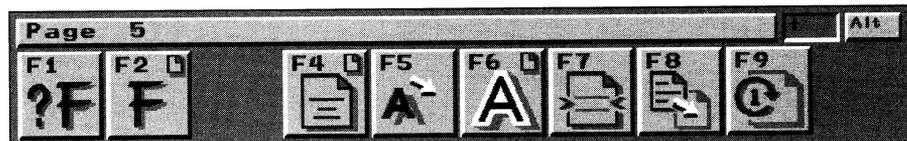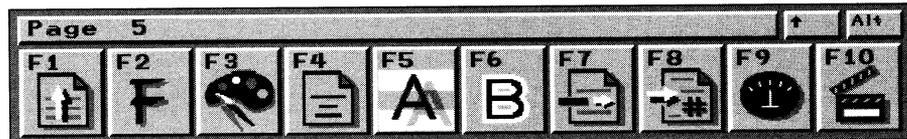
- Abort or end scroll pages by clicking the right mouse button.

- Auto-Scroll - When you are editing a Scroll Page, this feature moves the lines that you have typed off the top of the screen so that you can continue to add new lines.

- The Home key (7 on the numeric keypad) moves the cursor to the top of the page.

- The End key (1 on the numeric keypad) moves the cursor to the bottom of the page.

- Scroll pages move at one of five speeds.

- Scroll pages can be played once through, played continuously, or played once through with a pause.

There is one limitation as well:

- Color ToasterFonts (the Toaster's 16.8 million color fonts) are not available.

The Crawl Page

The Crawl page keys a single line of text (moving across the screen from right to left) over the Program output. This line of text can crawl across the screen at any height you set using the shift key with the up or down arrow keys when editing. The Crawl Page is used primarily in special bulletins and stock market reports, wherever information needs to be put on screen without obscuring the video. The following chart shows the functions that are available when you create a Crawl Page. Descriptions for these functions follow in the reference section.

	Normal	With Shift Key	With Alt Key
F1	Choose page Type	Which Font	Load Text
F2	Next Font	————————	Select Fonts
F3	Text Color	————————	————————
F4	————————	————————	Horizontal Center page
F5	Shadow Type	Shadow Distance	Shadow Distance
F6	Outline Type	————————	————————
F7	————————	————————	————————
F8	Jump to page	Copy this page to Another	Erase this page
F9	Crawl Speed	Crawl Loop Mode	————————
F10	Take to Program	————————	Erase book
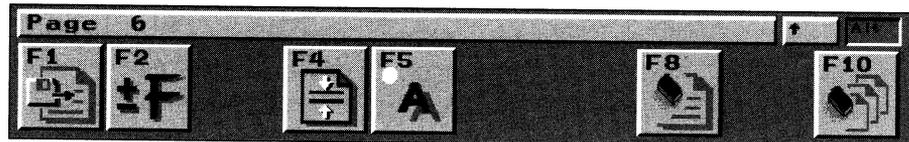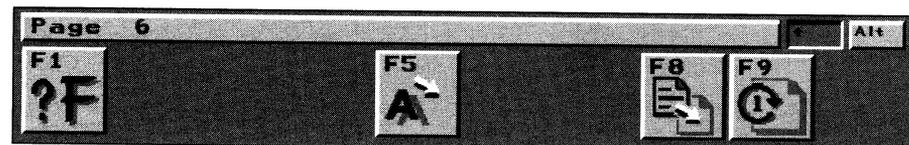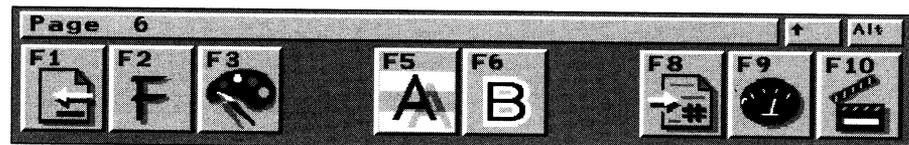
Note the following features and limitations for Crawl Pages:

- Auto-Crawl - this feature moves the text that you have already typed in off the left edge of the screen so that you can continue to type in text, even after the line grows longer than the width of the screen.
- The Home key (7 on the keypad) moves the cursor to the beginning of the line.
- The End key (1 on the keypad) moves the cursor to the end of the line.
- Shift-left arrow key moves the cursor five spaces to the left.
- Shift-right arrow key moves the cursor five spaces to the right.
- Crawl pages move at one of four speeds.
- Crawl pages can be played once or played continuously.
- Color ToasterFonts (the Toaster's 16.8 million color fonts) are not available.
- Graphic separators are not available.

Book
When you activate ToasterCG there are automatically one hundred pages available for you to use. This is known as a book. You may safely enter text on one page, go to another page, and so on, without having to save each page every time. When you complete editing pages, you save the entire book. If you work with CG a great deal, you may have many, many books of prepared graphics and text. Here is some background information about books:

- A book contains 100 pages.
- A book may use up to 20 different fonts.
- Only one book may be in use at a given time.
- To save a book, you must save a project. Books are saved within project files. (Projects are saved from the Toaster Preferences screen.)
- A book may be loaded from within any project without having to load the project itself.

Project
Projects are saved from the Toaster Preferences screen. You should think of a Project as a three-part file: it contains the current book (if the CG is active when the Project is saved), the current effects and applications that are loaded into the Switcher, and the Switcher settings that are shown on the Preferences screen. A Project can hold only one book.

When you load a Project, you load all three parts. To load just the CG book, activate the CG from the Switcher, then go to Toaster Preferences, locate the correct Project, and double-click the Load Book button.

If you have a 5 or 7 MB unaccelerated Toaster, and work in CG extensively, you may find it useful to load the GetSmall project that ships with the Video Toaster. It conserves memory, (when active) and storage (when saving) files. See the Load CG Page button in the Switcher Manual for information on working with the GetSmall project.

The Function Keys
The control panel buttons along the bottom of the screen represent the function keys at the top of the keyboard. Each button is labeled with a number, as well as a descriptive image of its function. Press the desired function key on the keyboard to activate the feature that you wish to use. Some buttons have more than one state, in which case their appearance will change accordingly each time you press them. Often their appearance will show the status of a particular function. Buttons that are not visible are not available at the moment. For example, Color ToasterFonts (multi-colored fonts) do not have shadows. Therefore, on a text line containing a Color ToasterFont, F5 and F6 will not be visible, since they pertain to shadow functions.

The Shift-Function Keys
Most shifted function keys pertain to full-page operations. That is, they apply one item from the current line (such as font, color, or justification) to the entire page. This is indicated by the small page icon that appears in the upper corner of each button when you depress the shift key. This may be called a global operation. To use these buttons, hold the shift key and press the desired function key. When you press the shift key, the shift box on the far right end of the menu bar will appear depressed and the control panel buttons will change appearance, indicating their new functions.

The Alt-Function Keys
To use these buttons, hold the Alt key and press the desired function key. When you press the Alt key, the Alt box (at the right end of the menu bar) will indent and the control panel buttons change appearance to indicate their alternate functions.
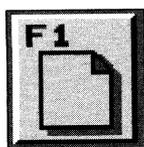
F1   Choose Page Type
When you first enter Toaster CG you start on a Blank Page, number 00. The control panel across the bottom of the screen has two buttons only: Choose page Type (F1) and Jump To page (F8). Press Choose page to select a page format for this page.
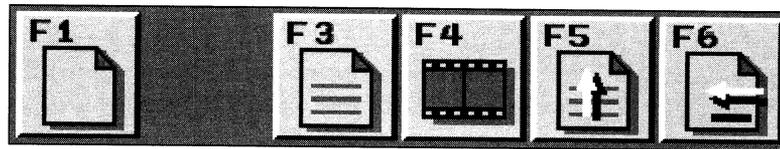
The Choose Page Type button takes you to a secondary control panel with five buttons, one for each page type. Icon images on each button represent the five page types. Selecting a page type will place the icon image for this page on the F1 button, and enable the control panel buttons for the page. To change the page type, select F1 again.

Note that selecting a new page type will always clear the current page. If you accidentally press F1 while editing a page, and you do not want to erase the page, press Escape. You will be returned to the page as it was.

Shift-F1 Which Font?

Press Which Font? to display the name of the font on the current edit line in the menu bar. The name of the font is usually not displayed (unless you are selecting or changing fonts). The Which Font? button will recall the name of the font without changing it.
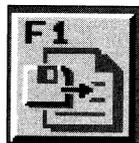
Alt-F1   Load Text File

Press Load Text to load a text file (that has been previoulsy created in a word processor or text editor) into the current page. ToasterCG will look for a file in the Toaster directory named "CGTextFiles/page##.text" (## indicates the two-digit page number) and import it to the screen. If the page has any font or formatting information already set, that information will be maintained. For example, if you format a Scroll page so that every line alternates between a 40 and an 80 point text size, then the text will be formatted that way when it is loaded.

When you load a Framestore or Key type page, there may be more text than will fit on the page. You may have to set the font to a smaller size, and reload the text. Text files should be plain ASCII text, without formatting or font codes. Most word processors or database software can create this form of file, so that text or data can be easily turned into scrolling information.

If you are unfamiliar with ASCII text files, text editors, and directory structures, turn to the Appendix "Computer 101" for an understanding of these ideas.

Note that an example of the full DOS file name of the page directory would be DH0:Toaster/CGTextFiles/page##.text. Remember, ## are the two digits that specify the page number.

F2   Next Font

Press Next Font to replace the current font with the next font available in the book. In this manner all the fonts in the book can be viewed one after another, by repeatedly pressing the Next Font button. Hold the Ctrl key and press F2 to go backwards through the list. The name of the current font is displayed next to the page number in menu bar. Fonts are displayed alphabetically. If there are several sizes of the same font, they will appear from smallest to largest.

Color Toaster Fonts are not available on Scroll and Crawl pages. On these pages, Color Toaster Fonts will be skipped as you press the Next Font button.
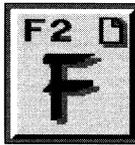
Shift-F2 Copy Font To Page

Press Copy Font to Page to apply the current font to all text on the page. Line spacing, which changes with font size, will alter also. A small "page" icon will appear on this button when the shift key is depressed, indicating it will be a full page operation.

Since Crawl pages have only one line of text, this button will not appear on the Crawl Page.
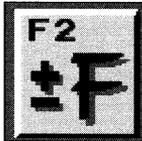
Alt-F2   Select Fonts

Press Select Fonts to go to the Font Selection screen. From Font Selection you can select fonts to add to (or remove from) the current book.
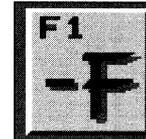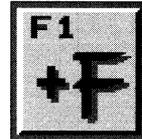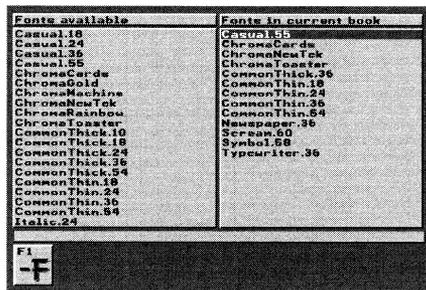
The Font Selection Menu

The Font Selection screen is divided into four major parts: two large windows, the Menu bar, and the function key control panel. The left window, titled "Fonts available," shows all available fonts on your hard drive. The right window, titled "Fonts in current book," shows the fonts currently loaded for use in CG.

When you first enter Font Selection, the first font in the "Fonts available" window is highlighted. This highlight may be moved up or down the font list within each window using the up and down arrow keys on the keyboard. Hold the Shift key and use the up or down arrows to advance by ten fonts at a time through the list. The left and right arrow keys move the highlight back and forth between the two windows. Its location in the left or right window determines whether you will be (a) loading a font into, or (b) taking a font out of the current book. The F1 button at the bottom of the screen will change functions, from Add (load font) to Subtract (remove font), as the highlight bar moves from side to side.

To add a font to the current book, highlight a font in the left window and press the Add Font (F1) button. *(Note that this menu is not designed to install Toaster fonts that you may have purchased to supplement the originally shipped fonts. It will only access fonts already on the hard drive, in the Toasterfonts directory. Most add-on font packages include their own installation procedures.)*

To remove a font from the current book, highlight a font in right window and press the Subtract Font (F1) button.

Note that this does not remove fonts from the hard drive of the Toaster. It merely removes them from active use in the current book.

The Menu Bar may display any of the following messages while you work in Font Selection:

Loading Toaster Font . . .
This message appears whenever you select Add Font.

There is no room left in this book
This message appears when you add a font to a book that already contains 20 fonts. Press an arrow key to remove this message.

This font is already in the book
This message appears when you load a font that has already been loaded. Press an arrow key to remove this message.

Unable to load Toaster font.
This message appears if you load in a font that is not a valid Toaster font, or if there is a disk error. Press an arrow key to remove this message.

You cannot remove this font.
This message appears if you remove the CommonThin.18 font. This font must be in the book at all times. Press an arrow key to remove this message.

Ran out of memory.
This message indicates that you have exceeded the available memory limits. Try to remove unnecessary fonts from the current book, or unload another Toaster application that is not in use.

F3 and the palette menu.
The F3 button accesses color controls (called the palette) for all color functions in ToasterCG. Depending on the type of page you are working with, there will be different F3 palette options available to you. The following section discusses the special functions of the F3 key, as well as the different palette options you have for each page.

F3   Text and Shadow Color
The Text and Shadow Color button takes you to a secondary control panel where you can select colors for text, shadows, (and if you are on a Framestore page: borders and backgrounds). **IMPORTANT:** this secondary menu is called the Palette, and although it looks similar from page to page, each page type differs slightly in its functions. The following list contains Palette functions that work consistently for each page type. Afterward, the different palette options pages and their differences are listed.

The Palette

The Menu Bar
The Menu Bar is the slim gray bar the runs across the top of the function keys. For Scroll, and Crawl pages, in the Palette it bears the reminder "RETURN updates line, Esc preserves line." For Key and Framestore pages, it states "RETURN updates page, Esc preserves page." This indicates that you may cancel any palette changes made here by pressing Escape, or use the changes you make by pressing Return.

The Current Color Box
The Current Color Box is visible only on the Preview output. It is just to the left of the color slider panel, and displays the current color value that you may modify using the RGB color sliders. For Key pages, this is a two-part indicator, showing both the current color value and the luminance value for shadows.

```
Red 48 →  ━━━━━━━■━━━━━━━━━━━━━
Grn 48    ━━━━━━━━■━━━━━━━━━━━━
Blu 255   ━━━━━━━━━━━━━━━━━━━━■
```
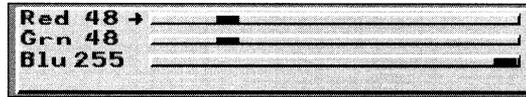
Color slider for an RGB color value.

```
Txt  0 → ■━━━━━━━━━━━━━━━━━━━━
```

Color slider for a Black & White value

The Color Sliders

The Color Sliders allow you to modify the current color (whether it is text face, shadow, border, or background color). The left and right arrows on the keyboard raise and lower the current value. The up and down arrows move the indicator (a small right-pointing arrow) among the different sliders. (B&W and Shadow sliders are black when set to the far left, and white when set to the far right. For the Red, Green and Blue sliders the minimum value is on the left and the maximum value is on the right.)
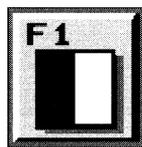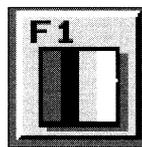
F1 Color/Black-and-White Toggle

When in the Palette, F1 will toggle between using a shade of gray for a color, or an RGB value for a color. This is not just a shortcut to creating gray scale text. Using the gray scale setting actually renders screens faster. Note that the color sliders available change depending on the state of this button.
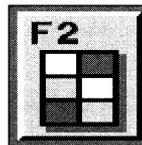
F2 Preset Colors

When in the Palette, F2 cycles through (a) five preset color choices for color text, and (b) one preset color choice for black-and-white. Any of these may be modified to create your own colors using the color sliders.

Note that modifying the color settings for any preset setting will not permanently change the setting.

```
Page  3   RETURN updates line, Esc preserves line
F1    F2           Red 224 →  ━━━━━━━━━━━━━━■━━
                   Grn 224    ━━━━━━━━━━━━━━■━━
                   Blu 224    ━━━━━━━━━━━━━━■━━
                   Shd  0     ■━━━━━━━━━━━━━━━━
```
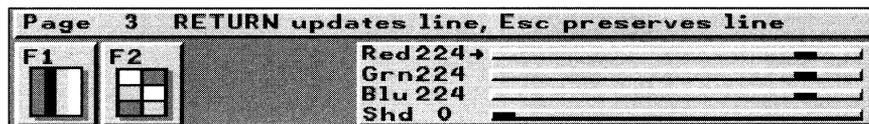
The Key Page Palette

The palette for Key pages affects a single line of text at a time (the current line). Here you have full control over the color of the typeface, and the luminance (black-and-white) value of the shadow. Borders are always black on this page. Note that this is the only palette where you will find a separate slider for controlling the luminance value of the shadow.

```
Page  4   RETURN updates line, Esc preserves line
F1    F2    F3      Red 16 →  ━■━━━━━━━━━━━━━━━
                    Grn 16    ━■━━━━━━━━━━━━━━━
                    Blu 255   ━━━━━━━━━━━━━━━━■
```
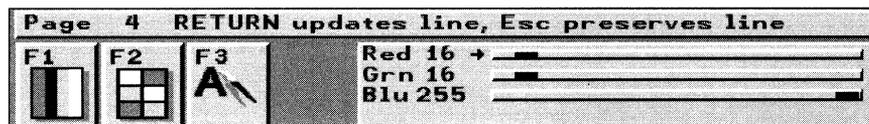
The Framestore Page Palette

The palette for Framestore pages affects a single line of text at a time (the current line, with the cursor). Here you have full control over the color of the typeface, plus borders and shadows. Note that only the Framestore page allows color choices for shadows and borders.

F3 is available on the Palette for Framestore pages only. It will cycle through the three items you can alter here: text color, shadow color, and outline color.
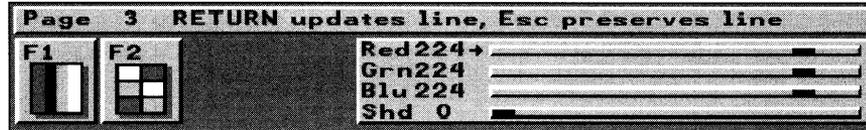
The Scroll and Crawl Page Palette

The palette for Scroll and Crawl pages affects the entire page. Here you have full control over the color of the typeface, and the size of shadows and borders. Shadows and borders are always black on these pages.

Shift-F3   Copy Text Color To Page

Press Copy Text Color to page to apply the current color and shadow value from the typeface to all text on the page. A small "page" icon will appear on this button when the shift key is depressed, indicating it will be a full page operation. The Copy Text Color To page button is not available on Crawl pages.
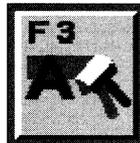
Alt-F3   Background Color (Framestore Page Only)

Alt-F3 brings up a special Palette option for Framestore pages only. It is not available for any other page type, and has some notable differences from the other Palettes. The F2 key here performs a different function than it does for normal Palette operations. And the F3 key is added.
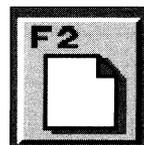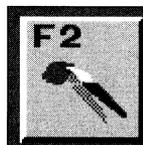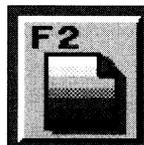
F2   Select Background

On this page, F2 cycles through the three background choices you may make here: a solid one-color background, a gradient two-color background, or a ToasterPaint canvas background.

Note: For the ToasterPaint canvas background to function, you must first enter ToasterPaint, load an image, then return to the Switcher (without quitting) and enter CG. Selecting the ToasterPaint canvas background function will then allow you to place text on top of a ToasterPaint image (freeze frame, Framestore, or artwork). You may render the image to check positioning and spacing, then change the position and rerender as many times as you wish. This ToasterPaint canvas is unaffected by rerendering. When you have the image you like, use Alt-F9 to save it as a complete Framestore image.
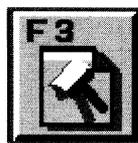
F3   Top/Bottom Color (Gradient Background)

Press F3 to toggle between the top and bottom of the background, so that you may modify the colors of each. ToasterCG will blend from one color to the next for a seamless background over which you can place text.
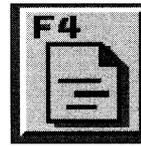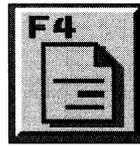
F4   Justify Line

Press this button to justify the text on the current line. There are four justification modes: center, left, right and none. Cycle through the different modes by repeatedly pressing this button. Note that the button changes appearance as you cycle through the different modes, so that you can tell at a glance how the line is justified. The Justify Line button is not available on Crawl pages.
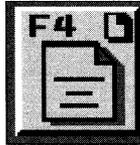
Shift-F4   Justify Page

Press the Shift-F4 button to apply the justification of the current line to the entire page. A small "page" icon will appear on this button when the shift key is depressed, indicating it will be a full page operation. The Justify page button is not available on Crawl pages.
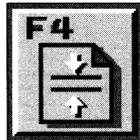
Alt-F4   Center Page

On Key and Framestore pages, Center page moves on screen text so that it is centered between the top and bottom of the screen, with equal space above and below. On Crawl pages this button moves the line of text from the center of the screen to the bottom of the screen. The Center Page button is not available on Scroll pages.
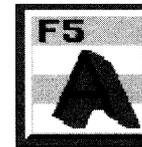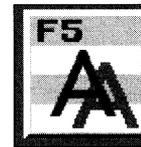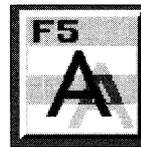
F5   Select Shadow

Press this button to select the type of shadow for every character on the current line. There are five shadow settings (No Shadow, Drop Shadow, Cast Shadow, Transparent Drop Shadow and Transparent Cast Shadow), which can be changed on a line-by-line basis. Note that the button changes appearance as you cycle through the different modes, so that you can tell at a glance which mode is in use. The Shadow Type button on Crawl or Scroll pages does not allow semi-transparent shadows.
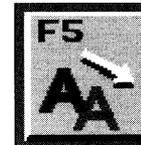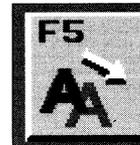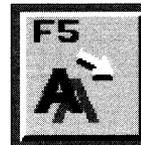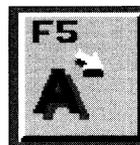
Shift-F5   Shadow Distance

Press this button to change the length of the shadow on the current text line. There are five shadow lengths available. Note that the button changes appearance as you cycle through the different modes, so that you can tell at a glance how long the shadow will be. The Shadow Distance button is not available on Crawl or Scroll pages.
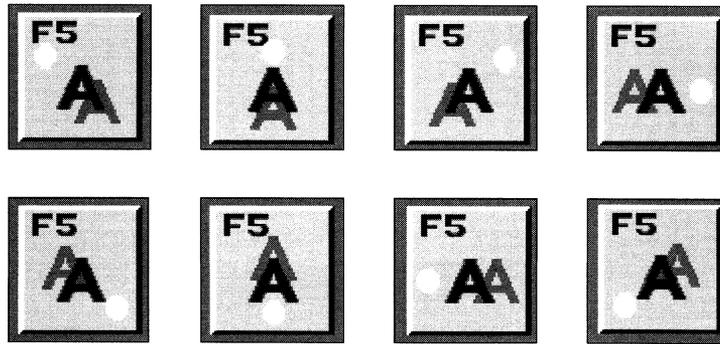
Alt-F5   Shadow Direction

Press this button to select the falloff, or direction of the shadow. There are eight directions for the shadow fall. Press the Shadow Direction button repeatedly to select the different settings. Note that the button changes appearance as you cycle through the different modes, so that you can tell at a glance in which direction the shadow is falling. The Shadow Direction button is not available on Crawl or Scroll pages.
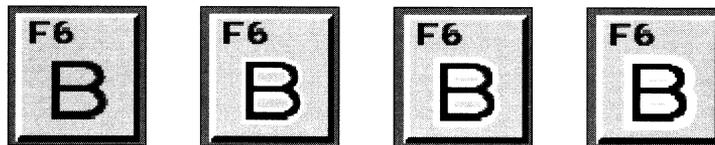
F6   Border Size

Press the Border Type button to choose the size of the border outlining the current text line. There are four border sizes: None, Thin, Medium and Thick. Press repeatedly to select different settings. Note that the button changes appearance as you cycle through the different modes, so that you can tell at a glance what size the border is.

Shift-F6   Copy Shadow and Border to Page

Press Copy Shadow and Border to page to apply all shadow and border qualities of the current line to the entire page. This function works among different fonts or font sizes as well. Copy Shadow and Border to Page is not available on Crawl pages.
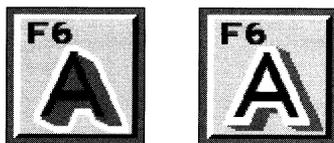
Alt-F6   Border Position

Press Alt F6 to select the part of the font to receive the border. The Border will outline either the face of the type itself, or it will outline both the typeface and its shadow. Border Position is not available on Scroll or Crawl Pages.
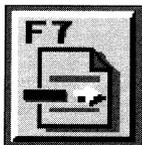
F7   Insert Graphic Separator

Press F7 to insert a graphic separator at the cursor's location. Press repeatedly to select different sizes. There are 4 different styles of graphic separators: Short, Short Thick, Long, and Long Thick. The Graphic Separator is not available on Crawl pages.

Note that short or short thick graphic separators may be positioned on screen using the line movement (shifted arrow) keys.

Shift-F7   Insert Line
Pressing this button to insert a blank line (of the same font size as the current font) above the current line. If you insert blank lines above lines containing text, lower lines may be pushed off the bottom of the screen and lost. Insert Line is not available on Crawl pages.

Alt-F7   Delete Line
Press this button to delete the current line. Lines below the deleted line move upscreen by one line. Delete Line is not available on Crawl pages.
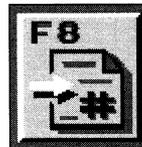
F8   Jump To Page
Press F8 to Jump To another page. The message "Enter page number" will appear in the Menu bar. Type in the two-digit number of the page (between 00 and 99) that you wish to go to. If you do not wish to jump to another page, press Escape to cancel the operation.

Note that the page you leave behind is in no way changed or deleted. It remains in the book, only it has been replaced on the screen with the new one. To save a page, you must save a book.
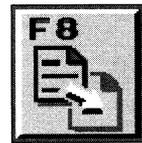
Shift-F8   CopyPage
Press Copy page to copy the current page to another. The message "Enter page to copy this page to" will appear in the Menu bar. Type in the two-digit number of the page (between 00 and 99) that you wish to duplicate this page to. This is useful when you are making several pages with the same basic format (colors, text qualities, etc.) but different messages.
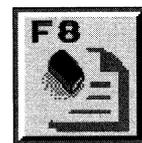
Alt-F8   Erase Page
Press Erase page to erase the current page of all settings and text. This function cannot be undone, therefore you will see this warning message in the Menu bar: "Do you want to erase this page?" Press Y if you do. Press N (or Escape) if you do not.
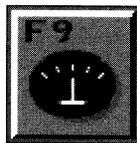
F9 Render page (Key and Framestore pages)
Effect Speed (Scroll and Crawl pages)
For Key and Framestore pages:

Press F9 to render the current page of text to the Preview Monitor. This step is required before Key and Framestore pages can be displayed on the Program output. Rendering will take a few moments. The message "Working..." will be displayed on the Menu bar until the rendering is complete. Press the right mouse button while "Working..." is displayed to abort the render. Pages render one line at a time. If after seeing the rendered image you decide to make any changes you will need to rerender the page in order to take it to Program. The indicator will show the current speed selected.

For Scroll and Crawl pages:

Since Scroll and Crawl pages do not need to be rendered, this button has a different function for these page types. It selects the speed of the scroll or crawl. There for five Scroll speeds and four Crawl speeds. Press F9 repeatedly to cycle through the speed settings.

Shift-F9 Render Line (Key and Framestore pages)
For Key and Framestore pages

Press Shift-F9 to render the current line to the Preview Monitor. The message "Working . . ." will be displayed on the Menu bar until the rendering is complete. To abort the render press the right mouse button while "Working..." is displayed. This is similar to rendering an entire Key or Framestore page, but functions on a line basis only. Use this function to preview text color, shadows, outlines, or background colors for the current line. Rendered lines will not be able to be taken to Program; you must instead use the Render Page (F9) button.
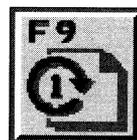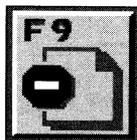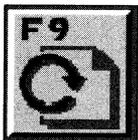
Loop Mode (Scroll and Crawl pages)
For Scroll and Crawl pages

Press Shift-F9 to control the end behavior of the scroll or crawl. This is called loop mode. There are three loop modes for the Scroll pages and two for Crawl pages. All may be interrupted by clicking the RMB.

• Once Through.

The Scroll or Crawl runs through the screen at the preset speed once.

• Continuous

The Scroll or Crawl runs continuously through the screen at the preset speed, repeating until interrupted by a click of the right mouse button.

• Once Through with Pause.

This is available only for the Scroll Page. The Scroll runs through the screen at the preset speed and halts at the end of the Scroll Page, with the text at the end of the Scroll Page still visible on screen. Click the RMB when you want to fade out the end graphic.

The small bracket in the lower left-hand corner of the Scroll Page screen indicates the "stop point" for this setting. During a Scroll, once this bracket reaches the bottom edge of the screen, the Scroll stops. To design a page with this in mind, remember to place the bracket at the bottom of the page when you create the text that will remain at the end, so that the pause works out perfectly.
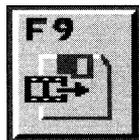
Alt-F9   Save Buffered Page

Press Alt-F9 to save the current Key or Framestore Page to a special directory within the current Framestore directory named "Pages/###.PG.000-DH0" (### indicates the three-digit page number). This button allows you to save composited images, so that you can render CG text onto ToasterPaint images directly and save the result. It will be rendered, then saved. Pages that have been saved into this directory will have a special symbol, a small lightning bolt, that appears on the Menu Bar, indicating this status.
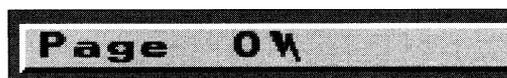
Buffered pages load faster into the Switcher when you render and save them from CG in this manner. The reason is that when you go to load a CG Page from the Switcher, the Toaster first checks to see if it has been pre-rendered first. If so, the page is loaded to a framebuffer (rather than rendered). If not, it must then be rendered. These pre-rendered pages are called buffered pages. They are especially useful if you have a series of Framestore pages to recall quickly. Rendering them while taping could be time-consuming. If you create and save them as buffered pages, they can be recalled in the same short span of time it takes for the Switcher to load Framestore images to the framebuffer.

Note: The buffered pages are recalled by the Switcher just as if they had been rendered at that moment. For example, Key pages, which display text over the Program video source, will remain Key pages.

If you are unfamiliar with ASCII, text editors, and directory structures (i.e., pathnames), turn to the Appendix "Computer 101" for an understanding of these ideas.

Note: An example of the full DOS pathname of the saved page would be DH0:Framestore/Pages/###.PG.000-DH0. Remember, ### are the three digits that specify the page number. The CG only saves these buffered pages (it cannot load them), and the Switcher only loads them (it cannot save images into the Framestore/Pages directory).

F10 Take To Program

Press this button to switch the Preview source to the Program output. Rendered Key or Framestore Pages cut directly to Program. Scroll or Crawl Pages immediately begin their display, keyed over the current Program output source. This button does not appear on the Key or Framestore Pages unless you have already rendered the page.

Alt-F10   Erase book

Press Erase book to erase the entire book of 100 pages. This function cannot be undone, therefore you will see this warning message in the Menu bar: "Do you want to erase the book?" Press Y if you do. Press N (or Escape) if you do not.

Additional Editing Tools on the Keyboard

Beside the 10 function keys, these keys have special functions to assist you in preparing text.
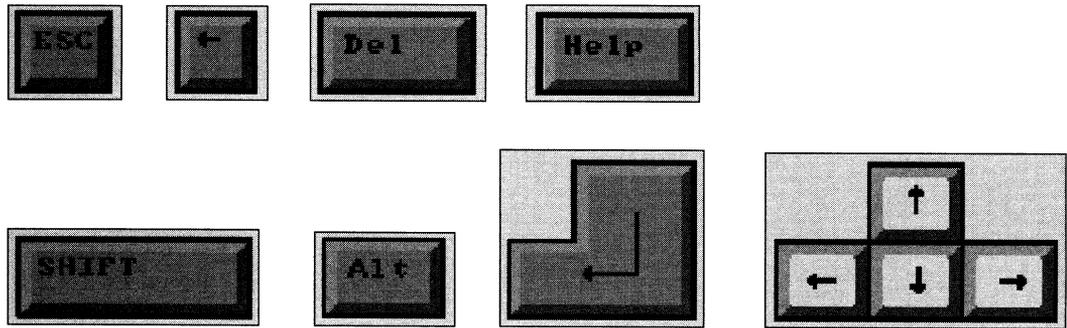
Escape

The escape key (Esc) usually prevents or aborts an action. Here is how:

- To exit Toaster CG and return to the switcher.

- To remove the Help screen and return to the editing Control panel.

- To cancel any changes you have made in any palette operations.

- To abort a "Copy this page to Another" (shift-F8) operation.

- To abort a "Jump to Another page" (F8) operation.
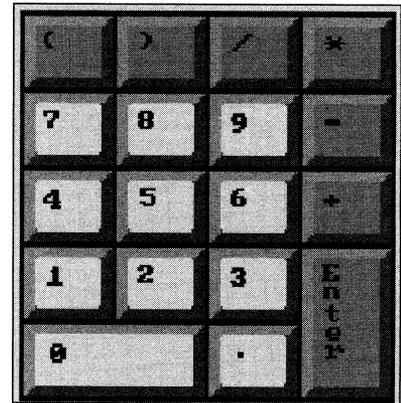
Shift-Escape

Shift + Esc returns you to the Switcher and removes Toaster CG from memory.
This is useful if you have more work to perform in another application, such as ToasterPaint or Lightwave. Both programs function at their best with as much available memory as possible, so it can be beneficial to remove CG from memory when you have completed your CG work.

Help

The Help key is known as a "toggle" button. This means that it shifts back and forth between two different settings, like a toggle switch. The Help key toggles the visibility of the Control panel buttons on and off. This is useful when editing lines that would normally be hidden by the Control panel, like a text crawl across the bottom of the screen.

Shift-Help

Press Shift-Help while the control panel is displayed to bring up the help and information screen. This screen contains information about the version number of Toaster CG, with some other button functions listed. Press Esc to return to the normal editing Control panel.

Ctrl

The Ctrl key is used to reverse the cycle direction of the F2 button. Normally, F2 cycles forward through the available fonts list. Hold Ctrl and press F2 to go backward through this list.

Adding/Subtracting Fonts

The up and down arrows move the font highlight. The left and right arrows choose between adding or subtracting fonts. The shifted up and down arrows move through the list by ten fonts at a time.

Editing and Placing Text

Cursor Movement

- Up Arrow - To move the cursor up one line.

- Down Arrow - To move the cursor down one line.

- Left Arrow - To move the cursor one space to the left.

- Right Arrow - To move the cursor one space to the right.

- Return - To move the cursor to the beginning of the next line down. This does not insert a blank line, nor does it have any effect on a crawl page (where there is only one line of text).

- Home (numeric keypad 7) - To return the cursor to the top line of the page, or to the beginning of the line on a crawl page.

- End (numeric keypad 1) - To take the cursor to the last line of the page, or to the end of the line on a crawl page.

Kerning
Kerning is the process of altering the spacing between characters. To kern ToasterCG text, hold Alt and press the left or right arrow keys (to move the current character left or right).

- Alt-Left Arrow- To kern to the left of the current character.

- Alt-Right Arrow - To kern to the right of the current character.

Line Movement
ToasterCG provides you with the means to move entire lines around on the page in much the same way you would move individual characters on a line. Line movement does not move past other lines of text, however.

- Shift-Left Arrow - To move the current line to the left.

- Shift-Right Arrow - To move the current line to the right.

- Shift-Up Arrow - To move the current line upward.

- Shift-Down Arrow - To move the current line downward.

Deleting Text
- Del (Delete) - To delete the character above the cursor, press Del (Delete).

- <- (Backspace) - To delete the character directly to the left of the cursor.

Moving From Page to Page
- (+) Numeric Keypad - To move to the next higher page number. Press and hold to move quickly through pages in the book.

- (-) Numeric Keypad - To move to the next higher page number. Press and hold to move quickly through pages in the book

- Page Up (numeric keypad 9) - To move to the next lower page number, press Page Up. Press and hold to move quickly through pages in the book.

- Page Down (numeric keypad 3) - To move to the next higher page number, press Page Down. Press and hold to move quickly through pages in the book.

LightWave 3D Manual

Table of Contents

Introduction

LightWave 3D Renderer abrings the power and features of high-end graphics workstations to your desktop at a fraction of the cost. LightWave renders and raytraces photorealistic images and animations with stunning clarity and ease. LightWave Renderer provides sophisticated yet easy-to-use color and texture mapping techinques to produce the ultimate in realistic 3D imagery and animation. And with realtime wireframe preview, watch your animations take shape fromany of five vantage points.

You'll find yourself rethinking your ideas about high quality computer graphics.

LightWave3D Reference

LightWave Terminology

Object
An object is a wireframe representation of an everyday thing, such as a chair, a plant, or a ball. The appearance of an object is defined by the color and texture qualities of the surfaces that make up the wireframe.

Polygon
Polygons define the surface of an object. A triangle, for example, is a simple polygon made up of three points and three lines. Polygons may have many points and lines. They can be assigned color and texture, and can be shaded realistically by LightWave Renderer.

Surface
A surface may be from one to a group of polygons that share color and texture properties. On a beachball, the polygons that make up the red plastic comprise one surface, while the polygons that make up the other colors (blue, yellow, white) would be other surfaces. Each of these surfaces belongs to the beachball object.

Point
Points anchor the "corners" of polygons. Groups of points can be connected and made into a polygon. Note that a point that has been connected to form a polygon is known as a vertex.

File Requester
A file requester is a menu box that appears on screen when you select a load or save function. It allows you to select among the different Toaster storage devices on your system to load or save files.

Render
To render an image is to have LightWave calculate a picture based on the camera's point of view and the objects it "sees."

Note: If you experience odd results when rendering, it may have to do with the design of your object. See "Creating objects properly for LightWave 3D"

Mapping Types
There are several different types of mapping in LightWave. Each allows for different surface characteristics to be applied to the surface of an object, making it look more realistic. Computer artists call this procedural mapping.

Item(s)
There are many instances in this manual where a button or a function can refer to objects, object surface files, the camera, light sources, motion files, scene files, or images. For the sake of simplicity, these are referred to as "items." Where specific items are concerned, they will be listed individually.

Toaster Terminology

Click
Click means to press and then quickly release the left mouse button. Buttons and icons may change shape or color when clicked on in this manner. The word select may also be used for click (as in, "select the Load Frame button," which means for you to click it).

Double-click
Double-click means to press then quickly release the left mouse button twice. In the Video Toaster, you double-click some buttons to activate their functions (as in, double-click the Load Frame button to load a still frame).

Shift-click
Shift-click means to hold the shift key on the keyboard, then quickly press and release the left mouse button.

Drag (also Dragging)
Dragging is holding down the left mouse button and moving the mouse.

Pull Down a Menu
To pull down a menu in ToasterPaint, hold down the right mouse button and move the mouse to the menus that appear. Menu options that you can select will appear to "drop down" as the pointer passes over them.

Return and Enter
These two keys are used for two distinct functions in the Video Toaster. Be aware that they will not perform the same actions. Generally, you use Return after typing text in order to restore the mouse pointer, while you use Enter to activate a function (as in, saving a Frame).

Select
A single click on an on screen button. This will highlight it, thus selecting it.

LightWave Screen Conventions

To make sure that your object appears in the proper orientation when loaded into LightWave there are a few conventions to keep in mind.

When you enter Layout, the camera is oriented so that it points into the positive Z axis. Note that the objects included with LightWave are created and oriented in this manner also. Keeping object orientation consistent will make for less alignment work in Renderer. The orientation of objects in LightWave matches the orientation they had at the time they were saved in the Modeler. While it may seem a little confusing at first to make a logo using a view labeled BACK, this positions the logo so that it will be facing toward you in LightWave.

Consider: The camera in Renderer sits at the center LightWave's spherical universe, facing forward (along the positive Z axis). Think of this in film terminology: another way to look at this is to say the camera is looking toward the "back wall" of a movie set. This is known as the BACK view in Modeler. Think of Modeler's BACK view as "looking toward the back wall" and you will have a clearer idea of the orientation.

Creating an object that looks correct in a FORWARD view in Modeler would appear backward, or reversed in Renderer. If you were to make it using FRONT view it would load backward in LightWave. This is because the BACK view has you looking into the positive Z axis, the same as in Layout.

Create objects with their actual size in mind. The included objects were created the same size they would be in reality. Again, the primary reason for this is ease of use in Renderer. You'll spend less time preparing scenes if you don't have to bother with constant resizing of the objects involved.

Entering Numeric Values

Throughout LightWave you have the ability to use numeric entry or numeric sliders to tell LightWave what value to use for, say, light brightness, color amount, ripple map amplitude, and more. You should know that all sliders range from 0-100, but if you prefer to use values higher than 100 (or 100%), you may enter them from the keyboard. For example, when you wish to "flood" a scene with light, set the value to 200%.

The LightWave 3D Interface Color Scheme

LightWave's screens may appear in one of two color schemes, depending on whether you are using a TV monitor or an RGB monitor, and on the setting of the Interface button on the Toaster Preferences screen. The gray scale is the preferred color scheme, and is generally easier to use. If you do not have the gray color scheme, go to Preferences and select the other monitor setting. (From the Switcher screen, you can press the Help key to switch monitor settings.)

Creating Objects Properly for LightWave 3D

Important Note: While the concept explained here can be extremely valuable to the 3D artist, if you're a newcomer to 3D it can be downright confusing. You can safely glance over this section at this time. Then, if objects don't look right when you use LightWave, remember to come back to this section to see if this may be the reason.

Surface Normals
Objects not created properly may not render properly in Renderer. Since this is a basic concept that can affect all your work, it is covered here. Improper rendering can be due to the facing direction of surface normals, or Phong shading.

- A polygon, one of the faces that makes up an object, may be "visible" from two sides — its front side and its back side. However, when only one side of a polygon will be seen in an image, it makes sense to use a one-sided polygon in its place. This causes the Renderer to use less memory and take less time to calculate an image.

The indicator that tells whether a polygon is one- or two-sided is called a surface normal. A surface normal looks like a small dotted line that protrudes perpendicularly from the face of a selected polygon. It indicates the side of the polygon that is "visible" when rendered. It may stick out one side (of a one-sided polygon) or both sides (of a two-sided polygon).

A polygon that faces the wrong way will not render properly. If you see objects rendering with missing faces, make sure that all surface normals are facing the right way.

- Phong shading is a mathematical method for calculating the shading of polygons across the surface of an object. Phong shading works with objects modeled a certain way. Compare the following images and text to understand this more clearly.
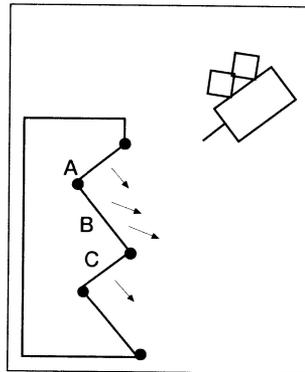
Left: An incorrectly shaded object.　　Center: Same object modeled differently.　　Right: Same object with split sections.
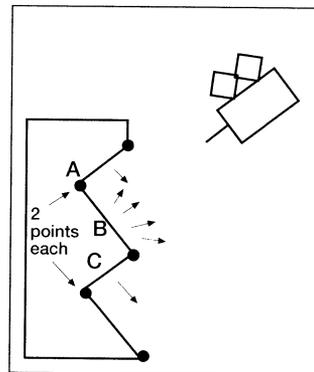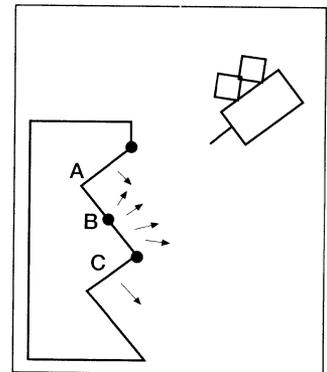
Sections A, B, and C will not be shaded as desired because of the way Phong shading calculates how surfaces should be shaded. It is generally with S-shaped objects such as these that shading errors will occur. This object was created with surfaces A, B, and C sharing connecting points.

The solution: model the object with those points as duplicates for the object to render correctly. In other words, each section would have its own set of points, as if this portion of the object were composed of three pairs of straight lines.

Note: After modeling an object in this fashion, do not perform a Merge Points operation. This would serve to join the segments, and recreate the problem.

Another solution: Split the surfaces with another point or line. The shading would then be calculated correctly.

Special Note: Texture Maps (which include Image Maps, Procedural Maps, and Bump Maps), are discussed in the back of the Lightwave section. Since these items can be accessed from several menus, they have been grouped together rather than be repeated.

Getting Around the Screen

The LightWave Main Screen (Renderer)

Main Menu Buttons
Each button enables a specialized control panel on the right, where you control all the aspects of the 3D world.

Main Menu Control Panel
This large area displays a variety of control panels, depending on which Main Menu button you press.
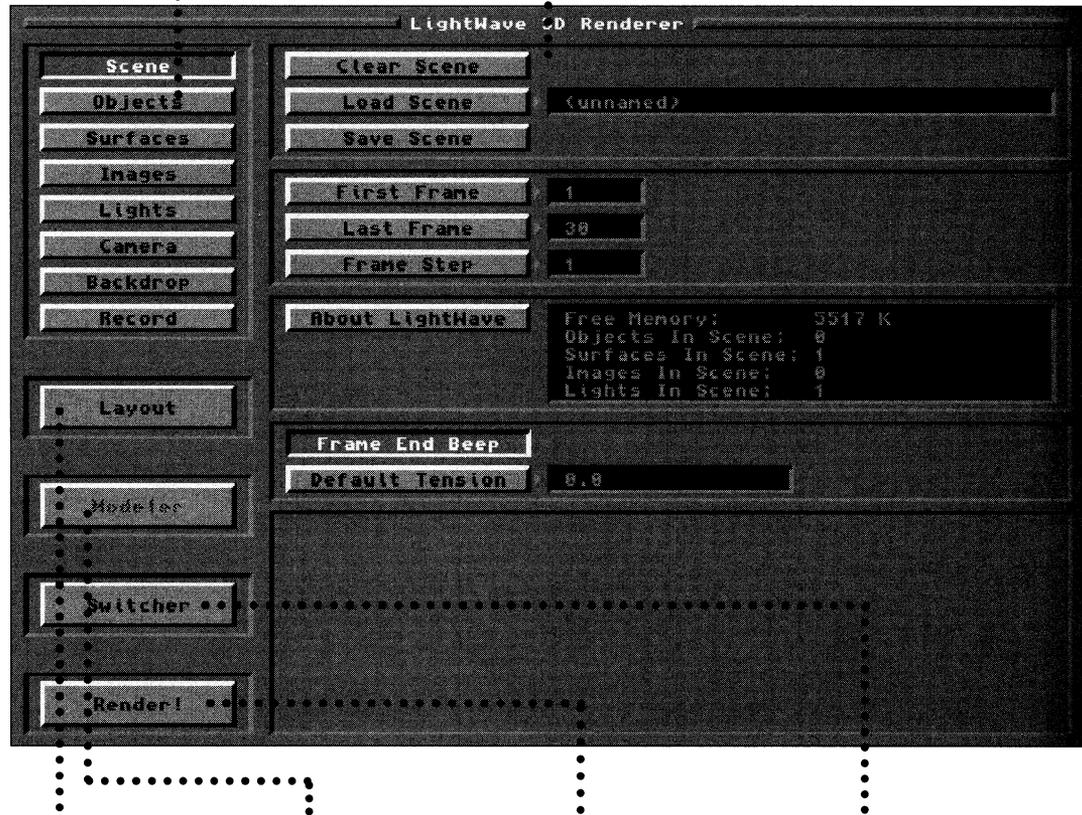
Layout Button
This button enters the Layout screen.

Modeler Button
This button enters LightWave Modeler.

Render Button
This button begins the rendering process.

Switcher Button
This button returns to the Switcher.

The LightWave Scene Layout Screen (Layout)

View Mode Buttons
These buttons change the Layout window's point of view.

Edit Item Buttons
These buttons select the onscreen item to be manipulated.

Mouse Function Buttons
These buttons select the manipulation to perform.

Axis/Direction Buttons
These buttons select the axis (or axes) to use for manipulation.
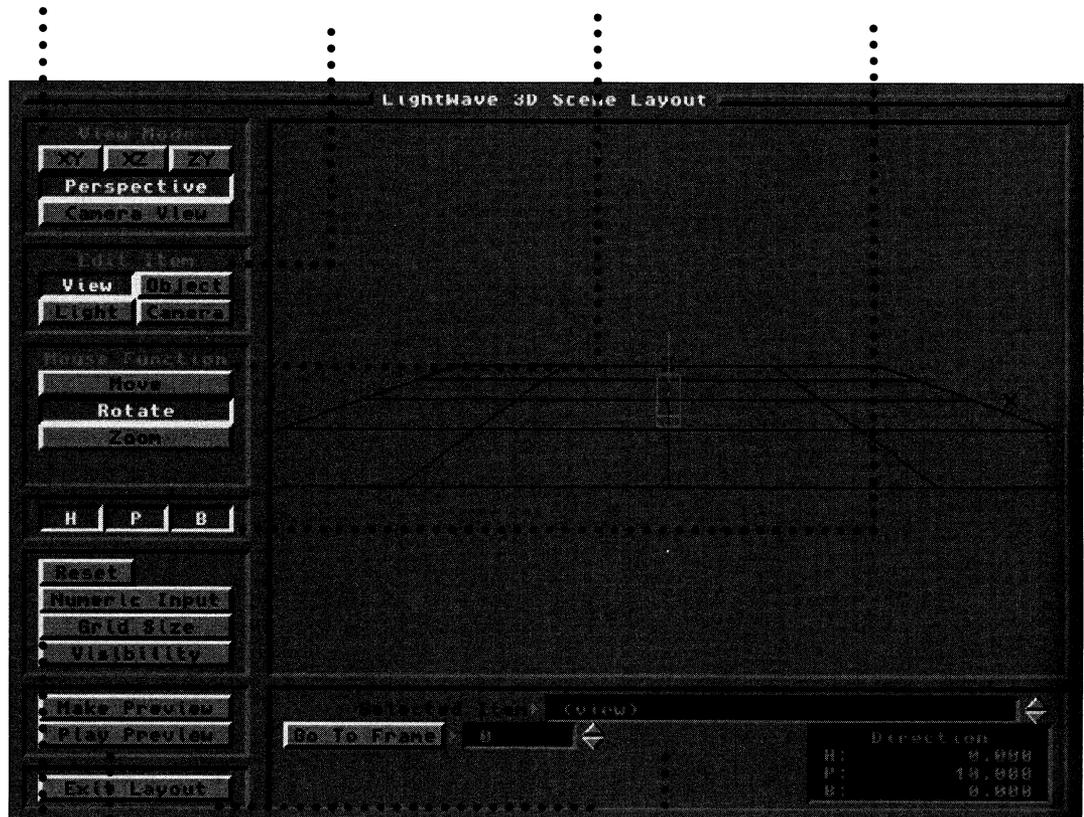
Layout Control Buttons
This panel contains different functions that affect the Layout workspace.

Preview Buttons
Use these two buttons to make and play wireframe preview animations.

Exit Layout Button
This button returns to LightWave Renderer.

Key Frame Control Buttons
Use these buttons to create and work with key frames in an animation.

The File Requester

In LightWave, the File Requester is the tool you use to Load or Save items. If you have used the Keypad Control Panel to load or save Framestore images from the Switcher Screen, the function of the file requester is similar. The difference is that the file requester allows you to see many files at once rather than just one file. Also, you can use the file requester to look on different devices for different files (the same devices you select for Framestores from the Preference screen). When you select a Load or Save function from within LightWave, you will see a file requester pop up on the screen, like so:

Parent button
This button takes you back one step in the file requester's listing.

The Scroll Bar
This allows you to view a long list of files within a directory.

Title Bar
This will display a reminder of the operation you have selected.

Device Buttons
These buttons select which device (drive or partition) to list.
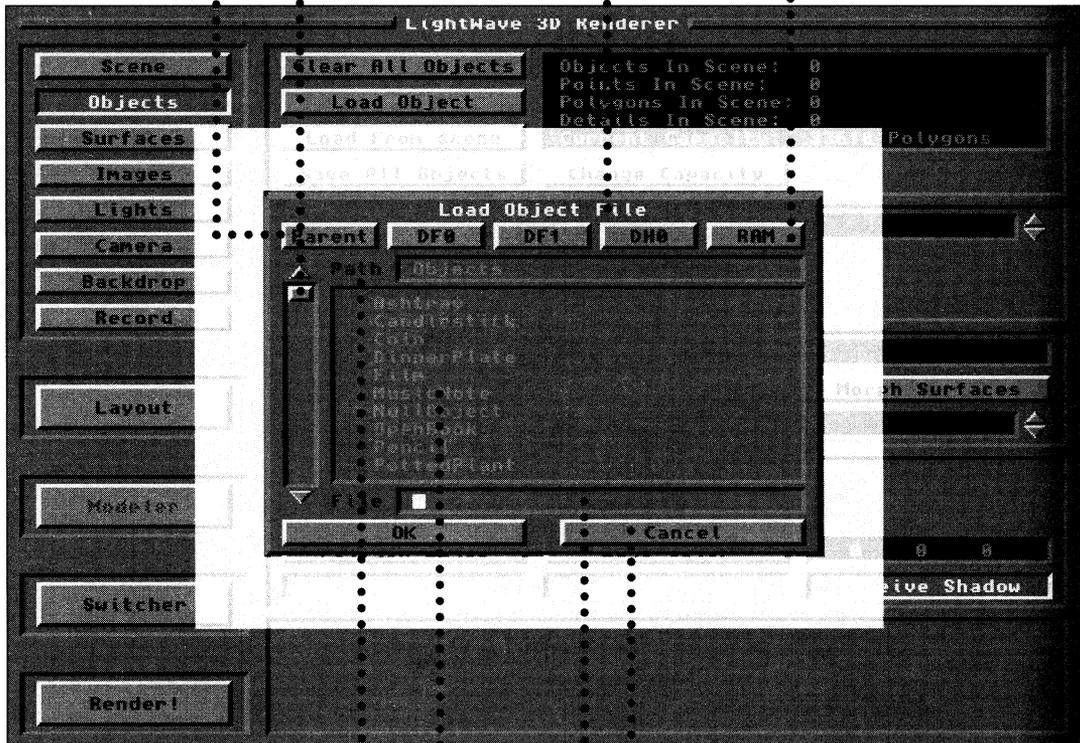
Drawer
This is the specific location on the device where the file requester the listing files from.

File Selection Window
This large area lists the files available within this drawer. To select a file, click on its name and it will appear in the File Name window below.

File Name Window
This window displays the filename selected from the File Selection window, above. You also may click in this window and type the name you wish.

OK and Cancel
These buttons allow you to OK your file selection, or Cancel the requester altogether if you should change your mind.

Reference

Scene
Objects
Surfaces
Images
Lights
Camera
Backdrop
Record
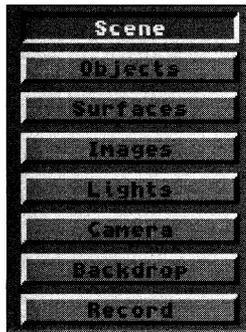
Scene

A scene is a collection of all of the information (such as objects, lights, camera, their positions, and more) used to render a single image or a complete animation.

```
Clear Scene
Load Scene          (unnamed)
Save Scene

First Frame         1
Last Frame          30
Frame Step          1

About LightWave     Free Memory:          5517 K
                    Objects In Scene:     0
                    Surfaces In Scene:    1
                    Images In Scene:      0
                    Lights In Scene:      1

Frame End Beep
Default Tension     0.0
```
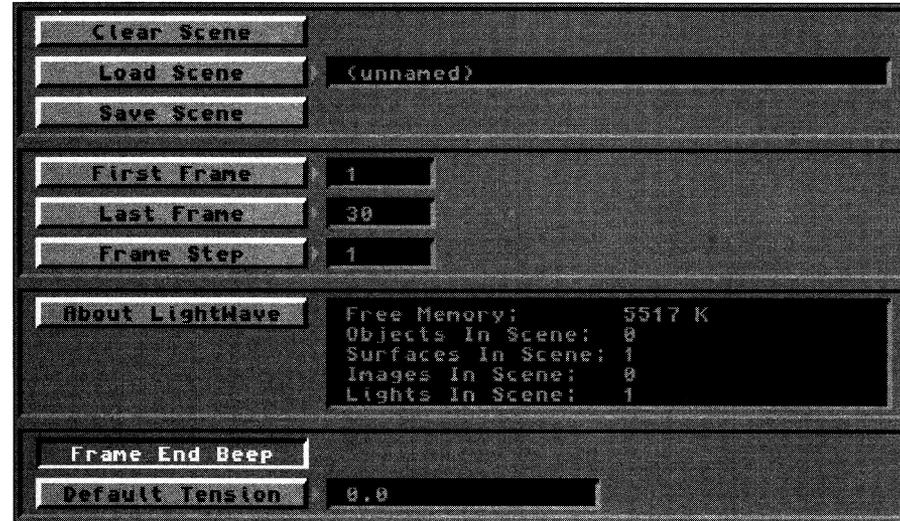
Clear Scene

Clear Scene clears all objects, images, motions, and envelopes, and returns the program to its default settings.

Load Scene

Load Scene loads all the necessary objects and motion files from the scene file you select. The window beside this button displays the name of the scene. If any element within the scene cannot be located (for example, if you had given an object a new name) LightWave will ask you if you wish to skip the item (cancel) or relocate it so that it may be loaded.

Note that the scene file keeps track of the original location (device and drawer names) where the objects were loaded from, as well. If you move any files to new locations, you may need to relocate them for LightWave when you next go to load the scene.

Save Scene

Save Scene saves all of the work that you have done in Layout. This includes information about what items were loaded, where they were loaded from, where they were positioned, and any motionpaths assigned to them.

Note that Save Scene does not save the surface settings for individual objects. Object surface settings are only saved individually (using the Save Surface button), or automatically (using the Save Object button, when saving the object).

First Frame, Last Frame

The settings for First Frame and Last Frame affect a number of other operations.

- When rendering an image, the number entered under First Frame is the frame that will be rendered. (When you click Render, and select the Manual button to render a single image, the Last Frame number is ignored.)

- When rendering an animation, the numbers entered for First Frame and Last Frame are used to determine which frames to render.

- When rendering a wireframe Preview animation in Layout, the numbers entered for First Frame and Last Frame are used to determine which frames may be previewed.

- When using the Play Frames button (after having rendered the images to a storage device), the numbers entered for First Frame and Last Frame are used to determine which frames to play back.

Frame Step
Frame Step skips over frames, saving test-rendering time in that you don't have to render every frame to see how an animation is progressing. This is useful for testing complicated animations that may require a lengthy rendering time. The number you type here will cause LightWave to render frames based on that number. A value of 1 (the default value) will render every single frame, 2 will render every second frame, 3 will render every third frame, and so on.

About LightWave
Click About to learn which revision of the LightWave software is installed on the Toaster. You may need to know this version number if you call Technical Support for assistance.

Screen Status Window
This window displays the information about the current screen.

Frame End Beep
Frame End Beep causes LightWave to produce an audible beep every time a frame has finished rendering.

Default Tension
This is an overall adjustment for the tension of motion paths that you create. Tension affects the tautness of the spline path between key frames. If you set a value here, any key frames you create will use this as their starting value. Key frames created before you use this button will not be affected by it. Recommended values here fall between -1 and 1.
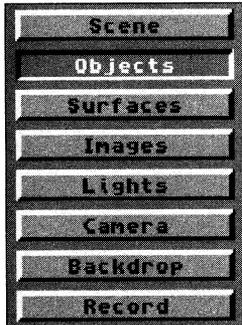
Objects
Click this button to access the object control panel.
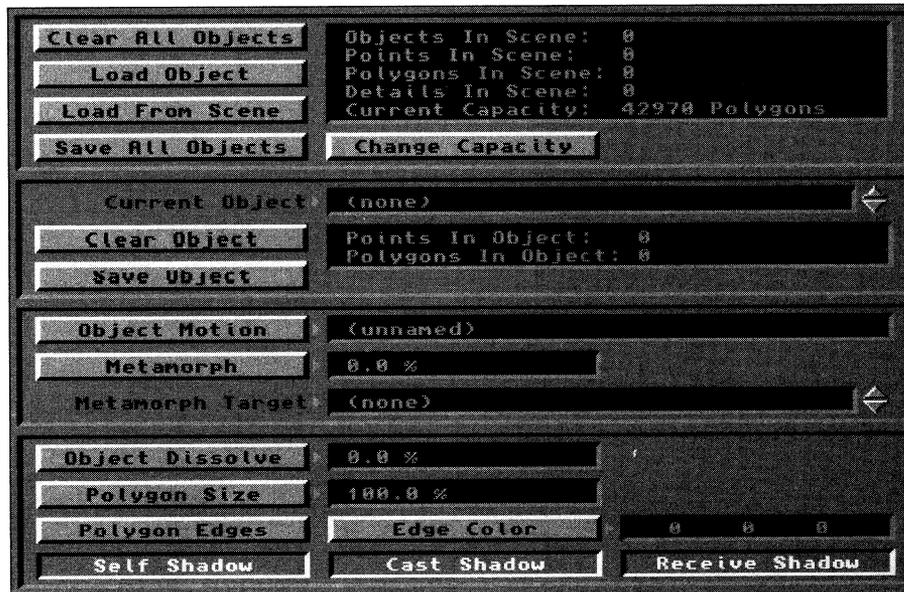
Clear All Objects
Clear All Objects removes all objects from the current scene. A requester will ask for confirmation.

Load Object
Load Object loads objects into Layout. A file requester will appear. By default, it displays the contents of the Objects directory on your hard drive. To direct LightWave to list the objects from another location, click another button at the top of the file requester, and click on the directory you desire. When you locate the object, click directly on it. Its name will appear in the File Name Window at the bottom of the requester. Click OK to load the object.

Objects and images require memory to be loaded into LightWave. The more objects and images you plan to use, the more memory you may need. If you have loaded many complex objects and do not have very much memory, you may have to be selective about the objects you load. Plan accordingly.

Currently, LightWave loads the object file formats listed here. (Others may have been added after this manual went to

press.) Lightwave will attempt to load these files. If it cannot identify a file with certainty, it will display a menu where you may select the type of file you are loading. Lightwave will then load the object. See the Appendix called T10.

- Videoscape 3D
- Sculpt 3D/4D
- AutoCAD DXF
- 3D Studio .3Ds
- Swivel 3D Pro
- Wavefront .obj

Load From Scene
Click Load From Scene to load the objects, motions, and parent information from a scene file into the current scene.

Save All Objects
Click Save All Objects to perform an automatic save of all objects in the current scene (with their existing object and surface names and settings). If you confirm this operation, the objects will be saved over any objects with the same names in the Objects directory.

Change Capacity
Click Change Capacity to change the maximum numbers of Points and Polygons allowed. Enter the new maximum value, and press Return. Values up to 65530 are allowed. It's a good idea not to raise the level much higher than you need, as more memory is used by higher values.

AllObjects Status window
The All Objects Status window provides the following information: the number of objects in the scene, the number of points in the scene, the number of polygons in the scene, the number of detail (or attached) polygons in the scene, and the current number of polygons your system can support.

Current Object window
This window provides information as to the number of objects loaded, and the number of points and polygons they utilize. The Current Limit reflects the maximum number available with the amount of RAM you now have (this number may vary, depending on whether other Toaster Applications are or have been active). Use the arrow buttons to scroll through the list of objects that have been loaded.

Clear Object
Click Clear Object to remove the object listed in the Current Object Window from the current scene.

Save Object
This button saves the current object and any surface settings that have been modified. This is the only method for saving an object's surface settings with the object itself. Surface settings are not saved when you use the Save Scene button.

Note also that this does not save changes made (in Layout) to an object's size. The Size and Stretch commands in Layout do not permanently change an object, they are just part of the scene description. To permanently alter an object's size, you must use LightWave Modeler.

Warning: Saving an object using the same name as a previous object will write the new object over the old one. The previous object will no longer exist. Recommendation: Save objects with different surfaces under slightly different names. For example, Ball might be changed and saved as Blue_Ball, or Ball_2, or Rough_Ball.

Current Object Status Window
The Current Oblect Status Window provides information about the number of pointd and polygons in the current object.

Object Motion
In order to load, save, and modify motion files for an object, click this button to enable to Object Motion control panel. Motion files contain information on object movement in a scene.

When you create an animation for an object, the computer saves a list of instructions that it will use to recreate the movements in the future. In Layout, motion files are created automatically as you move objects and create key frames.

Here, you can change existing motion files or create new ones from scratch.

When you have completed modifications on this screen, click Use Motion to return to the main screen.

Clear Motion
Click Clear Motion to clear the current motion file.

Load Motion
Click Load Motion to load a motion path. As with Save Motion, these files can be used by lights, objects, or the camera. When you load a motion file, its name appears in the window to the right of the button. Underneath the status window is the motion file information, displaying the number of key frames and the total number of frames in the motion file.

Why load or save motion files? A previously saved motion file can be incredibly useful. Assume you had created an animation where a company logo spins onscreen. Another client sees the animation and wants the same treatment for his logo. Once you have created his logo in Modeler and loaded it into Layout, load the previously saved motion file for the old logo. The new logo will now follow the exact same motions as the old one, saving you a great deal of work recreating the movement.

Save Motion
Click this button to save a motion path.

The Frame Display Window
This window displays the total number of frames and key frames.

End Behavior
End Behavior determines how an item will be treated when it reaches the end of its motion path. There are three end behaviors:

> **Reset** will reset all object values for the frame immediately after the final key frame. X, Y, Z (position) and H, P, B (direction) reset to zero. Object size resets to a factor of one. Assume a car hits a wall and falls to pieces. In the scene to follow, the car is once again whole. This is the function of the Reset button. Immediately following the last key frame in a motion file, the item would return to the values it had when first loaded into LightWave 3D.

> **Stop** will cause the object to stop, leaving it where it is upon reaching its final key frame. If there are 150 frames in your animation, and the car in your animation only has 60 frames, it will stay where it was at in frame 60. This is useful if the car was to park at a selected point.

> **Repeat** will have the object "loop through" the motion file until the end of the animation (if it is shorter than the animation itself). This is useful for objects with moving parts, such as a car with with rotating wheels. For a wheel to rotate 360' per second, create a key frame at frame zero with no rotation, and again at frame 30 with 360' of rotation. Use the Parent button to attach the wheel to the car. For a 300 frame (10 second) animation, with the wheel motion file 30 frames (1 second), the wheel would repeat the motion file every 30 frames. The wheel would rotate ten times over the course of animation.

Parent Object Window
The Parent Object Window displays the name of the object that is acting as the Parent for the current object. This is called a hierarchical relationship, indicating that one object follows the actions of another, its parent. Such relationships are useful for creating complicated objects with different moving parts. For example, your shoulder is the parent of your upper arm, which is the parent of your forearm, which is the parent of your hand, which is the parent of your fingers. Further detail, such as the elbow, wrist, or the individual joints of your fingers, involve further use of the parent button. There is also a Parent button on the Layout screen as well.

Position control panel
Use this control panel to specify the exact position and orientation of an object with X, Y, Z coordinates.

Position

Use Position to place an object at an exact X, Y, Z location, or to slightly adjust an object's position. Click Position, type in exact numbers, then click Use Motion to accept the new coordinates (or click Cancel to return to the original coordinates).

This is equivalent to clicking Move and then Numeric in Layout.

Direction

Use Direction to set the orientation of an object in any of three directions:
>   Heading - The direction an object faces (left or the right facing)
>   Pitch - The forward or backward tilt of an object (up or down tilting)
>   Bank - The left or right tilt of an object (left side to right side tilting)
>   Click Direction, type in exact numbers, then click Use Motion to accept the new orientation (or click Cancel to retain the original orientation).

This is equivalent to clicking Rotate and then Numeric in Layout.

Scale

Scale adjusts an object's size. Click Scale, type in exact numbers, then click Use Motion to accept the new scale (or click Cancel to return to the original scale). A value of 1 multiplies the object's size by 1, leaving it unchanged. Values above 1 increase size in the chosen dimension, values below 1 decrease size.

This is equivalent to clicking Stretch and then Numeric in Layout.

Linear

Linear determines the type of motion—straight or curved. Normally, movement in LightWave is along a spline path, i.e., it is non-linear. Click Linear to set object movement to straight lines at a constant speed.

Note that by turning Linear on or off at different key frames, motion paths may contain both smooth, curving arcs and straight-line segments. The Linear button only affects the path between the current key frame and the previous one.

Example:
Under Scenes, set the Last Frame to be 40. Under Objects, load the Knight (under Objects/Games/Chess Set). Click Layout. Go to the XZ (top) view. Place the Knight at the top center of the Layout Window and create a key frame at frame zero. Go to frame 10, place the Knight at the right center of the screen and create a key frame. Go to frame 20, place the Knight at the bottom center of the screen and create a key frame. Go to frame 30, place the Knight at the left center of the screen and create a key frame. Finally, go to frame 40, again place the Knight at the top center of the screen and create a key frame.

Click Make Preview. You will see the computer calculating the frames of the animation. When it has finished, click Play Preview and watch the animation. Notice how the Knight travels in a near-circle around the screen.

Exit Layout and return to the Objects control panel. Click Object Motion. Set the current frame to 0 and click Linear. Set the current frame to 10 and click Linear. Do this again for frames 20, 30, and 40. Click Use Motion.

Again, enter Layout and select the XZ (top) view mode. Click Make Preview. A completely different animation will be constructed. When it finishes, click Play Preview. The Knight will now move in straight lines between key frames. This is Linear motion.

Spline Controls

Spline Controls are advanced animation tools used to fine-tune object motion. If you animate a great deal, you may find these controls useful. Recommended values for each characteristic are given. Between these two end values, smaller value increments may be used.

Tension (Values: 0 = normal tension, 1 = high tension)

Tension causes an object in motion to slow down (move a little bit less in each frame) as it nears the key frame, and to accelerate (resume speed) as it passed. Without tension the object would pass through the key frame position at a constant speed. A pendulum is a good example. Tension on the key frames at either end of its swing would cause the pendulum to slow as it neared those key frames, and to accelerate away from them on the downward swing of its motion.

Note that any value set in Default Tension (under Surface) will automatically be entered in Tension all key frames created afterward. Key frames created prior to that will not be affected.

Continuity (Values: -1 = sharp continuity, 0 = normal continuity)

Continuity is used to accentuate a break or change in an object's motion path. It has no effect on the incoming or outgoing speed of the object, which is the function of tension. A bouncing ball provides a good example of both tension and continuity. At the top of its bounce, use tension to slow the rising motion and speed the falling motion of the ball. At the bottom of the bounce, a negative continuity value will accentuate the sharp change in the ball's sudden change of direction as it bounces off the ground.

Bias (Values: -1 = more slack incoming, 0 = equal slack, 1 = more slack outgoing)

Bias controls the "slack" at key frames that is the nature of spline paths. A typical spline path would "round off" angles in a motion path. Bias allows you to move this rounding off toward one side of the key frame or the other. This serves to accentuate motion: the incoming motion by undershooting the key frame (creating a feeling of anticipation) or the outgoing motion by overshooting the key frame.

Use Motion

Click Use Motion to exit the Object Motion control panel.

Metamorph

Metamorph transforms the current object's shape, color, or both, into that of another (the Morph Target). Metamorphosis requires the number of points in the objects to be equal. You cannot morph successfully between objects with a different number of points. A value of 50% would be half a transformation between the two objects.

To metamorphosize an object when rendering a single image: load two objects that share the same number of points, set one to be the Morph Target, set a Metamorph level, and render the image. To morph an object (or up to 16 objects) within an animation, use an Envelope.

Morph Surfaces

Morph Surfaces will cause the surface appearance of the current object to metamorphosize into the surface appearance of the target object as the object's shape changes.

Metamorph Target Window

Morph Target is the destination object for the Metamorph button. It contains the shape or color the object will change into. To select a Morph Target, or multiple targets, load all objects involved. Then choose the first object in the current window, and the target object in the metamorph window. If there are more objects to morph, continue the process.

Object Dissolve

Object Dissolve determines the percentage of visibility (or solidity) of an object, allowing it to fade out of a scene for example. To use Object Dissolve on an object in a single frame, click it, set a dissolve value, and render the image. To dissolve an object within an animation, use an Envelope.

Envelope

Click on Envelope to control the gradual fading in or out of an object during an animation. For detailed descriptions of the buttons found within envelope control panels, see "Working with Envelopes" at the end of this section.

Polygon Size

This button determines the size of the polygons in the object. It is useful for exploding objects or dissolving them into dust particles. If you decrease the polygon size, the object will break apart as the polygons travel toward the center of the object. Polygon Size affects the rendered image only. You will not see Polygon Size affect the wireframe appearance or preview animations on the Layout screen.

Envelope

Click on Envelope to control the polygon size of an object during an animation. For detailed descriptions of the buttons found within envelope control panels, see "Working with Envelopes" at the end of this section.

Polygon Edges

Polygon Edges causes all polygons in the scene to be outlined with the Edge Color. This could be used to create a wireframe look to items in the animation. Objects not created in LightWave Modeler might not be useful if they are composed of triangle-based polygons.

Edge Color

Click Edge Color to set the color of the edge when Polygon Edges is selected.

Self Shadow

Click this option to allow an object to cast a shadow on itself. This is useful if an object is the center of attention for a scene or animation.

Cast Shadow

Click this option to allow an object to cast a shadow onto other objects in the scene. This is useful if an object is in the background of a scene or animation, and its shadow would not be important.

Receive Shadow

Click this option to allow an object to receive a shadow being cast upon it by another object. This is useful for objects that receive a shadow, such as a lamp casting a shadow on the floor. In such a case the floor would receive a shadow, and the lamp would cast a shadow but not receive one.
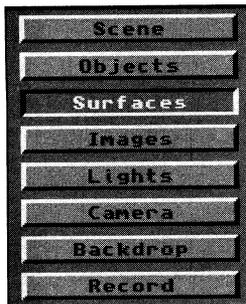
Surfaces

The Surfaces button accesses the Surfaces Control Panel within LightWave. Here you select proper colors, decide on textures, and apply image maps to the objects within scenes to determine the photographic appearance of the final rendered image—from stunning realism to cartoonish simplicity.

Current Surface Window

The Current Surface window contains a listing of the surfaces for all objects that have been loaded into Layout. To select different surface names click the up/down arrows to the right of this window. If multiple objects are loaded, all of their surface names will be listed in this window.

Load Surface

Use Load Surface to load previously saved surface definitions (including all color and texture qualities) onto another surface or object. To use: list the surface in the Current Surface Window, select Load Surface, select the surface you desire, and click OK.

Save Surface

Use Save Surface to save all surface settings of the current surface to a separate file. This is especially useful when you have several different surface names that need to share the same settings. Define the settings on one surface, save them, then load them onto the other surfaces.

Rename Surface

Use Rename Surface to change the name of the current surface. You might rename a surface from "legs" to "mahogany legs" as a better reminder of their appearance. Second, if you load multiple copies of an object with the idea of coloring them differently, you'll find that the objects remain distinct, as "couch (1)," "couch (2)," etc., but that their surface names become shared. Use Rename Surface to rename the first couch's surface names before loading the second couch. Then you'll be able to define their surfaces separately.

Note: To save the new surface name as a permanent part of the object, you must then resave the object. Otherwise, the change is only used during the current session.

Surface Color

Surface Color is where color and texture properties are assigned to the polygons that make up a given surface. Most objects consist of parts that have different colors and textures. Select a surface to alter by displaying its name in the Current Surface window. Alterations made to surface colors affect only the surface that is listed in the Current Surface window.

The three sets of numbers in the Surface Color menu refer to the amounts of red, green, and blue in the current surface color. Each color slider may vary between 0-255. To adjust a color, click the Surface Color button. Click any slider

gadget and drag to the left or right to raise or lower its color value. The Surface Color Bar at the bottom of the screen shows the current color value.

You can also type in the new color values directly. Since the cursor automatically appears in the first color box, type in a new value immediately without erasing the old one. Press Return, and the new value replaces the old one.

Texture

Clicking Texture on the Surface Color menu accesses the texture mapping control panels. The up/down arrows at the right of the window scroll through the available listings. A Surface Color texture map casts a projection-mapped image directly onto the assigned surface, ignoring any surface color values set in the Surface Color requester. For example, a surface projection map of a brilliant red sunset onto a blue vase yields a resulting image of a vase covered with a brilliant red sunset. If a procedural texture is used, two sets of color values are used to create the texture of the surface: those of the Surface Color requester and those set within that texture map's control panel.

Through the Surface Color Texture button, three projection and seven texture map types are available. Note that the procedural maps are best used for image maps that move, or for objects that need to appear solid (such as a block of wood). Otherwise, most mapping is projection texture mapping, which achieves the greatest realism by using real-life images mapped onto surfaces.

Luminous

Luminous will cause the selected surface to appear perfectly lit, even in darkness. It is best used to depict light sources, such as neon.

Outline Only

OutLine Only causes the polygons that make up this object to be rendered as outlines rather than surfaces. The outlines will render in the surface color.

Sharp Terminator

Sharp Terminator is used to cause a more severe shadow edge on objects rather than a gradual falloff of light. The planet Earth from the Revolution video is rendered with Sharp Terminator activated.

Diffuse

Diffusion affects the amount of surface color that reflects off an object. An object with low diffusion will appear dim, almost unlit. An object with high diffusion will appear solid and fully lit. To achieve more realistic appearances, especially with reflective surfaces, do not set Diffuse too high.

Texture

Clicking Texture on the Diffuse menu accesses the texture mapping control panels. The up/down arrows at the right of the window scroll through the available listings. A Diffuse texture map uses the differences in brightness from the projection mapped image or procedural texture pattern to map apparent surface variations. It uses no color information for this. For a diffuse projection map of a brilliant red sunset onto a blue vase, the resulting image would be that of a blue vase with a sunset on its surface that is rendered entirely in varying shades of the blue vase color.

Through the Diffuse texture map button, three projection and seven texture map types are available. See "About Texture Mapping" at the end of this section.

Specular

Specular determines the amount of highlight reflection on a surface, if any. The highlight will be the color of the light source.

Texture

Clicking Texture on the Specular menu accesses the texture mapping control panels. The up/down arrows at the right of the windows scroll through the available listings. Specular maps a projection mapped image or the pattern of a procedural texture so that the image or texture is visible only where specular highlights occur on the surface. For a specular projection map of a brilliant red sunset onto a blue vase, the resulting image would be portions of the sunset (with its original red colors) showing through the specular reflections on the surface of

the vase. Use lower glossiness settings for greater visibility with this type of mapping.

Through the Specular texture map button, three projection and seven texture map types are available. See "About Texture Mapping" at the end of this section.

Color Highlights
Color Highlights causes the object's surface color to "show through" the specular highlight. Normally, a specular highlight shows in the color of the light striking the object. A color highlights blends the object's color with the light source's color, causing a more metallic appearance. Reflection maps are also tinted by the surface color when a reflection map is being used.

Glossiness
Gloss determines how spread out the highlight is on a surface (the specular reflection). Glossiness may be set Low, Medium, or High.

Reflection Map
Reflection Map determines the level of reflection in an object's surface. This can be a reflection of the sky and ground colors, or an image you select. A reflection level of 100% will cause the object's surface to be completely reflective (i.e., none of its own color will be visible) unless color highlights or some percentage of diffuse or specularity is used.

Texture
Clicking Texture on the Reflection Map menu accesses the texture mapping control panels. The up/down arrows at the right of the window scroll through the available listings. Reflection uses the differences in brightness from the projection mapped image or procedural texture pattern and creates a reflected appearance. For a reflected projection map of a brilliant red sunset onto a blue vase, the resulting image would be that of a blue vase reflecting the colors of its surroundings in such a manner that the highlights hint at the shape of the sunset image. The amount of reflection will vary, with more reflection occurring where the mapped image is brighter (and less where it is darker). Brighter areas are more reflective and mirrored, dark areas are less so.

Through the Reflection Map texture map button, three projection and seven texture map types are available. See "About Texture Mapping" at the end of this section.

Reflected Image
Reflected Image allows you to reflect an image in the surface of the currently selected object. To select an image, click the up/down arrows to the right of this window.

The higher the reflection map percentage, the more that the image will be calculated in the surface as opposed to the original surface color. A value of 100% would cause the image to be the entire source of color for the surface.

Transparency
Transparency determines the amount of light passing through the surface. 0% means the object is opaque. A high percentage of Transparency will produce a glass-like appearance.

Texture
Clicking Texture on the Transparency menu accesses the texture mapping control panels. The up/down arrows at the right of the window to scroll through the available listings. Transparency uses the differences in brightness for the projection mapped image or procedural texture pattern to create transparency. Brighter areas will map more transparently, and darker areas are more solidly. In a transparent projection map of a sunset image onto a vase, the vase would be see-through where the sun appears, while darker portions of the image would be more solid (and show more of the blue vase underneath). Brighter areas are more see-through, dark areas more opaque.

Through the Transparency texture map button, three projection and seven texture map types are available. See "About Texture Mapping" at the end of this section.

Color Filter
Selecting color filter allows only the surface color to pass through a transparent object's surface. Imagine looking through a green wine bottle. Objects behind it would be green as well, even the light sources. Useful for color glass.

Refractive Index
Refraction is used to emulate the bending of light as it passes through glass or glass-like objects. Most useful values here range from 1.0 - 2.4. For a list of specific refractive indices, see the chart at the back of the LightWave reference.

Edge Opacity
Edge Opacity determines the degree of delineation for surface edges. A Clear Edge causes the object to blend into its surroundings. Opaque Edge creates a solid edge.

Edge Threshold
Edge Threshold affects only the Transparent and Opaque settings under Edge Transparency. Edge Threshold determines the amount of blending between the surface color and the transparent part of the object surface. This transition zone may be wide, softly blended over the face of the surface; or it may be sharp, apparent as a thinner line.

Edge Threshold is normally set a 1.0. Use lower values for a sharper transition. Use higher values for a softer transition.

Bump Map
Click Bump Map to apply a "bumpy" appearance to a surface. This button takes you directly to a selection of bump map types, many of which are similar to texture map types explained earlier. Depending on the type of mapping you choose, you can create the appearance of raised and lowered portions to any surface in the form of image maps, ripples, and bumps.

Smoothing
Smoothing makes objects appear to have smoothly rounded surfaces even though the object is composed of flat polygons. This is sometimes referred to as "Phong Shading."

If two smooth-shaded polygons share a side and have some vertices in common, they will appear as one continuous curved surface. The shared edge between them will no longer be visible. The program will not try and smooth across two polygons if the angle between them is 90 degrees or sharper.

Double Sided
If you are importing objects from other 3D modelling programs, either directly or through a conversion utility, LightWave may be unable to determine which direction some polygons face, causing the object to render improperly. Click Double Sided to cause LightWave to treat all polygons on the selected surface as two sided, correcting for any rendering errors.

Note that this will increase rendering time, as there are more polygons to calculate. Note also that if you select Double Sided, then save the object, the Double Sided setting will remain intact as a part of the surface description for this surface.
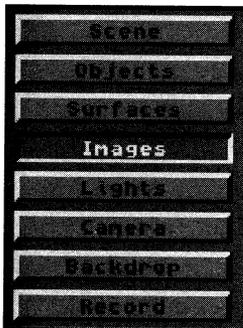
Images Control Panel
In the Images control panel you can load IFF images (from 2-bit black-and-white to 24-bit true color) for use as background, texture, or bump maps.

Clear All Images
Clear Images will clear all images that have been loaded.

All Images Status Window
This window displays the total number of images currently loaded into LightWave.

Load Image

Load Image allows you to load an image. LightWave will directly accept:
- Framestore files

- Images saved using Save RGB from ToasterPaint

- Brushes saved from ToasterPaint

- Standard format IFF images and brushes, from 2-bit to 24-bit

Load Sequence
Load Sequence allows you to use a set of images as sequential image maps on an object or surface during an animation. The sequence of images must have the same prefix, which you select from a file requester, followed by a sequentially-numbered suffix. For example, to load the sequence FlyBy001, FlyBy002, FlyBy003, etc., enter only FlyBy in the file requester. LightWave uses the prefix only, and will determine the numerical order to follow. (See Load Image, above, for specifics on acceptable image formats.)

Note that if you click on the name FlyBy001 and select OK in the file requester, LightWave will be unable to locate the correct files. Make certain the three-digit suffix has been removed before clicking OK.

Current Image Window
This displays the current image. If more than one image has been loaded, the arrows to the right of this window scroll through their names.

Clear Image
This removes the current image from memory. If more than one image has been loaded, use the arrows to the right of this window to locate the image you wish to remove.

Current Image Status Window
The Image Status window displays the resolution of the current image, the depth in bitplanes, and the amount of RAM used by the image.

Frame Offset
Frame Offset functions in conjunction with Load Sequence. Using the FlyBy sequence example from the Load Sequence button, if you wanted to skip the first 60 frames of FlyBy for image mapping, enter 60 here. LightWave will ignore the first 60 frames and begin image mapping with frame 61. This is useful if you need to continue animating from an interrupted point.

Loop Sequence
Click this button to have a sequence repeat itself upon reaching its final frame (if it contains fewer frames than the entire animation itself).

Loop Length
Click this button and enter a value to have a sequence repeat itself a certain number of times within an animation. Enter the number of repetitions here.
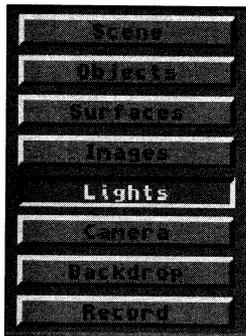
Lights Control Panel

Click Lights to enable the Lighting Control Panel.
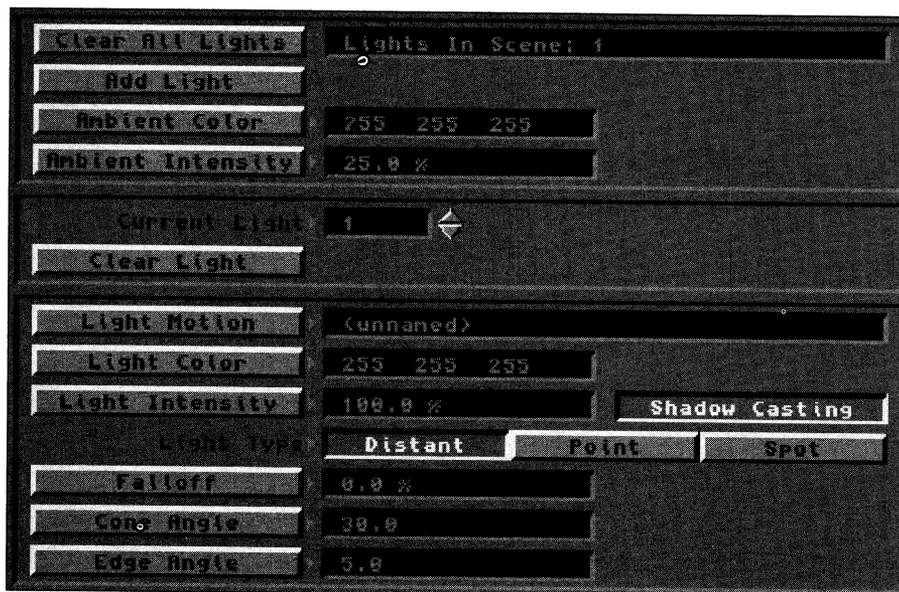
Clear All Lights
Click Clear Lights to clear all lights from the screen except for the one default light source.

Add Light
Click Add Light to add additional lights to the scene. Note that the more lights in the scene the longer the rendering time.

Ambient Color
Click Ambient Color to modify the R, G, and B color values for ambient light.

Ambient Intensity
Ambient light shines equally on all surfaces, and adds an amount of light to the overall scene. Without ambient light, unlit surfaces are completely dark. With too much ambient light scenes appear washed out, without shading. A value of 100% will light evenly all sides of all objects. An intensity value greater than 25% (the default amount) may tend to wash out your pictures.

> **Envelope**
> Click Envelope to animate the amount of ambient light over a series of frames. For detailed descriptions of the buttons found within envelope control panels, see "About Texture Mapping" at the end of this section.

Current Light window
The Current Light window displays the number of the active light source. To change the values of a different light source, click the arrows beside the window.

Clear Light
Click Clear Light to remove the current light from the scene.

Light Motion
The Light Motion allows you to choose motion paths for your lights, independent of the camera and objects. The advantage of this is you can choose the same path for the lights and lock the lights onto the object through the entire animation (to maintain constant lighting), or you can change the lighting throughout to create striking lighting effects.

Clear Motion
Clear Motion clears any loaded motion files for the current light source.

Load Motion

Click Load Motion to load previously created motion files onto a light source. Motion files can be used by lights, objects, or the camera. When you load a motion file, its name appears in the window to the right of the button. Underneath the status window is the motion file information, displaying the number of key frames and the total number of frames in the motion file.

Save Motion

This button brings up a requester that allows you to store this motion file for future use. Motion paths may be used by lights, objects, or the camera.

The Frame Display Window

This window displays the total number of frames and key frames.

End Behavior

End Behavior determines how an item will be treated when it reaches the end of its motion path. There are three end behaviors:

> **Reset** will reset all object values for the frame immediately after the final key frame. X, Y, Z (position) and H, P, B (direction) reset to zero. Object size resets to a factor of one.

> **Stop** will cause the object to stop, leaving it where it is upon reaching its final key frame.

> **Repeat** will have the object "loop through" the motion file until the end of the animation (if it is shorter than the animation itself).

Parent Object Window

The Parent Object Window displays the name of the object that is acting as the Parent for the current object. This is called a hierarchical relationship, indicating that one object follows the actions of another, its parent. Such relationships are useful for creating complicated objects with different moving parts. For example, your shoulder is the parent of your upper arm, which is the parent of your forearm, which is the parent of your hand, which is the parent of your fingers. Further detail, such as the elbow, wrist, or the individual joints of your fingers, involve further use of the parent button.

There is also a Parent button on the Layout screen as well.

Target Object Window

The Target Object Window refers to the object the light source is trained on. This command is useful for locking the light source to an object that is in motion.

Position control panel

Use this control panel to specify the exact position and orientation of an object with X, Y, Z coordinates.

Current Key Frame Window

The Current Frame Window allows you to go to any frame to adjust the light's position and orientation using the coordinate values in the Position and Direction buttons.

Position

Use Position to place an object at an exact X, Y, Z location, or to slightly adjust an object's position. Click Position, type in exact numbers, then click Use Motion to accept the new coordinates (or click Cancel to return to the original coordinates). This is equivalent to clicking Move and then Numeric in Layout.

Direction

Use Direction to set the orientation of an object in any of three directions:
> Heading - The direction an object faces (left or the right facing)
> Pitch - The forward or backward tilt of an object (up or down tilting)
> Bank - The left or right tilt of an object (left side to right side tilting)
> Click Direction, type in exact numbers, then click Use Motion to accept the new orientation (or click Cancel to retain the original orientation).

This is equivalent to clicking Rotate and then Numeric in Layout.

Linear

Linear determines the type of motion—straight or curved. Normally, movement in LightWave is along a spline path, i.e., it is non-linear. Click Linear to set object movement to straight lines at a constant speed.

Note that by turning Linear on or off at different key frames, motion paths may contain both smooth, curving arcs and straight-line segments. The Linear button only affects the path between the current key frame and the previous one.

Spline Controls

Spline Controls are advanced animation tools used to fine-tune object motion. If you animate a great deal, you may find these controls useful. Recommended values for each characteristic are given. Between these two end values, smaller value increments may be used.

Tension (Values: 0 = normal tension, 1 = high tension)

Tension causes an object in motion to slow down (move a little bit less in each frame) as it nears the key frame, and to accelerate (resume speed) as it passed. Without tension the object would pass through the key frame position at a constant speed. A pendulum is a good example. Tension on the key frames at either end of its swing would cause the pendulum to slow as it neared those key frames, and to accelerate away from them on the downward swing of its motion.

Note that any value set in Default Tension (under Surface) will automatically be entered in Tension all key frames created afterward. Key frames created prior to that will not be affected.

Continuity (Values: -1 = sharp continuity, 0 = normal continuity)

Continuity is used to accentuate a break or change in an object's motion path. It has no effect on the incoming or outgoing speed of the object, which is the function of tension. A bouncing ball provides a good example of both tension and continuity. At the top of its bounce, use tension to slow the rising motion and speed the falling motion of the ball. At the bottom of the bounce, a negative continuity value will accentuate the sharp change in the ball's sudden change of direction as it bounces off the ground.

Bias (Values: -1 = more slack incoming, 0 = equal slack, 1 = more slack outgoing)

Bias controls the "slack" at key frames that is the nature of spline paths. A typical spline path would "round off" angles in a motion path. Bias allows you to move this rounding off toward one side of the key frame or the other. This serves to accentuate motion: the incoming motion by undershooting the key frame (creating a feeling of anticipation) or the outgoing motion by overshooting the key frame.

Use Motion

Click Use Motion to accept any changes that you have made and to return to the Lights control panel.

Light Color

Click Light Color to adjust the color of the currently selected light using the R, G, B color sliders.

Intensity

Intensity determines the brightness of the light source from 0-100%.

Envelope

Click Envelope to animate a light's intensity over a sequence of frames. Think of it as a dimmer control. For detailed descriptions of the buttons found within envelope control panels, see "About Texture Mapping" at the end of this section.

Shadow Casting

Click Shadow Casting to cause the objects that are illuminated by this light to cast shadows. Note that this is a ray tracing feature, and may greatly increase the rendering time.

Light Types
There are three different types of light sources in LightWave: Distant, Point, and Spot Lights.

Distant (sometimes called "Directional" or "Infinite" lights)
This type of light shines in the same direction equally across the scene. The actual location of the light source icon and its nearness to any objects in Layout has no effect; only the direction that it faces matters. Sunlight is usually modeled this way.

Point
This type of light radiates in all directions from a single point, such as the light of a campfire, a bare light bulb, or a candle flame. It appears as a star in Layout, since it does not face a particular direction.

Spot
This type of light is like stage spotlight, a cone of light emanating from a single point in a single direction, such as flashlights or car headlights..

Falloff
Falloff determines how Point light or Spot light intensity falls off (gets dimmer) with distance. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the light source.

Cone Angle
This parameter controls the spread of light from a Spot light. It defines the angle (in degrees) between the centerpoint of the light's direction, and the edge of the cone of illumination.

Edge Angle
This parameter controls the size of the soft edge of the cone of light from a Spot light. Its value represents the angle in degrees between the beginning and ending of the soft edge of light.
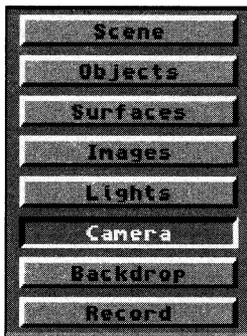
Camera Control Panel
Clicking on the Camera button brings up the Camera Control Panel.
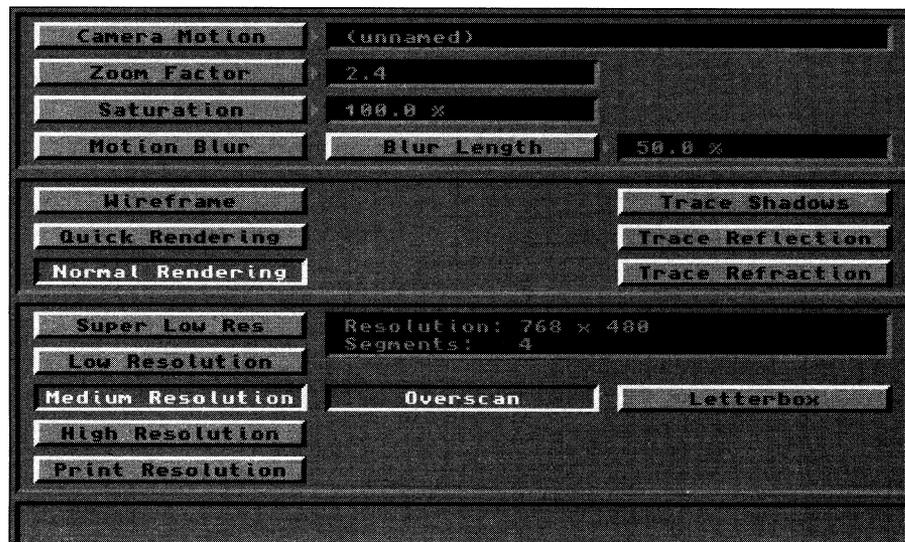
Camera Motion
Click Camera Motion to bring up the camera motion control panel.

Clear Motion
Clear Motion clears any loaded motion files for the camera.

Load Motion
Click Load Motion to load previously created motion files onto the camera. Motion files can be used by lights,

objects, or the camera. When you load a motion file, its name appears in the window to the right of the button. Underneath the status window is the motion file information, displaying the number of key frames and the total number of frames in the motion file.

Save Motion
This button brings up a requester that allows you to store this motion file for future use. Motion paths may be used by lights, objects, or the camera.

The Frame Display Window
This window displays the total number of frames and key frames.

End Behavior
End Behavior determines how an item will be treated when it reaches the end of its motion path. There are three end behaviors:

> **Reset** will reset all object values for the frame immediately after the final key frame. X, Y, Z (position) and H, P, B (direction) reset to zero. Object size resets to a factor of one.

> **Stop** will cause the object to stop, leaving it where it is upon reaching its final key frame.

> **Repeat** will have the object "loop through" the motion file until the end of the animation (if it is shorter than the animation itself).

Parent Object Window
The Parent Object Window displays the name of the object that is acting as the Parent for the current object. This is called a hierarchical relationship, indicating that one object follows the actions of another, its parent. Such relationships are useful for creating complicated objects with different moving parts. For example, your shoulder is the parent of your upper arm, which is the parent of your forearm, which is the parent of your hand, which is the parent of your fingers. Further detail, such as the elbow, wrist, or the individual joints of your fingers, involve further use of the parent button.

There is also a Parent button on the Layout screen as well.

Target Object Window
The Target Object Window refers to the object the camera is focused on. This command is useful for locking the camera to an object that is in motion.

Manual Positioning control panel
Use this control panel to specify the exact position and orientation of an object with X, Y, Z coordinates.

> #### Current Key Frame Window
> The Current Frame Window allows you to go to any frame to adjust the light's position and orientation using the coordinate values in the Position and Direction buttons.

> #### Position
> Use Position to place an object at an exact X, Y, Z location, or to slightly adjust an object's position. Click Position, type in exact numbers, then click Use Motion to accept the new coordinates (or click Cancel to return to the original coordinates).

> This is equivalent to clicking Move and then Numeric in Layout.

> #### Direction
> Use Direction to set the orientation of an object in any of three directions:
> > Heading - The direction an object faces (left or the right facing)
> > Pitch - The forward or backward tilt of an object (up or down tilting)
> > Bank - The left or right tilt of an object (left side to right side tilting)
> > Click Direction, type in exact numbers, then click Use Motion to accept the new orientation (or click Cancel to retain the original orientation).
> This is equivalent to clicking Rotate and then Numeric in Layout.

Linear

Linear determines the type of motion—straight or curved. Normally, movement in LightWave is along a spline path, i.e., it is non-linear. Click Linear to set object movement to straight lines at a constant speed.

Note that by turning Linear on or off at different key frames, motion paths may contain both smooth, curving arcs and straight-line segments. The Linear button only affects the path between the current key frame and the previous one.

Spline Controls

Spline Controls are advanced animation tools used to fine-tune object motion. If you animate a great deal, you may find these controls useful. Recommended values for each characteristic are given. Between these two end values, smaller value increments may be used.

Tension (Values: 0 = normal tension, 1 = high tension)

Tension causes an object in motion to slow down (move a little bit less in each frame) as it neared the key frame, and to accelerate (resume speed) as it passed. Without tension the object would pass through the key frame position at a constant speed. A pendulum is a good example. Tension on the key frames at either end of its swing would cause the pendulum to slow as it neared those key frames, and to accelerate away from them on the downward swing of its motion.

Note that any value set in Default Tension (under Surface) will automatically be entered in Tension all key frames created afterward. Key frames created prior to that will not be affected.

Continuity (Values: -1 = sharp continuity, 0 = normal continuity)

Continuity is used to accentuate a break or change in an object's motion path. It has no effect on the incoming or outgoing speed of the object, which is the function of tension. A bouncing ball provides a good example of both tension and continuity. At the top of its bounce, use tension to slow the rising motion and speed the falling motion of the ball. At the bottom of the bounce, a negative continuity value will accentuate the sharp change in the ball's sudden change of direction as it bounces off the ground.

Bias (Values: -1 = more slack incoming, 0 = equal slack, 1 = more slack outgoing)

Bias controls the "slack" at key frames that is the nature of spline paths. A typical spline path would "round off" angles in a motion path. Bias allows you to move this rounding off toward one side of the key frame or the other. This serves to accentuate motion: the incoming motion by undershooting the key frame (creating a feeling of anticipation) or the outgoing motion by overshooting the key frame.

Use Motion

Click Use Motion to accept any changes that you have made and to return to the Lights control panel.

Zoom Factor

Zoom Factor sets the camera lens magnification. It works just as a camera zoom does, showing wide or narrow angle views. Zoom can be changed at any key frame. Zooming in or out effect differs greatly from physically moving the camera position closer or further away.

Envelope

Click to animate the lens setting of the camera. For detailed descriptions of the buttons found within envelope control panels, see "About Texture Mapping" at the end of this section.

Saturation

Saturation allows you to control the amount of color in a scene (or in an animation, if using an Envelope). 100% Saturation = full color, while 0% Saturation = black and white.

Envelope

Click Envelope to animate a scene's color levels fading in or out. For detailed descriptions of the buttons found within envelope control panels, see "About Texture Mapping" at the end of this section.

Motion Blur

Click Motion Blur to cause single point polygon objects to blur, smoothing out their motion. This is especially useful for simulating star fields, exploding sparks, or rainfall. Even when an animation moves at 30 frames per second, the eye is able to detect the individual frames. Motion blur can help fool the eye into perceiving the motion is more fluid.

Blur Length

Blur Length alters the amount of motion blur applied to single-point polygons. A value of 50% would typify a movie camera's setting.

Wireframe

Click Wireframe to set rendering to a wireframe representation of the scene.

Quick Rendering

Click Quick Rendering to set rendering to a scene with no shading, texture mapping, or transparency. It will give you a better idea than wire frame as to what is actually visible from the camera's point of view.

Normal Rendering

Click Normal Rendering to set rendering to produce a scene with full shading, texture mapping, and any ray-tracing options that were selected.

Trace Shadows

Activate Trace Shadows to render shadows for any surfaces that are illuminated by light sources that have Cast Shadows activated. Note that if you have set Background colors for a sky and ground, the ground will not receive shadows as it is illusory and not a real object. To cast shadows onto the ground, you must create an object out of polygons and use it as the ground.

Trace Reflections

Activate Trace Reflections to have surfaces with any degree of reflection (yet no specified projection or procedural texture maps) render with true ray traced reflections. This function does not ray trace unless Normal Render is selected under the Camera menu.

Note: Certain items cannot be hit by a ray tracer's rays. Therefore, they will not be seen on surfaces that are reflecting or refracting (although they will be seen directly within the scene). For example, a starry sky made up of particles (single-point polygons) will show up in the sky, but would not be seen reflecting off the smooth surface of a lake below. These objects include particles, lines (pairs of single-point polygons made into polygons), and outlines (objects set to Outline). The Antialiasing function of image mapping will also not be seen on reflected or refracted surfaces.

Trace Refraction

Activate Trace Refraction to have surfaces with any degree of transparency (and a Refractive Index value) render with true ray traced refraction. Refraction is the bending of light as it passes through a semi-transparent surface. Useful values here range from 1.0 (normal, no refraction) - 3.0 (diamond, extreme refraction).

Note: see the Ray Tracing Note under Trace Reflections above.

Super Low Res

Super Low Resolution renders the fastest images, yet with the lowest image quality. This is useful for test rendering images to check the appearance of textures, or even the look rough animations where fine detail is not critical.

Low Resolution

Low Resolution renders the second fastest images, yet with the second lowest image quality. This is useful for quick test renderings.

Note that this setting corresponds to the Low Res setting in the Video Toaster v1.0.

Medium Resolution

Medium Resolution renders sharp image quality.

Note that this setting corresponds to the High Res setting in the Video Toaster v1.0.

High Resolution

High Resolution renders a very sharp image quality. If you plan to keep an image or animation, render it in this mode. RGB Images rendered at High Resolution cannot be loaded into ToasterPaint or LightWave due to their size.

Note that this setting corresponds to the Antialias setting in the Video Toaster v1.0.

Print Resolution

Print Resolution is LightWave's highest image quality, intended for output to film or print mediums. RGB Images rendered at Print Resolution cannot be loaded into ToasterPaint or LightWave due to their size.

Overscan

Select Overscan to render the image out to the edges of the screen display area (with no visible borders). The Overlay button in the Layout Visibility control panel shows the Overscan area so that you can see what will be rendered.

Letterbox

Select Letterbox to render the image in Letterbox format, leaving the top and bottom areas of the screen black. This decreases rendering time by about 30% and will produce a letterboxed movie appearance to your animations. The Overlay button in the Layout Visibility control panel shows the Letterbox area so that you can see what will be rendered.
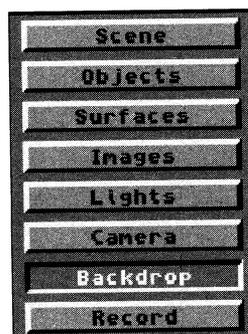
Backdrop Control Panel

Backdrop allows you to set sky and ground colors, fog, and background images.
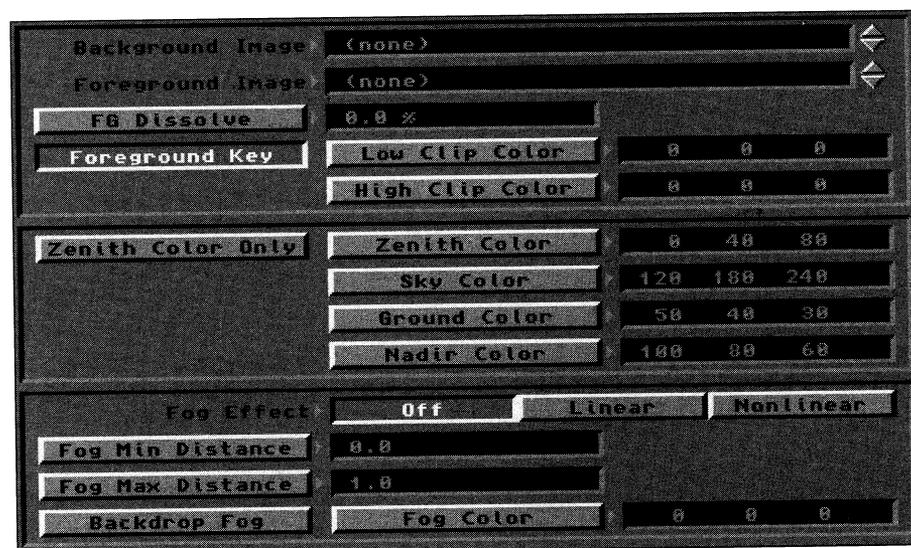
Background (BG) Image Window

Click the up/down arrows beside this window to specify an image to be used as a background behind all objects in the scene.

Foreground (FG) Image Window

Click the up/down arrows beside this window to specify an image to be used as a foreground in front of all objects in the scene.

Foreground (FG) Dissolve

This value varies the transparency of the foreground image. Animated with an envelope, the foreground can be used to perform dissolves between scenes.

Envelope

Click Envelope to animate a dissolve between an image and the actual rendered scene. For detailed descriptions of the buttons found within envelope control panels, see "About Texture Mapping" at the end of this section. This is useful to perform a fade to black.

Foreground Key

Activate Foreground Key when you want to "key out" a color or range of colors from the Foreground Image. The Low and High Clip Color values set the color or range of colors to key.

Low Clip Color

The color value you set here will be the darkest color value that will be "keyed out" (not rendered or seen) when using a Foreground Key.

High Clip Color

The color value you set here will be the brightest color value that will be "keyed out" (not rendered or seen) when using a Foreground Key.

Clear Black

Clear Black allows areas of the foreground image that are pure black (where R, G, and B values equal 0) to be transparent "holes" in the image. This is useful for animating a scene from the view of a pair of binoculars, for example.

Zenith

Zenith is the color of the sky directly above the camera. Consider the Layout workspace as a giant sphere. Imagine that wherever your camera is, it is always at center of this giant sphere.

Zenith Only

When activated, Zenith Only uses the color values for Zenith Color as a solid full-screen background color, overriding the other background selections. If it is not selected, the Zenith, Sky, Ground, and Nadir colors will be rendered as a gradient from top to bottom. Tip: Once you set the sky colors, use Zenith Only during test rendering to save time.

Sky

This button sets the color of the sky from the horizon up to the zenith.

Ground

This button sets the color of the ground from the horizon down to the nadir.

Nadir

Nadir is the color of the ground directly beneath your feet if you were holding the camera in the scene.

Fog Effect

These three buttons govern the three fog settings: Off, Linear, Nonlinear. Fog blends the objects in the scene into a color in the distance (or into the background, if you so choose).

Off

This button turns off fog and ignores the settings on the fog control panel.

Linear

This button turns on fog, uses the settings on the fog control panel, and maps fog in a linear fashion onto the image.

Nonlinear

This turns on fog, using the fog control panel settings, and maps fog in a more realistic, nonlinear fashion onto the image.

Fog Min Dist

This determines the minimum distance (in meters) between the camera's position and the first appearance of the fog.

Fog Max Dist

This determines at what distance from the camera (in meters) objects would not be visible due to the thickness of the fog.

Fog Color

This determines the color of the fog (when fog is active).

Backdrop Fog

This uses the background color(s) as the fog. If you have a gradient blue sky and green ground, objects past the maximum fog distance will blend into those background colors.
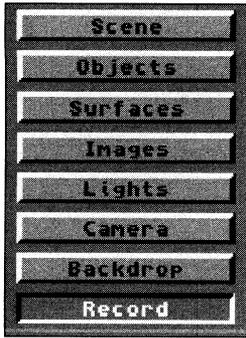
Record Control Panel

The Record Control Panel is where you can specify where images are saved, or set up the output to a single frame controller.
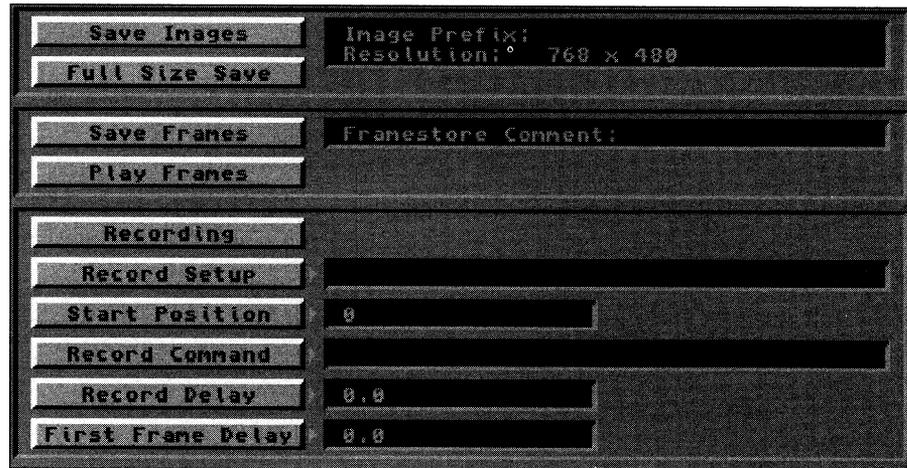
Save Images

Click this button to save the rendered image(s) in the 24-bit IFF file format. A file requester will allow you to select the location where the images will be saved, and to provide an image name prefix. Images saved with this button can be directly loaded into Toaster Paint for further manipulation.

For example, to save the frames from an animation that called "LogoSpin," each image would be saved to disk with the name LogoSpin followed by a three-digit number—such as LogoSpin001, LogoSpin002, LogoSpin003, etc.

Full Size Save

This button causes High Resolution (1504 x 960) and Print Resolution (3008 x 1920) images to be saved in their full dimensions, which is useful for transferring the image to a desktop publishing program or a film recorder. Note that these oversized images cannot be loaded into ToasterPaint, which can accept image sizes up to 752 x 480, nor can they be reloaded as Images in LightWave.

When this button is not active images are saved at 752 x 480.

Save Frames

Select this to render frames in the Framestore format. A file requester will allow you to select the location where the images will be saved, and to provide a Framestore name prefix.

By rendering frames to a storage device, and using Play Frames to recall them, less wear and tear is placed on the VCR when recording via a single-frame controller.

Play Frames

This button is to be used in conjunction with a single frame controller, allowing quick recall of rendered frames. Play Frames only needs the Prefix for the frames. After you select a frame, click in the filename window and delete the three-digit number following the name. Use the Record Delay button to allow the single-frame controller and VCR to keep up, as the frames will come up very quickly. The First Frame and Last Frame buttons (under the Scene button) will determine which frames are used.

Record On

Record On causes the Toaster to (a) save completed frames or images to the storage device of your choice, and/or (b) send the "record" signal (via the serial port) to the single-frame controller for recording to tape.

Record Set-up

This sends a one-time command out of the serial port when OK in the requester is clicked.

Start Position
This allows you to set the starting frame position on the video tape. The value entered here would be the equivalant of a "#" inserted in the record command string. This number is equal to a number of frames into the tape. The frame number that you are currently rendering would be added to this number to become the current frame number. This is only required if your single frame controller needs to receive a frame number from the computer.

Record Command
This specifies the command string that gets sent out the serial port every time a frame is completed.

Record Delay
This determines how many seconds LightWave will wait after sending the record command before starting on the next frame (to allow for preroll time on VTRs). For laser disc recorders, this could probably be zero. A typical VTR setting might be five seconds.

First Frame Delay
This extends to Record Delay for the first frame to allow for VTRs that need more time for the first preroll. This value is expressed in seconds.
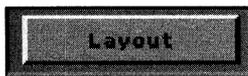
Layout
Click this button to enter Layout, the main screen for placing objects and creating key frames for animation.
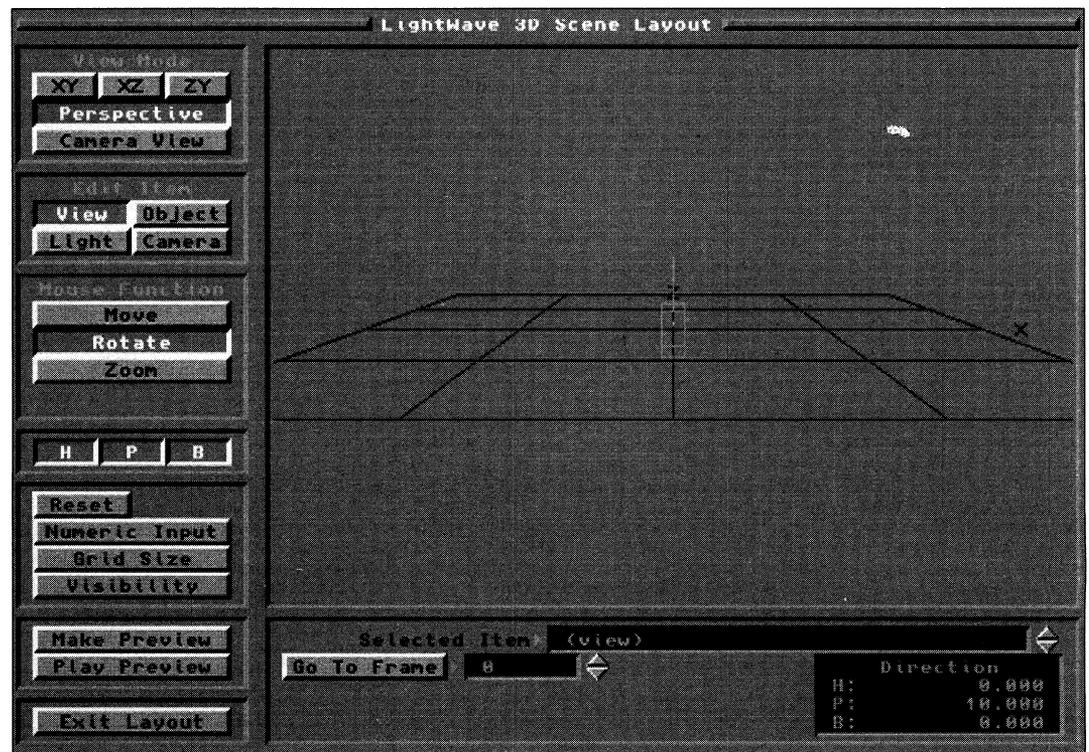
The LightWave 3D Layout Screen (Layout).
Use Layout to create scenes and animations in LightWave. Here you place lights, objects, and the camera, and create motion files for animations

The Layout Window
The Layout window is the large window that dominates most of the screen. Control panels on the left and bottom edges of the screen contain tools for placing and orienting items in preparation for rendering a still frame or animation. You can also create realtime wireframe preview animations.

By default, the visibility settings for the Camera and the Grid are turned on, although these objects will not be seen in any rendering you perform. They exist for reference, so that you may work more efficiently.

View Mode Control Panel

The View Mode Control Panel contains five buttons that govern the Layout window display. Click the corresponding button to select one of:

- Three orthagonal views: front (XY), top (XZ), side (ZY)
- Two external views: third-person (Perspective) and first-person (Camera)

To place objects with greater accuracy, work within one of the orthagonal views. In these view modes the mouse functions slightly differently: it cannot move in the dimension that you are sighting along. For example, in the XZ view you cannot move objects along the Y axis.

XY view ▲ F1
XY is the front view of the scene (the same as the front view in Modeler).

XZ view ▲ F2
XZ is the top (or overhead) view of the scene.

ZY View ▲ F3
ZY is the left view of the scene (looking to the left from the right side).

Perspective view ▲ F4
This is the view mode upon starting the program. Consider it a third-person, or director's, point of view. It allows you to see exactly what is going on in your scene with a real three-dimensional feel for all objects, lights or camera from any angle. In this mode manipulation in all dimensions is possible.

Camera View mode ▲ F5
This button selects the camera's point of view, the point of view used for rendering. In this mode manipulation in all dimensions is possible. It is useful to make final adjustments to object positions from within this view mode. When setting up scenes and animations, make certain to view them from Camera View mode before rendering to ensure there are no mistakes.

Edit Item Control Panel

This control panel, in conjunction with the Keyframe Control Panel at the bottom of the screen, determines the item being manipulated (object, camera, or view). If more than one object or light is in the scene, use the up/down arrows on the Keyframe Control Panel to locate the desired object.
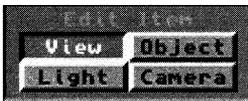
View ▲ v
When View is selected, the view in the layout window may be moved, rotated, or zoomed (depending on the function selected in the Mouse Function control panel).

Object ▲ o (up and down arrows cycle objects)
When Object is selected, the active object in the layout window may be moved, rotated, sized, or stretched (depending on the function selected in the Mouse Function control panel). If more than one object is in the scene, use the up/down arrows on the Keyframe Control Panel to locate the desired object. Note the commands available in the Keyframe Control Panel (beneath the main layout window for Object).

Light ▲ l (up and down arrows cycle objects)
When Light is selected, the active light source in the layout window may be moved or rotated (depending on the function selected in the Mouse Function control panel). If you have more than one light source is in the scene, use the up/down arrows on the Keyframe Control Panel to locate the desired light source. Note the commands available in the Keyframe Control Panel (beneath the main layout window for Light).

Lights are not, by default, visible in the layout window. However, they do appear while the Light button is selected. All lights may be made visible by activating lights under Visibility on the Utility control panel.

Camera ▲ c
When Camera is selected, the camera in the layout window may be moved or rotated (depending on the function selected in the Mouse Function control panel).
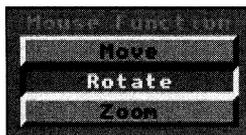
Mouse Function Control Panel

This control panel, in conjunction with the Axis control panel, allows you to manipulate items in Layout with any combination of the X, Y, Z axes. Make certain you have activated the desired axis (or axes), then use the left or right mouse button and drag the mouse, depending on the movement desired. Note that these functions may alter depending on the type of item (view, light, object, camera) selected.

Move ▲ spacebar

Move allows you modify the position of the view, object, light, or camera in any of the three X, Y, Z dimensions that are active in the Axis control panel.

- To move on the X axis only, drag the left mouse button left or right .
- To move on the Y axis only, drag the right mouse button up or down.
- To move on the Z axis only, drag the left mouse button up or down.

Rotate ▲ spacebar

Rotate allows you to alter the facing orientation of the view, object, light, or camera in any of the three (H, P, B) dimensions that are active in the Axis control panel.

- To rotate around the Heading axis only, drag the left mouse button left or right.
- To rotate around the Pitch axis only, drag the left mouse button up or down.
- To rotate around the Bank axis only, drag the right mouse button left or right.

Zoom ▲ spacebar

Zoom is available only when View is the selected view mode. It allows you to zoom the view in or out. The X, Y and Z buttons in the Axis control panel do not affect the Zoom button's operation.

- To zoom out (allowing you to see more of the scene), drag either mouse button to the left.
- To zoom in (allowing you to see less of the scene), drag either mouse button to the right.

Size ▲ spacebar

Size is available only when an object is selected. It alters the size of the object equally in all three dimensions, maintaining the same aspect ratio. The X, Y and Z buttons in the Axis control panel have no effect when the Size button is selected.

- To increase the size of the object, drag either mouse button to the left.
- To decrease the size of the object, drag either mouse button to the right.

Stretch ▲ spacebar

Stretch is available only when an object is selected. It alters the size of the object freely on any axis, without regard for the object's original aspect ratio.

- To stretch the object on the X axis only, drag the left mouse button left or right.
- To stretch the object on the Y axis only, drag the right mouse button up or down.
- To stretch the object on the Z axis only, drag the left mouse button up or down.

Axis Control Panel

This control panel governs which of the X, Y, Z axes is selected for manipulation by the Mouse Function controls. By default, all are active. Since it is often useful to work with only one axis at a time, you can activate and deactivate the axes by clicking their buttons.

X Axis

X movement occurs horizontally, in a left-right fashion when you are in the front view. Positive movement occurs to the right.

Y Axis

Y movement occurs vertically, in an up-down fashion. Positive movement occurs up.

Z Axis

Z movement occurs horizontally, in a "coming closer" or "going further away" fashion from the front view. Positive movement occurs going further away.

H Axis ▲ Heading

This is rotation around the Y axis. Changes are expressed in degrees. Positive change is clockwise when looking straight down, along the positive Y axis toward the origin. Negative values produce a counter-clockwise movement.

P Axis ▲ Pitch

This is rotation around the X axis. Again, changes are in degrees. Positive values produce clockwise rotation around the positive X axis toward the origin. Negative values travel counter-clockwise.

B Axis ▲ Bank

This is rotation around the Z axis. Again, the changes are expressed in degrees. Positive values produce clockwise rotation around the positive Z axis toward the origin. Negative values produce counter-clockwise movement.
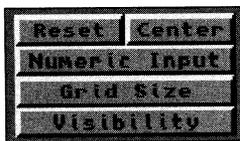
Utility Control Panel

This control panel allows a variety of manipulations that can increase your productivity when using LightWave 3D.

Reset

Reset is a powerful tool for returning items to their original values (position, orientation, and size). This tool works on the view, object, camera, or light, and affects the selected mouse function and selected axis (or axes). This is useful is case you grow confused while manipulating an object and need to reset one (or more) of its original values. Reset will only function the axis that is (or are) selected, so you can reset only the ones you want.

Center

Center shifts the entire scene so that the currently selected item is centered in the Layout window. This is useful in case you lose track of an object. Note that Center is available only from the Perspective View Mode.

Numeric Input ▲ n

This button allows you to input numeric values for precise manipulation of the selected item (view, object, camera, light). The Numeric menu works for all mouse functions. Type values from the keyboard and click OK.

Grid Size

Grid Size alters the scale of the reference grid (in meters) in the Layout window. If you have a lot of objects on the screen and need to do detail work, decrease the grid size. Grid Size also affects movement and rotation values when very large and very small objects have been loaded into the same scene. If you find that you cannot place a small object properly in relationship to a larger one because the smaller object moves in too-large increments, decrease the grid size. Grid size, by default, is set to provide ample viewing space based on the size of the object loaded, and may affect smaller objects when loaded.

Note: The grid size has no effect on the camera view mode. Also, the grid in your Layout window never renders in your final pictures. It is only there as a reference point to the horizon line. If you would prefer not to see it, you can disable it through the Visibility button.

Visibility

Visibility determines what items are visible in the Layout window. There are five reference settings that may be activated for Visibility. None of these settings has any effect on the rendered image, i.e., turning off object visibility will not cause objects to disappear when rendering.

Grid

Grid toggles visibility for the horizon reference grid in the Layout window.

Objects

Objects toggles visibility for all objects (except the active object) in the Layout window.

Lights

Lights toggles visibility for all light sources (except the active light) in the Layout window.

Camera

Camera toggles visibility for the camera (except when active) in the Layout window.

Overlay

Overlay toggles visibility for the overlay boxes in the Layout window. Overlay displays the overscan and letterbox boundary areas.
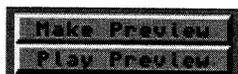
Preview Control Panel

Typically, animations are recorded at the NTSC video rate of 30 frames per second. In order to animate efficiently you need to see them in some form before you begin the time-consuming process of rendering them in full color. For this purpose, LightWave can animate real-time wireframe previews in the Layout window. These previews always play at 30 frames per second.

Make Preview

Make Preview calculates a preview animation based on (a) the point of view you are currently using, and (b) the number of frames allocated for preview (this number is set by the First Frame and Last Frame buttons under the Scene control panel). Use the Escape key if you wish to cancel making the preview animation.

LightWave can create a preview in any of the View Modes available. You may want to watch from a perspective view, like a director on the set of a movie, or from an orthagonal view to make certain that objects travel the proper paths.

Bounding Box

Bounding Box creates a preview with all objects represented by a simple wireframe box that encloses their longest dimensions. This is useful for complex animations that might otherwise take a great deal of time to preview.

Wireframe

Wireframe creates a preview with all objects represented as they normally appear in LightWave Layout. This is useful when accuracy is important and you need to see exactly where objects are in relation to one another. This preview takes longer to create than the Bounding Box preview.

Full-color renderings are always rendered from the Camera View, so be certain that all elements are correct from that point of view prior to rendering.

Play Preview

Play Preview accesses a control panel with VCR-like controls for viewing preview that have just been rendered. There are four speeds for playback, both in forward or reverse. Until you create another preview, the current one will reside in memory.

If an object moves is too fast, increase the number of frames between key frames. If it is too slow, then decrease the number of frames between key frames.

Reverse 30 FPS

Click this button to play the animation backward at a rate of 30 frames per second.

Reverse 15 FPS

Click this button to play the animation backward at a rate of 15 frames per second.

Reverse 10 FPS

Click this button to play the animation backward at a rate of 10 frames per second.

Reverse 1 Frame
Click this button to step backward through the animation, one frame each time you click the mouse button.

Forward 1 Frame
Click this button to step forward through the animation, one frame each time you click the mouse button.

Forward 10 FPS
Click this button to play the animation forward at a rate of 10 frames per second.

Forward 15 FPS
Click this button to play the animation forward at a rate of 15 frames per second.

Forward 30 FPS
Click this button to play the animation forward at a rate of 30 frames per second (real time).

End Playback
Click this button to exit playback mode. No other layout button will function until you end project.

Keyframe Control Panel

Animation control allows you to work with key frame information for every item in the Layout window, i.e., create key frames, attach objects in a hierarchy, and track objects. This panel is located just below the Layout window.
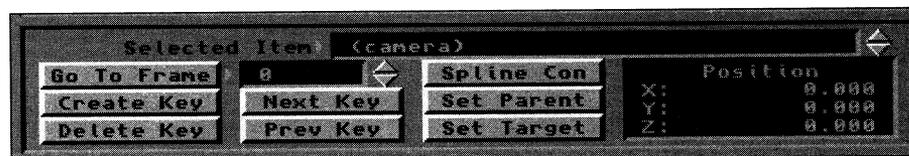
Selected Item Window
When there are multiple objects (or light sources) in the Layout window and you need to manipulate a specific one, use the arrows beside the Selected Item Window to select one from the names listed here. Choose between objects or lights in the Edit Item control panel.

Status Window
The Status Window, in the lower right corner of the Keyframe Control Panel, displays information about the current item. The information displayed is based on the Mouse Function selected.

Mouse Function Selected	Status Window Display
Move	Position
Rotate	Direction
Size	Scale
Stretch	Scale
Zoom	Zoom

Go To Frame ▲ g
To advance to a particular frame, click Go To Frame. Type in the frame number to go to, followed by Return (or click OK). Click cancel if you entered this requester by mistake.

Use the up or down arrows on the keyboard to advance or reverse a key frame at a time. Use the left or right arrows on the keyboard to advance or reverse one frame at a time.

Create Key ▲ Return or Enter
To create a key frame, click Create Key. A requester will appear. The current frame number will automatically be entered. Click either the Selected Item or All Items button, depending on which you prefer to set the key frame for. Enter the key frame number to make, or press Return to use the current number.

Note that each item can have its own individual key frames—if the incorrect item is selected, you may not find the key frame you are looking for.

Delete Key ▲ Delete

To delete a key frame, click Delete Key. A requester will appear. The current frame number will automatically be entered. Click either the Selected Item or All Items button, depending on which you prefer to set keyframe for. Enter the key frame number to delete, or press Return to use the current number.

Note that each item can have its own individual key frames—if the incorrect item is selected, you may not find the key frame you are looking for.

Next Key ▲ shift-right arrow

To go to the next highest key frame, click Next Key.

Note that each item can have its own individual key frames—if the incorrect item is selected, you may not find the key frame you are looking for.

Prev Key ▲ shift-left arrow

To go to the next lowest key frame, click Prev Key.

Note that each item can have its own individual key frames—if the incorrect item is selected, you may not find the key frame you are looking for.

Spline Con ▲ s

Spline Controls

Spline Controls are advanced animation tools used to fine-tune object motion. If you animate a great deal, you may find these controls useful. Recommended values for each characteristic are given. Between these two end values, smaller value increments may be used.

Tension (Values: 0 = normal tension, 1 = high tension)

Tension causes an object in motion to slow down (move a little bit less in each frame) as it neared the key frame, and to accelerate (resume speed) as it passed. Without tension the object would pass through the key frame position at a constant speed. A pendulum is a good example. Tension on the key frames at either end of its swing would cause the pendulum to slow as it neared those key frames, and to accelerate away from them on the downward swing of its motion.

Note that any value set in Default Tension (under Surface) will automatically be entered in Tension for all key frames created afterward. Key frames created prior to that will not be affected.

Continuity (Values: -1 = sharp continuity, 0 = normal continuity)

Continuity is used to accentuate a break or change in an object's motion path. It has no effect on the incoming or outgoing speed of the object, which is the function of tension. A bouncing ball provides a good example of both tension and continuity. At the top of its bounce, use tension to slow the rising motion and speed the falling motion of the ball. At the bottom of the bounce, a negative continuity value will accentuate the sharp change in the ball's sudden change of direction as it bounces off the ground.

Bias (Values: -1 = more slack incoming, 0 = equal slack, 1 = more slack outgoing)

Bias controls the "slack" at key frames that is the nature of spline paths. A typical spline path would "round off" angles in a motion path. Bias allows you to move this rounding off toward one side of the key frame or the other. This serves to accentuate motion: the incoming motion by undershooting the key frame (creating a feeling of anticipation) or the outgoing motion by overshooting the key frame.

Set Parent

This button allows you to attach the currently selected item to any object in the scene. Such objects are often referred to as "parent" and "offspring" objects. Follow these steps to set an object and its parent successfully:

• Select the offspring object (the object that you intend to attach).

- Click Set Parent. Use the up/down arrows to select the name of the parent object. Click OK. The offspring object may seem to jump to the parent object in the Layout window.

- Place the offspring object where it should be in relation to the parent object.

- Select the parent object, and move it about. Note that the offspring object mimics its movements exactly. It will duplicate any mouse functions performed on the parent object (such as size, stretch, etc.)

Set Parent can be used to attach the camera or lights to an object as well. It is only available when the Edit Item is an object, light, or camera.

Set Target
Set Target is only available for a light source or the camera. It locks the camera's aim (or light) on a selected object. This is best used to have the camera track an object through a scene, much like a camera would track an actor or actress in a movie.

Exit Layout
Click Exit Layout to return to the Renderer screen.

Modeler
This button acts like a Switcher application button. Click once to load the Modeler (activate it). Click it a second time to enter the Modeler. Shift-click this button to deactivate the Modeler and remove it from memory.
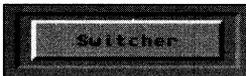
Switcher
Click this button to return to the Video Toaster Switcher. LightWave will remain active in memory, with all your work still available. If you have rendered an image to a framebuffer and would like to save it, it will remain in a framebuffer when you return to the switcher. Use the switcher's Save Frame function to save the frame.

Render ▲ F10
Click render, to have Lightwave create the image. A new menu prompts you to choose between Manual or Automatic rendering. Select the Manual to render a single image. Select Automatic to render a sequence of images.

About Texture Mapping

Planar Image Map

Planar Image Map projects the image straight onto the object's surface, like a film projector This can be anything from a digitized picture of wood grain or a picture you created in Toaster Paint. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.
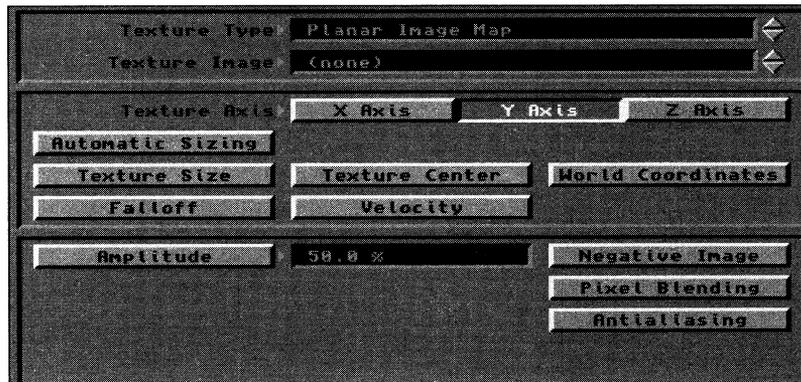
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Image Window
Click the arrows beside this window to select the image to use as the planar map. To be listed here, images must first be loaded from the Images button.

Texture Axis
Select which axis to project the planar map along.

Projection Type and Axis		Texture size parameters that affect the results	Texture center parameters that affect the results	Diagrams	Examples
Planar	X	Y,Z	Y,Z		Mapping insignia onto the tail fin of an aircraft
	Y	X,Z	X,Z		Mapping aerial photo onto terrain
	Z	X,Y	X,Y		Mapping a picture onto TV screen or logo front

Automatic Sizing
Automatic Sizing automatically determines the proper "fit" between the image map and the surface size, and sets the texture center point. Hint #1: After clicking Automatic Size, click Texture Size to see the values that LightWave used. Modify these to fine-tune the mapping, if you wish. Note that these settings will remain as you click through the other mapping types. Hint #2: The size values created by clicking Automatic Sizing will remain as the Texture Size values, even if you then change the type of mapping you use for this surface.

Note also that Automatic Sizing sets the following values to 0: Falloff, Velocity. You may alter these afterward, but any values entered prior to selecting Automatic Sizing will be lost. World Coords is not used by this command, and will also be reset.

Texture Sizing
Use the X, Y, Z values to determine the size of the image on the surface. Use these for finer control than Automatic Sizing allows. You can also enter a negative value here to "flip" the image on any axis to reverse the image map. For a Planar Image Map, only two of the three axes will effect the map size (the third axis is not affected, since it is the axis along which the map is projected.)

Texture Center
This is the X, Y, Z location for the center of the image map. Use this menu to "offset" the image by some amount. For a Planar Image Map, only two of the three coordinates will effect the map location (the third axis is not affected, since it is the axis along which the map is projected.)

World Coordinates
Select World Coords to anchor a texture map to the 3D world space so that it will not move through space. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. Changing the Velocity value with a planar map would animate the image across the surface of the object. The pattern would move the specified distance per frame.

Negative Image
Click Negative Image to map a photographic negative of the image instead of the normal image.

Pixel Blending
Click Pixel Blending for image maps that come near the "camera." This helps reduce the effect of a tiny pixel looming large when a mapped surface comes near the Lightwave camera. Pixel Blending softens the pixel's edges with those around it.

AntiAliasing
Click AntiAliasing to help eliminate the unwanted appearance of movement that can occur within a texture map when its pattern grows too fine for the screen to display accurately. Generally, this is useful when the pattern is somewhat distant in the scene, although it can help with busy texture patterns as well.

Cylindrical Image Map

Cylindrical Image Map projects the image outward in a tube-like manner. In a Cylindrical Image Map each pixel of the image is projected perpendicular to a specified axis. (The projected pixel is like a long thin pie shape). Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.

Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Image Window
Click the arrows beside this window to select the image to use as the cylindrical map. To be listed here, images must first be loaded from the Images button.

Texture Axis
Select which axis to project the cylindrical map from.

Projection Type and Axis		Texture size parameters that affect the results	Texture center parameters that affect the results	Diagrams	Examples
Cylindrical	X	X only	X, Y, Z		
	Y	X only	X, Y, Z		Mapping label onto wine bottle or coke can
	Z	X only	X, Y,Z		

Automatic Sizing
Automatic Sizing automatically determines the proper "fit" between the image map and the surface size, and sets the texture center point. Hint #1: After clicking Automatic Size, click Texture Size to see the values that LightWave used. Modify these to fine-tune the mapping, if you wish. Note that these settings will remain as you click through the other mapping types. Hint #2: The size values created by clicking Automatic Sizing will remain as the Texture Size values, even if you then change the type of mapping you use for this surface.

Note also that Automatic Sizing sets the following values to 0: Falloff, Velocity. You may alter these afterward, but any values entered prior to selecting Automatic Sizing will be lost. World Coords is not used by this command, and will also be reset.

Texture Sizing

Use the X, Y, Z values to determine the size of the image on the surface. Use these for finer control than Automatic Sizing allows. You can also enter a negative value here to "flip" the image on any axis to reverse the image map. For a Cylindrical Image Map, only one of the three axes will effect the map size (the one along which the map is being projected).

Texture Center

This is the X, Y, Z location for the center of the image map. Use this menu to "offset" the image by some amount.

World Coordinates

Select World Coords to anchor a texture map to the 3D world space so that it will not move through space. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff

Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity

Velocity is used to animate a texture across a surface. Changing the Velocity value with a cylindrical map would animate the image across the surface of the object. The pattern would move the specified distance per frame.

Negative Image

Click Negative Image to map a photographic negative of the image instead of the normal image.

Pixel Blending

Click Pixel Blending for image maps that come near the "camera." This helps reduce the effect of a tiny pixel looming large when a mapped surface comes near the Lightwave camera. Pixel Blending softens the pixel's edges with those around it.

AntiAliasing

Click AntiAliasing to help eliminate the unwanted appearance of movement that can occur within a a texture map when its pattern grows too fine for the screen to display accurately. Generally, this is useful when the pattern is somewhat distant in the scene, although it can help with busy texture patterns as well.

Width Tiling

Although a cylindrical image map has one height (since it is projected in a tube, the height from one end to the other does not alter), it can have many repetitions of the image around its circumference. Use Width Tiling to set the number of repeated images.

Spherical Image Map

Spherical Image Map projects the image outward in all directions from a single point. In a Spherical ImageMap, each pixel of the image is projected out from a single center point, sort of like forming a long thin pyramid. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.

Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Image Window
Click the arrows beside this window to select the image to use as the spherical map. To be listed here, images must first be loaded from the Images button.

Texture Axis
Select which axis to project the spherical map from.

Projection Type and Axis		Texture size parameters that affect the results	Texture center parameters that affect the results	Diagrams	Examples
Spherical	X	None	X, Y, Z		(Rarely used)
	Y	None	X, Y, Z		Mapping world map onto globe
	Z	None	X, Y, Z		(Rarely used)

Automatic Sizing
Automatic Sizing automatically determines the proper "fit" between the image map and the surface size. However, for Spherical Image Mapping it only sets the proper X, Y, Z location for the image map, since texture size does not apply to this form of image mapping. Hint #1: After clicking Automatic Size, click Texture Size to see the values that LightWave used. Modify these to fine-tune the mapping, if you wish. Note that these settings will remain as you click through the other mapping types. Hint #2: The size values created by clicking Automatic Sizing will remain as the Texture Size values, even if you then change the type of mapping you use for this surface.

Note also that Automatic Sizing sets the following values to 0: Falloff, Velocity. You may alter these afterward, but any values entered prior to selecting Automatic Sizing will be lost. World Coords is not used by this command, and will also be reset.

Texture Center

This is the X, Y, Z location for the center of the image map. Use this menu to "offset" the image by some amount.

World Coordinates

Select World Coords to anchor a texture map to the 3D world space so that it will not move through space. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff

Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity

Velocity is used to animate a texture across a surface. Changing the Velocity value with a spherical map would animate the image across the surface of the object. The pattern would move the specified distance per frame.

Negative Image

Click Negative Image to map a photographic negative of the image instead of the normal image.

Pixel Blending

Click Pixel Blending for image maps that come near the "camera." This helps reduce the effect of a tiny pixel looming large when a mapped surface comes near the Lightwave camera. Pixel Blending softens the pixel's edges with those around it.

AntiAliasing

Click AntiAliasing to help eliminate the unwanted appearance of movement that can occur within a texture map when its pattern grows too fine for the screen to display accurately. Generally, this is useful when the pattern is somewhat distant in the scene, although it can help with busy texture patterns as well.

Width Tiling

A spherical image map can have many repetitions of the image around its equatorial circumference. Use Width Tiling to set the number of repeated images.

Height Tiling

A spherical image map can have many repetitions of the image around its polar circumference. Use Width Tiling to set the number of repeated images.

Checkerboard

Checkerboard generates a tiled appearance on an object's surface. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.
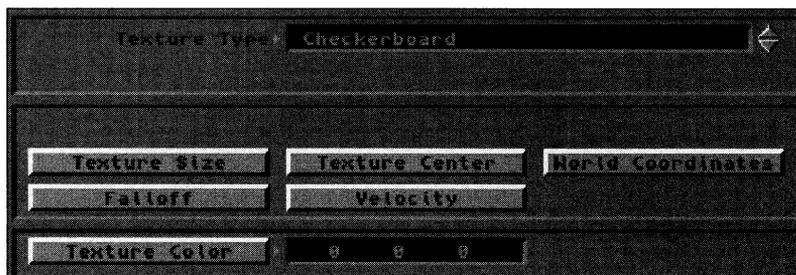
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Size
Click Texture Size to set the size of each square in the pattern.

Texture Center
This determines the center point of the pattern. By default the Checkerboard pattern is offset from the world coordinate center of 0, 0, 0 so that that coordinate location falls inside one of the checkered squares.

World Coords
Select World Coords to anchor a texture map to the 3D world space so that it will not move through space. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. Changing the Velocity value within Checkerboard would animate the Checkerboard pattern across the surface of the object. The pattern would move the specified distance per frame.

Texture Color
The color chosen here will be the color of the squares produced by the Checkerboard pattern. The odd squares will be the color specified in the Surface Color menu.

Grid

Grid generates a grid on an object's surface. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.
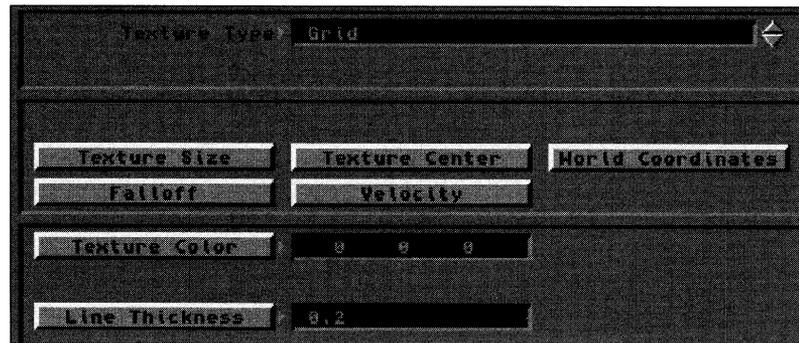
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Size
This determines the space between the lines in the Grid pattern.

Texture Center
This determines the center point of the pattern. By default the Grid pattern is centered around the world coordinates 0, 0, 0 so that that coordinate location falls inside one of the squares defined by the grid pattern.

World Coords
Select World Coords to anchor a texture map to the 3D world space so that it will not move through space. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. Changing the Velocity value within Grid would animate the Grid pattern across the surface of the object. The pattern would move the specified distance per frame.

Texture Color
The color chosen here will be the color of the Grid pattern.The base color of the pattern is set in the Surface COlor menu

Line Thickness
This value determines the thickness of the lines in the grid.

Dots

Dots generates a pattern of dots on an object's surface. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.
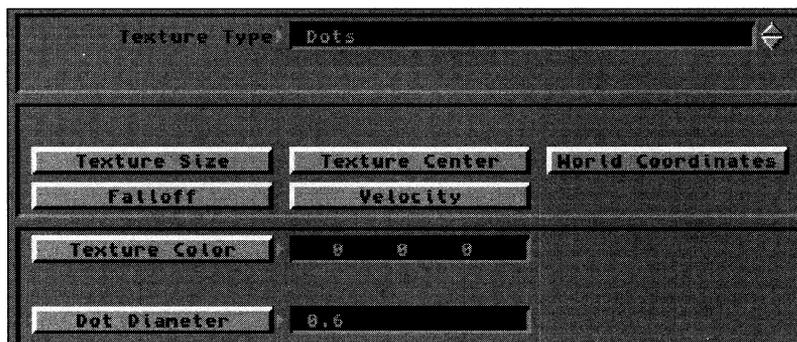
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Size
This value, expressed in meters, determines the spacing between dots for each axis.

Texture Center
This determines the center point of the pattern. By default the dot pattern is offset from the world coordinate center of 0, 0, 0.

World Coords
Select World Coords to anchor a texture map to the 3D world space so that it will not move through space. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. Changing the Velocity value within Dots would animate the dot pattern across the surface of the object. The pattern will move the specified distance per frame.

Texture Color
The color chosen here will be the color of the dot pattern.The base color of the pattern is set in the Surface COlor menu

Dot Diameter
This determines the size of the dots in the pattern.

Marble

Marble generates a marble pattern on an object's surface. The pattern is calculated in veins, like layers in space that are perpendicular to the axis you choose for the procedural map. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.

A rule of thumb for using Marble: Start by selecting a proper Vein Spacing and Texture Axis first, then set Frequencies, Turbulence, and Texture Size afterward.
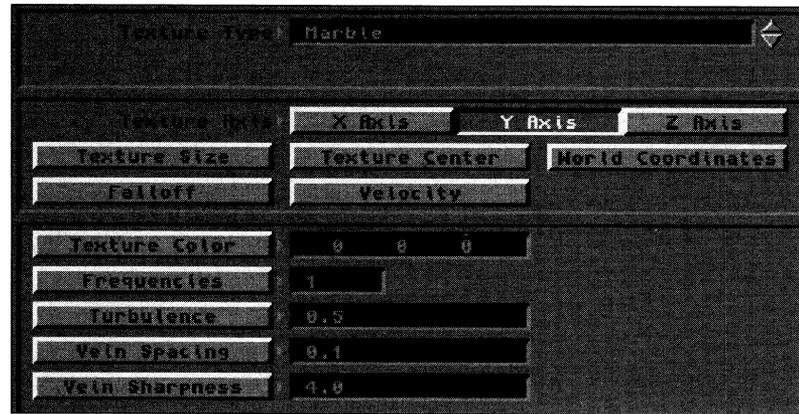
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Axis
Select the axis to calculate the texture on.

Texture Size
The smaller the texture size, the more variance in the marble pattern. The Texture Size you choose is used as an invisible 3D grid upon which the amount of marble variance is based.Variance is introduced as the pattern encounters a new cell in this grid. A good rule of thumb when first experimenting with marble would be to set this value to one-half the size of the Vein Spacing value.

Texture Center
This determines the center point of the pattern. By default the Marble pattern is centered at the world coordinates 0, 0, 0.

World Coords
Select World Coords to anchor a texture map to the 3D world space so that it will not move through space. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. Changing the Velocity value within Marble would animate the marble pattern across the surface of the object. The pattern will move the specified distance per frame.

Texture Color
The color chosen here will be the color of the veins in the marble pattern.The base color of the pattern is set in the Surface COlor menu

Frequencies

Frequencies determines the level of detail produced in the vein. It is not useful to set a value above 6 here, as the variance would be microscopic in size. Hence, it would be unseen. The higher the value, the better looking the pattern becomes, but the longer the rendering time as well.

Turbulence

The value specified here should be a fraction of the Vein Spacingvalue. It determines how close a vein may become to a neighboring vein. A good rule of thumb here would be to have the Turbulence set to 1/2 of the Vein Spacing (.5).

Vein Spacing

This determines the space between the veins. With Marble, you would probably want the Vein Spacing to be around twice the Texture Size.

Vein Sharpness

This value determines the contrast level between the vein color and the surface color. The lower the value, the more blending that will occur between the veins and the surface color. Higher values will produce very sharp, distinct veins.

Wood

Wood generates a wood surface on an object's surface. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.

A rule of thumb for using Wood: Start by selecting a proper Vein Spacing and Texture Axis first, then set Frequencies, Turbulence, and Texture Size afterward.
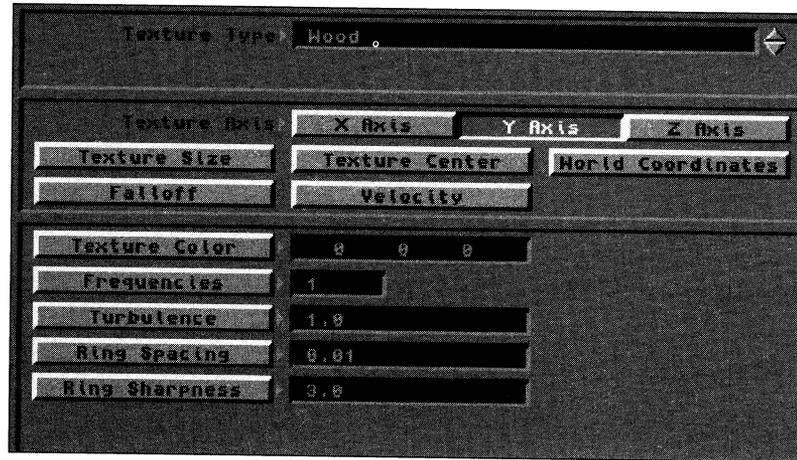
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Axis
This determines which axis the pattern will project itself onto.

Texture Size
The smaller the texture size, the more variance in the marble pattern. The Texture Size you choose is used as an invisible 3D grid upon which the amount of marble variance is based. Variance is introduced as the pattern encounters a new cell in this grid. A good rule of thumb when first experimenting with marble would be to set this value to one-half the size of the Vein Spacing value.

Texture Center
This determines the center point of the pattern. By default the Wood pattern is centered at the world coordinates 0, 0, 0.

World Coords
Select World Coords to anchor a texture map to the 3D world space so that it will not move through space. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
The values selected here determine at what distance from the camera the color selected for the Wood Rings blends completely with the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. Changing the Velocity value here will move the Wood pattern the selected distance per frame.

Texture Color
The color selected here will be the color of the rings in the Wood pattern. The base color of the pattern is set in the Surface COlor menu

Frequencies
Frequencies determines the level of detail produced in the vein. It is not useful to set a value above 6 here, as the variance

would be microscopic in size. Hence, it would be unseen. The higher the value, the better looking the pattern beceoms, but the longer the rendering time as well.

Turbulence
The value specified here is a percentage of the Ring Spacing. It determines how close a ring may become to a neighboring ring. A good rule of thumb here would be to have the Turbulence set to 1/2 of the Vein Spacing.

Ring Spacing
This determines the distance between between rings. A good rule of thumb here would be to make the Ring Spacing about one third of the Texture Size.

Ring Sharpness
This value determines the amount of blending between the ring color and the surface color. The lower the value, the more blending that will occur between the rings and the surface color. Higher values will produce very sharp, distinct rings.

Underwater

Underwater generates a rippling pattern similar to the play of sunlight on the sides of a pool. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.
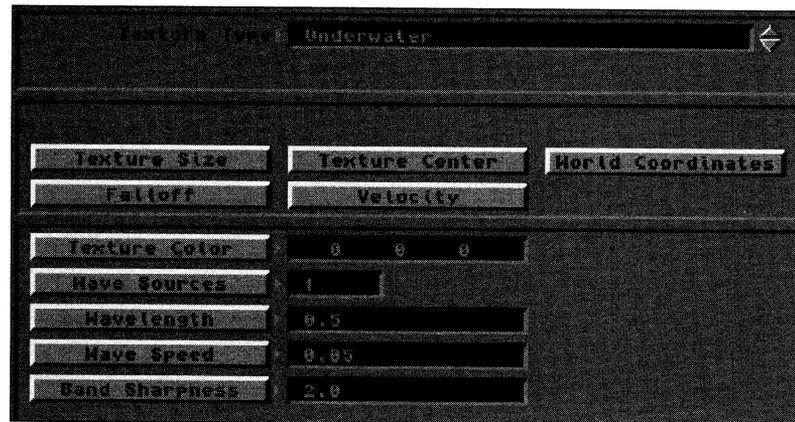
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Size
Texture Size determines the size of the 6-sided pattern that is used to create the individual ripples.

Texture Center
Texture Center determines where the band pattern will be centered.

World Coords
Select World Coords to anchor a texture map to the 3D world space so that it will not move through space. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. Falloff is based on meters. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance away from the texture center.

Velocity
Velocity is used to animate a texture across a surface.

Texture Color
Click Texture Color to set the color for the Underwater ripple pattern. The base color of the pattern is set in the Surface COlor menu

Wave Sources
Wave sources determines the number of ripple sources to utilize. The higher the value, the greater the number of areas rippling with waves. A value of one would have one ripple pattern. Values higher than 16 are not used.

Wavelength
Wavelength controls the distance between the ripples. The lower the value, the closer the waves will appear to each other.

Wave Speed
Wave Speed determines the rate at which waves ripple outward in an animation. The value should be smaller than the Wavelength value. (If they were equal, you would not see movement, as the waves will move into each other's position at every frame). A good value to work with would be about one tenth of the Wavelength.

Band Sharpness

This value determines the amount of blending between the band color and the surface color. The lower the value, the more blending that will occur between bands. Higher values will produce very sharp, distinct bands.

Use Texture

Click Use Texture to accept any changes made in this control panel and to return to the previous one.

Free Texture

Select Free Texture to abandon the Texture and values you have set, and to return to the previous control panel. To remove a Texture that has been previously assigned to a surface, reenter its control panel and exit using the Free Texture button.

Fractal Noise

Fractal Noise is one of the most versatile and useful forms of mapping. Under Transparency, Fractal Noise can be used to generate realistic-looking clouds. Under Surface Color (or Diffuse), Fractal Noise can produce a weathered look to surfaces, such as grass or dirt ground. You'll find numerous possibilities for Fractal Noise. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.
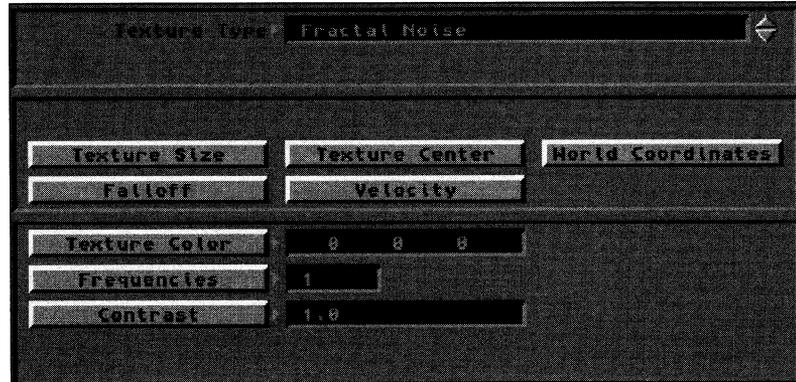
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Size
This value determines the feature size of the Fractal Noise pattern (in meters) that is applied to the object's surface. Think of the Texture Size as an invisible 3-dimensional grid that is applied to the object's surface. The smaller the size, the more variance in the Fractal Noise pattern, as the noise may change course again each time it encounters a new cell. A cell is the area contained within one grids cube of the Texture Size values. When using Fractal Noise, the Texture Size can vary greatly depending on what type of effect you are trying to achieve.

Texture Center
This determines where the Fractal Noise pattern (the invisible 3-dimensional grid) is placed in relation to the World Origin of the object. The pattern can be offset by changing the values.

World Coords
Select World Coords to anchor a texture map in place. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
The values selected here determine at what distance from the camera the color selected for the Fractal Noise Color blends completely with the surface color. This value is set in percentage of falloff per meter.

Velocity
Changing the Velocity value here would move the Fractal Noise pattern the selected distance (in meters) per frame.

Texture Color
Fractal Noise is based on two colors,the Surface Color and the Texture Color. The actual color will be some color value range between the two, depending on the Contrast you set. The lower the Contrast, the softer the noise, as there will be a smoother range of color. The higher the Contrast, the sharper the noise,as there will be a sharper delineation between the colors used.

Frequencies
Within the Fractal Noise Control Panel, Frequencies determines the level of detail produced in the noise pattern. Increasing this level will decrease the apparent Texture Size by allowing more variations in the noise pattern for each cell. It probably would not be useful to use a value above 6 here. The higher the value, the longer the rendering time.

Contrast

This determines the contrast between the surface color and the noise color. The higher the level (above 1) the more defined the noise pattern is, whereas a lower value (between 0 and 1) produces a less visible pattern.

Use Texture

Select Use Texture to accept the Texture and values you have set, and to return to the Surfaces control panel.

Free Texture

Select Free Texture to abandon the Texture and values you have set, and to return to the Surfaces control panel. To remove a Texture that has been previously assigned to a surface, reenter its control panel and exit using the Free Texture button.

About Bump Mapping

Bump Mapping is the process of shading objects with a textured appearance to produce an embossed effect—that of raised and lowered surfaces—without having to actually model a bumpy surface. Imagine trying to model a golf ball. It would take an enormous amount of time to actually model the dimples on the ball's surface. With bump mapping, it would be a simple process of mapping precise and even bumps around it with an image map. The varying brightness levels in the image are used to determine which areas appear raised (brighter areas) and recessed (darker areas).

Since diffusion and specularity maps also effect the shading of light and surfaces, combinations of these three mapping types create highly realistic renderings.

For Planer, Cylindrical, and Spherical image mapping, we recommend using pixel blending, perhaps with antialiasing, for best results. If you are familiar with LightWave 1.0 or 1.05, you may notice that Image Bump Maps appear slightly different. This is due to a newer implementation of Bump Mapping that yeilds more accurate results.

Planar Image Bump Map

Planar Image Map bump maps the image straight onto the surface along the axis you choose. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.
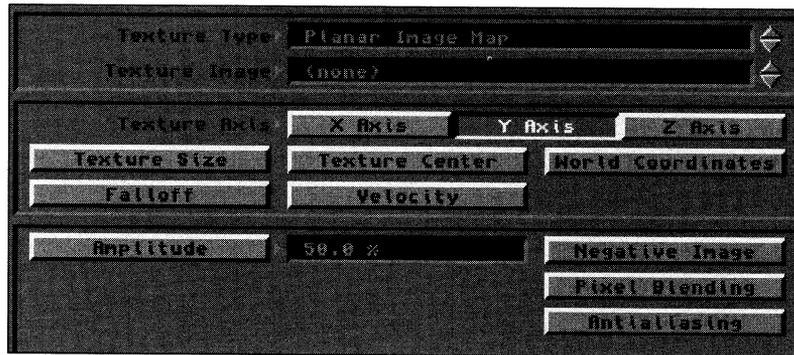
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Image Window
Click the arrows beside this window to select the image to use as the planar map. To be listed here, images must first be loaded from the Images button.

Texture Axis
Select which axis to project the planar map along.

Automatic Sizing
Automatic Sizing automatically determines the proper "fit" between the image map and the surface size, and sets the texture center point. Hint: After clicking Automatic Size, click Texture Size to see the values that LightWave used. Modify these to fine-tune the mapping, if you wish. Note that these settings will remain as you click through the other mapping types.

Note also that Automatic Sizing sets the following values to 0: Falloff, Velocity. You may alter these afterward, but any values entered prior to selecting Automatic Sizing will be lost. World Coords is not used by this command, and will also be reset.

Texture Sizing
Use the X, Y, Z values to determine the size of the map on the surface. Use these for finer control than Automatic Sizing allows.

Texture Center
This is the X, Y, Z location for the center of the image map. Use this menu to "offset" the image by some amount.

World Coordinates
Select World Coords to anchor a texture map in place. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. Changing the Velocity value with a planar map would animate the image across the surface of the object. The pattern would move the specified distance per frame.

Amplitude

Amplitude affects the amount of the apparent height (or depth) of a bump map, how much lighting contrast there is between the highlighted surface and the darker areas of the image. This ranges from 0% (unnoticeable) to 100% (maximum).

Negative Image

Click Negative Image to map a photographic negative of the image instead of the normal image.

Pixel Blending

Click Pixel Blending for image maps that come near the "camera." This helps reduce the effect of a tiny pixel looming large when a mapped surface comes near the Lightwave camera. Pixel Blending softens the pixel's edges with those around it.

AntiAliasing

Click AntiAliasing to smooth the jagged edges in any image maps that you use that have jagged lines in them.

Cylindrical Image Bump Map

Cylindrical Image Map bump maps the image outward in a tube-like manner. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.

Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Image Window
Click the arrows beside this window to select the image to use as the cylindrical map. To be listed here, images must first be loaded from the Images button.

Texture Axis
Select which axis to project the cylindrical map from.

Automatic Sizing
Automatic Sizing automatically determines the proper "fit" between the image map and the surface size, and sets the texture center point. Hint: After clicking Automatic Size, click Texture Size to see the values that LightWave used. Modify these to fine-tune the mapping, if you wish. Note that these settings will remain as you click through the other mapping types.

Note also that Automatic Sizing sets the following values to 0: Falloff, Velocity. You may alter these afterward, but any values entered prior to selecting Automatic Sizing will be lost. World Coords is not used by this command, and will also be reset.

Texture Sizing
Use the X, Y, Z values to determine the size of the map on the surface. Use these for finer control than Automatic Sizing allows.

Texture Center
This is the X, Y, Z location for the center of the image map. Use this menu to "offset" the image by some amount.

World Coordinates
Select World Coords to anchor a texture map in place. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. Changing the Velocity value with a cylindrical map would animate the image across the surface of the object. The pattern would move the specified distance per frame.

Amplitude

Amplitude affects the amount of the apparent height (or depth) of a bump map, how much lighting contrast there is between the highlighted surface and the darker areas of the image. This ranges from 0% (unnoticeable) to 100% (maximum).

Negative Image

Click Negative Image to map a photographic negative of the image instead of the normal image.

Pixel Blending

Click Pixel Blending for image maps that come near the "camera." This helps reduce the effect of a tiny pixel looming large when a mapped surface comes near the Lightwave camera. Pixel Blending softens the pixel's edges with those around it.

AntiAliasing

Click AntiAliasing to smooth the jagged edges in any image maps that you use that have jagged lines in them.

Width Tiling

Although a cylindrical image map has one height (since it is projected in a tube, the height from one end to the other does not alter), it can have many repetitions of the image around its circumference. Use Width Tiling to set the number of repeated images.

Spherical Image Bump Map

Spherical Image Map bump maps the image outward in all directions from a single point. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.

Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Image Window
Click the arrows beside this window to select the image to use as the spherical map. To be listed here, images must first be loaded from the Images button.

Texture Axis
Select which axis to project the spherical map from.

Automatic Sizing
Automatic Sizing automatically determines the proper "fit" between the image map and the surface size, and sets the texture center point. Hint: After clicking Automatic Size, click Texture Size to see the values that LightWave used. Modify these to fine-tune the mapping, if you wish. Note that these settings will remain as you click through the other mapping types.

Note also that Automatic Sizing sets the following values to 0: Falloff, Velocity. You may alter these afterward, but any values entered prior to selecting Automatic Sizing will be lost. World Coords is not used by this command, and will also be reset.

Texture Center
This is the X, Y, Z location for the center of the image map. Use this menu to "offset" the image by some amount.

World Coordinates
Select World Coords to anchor a texture map in place. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance moving away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. Changing the Velocity value with a spherical map would animate the image across the surface of the object. The pattern would move the specified distance per frame.

Amplitude
Amplitude affects the amount of the apparent height (or depth) of a bump map, how much lighting contrast there is between the highlighted surface and the darker areas of the image. This ranges from 0% (unnoticeable) to 100% (maximum).

Negative Image

Click Negative Image to map a photographic negative of the image instead of the normal image.

Pixel Blending

Click Pixel Blending for image maps that come near the "camera." This helps reduce the effect of a tiny pixel looming large when a mapped surface comes near the Lightwave camera. Pixel Blending softens the pixel's edges with those around it.

AntiAliasing

Click AntiAliasing to smooth the jagged edges in any image maps that you use that have jagged lines in them.

Width Tiling

A spherical image map can have many repetitions of the image around its equatorial circumference. Use Width Tiling to set the number of repeated images.

Height Tiling

A spherical image map can have many repetitions of the image around its polar circumference. Use Width Tiling to set the number of repeated images.

Ripples

Ripples bump maps fluid waves or ripples along the selected axis. Use it to simulate water, or to put a wave in a flag. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.
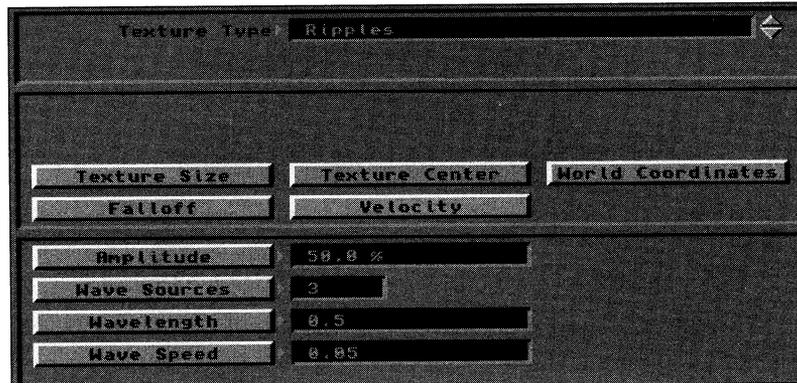
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Size
This determines the size of the 6-sided pattern that is used to create the individual ripples. To ensure that the pattern is seen on the surface of the object, use size values here that are smaller than the size of the object itself.

For example, a 1-meter cube with a .25-meter ripple size would show four ripples across its surface. A 1-meter cube with a 10-meter ripple size might show one ripple, depending on whether the object's placement coincided with one of the ripples as it emanated within the 3D workspace.

Texture Center
Texture Center determines where the ripple pattern will be centered. Bump Maps are calculated from the World Origin outward unless you set the Texture Center to be other than 0,0,0. If you had created a rectangle for a swimming pool and dropped a stone directly in the center of the pool, ripples would outward from that spot. On the other hand, if you had dropped the stone at the left end of the pool, the waves would head out in rings towards the right side of the pool. This is the result of offsetting the Texture Center.

World Coords
Select World Coords to anchor a texture map in place. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines the rate at which a texture map blends into the surface color. Falloff is based on meters. The value you enter is a percentage specifying how much falloff should be apparent for every meter of distance away from the texture center.

Velocity
Velocity is used to animate a texture across a surface. However, due to disadvantages of the velocity effect and the ripple texture, use Wave Speed to better achieve animated wave textures.

Amplitude
Amplitude determines how much lighting contrast there is between the highlighted surface and the darker areas of the image, i.e., the height of the wave crest and the depth of the wave valley. The higher the amplitude the more visible ripples will be.

Wave Sources
Wave sources determines the number of ripple sources to utilize. The higher the value, the greater the number of areas rippling with waves. A value of one would have one ripple pattern. Values higher than 16 are not recommended; they require longer rendering time and may not add to the appearance of the texture.

Wavelength

Wavelength controls the distance between the ripples. The lower the value, the closer the waves will appear to each other.

Wave Speed

Wave Speed determines the rate at which waves ripple outward in an animation. The value should be smaller than the Wavelength value. (If they were equal, you would not see movement, as the waves will move into each other's position at every frame). A good value to work with would be about one tenth of the Wavelength.

Use Texture

Click Use Texture to accept any changes made in this control panel and to return to the previous one.

Free Texture

Select Free Texture to abandon the Texture and values you have set, and to return to the previous control panel. To remove a Texture that has been previously assigned to a surface, reenter its control panel and exit using the Free Texture button.

Fractal Bumps

Fractal Bumps maps an irregular bump pattern that is somewhat raised from the surface of the objects. Numeric values for these settings are all expressed in the measurement unit of your preference. We recommend using meters.
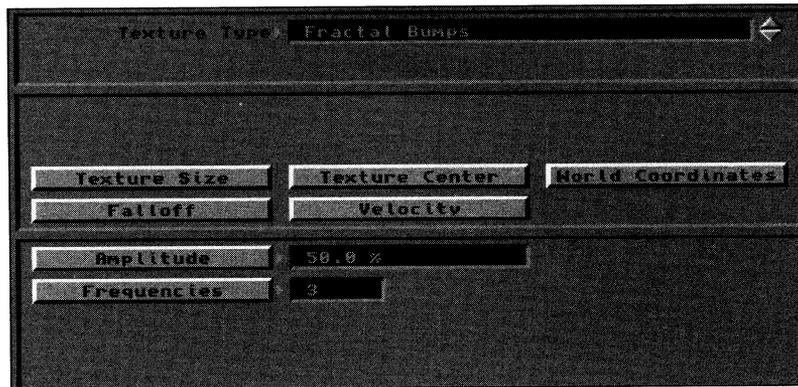
Texture Type Window
Click the arrows beside this window to select the type of mapping to use.

Texture Size
This determines the size of the fractal bump pattern.

Texture Center
This determines where the center of the fractal pattern will be located in relation to the origin of the object.

World Coords
Select World Coords to anchor a texture map in place. Normally, with World Coords off, an object and its texture map will move together, as one unit. With World Coords on, the object will appear to move through the texture map. The texture will not move in an animation, even if its host surface (or object) moves.

Falloff
Falloff determines at the rate that the texture blends with the surface color until only the surface color is visible.

Velocity
Velocity is used to animate a texture across a surface. The fractal bumps pattern would appear to roll across the surface in the selected direction(s).

Amplitude
Amplitude determines the height of the bump, how much contrast there is between the highlighted surface and the darker areas of the image. The higher the amplitude percentage, the more visible your bumps will be.

Frequencies
The frequencies value determines the complexity of the pattern. A low value will have a simple fractal pattern, whereas a higher value will decrease the size of the features in the fractal pattern. With Bump Mapping it is not useful to use a value higher than six.

Use Texture
Click Use Texture to accept any changes made in this control panel and to return to the previous one.

Free Texture
Select Free Texture to abandon the Texture and values you have set, and to return to the previous control panel. To remove a Texture that has been previously assigned to a surface, reenter its control panel and exit using the Free Texture button.

Working with Envelopes

An envelope is a function of LightWave that allows you to alter the settings for an attribute over a series of frames in an animation. For example, one envelope attribute is Object Metamorphosis, which allows you to change the shape of an object from one to another over a course of time. The following is a list of the values that may be modified in LightWave.

- Object Metamorphosis
- Object Dissolve
- Polygon Size
- Ambient Light Intensity
- Light Source Intensity
- Camera Zoom Factor
- Color Saturation
- Foreground Dissolve.

In an envelope control panel, your work is displayed in the form of a graph showing key frames and percentage values of the desired effect. At each key frame location, the characteristic amount of each attribute is shown. For example, at key frame 1, a light source is set to 100%. At key frame 10, it is set to 50%. In the completed animation, the light would dim to one-half its brightness. The envelope control panel would display a key frame at each end of the graph, one at 100% and one at 50%, with a slanted line between the two that represents that change in brightness.

Just as you create these key frames in Layout, you must create them in the envelope control panel. After creating a key frame, you choose a setting of, set other characteristics concerning the smoothness of the changes, and exit the control panel. This provides you with total control over the application of the envelope
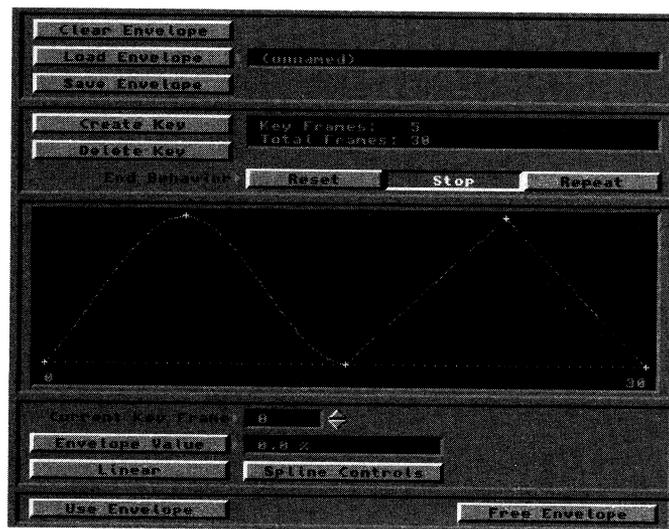
This is an example envelope, with two keyframes set to "Linear" and two set to "NonLinear."

Clear Envelope
Click Clear Envelope to clear any envelope values for the current object.

Load Envelope
Click Load Envelope to load a presaved envelope to the current object.

Save Envelope
Click Save Envelope to save an envelope for future use with other objects.

Create Key
To create a key frame, click this button and enter the number frame number to assign. Envelopes automatically set a key frame at 0. Use Create Key to create more.

Delete Key

To delete a key frame, click this button and enter the number frame number to delete. Note that you cannot delete the key frame at frame 0.

Key Frame Status Window

This window displays the number of key frames established, as well as the total number of frames in the animation.

End Behavior

End Behavior determines how an item will be treated when it reaches the end of its motion path. There are three end behaviors:

> Reset will reset all object values in the frame immediately after the final key frame. X, Y, Z (position) and H, P, B (direction) reset to zero. Object size resets to a factor of one.

> Stop will cause the object to stop, leaving it where it is upon reaching its final key frame.

> Repeat will have the object "loop through" the motion file until the end of the animation (if it is shorter than the animation itself).

Animation Window

This window displays a graphic representation of the animation's key frames and their envelopes.

Current Key Frame

Use the arrow buttons to move between the different key frames for this object.

Envelope Value

Click Envelope Value to set the percentage for the effect at the current key frame.

Linear

Click Linear so that the effect occurs in a linear, or straight, fashion, rather than with a gradual easing. Linear affects the timeline between the current key frame and the previous key frame.

Spline Controls

Spline Controls are advanced animation tools used to fine-tune object motion. If you animate a great deal, you may find these controls useful. Recommended values for each characteristic are given. Between these two end values, smaller value increments may be used.

> **Tension** (Values: 0 = normal tension, 1 = high tension)
> Tension causes an object in motion to slow down (move a little bit less in each frame) as it neared the key frame, and to accelerate (resume speed) as it passed. Without tension the object would pass through the key frame position at a constant speed. A pendulum is a good example. Tension on the key frames at either end of its swing would cause the pendulum to slow as it neared those key frames, and to accelerate away from them on the downward swing of its motion.

> *Note that any value set in Default Tension (under Surface) will automatically be entered in Tension all key frames created afterward. Key frames created prior to that will not be affected.*

> **Continuity** (Values: -1 = sharp continuity, 0 = normal continuity)
> Continuity is used to accentuate a break or change in an object's motion path. It has no effect on the incoming or outgoing speed of the object, which is the function of tension. A bouncing ball provides a good example of both tension and continuity. At the top of its bounce, use tension to slow the rising motion and speed the falling motion of the ball. At the bottom of the bounce, a negative continuity value will accentuate the sharp change in the ball's sudden change of direction as it bounces off the ground.

> **Bias** (Values: -1 = more slack incoming, 0 = equal slack, 1 = more slack outgoing)
> Bias controls the "slack" at key frames that is the nature of spline paths. A typical spline path would "round off" angles in a motion path. Bias allows you to move this rounding off toward one side of the key frame or the other. This serves to accentuate motion: the incoming motion by undershooting

the key frame (creating a feeling of anticipation) or the outgoing motion by overshooting the key frame.

Use Envelope

Click Use Envelope when you have completed working with this envelope and are ready to return to the main screen.

Free Envelope

Click Free Envelope when you want to return to the main screen and ignore any changes made to this envelope.

LightWave 3D Tips and Tricks

- The first frame and last frame numbers only affect the frames rendered and shown in Layout. They do NOT erase frames outside of the range or keep you from creating keyframes outside of that range. For instance, if your first frame is 1 and your last frame is 30, you can still create a keyframe at frame 75. It won't be rendered or shown as part of your Preview in Layout, however, until you change the last frame to 75 or higher.

- So why not just set high last frame numbers to start with? Memory, that's why. LightWave's Layout screen can only hold so many frames before it runs out of memory and gives you an error message saying, 'Only xxx frames could be allocated.'

There are two methods for avoiding this problem. First, you can work with only a certain range of frames at a time. For instance, you could work on frames 1 to 150, and then work on frames 151 to 300. When you're satisfied with the previews and no longer need to work in Layout, just set first frame to 1 and last frame to 300. (Remember - the memory problem only comes up in Layout.)

The other method is to use the Frame Step. Set Frame Step to 2, and then, when you create your preview in Layout, watch it at 15 fps. This will only show you every other frame, but at the proper speed. You could also use a Frame Step of 3, and then view it at 10 fps. Again, for final render you'd want to set the Frame Step value back to 1.

Envelopes
Envelopes allow you to animate values. By using envelopes, you can change the brightness of light over the course of an animation, animate the zoom factor of your camera, morph and dissolve objects, and much more.

Creating envelopes is a fairly straightforward process. You enter the Envelope panel by clicking on one of the Envelope buttons, which are located in a number of different requestors. (Many examples of where this button appears are given below. See the LightWave Reference section of this manual for a complete listing.)

You then create a keyframe for each value that you wish to animate. Just as in the Layout window, the computer will create the 'in-between' frames. You can also adjust the spline settings of envelopes, as in Layout.

You can also set an End Behavior for envelopes, just as you did for motions in the Butterfly Tutorial. These behaviors are Reset, Stop and Repeat, and they work exactly the way they do for motions; detailed descriptions are in the Reference section.

Finally, you can save and load your envelopes for later use or for use within the same animation.

Here are a few tips for using envelopes.

- To create a strobe light effect, give your lights (including ambient light) a short repeating envelope. For instance, click on Envelope from the Light Intensity requestor, and then create keyframes at frames 1 and 3. Give frame 1 a value of 100, and give frame 3 a value of 0. Set End Behavior to Repeat. Try creating longer fade times by setting your keyframes further apart.

- The Saturation button (from the Camera menu) controls how saturated the colors are in your animation. You can animate this value (creating an animation that goes from color to black and white, for example) by creating a keyframe value of 100% for the first frame of your animation and a keyframe value of 0% for the last frame.

- You can create dissolves (like the Switcher's Smooth Fade effect) within your animations by creating an envelope for the Foreground Dissolve function (the button is located in the Backdrop menu.) Just select the frame or sequence of frames that you want to dissolve to, and create an envelope to set how long the dissolve will take.

- To make complex camera moves, you can create an envelope to control the camera's zoom factor. Try panning the camera, and then slowly zooming in on an object.

- You can create explosion effects by creating an envelope for Polygon Size function, which is located in the Objects menu. These types of explosions are used often in Todd Rundgren's *Change Myself* video. As the

polygon size of an object gets closer to 0, the object's polygons become smaller. By simultaneously increasing the object's Size (from the Layout window) and decreasing its Polygon Size, you can create interesting explosions. By reversing the process, you can 'unexplode' objects. Again, *Change Myself* has many examples of this.

Morphing

Object morphing (changing one object into another one, as was often used in the movie *Terminator II*) is also done by using envelopes. You simply load two or more objects, (one is the initial object, the others are targets), select a morph target from the objects menu, and then set an envelope to choose the keyframes that the objects will morph over.

Morphing is covered in the Reference section, but there are a few things to remember about object morphing.

- You can only morph between objects with the same number of points and polygons. Also, the points and polygons must have been created in the same order. These restrictions mean that the best way to create morph targets for an object is to modify the original object using the Modeler. The bend, twist, and magnet tools are very useful here.

- Morphing does NOT dissolve between objects. This is very important to understand, because otherwise you'll be wondering why you're seeing both the object and its morph target at the same time. The easiest way to make your morph targets invisible is to simply move them behind your camera. If your scene has a lot of camera movement, you might want to parent the targets behind the camera.

Backdrop

- To create a smooth gradient background, set your Sky and Ground to the same values.

- Backdrop fog can also be used to create an 'inky night' effect. Set your Fog color to pure black (R : 0, G : 0,   B : 0), and set your backdrop to dark shades or black. As you move through the landscape, objects will come out of the darkness.

General

- Using the F10 keyboard shortcut for rendering allows you to bypass the requestor asking whether you want manual or automatic frame advance. Pressing F10 starts rendering immediately, using the frame advance setting you selected.

- To create a smooth rotation around an object, load the NullObject and parent the camera to it. Then rotate the NullObject, and the camera will follow it.

- People often ask how to get realistic looking water, so we've enclosed a Scene file that does just that for you to study. One important factor is to have one light source aimed at the water at exactly 90°.

- LightWave's lighting defaults are set to give you a good looking picture when you render, but you can create dramatic effects by changing the lighting. Light a 3D scene just as you would a real one. Three point lighting, using colored filters and different types of lights...all of these principles work very well in the 3D world.

- To create more dramatic shading, drop your ambient light down to near 0.

- To create realistic shading for planets, use the Sharp Terminator option, located in the Surfaces panel.

- When using either of the Star objects (in the Space directory), don't forget to change your grid size to something smaller.

- To create more realistic transparent objects, change the Edge Transparency (from Surfaces) to Opaque. You may want to adjust your Edge Threshold a little.

Modeler Hints

- To assign surface names to objects, first create the surface names by using the the Edit Surface requestor (from Modeler's Options menu). Just type in the name that you want and then click on Create. You can create as many names as you want.

Then select the poygons that you want to assign to a given surface name. When they are selected, click on Surface (from the Polygon menu) and use the arrow buttons (these are the buttons on your screen, not the arrow keys on the keyboard) to choose which surface name you want to apply to the chosen polygons.

It's important to remember that a surface name is just a name; it doesn't change anything about the surface itself. For instance, just naming an object's surface 'ShinyBluePlastic' doesn't do anything to make the object actually look shiny, blue or plastic. All surface attributes are changed by using LightWave Renderer's Surfaces panel. Also, don't forget that you'll need to resave an object (using LightWave Renderer's Save Object button in the Objects menu) before exiting LightWave; otherwise, you'll lose any changes made to the surface attributes.

- If you are creating an object with many different parts, such as a car or bicycle, one reason for using different layers is that it makes it very easy to assign surface names. Each layer should be created so that all polygons in that layer will have the same surface name. Just go to the layer you want to work, and bring up the Statistics requestor by pressing the w key. Select all polygons, and then assign the surface name using the procedure outlined above.

- If you don't assign a surface name to an object's polygons, they will take on the name of the last surface you selected. If you are starting a project from scratch, this name will be Default.

- Also, remember that you can change the name of a surface from LightWave Renderer's Surface panel simply by clicking on the Rename Surface button.

- It's easy to separate out parts of an object by Surface name. Click on the Select Polygons button on the far left hand side of Modeler's screen and bring up the Statistics requestor. Use the arrow buttons to select the surface you want. You'll notice that the requestor tells you how many polygons have that particular surface. Click on the + key next to the 'with surface:' section, and all polygons with that surface will be selected. You can then Cut or Copy the selected polygons and Paste them to another layer.

- It's important to remember that you can't extrude double-sided objects. Any of the primitives that you drag out are double-sided, so, in order to extrude them, you need to use the Info command. This is shown in the Mug Tutorial in the Modeler Tutorials.

- To create an italicized version of a font, use Modeler's Shear function, applied to the top of the letters.

- If you're going to create a morph target for an object and you'll be using tools like Bend or Twist, you might want to use the Triple function on any polygons that will be twisted, stretched or bent radically. Not tripling polygons may cause rendering errors. Also remember that, since morphing requires objects to have the same number of points and polygons, you'll want to triple and save the base object before you begin creating your morph targets.

- One good technique for creating morph targets is to load an object, and then Copy the entire object. Paste it to a few different layers. You can then bring the original object up as a background layer to compare the target to.

- If you don't have any points selected, and are in Select Points mode, you will affect the entire object.

- If you are creating a vehicle or landscape, it's a good idea to use the correct view mode. The views are designed to let you view objects from the angles that you need for maximum ease of creation.

The Biggest Tip In The Book
Constantly search for new tips and techniques. Watch other people's work, share your work with others and always try to find new and better ways of doing things. This is the first time in history that 3D tools this powerful have been available at this price, and we at NewTek have been blown away by much of the work that we've seen people do since we released the Toaster. We've given you hundreds of new tools with System 2.0, and we can't wait to see what you'll do with them.

RGB Color Value Chart and Index of Refraction

Use the **RGB Color Values** listed here as a guideline for your RGB color selections in LightWave 3D (these colors are also useful in ToasterPaint and ToasterCG). Use the **Index of Refraction** values listed below as a guideline for refraction values (entered via the Refractive Index button found under the Surface button in LightWave Renderer). Remember: the higher the index the longer the rendering time.

Whites	R	B	B
antique white	250	235	215
azure	240	255	255
bisque	255	228	196
blanch almond	255	235	205
cornsilk	255	248	220
eggshell	252	230	201
floral white	255	250	240
gainsboro	220	220	220
ghost white	248	248	255
honeydew	240	255	240
ivory	255	255	240
linen	250	240	230
navajo white	255	222	173
old lace	253	245	230
seashell	255	245	238
snow	255	250	250
wheat	245	222	179
white	255	255	255
white smoke	245	245	245

Greys			
cold grey	128	138	135
grey	192	192	192
slate grey	112	128	144
warm grey	128	128	105

Blacks			
black	0	0	0
ivory black	41	36	33

Reds			
brick	156	102	31
cadmium red dp	227	23	13
coral	255	127	80
firebrick	178	34	34
indian red	176	23	31
limaroon	176	48	96
pink	255	192	203
raspberry	135	38	87
red	255	0	0
salmon	250	128	114
tomato	255	99	71

Oranges			
cadmium orange	255	97	3
carrot	237	145	33
orange	255	128	0
orange red	255	69	0

Browns	R	G	B
beige	163	148	128
brown	128	42	42
burnt sienna	138	54	15
burnt umber	138	51	36
chocolate	210	105	30
flesh	255	125	64
khaki	240	230	140
rosy brown	188	143	143
raw sienna	199	97	20
raw umber	115	74	18
sepia	94	38	18
sienna	160	82	45
saddle brown	139	69	19
sandy brown	244	164	96
tan	210	180	140

Yellows			
banana	227	207	87
cadmium yellow	255	153	18
gold	255	215	0
goldenrod	218	165	32
melon	227	168	105
yellow	255	255	0

Blues			
blue	0	0	255
cobalt	61	89	171
dodger blue	30	144	255
indigo	8	46	84
manganese blue	3	168	158
midnight blue	25	25	112
navy	0	0	128
peacock	51	161	201
powder blue	176	224	230
royal blue	65	105	225
slate blue	106	90	205
sky blue	135	206	235
steel blue	70	130	180
turquoise blue	0	199	140
ultramarine	18	10	143

Cyans			
aquamarine	127	255	212
cyan	0	255	255
turquoise	64	224	208

Greens	R	G	B
chartreuse	127	255	0
cobalt green	61	145	64
emerald green	0	201	87
forest green	34	139	34
green	0	255	0
lawn green	124	252	0
lime green	50	205	50
mint	189	252	201
olive drab	107	142	35
sap green	48	128	20
sea green	46	139	87
spring green	0	255	127
terre verte	56	94	15

Magentas			
blue violet	138	43	226
magenta	255	0	255
orchid	218	112	214
plum	221	160	221
purple	160	32	240
violet	143	94	153

Index of Refraction

Air	1.000
Liquid Carbon Dioxide	1.200
Water	1.330
Flourite	1.434
Calspar2	1.486
Zinc Crown Glass	1.517
Hi-dispersion Crown Glass	1.520
Sodium Chloride (salt)	1.544
Quartz	1.553
Emerald	1.570
Light Flint Glass	1.575
Lapis Lazuli	1.610
Topaz	1.610
Heavy Flint Glass	1.650
Calspar1	1.660
Ruby & Sapphire	1.770
Heaviest Flint Glass	1.890
Crystal	2.000
Diamond	2.420
Chromium Oxide	2.500
Copper Oxide	2.705
Amorphous Selenium	2.920
Iodine Crystal	3.340

LightWave Keyboard Commands

LightWave Renderer

Render! ....F10 (Render image with last-used Frame Advance setting)

LightWave Layout

XY View Mode F1

XZ View Mode F2

ZY View Mode F3

Perspective View Mode F4

Camera View Mode F5

View v

Object ....o

Select next item........................up arrow

Select previous item.................down arrow

Light l

Camera c

Mouse Function ....Spacebar (Cycles through available Mouse Functions)

Go to Frame ....g

Create Key Frame ....Return

Delete Key ....Delete

Next Key Frame ....Shift-Right Arrow

Previous Key Frame ....Shift-Left Arrow

Spline Controls ....s

Cancel Making Preview Animation ....Escape Key

Lightwave Modeler Manual

Table of Contents

LightWave Modeler Reference

Modeler Terminology

Polygon
Polygons are used to define the surface of an object. A triangle, for example, is a simple polygon made up of 3 points and 3 lines. Polygons may have any number of points and lines. They can be assigned color and texture, and can be shaded realistically by LightWave Renderer.

Surface
A surface may be one polygon (or a group of polygons) with the same color and texture properties. On a beach ball object, for example, the polygons that make up the red, white, blue, and yellow faces would all be considered different surfaces on a single object .

Point
Points are used to anchor the "corners" of polygons. Groups of points can be connected and made into a polygon. Note that a point that has been connected to form a polygon is known as a vertex.

File Requester
A file requester is a menu box that appears on screen when you activate a load or save function. It allows you to select among the different Toaster storage devices on your system to load or save files.

Layer
Think of layers as "see-through" work screens. You use layers to work on a specific part of an object without your operations affecting other parts. It would be simpler to work on the canopy of an F-15 jet airplane in layer 1,while the wings are in layer 2, the nose in layer 3, etc.

Select
A single click on a button, point, or polygon. This will highlight it, thus selecting it.

Drag Out a Box
Click the left mouse button and *while holding the button down* drag the mouse. A box-shape will be drawn from the first point you click to the location of the pointer when you let go the button.

Default Values
This term is used to define the standard values that certain screen functions use every time you invoke them. For example, LightWave programs default to the Objects directory when you first go to Load or Save an object.

Toaster Terminology

Click
Click means to press and then quickly release the left mouse button. Buttons and icons may change shape or color when clicked on in this manner. The word select may also be used for click (as in, "select the Load Frame button," which means for you to click it).

Double-click
Double-click means to press and then quickly release the left mouse button twice. In the Video Toaster, you double-click some buttons to activate their functions (as in, double-click the Load Frame button to load a still frame).

Shift-click
Shift-click means to hold the shift key on the keyboard, then quickly press and release the left mouse button.

Drag (also Dragging)
Dragging is holding down the left mouse button and moving the mouse.

Pull Down a Menu
To pull down a menu in ToasterPaint, hold down the right mouse button and move the mouse to the menus that appear. Menu options that you can select will appear to "drop down" as the pointer passes over them.

Return and Enter
These two keys are used for two distinct functions in the Video Toaster. Be aware that they will not perform the same actions. Generally, you use Return after typing text in order to restore the mouse pointer, while you use Enter to activate a function (as in, saving a Frame).

Select
A single click on an on screen button. This will highlight it, thus selecting it.

General Modeler Tips

In Modeler, you place points on a grid that has height, width, and depth. You connect these points with lines to create flat surfaces called polygons. Polygons are grouped, edge to edge, to form surfaces that define an object's shape. Flat or straight objects are not difficult to create, since you are working with straight lines and flat surfaces. In 3D modeling, it is difficult to create truly smooth, rounded surfaces, such as that of a beach ball, using flat surfaces. Therefore, many small flat surfaces are joined together to approximate larger, smooth shapes. (A rendering method called Phong Shading actually calculates a smooth appearance to such surfaces, which is the reason such exacting detail is not required.)

Once you create points and polygons, and join them to form more complex objects, you assign each different surface a name, giving it an identity. An object may have any number of defined surfaces. For example, if you created a book, you might have the following surfaces to define the different surface appearances of the book: Front Cover, Spine, Back Cover, Page Sides, Open Pages. Then, when the book is loaded into LightWave Renderer, you would select each surface one at a time to assign each a different color, and maybe a texture as well. When LightWave renders the image, you will see a complete book, with each surface having its own attributes.

Working on the Screen
Once the workspace is filled with points, polygons, and objects, it can become difficult to separate the different parts into manageable sections. Modeler has five ways to help you with this.

Selection Tools. There are three buttons at the left edge of the screen that enable you to define exactly that item you wish to work with at a given time: Point, Polygon, and Volume.

If you wish to move a point to a new location, click Point, click on the point you wish to move, then click on the Move button. At this time you can drag the point anywhere on the screen by dragging the mouse. You can also select a number of points to move in one operation if you wish.

If you wish to rotate a polygon to a new location, click Polygon, click on the polygon you wish to rotate, then click on the Rotate button. At this time you can rotate the polygon on the screen by dragging the mouse. You can also select a number of polygons to rotate in one operation if you wish.

If you wish to stretch a group of points or polygons that are in a certain area, click Volume. Use the left mouse button to drag out a 3D box on the screen, surrounding the points or polygons you wish to stretch. Click Stretch. Now drag the mouse button on the screen to stretch the selected items. Volume works in two ways: including only those polygons completely within the box, or including all those that are even partially within the box.

Layers. Modeler has eight active workspaces at one time. Think of them as overlays, or transparent work areas. At any time, any combination of these may be worked on. This allows you to keep distinct surfaces, or parts of the object, separate, and to act on them individually as needed.

Surface Names and Statistics. By naming different surfaces as you create them, you can activate (or select) them for further use by calling up the Statistics menu. Statistics shows you data about points, polygons, or volumes, depending on the Selection Tool that is active. You can also choose these items by name from Statistics.

How the Tools Function
Tools in Modeler function in the same general manner.

First, you highlight (or select) the item to work on (points, polygons, a volume, or a named surface).

Second, you select a tool. The menu buttons across the top of the screen activate different tool functions along the left edge of the screen. Locate the tool and click on it to use it.

Third, you move the mouse into one of the edit windows and drag the one of the mouse buttons. (Usually you drag the left button; on occasion, sometimes it will be the right due to special options. The manual will let you know which is which.) You can also use a special menu called Numeric that allows you to tailor the operation of the tool you've chosen to use. This allows you finer control over the tool's function.

Fourth, once you've completed the operation, you select another tool to operate on these same items, or "drop" the tool by pressing the slash key on the keyboard and go on to work with different items.

About the Reference Section
Since most Modeler tools function in the manner just described above, the Reference section does not always specify how a tool works, since it would be repetitious to remind you to use the left mouse button. Where needed, the Reference section will let you know when a special use requires different input from you.

Getting Around the Screen

The Modeler Screen

The following picture represents the Modeler screen.

Menu Buttons
Use these buttons to access the Command buttons that govern different aspects of Modeler functions.

The Edit Windows
These windows are the three windows that display orthographic views of the modeling workspace. To work in one window at a time, see *Moving the View Windows*.

The Preview Window
This window displays a three-dimensional wireframe of the object within the workspace. Activate it using the Preview command button under the Options menu button.

Layer Buttons
The Layer Buttons let you work on different objects or parts of an object, each in a separate layers, yet all on the same screen. A layer may be set to one of three states: visible and active, visible and inactive, or invisible and inactive.
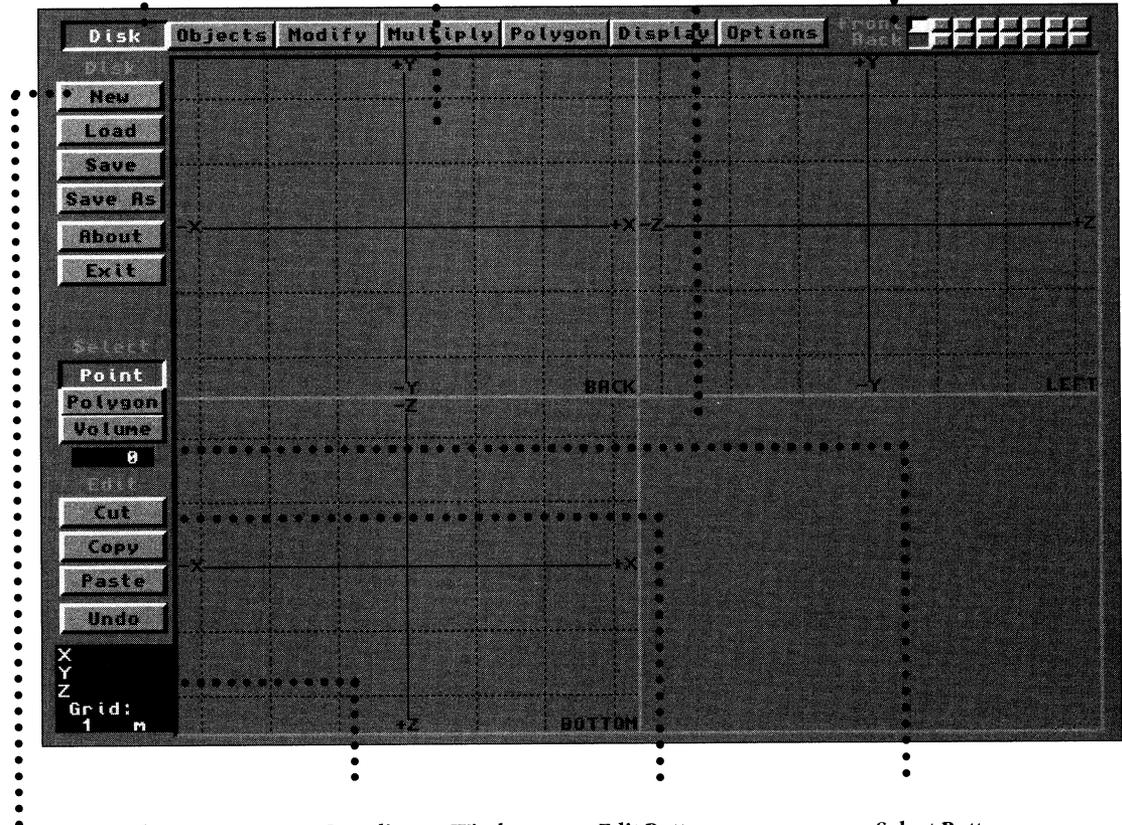
Command Buttons
Command buttons perform specific actions on objects. Command buttons change function depending on the Menu button selected.

Coordinates Window
This window displays the current X, Y, Z, location of the cursor. In addition, it shows the current size of the reference grid in the workspace.

Edit Buttons
These buttons perform commonly-used actions on objects, such as Cut, Copy, or Paste. Since these commands are often used, they are always available.

Select Buttons
These three buttons select which portion of the object you are editing - either points, polygons, or a cubic volume of space (that contains points and polygons).

Moving the View Windows
The Preview and Edit Windows are, quite literally, your "windows on the world." In this case, the 3D world. These windows are capable of being moved about the screen so that you may concentrate on working in the window you prefer. To move these windows about, use the light gray crossbars that divide the screen into four views. These bars are actually a "handle" on the screen. Click anywhere on them and drag the window display until it is positioned as you desire.

The File Requester

In LightWave, the File Requester is the tool you use to Load or Save items within the scenes you create. If you have used the Keypad Control Panel to load or save Framestore images from the Switcher Screen, the *function* of the file requester is similar. The difference is that the file requester allows you to see a number of files at one time rather than just one file. Also, you can use the file requester to look on different devices for different files (the same devices you select for Framestores from the Preference screen).

When you select a Load or a Save function from within LightWave, you will see a file requester pop up on screen, like so:

Title Bar
This will display the operation you have requested. For example, "Load Scene File" indicates that the Load command was selected.

Device Buttons
These buttons select the device where the file requester is currently listing files.

Drawer
This is the location on the hard drive (device) where the file requester is currently listing files from.

File Selection Window
This large area lists the files available within this drawer. To select a file, click on its name. It will appear in the File Name window below.
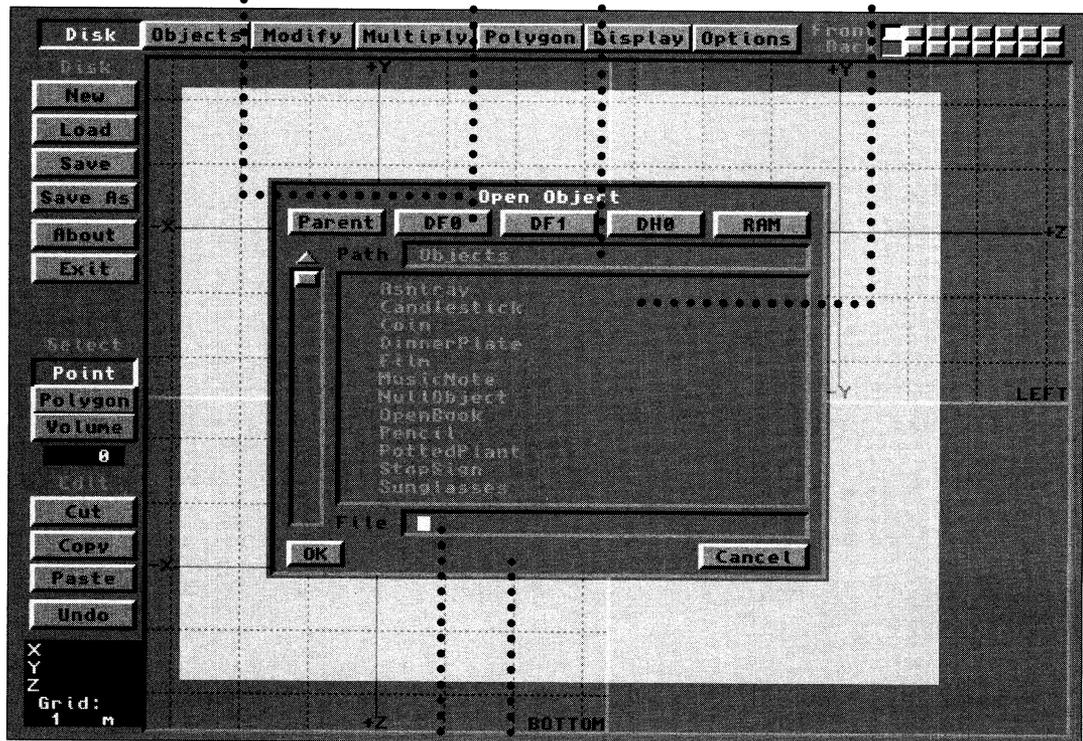
File Name Window
This window displays the filename selected from the File Selection window, above. You may also click in this window and type the name you wish.

OK and Cancel
These buttons allow you to OK your file selection, or Cancel the requester altogether if you should change your mind.

Reference Section

The Menu Bar

The Menu Bar is the row of buttons along the top of the screen. Click one of these buttons to display its menu options to appear along the upper left side of the interface.
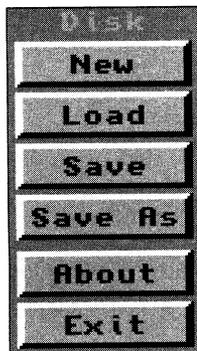
Disk

New ▲ N
To clear all layers of objects and reset all buttons to their default settings, click on New.

Load ▲ l
To load objects into the Modeler, select Load. You will be presented with a file requester that is preset to the "Objects" directory on the hard drive. Click on the name of the file you wish to load, then click OK to load the object into the current layer.

Save ▲ s
To save the current object using the current file name select Save. This button is a shortcut. It saves you the repetition of having to retype the same object name every time you save modifications. A menu box will appear, asking you to confirm that you want to save this object right over the old object. Click OK if you do, or CANCEL if you do not. To save objects under different names, use the Save As command.

Save As ▲ S
To save the current object using a different file name select Save As. You will be presented with a file requester that is preset to the "Objects" directory on the hard drive. Click in the box labelled "file" near the bottom of the file requester, type the name of the object you wish to save, then click OK to save the object.

About
To find out the current program version of Modeler, and the amounts of available memory you have, click on About.

Exit ▲ Q
To return to LightWave 3D Control, click the Exit command. Modeler remains loaded and active in memory, so if you have objects in any layers, they will still be there when you reenter Modeler. (Note: If you unload Modeler by holding the shift key and clicking on its button, Modeler will be shut down and any active objects lost.)
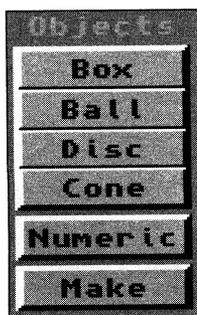
Objects

Box
Click Box to create cubes. Move to one of the views and drag out a bounding box (this box defines the boundaries of the cube). Move another view to drag out the third dimension. Click Make to generate the box. To create boxes with specified X-Y-Z coordinates: click Box, click Numeric, enter the proper settings, click OK, then click Make.
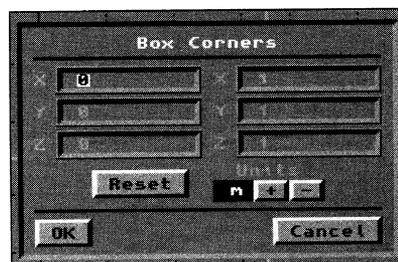
Box - Numeric Menu
Click Numeric after selecting Box to:
- Specify the X-Y-Z coordinates for one corner of the cube
- Specify the X-Y-Z coordinates for the opposite corner of the cube
- Specify the unit of measurement to use for size (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Ball
Click Ball to create spheres. Move to one of the views and drag out a bounding box (this box defines the boundaries of the ball). Move to another view to drag out the third dimension. Click Make to create the sphere. To create spheres with a specified number of rings and segments: click Ball, click Numeric, enter the proper settings, click OK, then click Make.
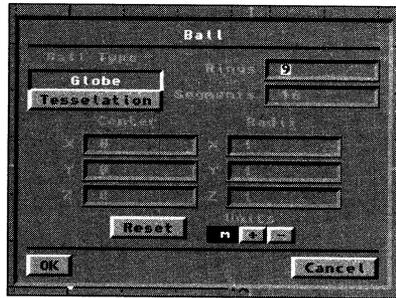
Ball - Numeric Menu

Click Numeric after selecting Ball to:

- Specify a ball made up of polygons (Globe) or triangles (Tesselated)
- Specify the number of rings (top-to-bottom cross sections) and segments (pie-cuts in a 360-degree sweep) for the Globe
- Specify the level of complexity for the Tesselated sphere (a value of 2-4 is best)
- Specify the center coordinate for the sphere
- Specify the radius for the sphere
- Specify the unit of measurement (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Note: To create good-looking Ball objects, use the following formula as a guideline: Select an even number for Segments, enter that value. Divide that number by two, and add one. For example, a 16-segment ball should have 9 rings (16 divided by 2 equals 8. Add 1 to make 9).

Disc

Click Disc to create discs or cylinders. Move to one of the views and drag out a bounding box (this defines the boundaries of the disc). Click Make to generate the disc. (If you wish to create a cylinder, move to another view and drag out depth to the box.)

To create disks with a specified number of segments: click Disk, click Numeric, enter the proper settings, click OK, then click Make.
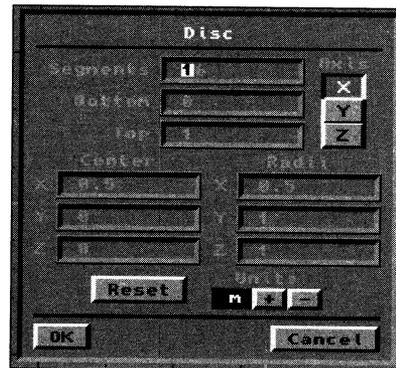
Disc - Numeric Menu

Click Numeric after selecting Disc to:

- Specify the number of segments (pie-cuts in a 360-degree sweep) for the disc
- Specify a coordinate on any axis for the bottom end of the disc (or cylinder)
- Specify a coordinate on any axis for the top end (of the cylinder)
- Specify the center coordinate for the disc (or cylinder)
- Specify the radius for the disc (or cylinder)
- Specify the unit of measurement (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Cone

Click Cone to make cones. Move to one of the views and drag out a bounding box (this defines the boundaries of the cone). Move to another view to drag out the third dimension. Click Make to generate the cone. To create cones with a specified number of rings and segments: click Cone, click Numeric, enter the proper settings, click OK, then click Make.
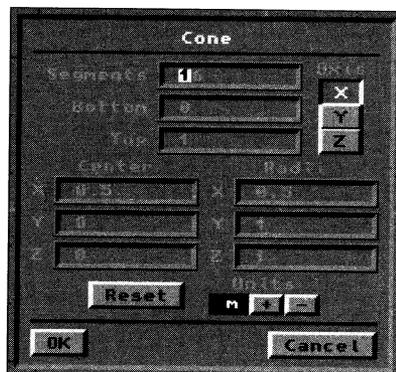
Cone - Numeric Menu

Click Numeric after selecting Cone to:

- Specify the number of segments (pie-cuts in a 360-degree sweep) for the cone
- Specify an axis and coordinate for the bottom end of the cone
- Specify an axis and coordinate for the top end of the cone
- Specify the center
- Specify the radius for the cone
- Specify the unit of measurement (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Numeric (n)

Click Numeric after clicking one of the built-in object commands to enter specific parameters about the object (coordinates, distance, size, etc.).

Make (return)

The Make button in the Objects Menu completes the creation of basic building block objects. For example, after defining the boundaries for a sphere, click Make to generate the sphere.
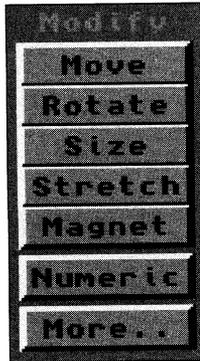
Modify

The Modify menu is unique in that it has two sets of Command buttons associated with it, and the buttons on these menus are directly related to their counterparts. No other Menu button sports this feature. Click the More button to see the second set of operations. The relationship is that the first menu items affect points, polygons, or objects in a certain, general manner. The second menu items affects these items in a more specific manner. For example, Rotate will rotate an object 45 degrees, while Twist will twist the top portion of the object about 45 degrees (leaving the bottom fixed). Using the Numeric menus allows for even greater control in affecting objects.

Button	"More" Button
Move	Shear
Rotate	Twist
Size	Taper1
Stretch	Taper2
Magnet	Bend

Move

Click Move to move points (and therefore polygons) around the screen. The view you are working in determines which two axes the selected objects may be moved on. Move acts on points only.
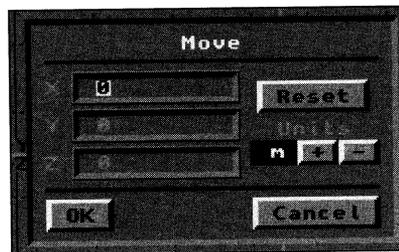
Move - Numeric
Click Numeric after selecting Move to:
- Specify a distance to move the object on any combination of axes.
- Specify a unit of measurement for the move (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

A keyboard "shortcut" for moving points to a specific location is j, for jump. Instead of dragging these items around the screen with the mouse, select them, then move the mouse to the new location, and press j. Instantly the selected item will jump to the mouse position.

Rotate

Click rotate to rotate the object around a single axis. This rotation axis is centered on the pointer. This can be used to "twist" objects by selecting certain sections individually and performing a rotation with the pointer off to one side. The pointer indicates a rotation operation by turning into two curved arrows. The degree of rotation is displayed in the Grid Size Window.
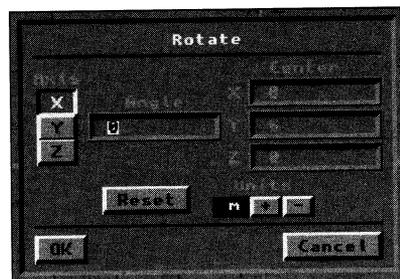
Rotate - Numeric
Click Numeric after selecting Rotate to:
- Specify the axis of rotation (X-Y-Z)
- Specify the angle (amount of rotation) in degrees
- Specify a coordinate point around which the rotation occurs
- Specify a unit of measurement for the rotation (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Size

Click Size to change the dimensions of a polygon (on two axes) or an object (on all three axes) equally. The position of the pointer in the window determines how the object will shrink or enlarge. The pointer indicates a sizing operation by turning into two small boxes, one with dotted and one with solid lines.

Note: Don't confuse Modeler's Size Command with LightWave's Size Function button. The Size Command in Modeler affects the objects "actual" size. An object resized within Layout, then resaved, would load back into both Layout and Modeler in its original size. The size command in Layout is used primarily to change an object's size within an animation.
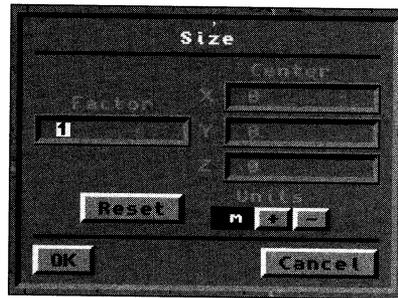
Size - Numeric

Click Numeric after selecting Size to:
- Specify a size factor to multiply the X-Y-Z dimensions by
- Specify a center coordinate point
- Specify a unit of measurement for the sizing (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Stretch

Click Stretch to change the dimensions of an object or polygon. The view window determines the two axes used for sizing. Unlike size, Stretch does not affect all three axes equally. The position of the pointer in the window determines how the operation will affect the object.

Stretch - Numeric

Click Numeric after selecting Stretch to:
- Specify stretch factors to multiply the X-Y-Z dimensions independently
- Specify a center coordinate point
- Specify a unit of measurement for the stretching (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Magnet

Use Magnet to drag or move points. Points are not pulled toward the center of the magnet. Rather, they are pulled in the direction that you drag. The amount of "pull" exerted by the magnet is stronger for those points that are closer to its center. The center point will follow the mouse pointer exactly, while nearby points will move less under the lesser field of influence. A bounding box will appear. This represents the sphere of influence for the Magnet tool's "pull." Use the left mouse button to click as needed to position the box properly. Once positioned, click and drag with the right mouse button to stretch out some portion of the object.
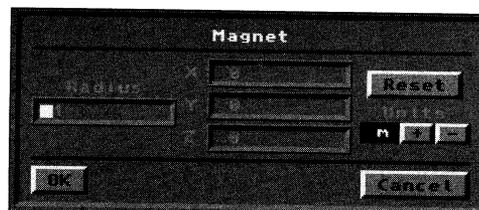
Magnet - Numeric

Click Numeric after selecting Magnet to:
- Specify a radius of influence for the magnet's pull
- Specify the center coordinate for the magnet's location
- Specify a unit of measurement for the effect (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

To use magnet, click in an edit window with the left mouse button. A bounding box will appear. Click as needed to position the box where you want. Now click and drag with the right mouse button to "Pull" points in the right direction.

Shear

Use shear to tilt or angle objects. A good use of shear would be to italicize text objects.
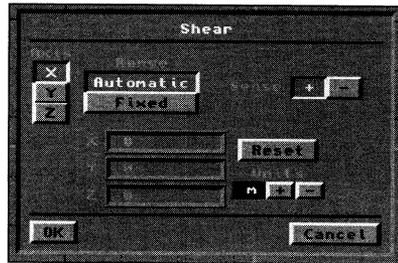
Shear - Numeric

Click Numeric after selecting Shear to:

- Specify the axis for the shear effect
- Specify the range as automatic (to affect the entire length of the object along the selected axis) or fixed (between two location points along the selected axis that you enter)
- Specify the sense as positive (affecting the object's positive-facing end) or negative (affecting the object's negative-facing end)
- Specify the distance for the shear effect on any combination of X-Y-Z axes
- Specify a unit of measurement for the effect (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Twist

Twist allows you to twist objects into new shapes. For example, you might twist a Roman column so that its fluted edges resemble the twisted stripes on a candy cane. The Twist function operates along the axis you are sighting on (that is, the axis that is not identified in whichever edit window you choose for the operation).
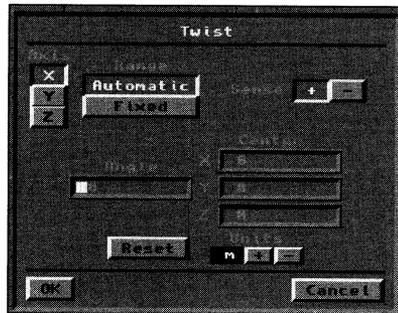
Twist - Numeric

Click Numeric after selecting Twist to:

- Specify the axis for the twist effect
- Specify the range as automatic (to affect the entire length of the object along the selected axis) or fixed (between two location points along the selected axis that you enter)
- Specify the sense as positive (affecting the object's positive-facing end) or negative (affecting the object's negative-facing end)
- Specify the angle (amount of twist) in degrees
- Specify the center coordinate for the twist effect
- Specify a unit of measurement for the effect (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Taper1 (Taper uniformly)

Taper1 will taper two axes equally. The axes that will be tapered are determined by the edit window you click in (the axes whose letters you see in that window are the ones that will be modifiable). The axis you are sighting along will be unaffected.
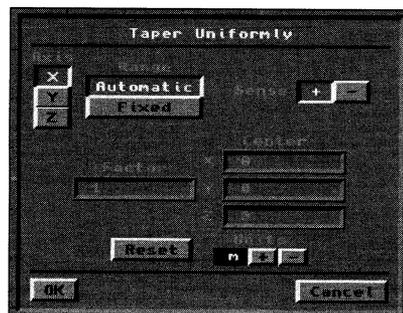
Taper1 - Numeric

Click Numeric after selecting Taper1 to:

- Specify the axis for the Taper1 effect
- Specify the range as automatic (to affect the entire length of the object along the selected axis) or fixed (between two location points along the selected axis that you enter)
- Specify the sense as positive (affecting the object's positive-facing end) or negative (affecting the object's negative-facing end)
- Specify the Taper1 factor
- Specify the center coordinate for the Taper1 effect
- Specify a unit of measurement for the effect (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Taper2 (General Taper)

Taper2 will taper two axes independently. The axes that will be tapered are determined by the edit window you click in (the axes whose letters you see in that window are the ones that will be modifiable). The axis you are sighting along will be unaffected.
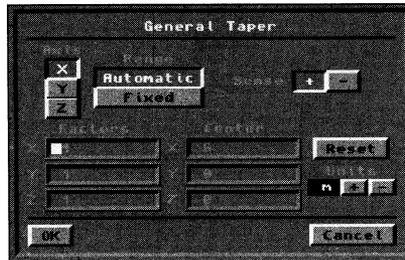
Taper2 - Numeric

Click Numeric after selecting Taper2 to:

* Specify the axis for the Taper2 effect
* Specify the range as automatic (to affect the entire length of the object along the selected axis) or fixed (between two location points along the selected axis that you enter)
* Specify the sense as positive (affecting the object's positive-facing end) or negative (affecting the object's negative-facing end)
* Specify the Taper2 factors for all three X-Y-Z axes
* Specify the center coordinate for the Taper2 effect
* Specify a unit of measurement for the effect (i.e., meters, millimeters, etc.)
* Reset all menu values to the original settings

Bend

Bend will bend an object. For example, with bend you could transform a straight tube into an elbow-shaped tube. When using the mouse, the axis that you are looking along in each edit window is the bend axis.
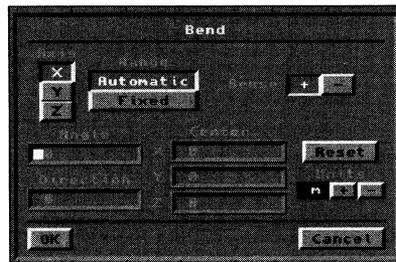
Bend - Numeric

Click Numeric after selecting Bend to:

* Specify the axis for the bend effect
* Specify the range as automatic (to affect the entire length of the object along the selected axis) or fixed (between two location points along the selected axis that you enter)
* Specify the sense as positive (affecting the object's positive-facing end) or negative (affecting the object's negative-facing end)
* Specify the angle (amount of bend) in degrees
* Specify the center coordinate for the bend effect
* Specify a direction for the bend
* Specify a unit of measurement for the effect (i.e., meters, millimeters, etc.)
* Reset all menu values to the original settings
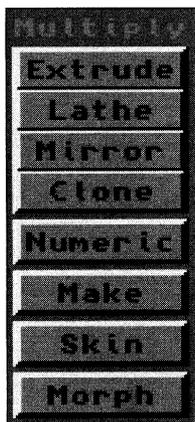
Multiply

Extrude

Click Extrude to stretch a polygon (or group of polygons) on an axis, taking a flat object and giving it depth. For maximum control over the extrusion, select the polygon(s) and click Extrude. Click Numeric, and enter the axis and extrusion values. Click OK. Click Make. Extrude cannot be performed manually, by dragging out a distance with the mouse.
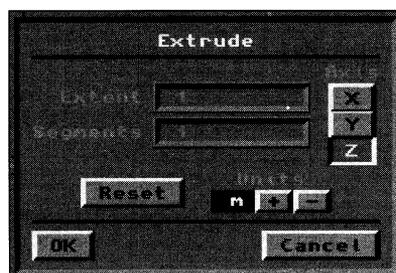
Extrude - Numeric

Click Numeric after selecting Extrude to:

* Specify the extent (distance) for the extrusion
* Specify the number of segments for the extrusion
* Specify the axis along which the extrusion occurs
* Specify a unit of measurement for extrusion (i.e., meters, millimeters, etc.)
* Reset all menu values to the original settings

Lathe The term lathe comes from wood and metal working, where a beam (or pole) is spun while a blade cuts into it, to give it a pleasing shape. Click Lathe to take an object, or an outline of an object, and spin it around an axis. To use Lathe, create an outline polygon, click on the Lathe tool, select the axis you want as your pivot axis, and click Make.
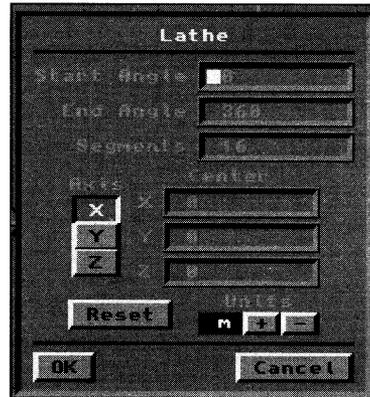
Lathe - Numeric
Click Numeric after selecting Lathe to:
- Specify a start angle to lathe from
- Specify an end angle to lathe to
- Specify the number of segments (pie-cuts around the lathe axis) for the lathed object
- Specify the axis around which the polygon will be lathed.
- Specify a center coordinate for the lathing
- Specify a unit of measurement for lathing (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Mirror

Click Mirror to duplicate an object on the opposite side of an axis. To Mirror an object, say the left half of an automobile you have built, click Mirror, click in a view and set the axis to mirror around (as you move the mouse around, the axes will shift), then click Make.
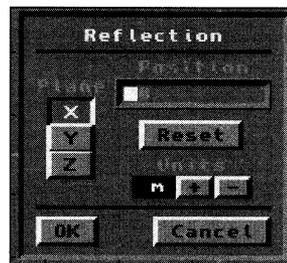
Mirror - Numeric
Click Numeric after selecting Mirror to:
- Specify an axis plane to reflect across
- Specify the position of the reflecting plane (in relation to the object)
- Specify a unit of measurement for mirroring (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Clone

The Clone command lets you take objects that have been cut or copied into the Paste buffer and paste several copies of the object in different positions at systematic increments. After you have your object in the Paste buffer, select the Clone button from the Multiply menu. Then click on the Numeric button and enter the number of copies you want to make. Next, enter the amount of offset and rotation for each copy. Then when you click on the OK button, your objects will be pasted.
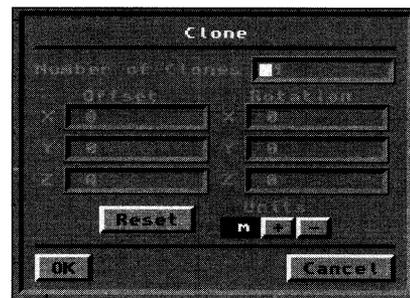
Clone - Numeric
Click Numeric after selecting Mirror to:
- Specify an axis plane to reflect across
- Specify the position of the reflecting plane (in relation to the object)
- Specify a unit of measurement for mirroring (i.e., meters, millimeters, etc.)
- Reset all menu values to the original settings

Make (return)

The Make button in the Multiply menu completes the functions set up by the other command buttons. For example, when extruding an object, use the numeric menu to set exact extrusion values, then click Make to complete the operation.

Skin

Skin allows you to cover a series of wireframe shapes with polygons. This is also called loafing (as if covering the slices of a loaf of bread). First, create an outline shape, such as a circle (a rough circle will do), and make it a polygon. Then copy and paste it, each time sizing it a little larger or smaller, and moving it a slight distance behind the original outline. After you have a series of hoops all in a line (so that you could see down them as you would a tunnel), select each polygon. Important: Select them in the order you want them connected. Then click Skin.

Morph

Morph will create a number of connected intermediate steps between two polygons, similar to the Morph command within LightWave Renderer. To use Morph, create a polygon. Copy that polygon, and modify the copy into the shape you want to Morph to. Click Morph, then Numeric. Specify the number if intermediate steps, or segments, and click OK. Click Make.
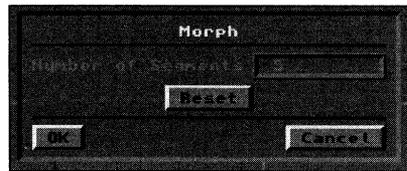
Morph - Numeric

Click Numeric after clicking Morph to:
- Specify a number of segments to Morph
- Reset all menu values to the original settings
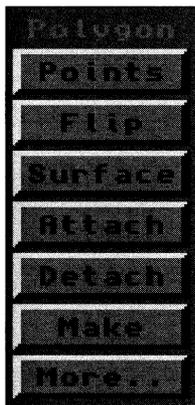
Polygon

Points

The Points command button (under the Polygon menu button) performs a different function than the Points select button. This button creates points within the Modeler workspace. Select Points from the Polygon Menu. Move the pointer to the position where you want the point to be generated, and press the left mouse button to display the crosshair. Click the right mouse button (or press Return on the keyboard) to place a point at that location.

Flip (f) Flip changes the facing direction of the surface normals of selected single-sided polygons. Surface normals are small dotted lines that indicate in which direction a polygon is visible. They appear when a polygon is selected.

Surface Click Surface to assign surface names to selected polygons. Surface names are created with the Surface Edit function under the Options Menu, and assigned through the Surface button under the Polygon menu. If you do not select a specific polygon (or group of polygons) prior to using this function, all polygons will be considered selected and the name will be assigned to the entire object.

Attach Use Attach to add polygons to the surface of others. An example of this would be attaching the polygons that form the word "Stop" to a six-sided polygon to form a stop sign. These are known as detail polygons. To attach polygon A to polygon B, select both polygons A and B so that they are highlighted. Click Attach. The pointer will turn into the word "TO" with an arrow. Click this pointer on polygon B to attach A to it.

Detach Detach is used to remove polygons that were attached with the Attach function. Select the polygons that you wish to separate, then click Detach to free attached polygons.

Make (return)

The Make button in the Polygon Menu creates Points (when the Points button is selected). For example, click Points and move the cursor into a window. Click the left mouse button. Any time the crosshairs are where you want them, press Return to create a point there.

To make a polygon out of these points, click the Select Points button. Press p on the keyboard to make a polygon. Remember: points must be selected (highlighted) in order to be made into a polygon (points you just created are automatically considered still selected).

Add Pnt
Select Add Pnt (add point) to add points to a polygon. First, use the Points button and actually add the point you want to the workspace, in relation to the polygon it will be added to. Second, select the polygon(s) involved. Third, click Add Pnt. The pointer now has an arrow with the word "TO" beside it. Click the tip of the arrow on the edge of the polygon that needs an additional point. The newly added point will become a part of that edge.

Rem Pnt
Select Rem Pnt (Remove Point) to remove unwanted points from a polygon. First select a polygon. Then select a point on that polygon. Click Rem Pnt to remove it.

Split
Select Split to split a polygon into two smaller polygons. First select a polygon. Then select two points that do not share any edges. These two points will soon share an edge that splits the polygon into two smaller polygons. Click Split to subdivide the polygon.

Merge
Merge will join two polygons. To Merge, select both polygons, then click Merge. This will function for coplanar and non-coplanar polygons as well. Once Merged, they will share the same surface normal.

Triple
Triple converts selected polygons into triangular polygons. For example, a square polygon becomes two triangular polygons. This is useful in case polygons do not render properly.

Align
When you have polygons making up a complex object, and their surface normals face in conflicting directions and are difficult to select and flip, use Align to ensure they all face the same direction. Select the polygons in that area and click Align. Align will attempt to turn all surfaces facing the same direction. This operation is complex and not foolproof. Be certain to save your current work, in case it does not succeed in aligning polygons as you desire.
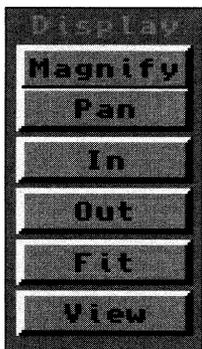
Display

In ▲.
Click this button to zoom in closer to the object in specific increments. Every time you click the view moves in closer. This is helpful when working on an object with much small detail.

Out ▲,
Click this button to zoom further away from the object in specific increments. Every time you click the view moves out further. This is helpful for zooming out from detail work.

Magnify
Click Magnify to drag the mouse in any window and zoom the view in (drag left) or out (drag right). Magnify is a mouse-driven way of clicking In or Out that allows for finer control. After selecting Magnet, click in any window with the left mouse button.

Pan ▲ Alt plus Mouse
Click Pan to drag the mouse in any window and move the view around. This is helpful when making a large object with small detail. Use In to move in close enough, Pan to move around to the portion of the object to work on, and Out to zoom back and view the results.

Fit ▲ a
Fit automatically adjusts the grid and object size so that an object is fully visible in all views. This is useful when an object is loaded that is too large for the current grid size.

View
Select View to change to a different set of view windows. These settings will not change the object, just the three angles from which you look at it. To see an object with a particular shape, you want three regions sometimes so you can maximize screen space.

Logo
Provides a BACK, BOTTOM, and SIDE view, just as in Layout. In this orientation the BACK view has you looking into the positive Z axis.

Map
Provides a TOP, LEFT, and BACK view. For designing a map, the main view shows the object at its best..

Side
Provides a LEFT, FRONT, and BOTTOM view. Main view is the side view rather than the top.

Vehicle
Provides a TOP, FRONT, and LEFT view. The FRONT view has you looking into the negative Z axis. Main is the top view, so if the object were a plane it would fly to the right off screen. Often vehicle are flat and low, so the side views are low.
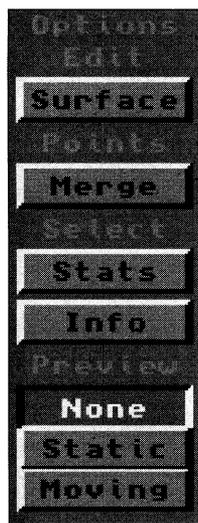
Options

Surface
Edit Surface allows you to create unique surface names to be assigned to object surfaces. Surface names serve as labels for certain groups of polygons. LightWave uses these names to distinguish what rendering properties the polygons will have. Edit Surface is only used to create new surface names (or rename existing ones). To assign these names to specific polygons, use the Surface Button under the Polygons Menu.

To add a new surface name to the current list, click the Surface button. A box will appear, displaying the current surface name. Click in the box, type in a name, and click Create. You have the option of creating names first and designing the object second, or vice versa, or naming surfaces as you go along building them. It's up to you.

Note: If you type in a name and press Return, the new name will not be added to the current surface name list! You must click on Create (or Rename) before leaving this menu for the new name to be accepted.

Note: Any polygons created after naming a surface will be given the same surface name until that name is changed.

Merge
To Merge points that are very close together (or occupying the same coordinates), click this button. This is a quick way to get rid of duplicate points that occur when making complex objects. This function is usually performed on the entire object.

Stats ▲ w
Stats is used to provide data about specific points, polygons, or objects, and to provide another means for selecting these items. There are three Stats menus, for points, polygons, and volumes. Click the appropriate Select button (point, polygon, volume), click the Options Menu button, then click Stats. To change to another item, you must exit the display and repeat these steps.

All three Stats displays functions similarly. They display a count of how many points, and polygons make up an object, using different criteria. At the top of the menu is the title. Below this you will see columns of (+) buttons, (-) buttons, numeric windows, and labels. At the bottom of the menu (except for Points) is a text window.

The (+) and (-) buttons are used to select or deselect the item listed at the bottom of the menu. For example, in a complex object such as an F-15 fighter jet with a dozen different surface names, you would click Polygon, then Stats, then the up/down arrows to find the surface named Canopy. Click the (+) button to select only the Canopy polygons, then exit the menu to return to modeling the canopy object further.

Point Statistics - This menu displays the total number of points in the current active layer (or layers), as well as data about the number of points that make up polygons of a certain size.

Polygon Statistics - This menu displays the total number of polygons in the current active layer (or layers), as well as data about the number of vertices (connected points) in those polygons.

Volume Statistics - This menu displays the points and polygons both inside and outside the described volume.

Info ▲ i

Info provides information on selected points or polygons. Click Info to display the coordinates of selected points; or to display the number of points, flatness percentage, and surface names of selected polygons. Flatness percentage should always be zero, indicating that all points share one common plane (are co-planar).

None

None turns off the display in the Preview Window.

Static

Static displays an unmoving wireframe view of the object.

In Select Point or Select Polygon mode:
• 	Click in the preview window to select points or polygons.
• 	Hold Alt on the keyboard and drag the mouse in the preview window to rotate the object.
In Select Volume mode:
• 	You cannot select points or polygons with a volume in the preview window.
• 	Drag the mouse in the preview window to rotate the object.
• 	Changes in the edit windows will be updated automatically in the static preview window.

Moving

Moving displays a rotating wireframe view of the object. To rotate the object to another orientation, with either Moving Wire or Moving Solid preview, drag the mouse in the preview window.

Wire

Click this button for a rotating wireframe view of the object.

Solid

Click on this button for a rotating solid view of the object. This is often known as hidden-line removal (the lines on the back side of the object won't be seen).

Changes in the edit windows will be updated automatically in the moving preview window.

Tri

Tri affects primitives and objects that are extruded or lathed. They will be created using triangles instead of rectangles for the connecting polygons.

Quad

Quad affects primitives and extruded and lathed objects. They will be created using rectangles instead of triangles for the connecting polygons.

1Sided

This refers to the number of sides your polygons will have when they are created.

2Sided

Click 2Sided to create objects and polygons with two visible sides (two surface normals).

Selection Modes
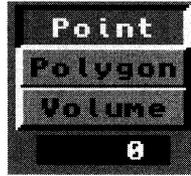
Points (Select button)
The select Points button allows you to select individual points for manipulation. Click Select Points and move the pointer into an edit window. Hold down the left mouse button and move over the points to select. Selected points will be highlighted. Release the mouse button when done.

To select more points (in addition to the currently highlighted ones), or to deselect one that was highlighted by mistake, hold the shift key on the keyboard and drag the mouse over the desired points.

When no points are selected ALL points are considered selected.

Polygons (Select button)
The select Polygons button allows you to select individual polygons for manipulation. Click Select Polygons and move the pointers into an edit window. Hold down the left mouse button and move over the edges of the polygons to select. Selected polygons will be highlighted. Release the mouse button when done.

To select more polygons (in addition to the currently highlighted ones), or to de-select one that was highlighted by mistake, hold the shift key on the keyboard and drag the mouse over the desired polygons.

Some operations, such as the Modify operations, are not allowed in Select Polygons mode. This is because transformations must affect points as well as polygons. The operations that will work with polygons must also include the points that make up the polygon. There is no way around this, because the polygon would cease to exist without the points.

Volume (Select button)
Select Volume allows you to drag out a bounding box that encloses points and polygons you want to manipulate. There are two modes within the volume: Inclusive and Exclusive. Click once or twice on the Volume button to select either volume mode.

- Inclusive (bounding box boundary is a solid line):
- In Inclusive Mode, polygons that are partially included in the volume will be included in any operation.
- Exclusive (bounding box boundary is a dotted line):
- In Exclusive Mode, polygons have to be totally included in the volume to be included in an operation.

To drag out a volume in either mode: click Select Volume, move into an edit window and drag out a box that surrounds the area you want. When you release the mouse button the boundary will remain. To resize the boundary, move to any of other views and drag the mouse to adjust the size. Make sure the boundary correctly encloses what you want in all three views.

When no polygons are selected ALL polygons are considered selected.

The Selected Item Window
This window displays the number of points or polygons selected in the view window.

Edit Functions
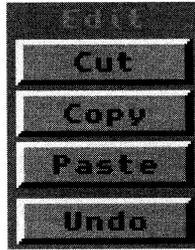
Cut ▲ x

Cut will remove the selected point(s), polygon(s), or object(s) from the workspace. The item is stored momentarily in memory in case you want to remove it from one layer (Cut) and restore it to another (Paste). If you have ever used Cut and Paste in a word-processor program, you have an idea how this works.

Cut holds only the last item that was cut in memory. If you cut one object, then cut another, only the second object will be able to be restored.

Copy ▲ c

Copy will duplicate the selected point(s), polygon(s), or object(s) in the same memory area that Cut uses. Unlike Cut, it will not remove the selected item(s) from the edit window.

Copy holds only the last item that was copied in memory. If you copy one object, then copy another, only the second object will be able to be restored.

Paste ▲ v

Paste will restore whatever item was last Cut or Copied into the temporary memory area. The item will be replaced in exactly the same size and position that it occupied originally.

If you paste something down in the same layer that it was cut or copied from without first moving the original, you won't see it because it will be put in the same position as the original.

Undo ▲ u

The Undo function allows you to take back the last operation performed. Undo will also undo its own previous operation. To undo an operation, click Undo.

Coordinates Window
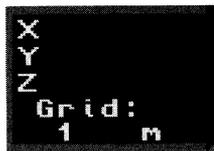
The Coordinates window displays two important forms of information: the X, Y, Z position of the cursor, and the size of the grid on the Modeler screen. To alter the grid size, use the In and Out buttons to alter the view while watching this window.

Layers

Modeler uses the powerful concept of layers to provide 8 independent workspaces in which to design, modify, and complete 3D models. A layer may be:

- **Visible and active** (Front - its contents can be seen and will be affected by editing operations).
- **Visible and inactive** (Back - its contents can be seen yet will not be affected by editing operations)
- **Invisible and inactive** (Off - its contents can not be seen and will not be affected by editing operations)

Consider how you might design a bicycle using layers to aid in its construction. You build them independently, like so:

> Layer 1 contains the front tire.
> Layer 2 contains the frame.
> Layer 3 contains the rear tire.
> Layer 4 contains the handlebars.
> Layer 5 contains the seat.
> Layer 6 contains the pedals.
> Layer 7 contains the bicycle chain.

To widen the tires, hold the shift key and select the front layer buttons for layers 1 and 3. This makes them active for editing.

To see just how much widening (in relation to the rest of the bicycle) is necessary, hold the shift key and select the back layer buttons for layers 2, 4, 5, 6, 7. This allows you to see the objects within these layers, yet not alter them as you edit the contents of the other two layers.

The Blank Area ▲ /
The Blank Area is the portion of the interface that falls "between the margins." In other words, it is the gray area between any buttons and control panels along the left side of the screen. To "drop" items, or deselect certain functions, press the / (slash) key, or click in this area.

Functions Without a Button
There is one function within Modeler that does not have a specific on screen button to engage its operation. That is Jump, and you press the j key on the keyboard to invoke it.

Jump is best used when moving points or polygons around the screen. Instead of dragging these items with the mouse, select them, then move the mouse to the new location, and press j. Instantly the selected item will jump to the mouse position.

Using the Axis Indicator
Certain Modeler functions, such as lathe, allow you to use either the mouse or the numeric menu to select the axis that serves as a basis for the operation. The visual indication of this is called the axis indicator, pictured below.
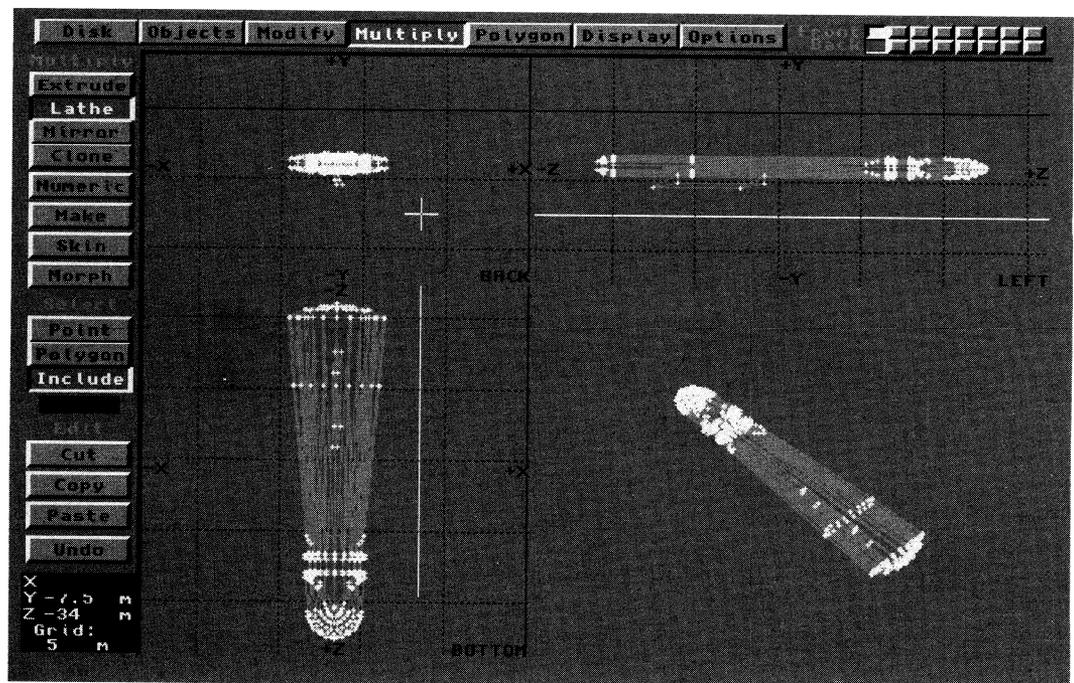
LightWave Modeler Keyboard Commands

Once you become familiar with the Modeler's object creation tools, you may find that moving around the screen with the mouse is slower than you'd prefer. For this reason, keyboard shortcuts have been written into Modeler. To see them at any time, press Help while in Modeler. These single and combination key commands will help you get around the workspace more quickly. Make certain that you use the shift key for capital letter commands.

Key	Function
Help	keyboard shortcuts
x	Cut
a	Fit
f	Flip
N	New
Q	Quit
c	Copy
u	Undo
j	Jump
l	Load
i	Info
v	Paste
/	Drop All
return	Make
s	Save
S	Save As
w	Statistics
.	Zoom In
,	Zoom Out
>	Zoom In 2X
<	Zoom Out 2X
z	Delete
g	Go to Center
p	Make Polygon
n	Numeric
1 to 8	Switch Layer to Front
Shift 1 to 8	Add Layer to Front
Alt 1 to 8	Switch Layer to Back
Shift Alt 1 to 8	Add Layer to Back

Video Toaster
Appendicies

Table of Contents

Appendix 1
Installing System 2.0

Installation of System 2.0 Software

Read this before you begin.

The installation procedure must install certain files that you may already have on your hard drive. Below is a list of the files that will be installed. Check your hard drive contents to see if you have any files that may share these names. If so, and if you wish to keep any, rename them so that the installation procedure will not overwrite them.

Assuming your Toaster hard drive is named DH0:

DH0:Toaster/ChromaFX/ChromaFX.Effects
DH0:Toaster/3D/Objects
DH0:Project/000.PJ.(any name)
DH0:Project/000.BK.(any name)
DH0:Project/001.PJ.(any name)
DH0:Project/000.BK.(any name)
DH0:Project/002.PJ.(any name)
DH0:Project/000.BK.(any name)
DH0:Project/003.PJ.(any name)
DH0:Project/000.BK.(any name)
DH0:FrameStore/000.FS.(any name)
DH0:FrameStore/001.FS.(any name)

If you're not sure

Here's an example of how to understand the above list. Assume your hard drive is known to the system as DH0:. When you run the Toaster, you see that you have two Framestores that use numbers 001 and 002, called 001 Television and 002 Radio. Therefore, their "full" names are DH0:Framestore/001.FS.Television and DH0:Framestore/002.FS.Radio. You should rename the file with the matching number (001) and give it a new number. Otherwise, since that file number matches one that System 2.0 requires, it will be erased when System 2.0 installs the new file in its place. The second file, with number 002, and any others that do not match the above list will not be changed in any way.

Here's an example for renaming the above file. This example assumes the hard drive is named DH0:. You may need to use the name of your own drive if it is different.

- First, open a CLI or Shell by double-clicking the icon with this name on your hard drive.
- Second, type the following in the window that appears:

rename DH0:Framestore/001.FS.Television as DH0:Framestore/237.FS.Televison

This will change the name of the file and allow you to keep it safe during the installation. Note that you do not specifically need to use capital or lowercase letters when giving the system commands using a CLI or Shell. It can help to maintain a visual understanding for you, however.

Within the 3D Objects Directory
All objects will be erased. If you've obtained or created any new objects that you wish to keep, copy them to a different location on your hard drive, or onto a set of floppy disks. Reinstall them after you have installed System 2.0.

Within the Framestore Directory

Any Framestore with the numbers 000 or 001 will be erased unless you rename them.

Within the Project Directory

Any Project or CG Book with the numbers 000, 001, 002, or 003 will be erased unless you rename them.

You will need 40 megabytes of space on the hard drive to install System 2.0. After the installation has completed, the install procedure will delete itself and the files it needed for installation. The total amount of space that System 2.0 will take up after installation is approximately 30 megabytes.

The installation procedure is fairly automatic, and can be found on Disk 1 of the System 2.0 software set.

1 Start the computer. You start the Installation from the Workbench. (If your Toaster automatically starts when you turn on the power, you will need to go to Preferences and exit the Toaster to reach the Workbench.)

2 Insert Disk 1 of System 2.0. After a moment, a floppy disk icon will appear on the Workbench.

3 Double-click the floppy disk icon. A window will pop up on the screen.

4 In the window, double-click the Install icon.

5 Choose the method you prefer for Video Toaster startup operations:

- Start Video Toaster every time computer boots. Select this option if you want the Toaster to run immediately upon powering up. Your computer will not be readily available for other applications until you exit the Toaster.

- Start From Workbench Icon. Select this option if you want the Toaster to function as a standard program from the computer's operating system.

6 The installation screen lists the hard drive locations available for installation. Click on the drive or drive partition where you would like to install the Toaster. Note that if your intended device does not have enough room, the install program will inform you how much information (in megabytes) must be removed in order for the installation to succeed. You will need to exit the install program, delete or remove a number of files, then retry.

7 Click Install. The installation program will begin. When it finishes with one disk, it will ask you to insert the next. These disks are in a format that the operating system does not recognize by itself! Therefore system will not recognize when you have swapped disks. You will need to click on the "Continue" button after inserting a new disk. Continue inserting disks until you have completed the full set.

Note: Do not double-click on the Install button! After the first click, it becomes an Abort button (for cancelling the installation procedure). Double-clicking will begin and then immediately abort the installation.

8 When the installation has completed, remove the last disk. Place your disks in a safe place in case you need to reinstall the software at another time.

9 Exit the installation program by clicking the Exit button.

10 Turn the computer off. Wait 20-30 seconds. Turn the power on and enter Video Toaster System 2.0.

Note that you will need to perform the AutoMatte and AutoHue processes for System 2.0, just as you did for the original Toaster software.

Changing Your Mind About the Startup Procedure

If you originally chose the Start Video Toaster every time computer boots option, and later choose to use the system as a general-purpose computer (say for word-processing applications), you can re-install the Toaster software by performing the following steps:

- Power up the system. It will automatically run the Toaster.

- Click on the Toaster Preferences to go to the Preferences screen.

- Click on the Exit button. A box will ask for confirmation. Click on Yes to return to the Workbench operating system.

- Go to Step 2 of the Installation and proceed, this time using the Start From Workbench Icon option.

If you originally chose the Start from Workbench Icon option, and later choose to dedicate the system to Video Toaster operations, you can re-install the Toaster simply software by starting up the system and, at the Workbench screen, go to Step 2 and proceed, this time using the Start Video Toaster every time computer boots option.

Appendix 2
Installing the Video Toaster Card

Installing the Video Toaster Card

Basic System Requirements

The following list describes the basic computer configuration required to run the Video Toaster. This is considered the absolute minimum. If you have purchased a Video Toaster Workstation, you need not concern yourself with this chapter.

- An Amiga with the "Fat Agnus" chip installed. This is the 1 megabyte Agnus chip. The newer 2 megabyte Agnus chip also will work with the Video Toaster.

Note: If you are uncertain how much CHIP RAM resides in your Amiga, perform the following check: Double click on the CLI or Shell icon. In the window that appears, type AVAIL, and press Return. A list of numbers will be presented. In the CHIP column, you should see a number around 920000. A number below 512000 would indicate that you do not have this chip.

- Four megabytes of fast RAM, sometimes called expansion RAM.

- Hard drive with 40 megabytes of free space (The Toaster software requires 40 megabytes for the installation procedure, but only 30 once the installation is completed.)

- Hard drive controller card that is auto-mounting and auto-booting. Systems sold today all follow these conventions. If you have purchased an older, used computer, you may need to have a dealer check this for you.

- One RGB or RGB/Composite monitor.

Note: If there is no RGB monitor attached to the AMIGA's RGB port, then the Video Toaster's encoder will not function properly. If you choose not to use an RGB monitor, you will need to install an RGB terminator plug on the RGB output.

- One additional composite video monitor.

The above system meets the Toaster's basic requirements. NewTek highly recommend using one RGB monitor and 2 TV monitors, or 3 TV monitors, for ease of use. The "best" configuration for the Video Toaster is the one that will suit your particular needs.

Hardware Installation

Important Safety Note: *Disconnect the power cord before performing the following steps. Never remove the cover while the power is connected!*

Installation Note: Removing the cover of your computer may void its warranty. Any damages incurred as a result of installing the Video Toaster are not covered by NewTek, either explicitly or implicitly.

It does not matter which you install first, the hardware or the software. However, since the software cannot function without the hardware installed, the hardware installation is the first step.

Remove power from the machine.

1   Unplug the power cord from the wall. Unplug the power cord from the computer.

Remove the cover of the computer:

2   Remove the four screws (two on either side) along the bottom edge of the sides of the machine, and the single screw in the rear, located in the upper center portion of the rear of the machine. Then slide the cover forward until it is free of the chassis of the computer and set it aside along with the screws.

Next unbolt the power supply chassis.

3   Remove the three screws holding the front of the power supply chassis and set them carefully aside.

4   Remove the four screws holding the rear of the power supply chassis and set them carefully aside.

5   Carefully lift the power supply chassis and set it upside down on the computer above the expansion slots.

Now you are ready to insert the Toaster board, which is installed in the computer's video slot. This slot is located to the right of the power supply (as you face the front of the computer).

6   Remove the two screws that hold the slot cover in place on the rear of the machine.

The Toaster should be installed so that the 6 BNC connectors protrude from the rear of the machine.

7   Insert the Toaster PC board in the video slot with the BNC connectors facing the rear of the computer. Make sure that the gold connectors are all the way in and the Toaster is sitting level in the slot.

8   Screw the Video Toaster into the slot using the two screws that previously held the slot cover.

Once your Toaster PC board is correctly installed in the computer's video slot, place the Toaster I/O sticker on the back of the computer.

9   Carefully set the power supply chassis in place and replace the seven screws that hold it in place.

10   Slide the cover back into place and replace the five screws that hold it in place.

Once these steps are complete, you are ready to proceed to the next chapter to set up your Toaster software.

Installing the Software

Your Video Toaster Card should now be installed.

Hard Disk Installation

When you install your Toaster software on the computer, you can choose to run it as a standard computer application or to make the computer a dedicated video production machine. Whichever method you decide to use, the installation procedure is automatic.

Automatic Toaster Startup
An auto-booting Toaster system starts automatically whenever you turn on the power to the system. This is best if you want to operate the computer primarily in the Video Toaster environment, and care little for working with the underlying computer system.

Computer Startup
As a standard computer application, you are able to switch between the operating system and the Toaster. That way, you can use the computer for other applications as well as video productions.

Requirements for Software Installation

• The hard drive has been formatted.

• The hard drive has 40 megabytes of space available.

• The computer's Workbench operating system software is already installed (for auto-booting systems).

If this is not the case, refer to your computer documentation for setting up hard drives, or have your dealer perform the work.

Steps for Software Installation

1 Turn on the power and allow the system to start up.

2 Insert Disk 1 of System 2.0. After a moment, a floppy disk icon will appear on the Workbench.

3 Double-click the floppy disk icon. A window will pop up on the screen.

4 In the window, double-click the Install icon.

5 Choose the method you prefer for Video Toaster startup operations:

• Start Video Toaster every time computer boots. Select this option if you want the Toaster to run immediately

upon powering up. Your computer will not be readily available for other applications until you exit the Toaster.

- Start From Workbench Icon. Select this option if you want the Toaster to function as a standard program from the computer's operating system.

6 The installation screen lists the hard drive locations available for installation. Click on the drive or drive partition where you would like to install the Toaster. Note that if your intended device does not have enough room, the install program will inform you how much information (in megabytes) must be removed in order for the installation to succeed. You will need to exit the install program, delete or remove a number of files, then retry.

7 Click Install. The installation program will begin. When it finishes with one disk, it will ask you to insert the next. These disks are in a format that the operating system does not recognize by itself! Therefore system will not recognize when you have swapped disks. You will need to click on the "Continue" button after inserting a new disk. Continue inserting disks until you have completed the full set.

Note: Do not double-click on the Install button! After the first click, it becomes an Abort button (for cancelling the installation procedure). Double-clicking will begin and then immediately abort the installation.

8 When the installation has completed, remove the last disk. Place your disks in a safe place in case you need to reinstall the software at another time.

9 Exit the installation program by clicking the Exit button.

10 Turn the computer off. Wait 20-30 seconds. Turn the power on and enter Video Toaster System 2.0.

Changing Your Mind About the Startup Procedure

If you originally chose the Start Video Toaster every time computer boots option, and later choose to use the system as a general-purpose computer (say for word-processing applications), you can re-install the Toaster software by performing the following steps:

- Power up the system. It will automatically run the Toaster.

- Click on the Toaster Preferences to go to the Preferences screen.

- Click on the Exit button. A box will ask for confirmation. Click on Yes to return to the Workbench operating system.

- Go to Step 2 of the Installation and proceed, this time using the Start From Workbench Icon option.

If you originally chose the Start from Workbench Icon option, and later choose to dedicate the system to Video Toaster operations, you can re-install the Toaster simply software by starting up the system and, at the Workbench screen, go to Step 2 and proceed, this time using the Start Video Toaster every time computer boots option.

Appendix 3
Troublshooting the Installation

Troubleshooting

If you receive the "Video Toaster not responding" error message, check for the following possiblities. Any of these things can prevent the Toaster from starting or operating properly.

Is the Video Toaster Card seated properly inside the computer?
Sometimes it can be loose, or not flush with the main circuit board. Apply gentle, firm pressure downward from the top of the card.

Is the edge connector on the Toaster clean?
The gold-plated connector on the Toaster can get dirty. This will cause it to lose important contacts. Use a pencil eraser (really) or a cotton swap with alcohol to clean both sides of the connector. Sometimes just removing and reinstalling it can solve the problem and make the connection..

Is the Video Toaster Card pressed together securely?
The card is actually three boards in one. Sometimes it can work itself apart through shipping and handling. Gently apply pressure over the the ends to press the gold pin connectors back together.

The Video Toaster Card contains a silver shield with two copper ground clips.
Are both clips secure?

If you have a Commodore RGB monitor: is the cable secure, and is it the one that came with the monitor?
Cables can work loose over time, far more often than you might think. Also, an RGB monitor with non-standard (unlike the Commodore 1080 & 1084) cabling connected to the RGB port may cause the Toaster to appear to stop during startup.

Technical note: You must have an RGB monitor connected (or a terminator for the R, G, B signals) for the Toaster's encoder to operate correctly, and the cabling must not use the H sync or V sync lines. Instead it should use the C sync line. This problem may not manifest itself until you actually try to perform a digital effect, in which case the video may look ragged or broken into strips. You may want to try starting and running the Toaster without the RGB monitor attached if you suspect you have this problem. The Toaster will still run without the RGB monitor attached, but scroll and crawl pages from ToasterCG, and all output from ToasterPaint will be illegal video (far too bright) and may "bleed" or "smear."

If there is a video source, is it turned on?
Some video sources, when not turned on, can cause the Toaster to not respond. Check this by connecting the video source directly to a monitor, bypassing the Toaster.

If there is a video source, is it time-base corrected?
Unless your video source is a live camera or laser-disc, it needs to be time-base corrected for the Toaster to accept it. If you do not have a TBC, you must disconnect the video source in order for the Toaster to run.

Are you running other utilities at the same time?
Shut off any screen blanking utilities, mouse accelerators, or any other programs that may be running when you start the Toaster.

Is there a printer connected and powered on at the same time?
Turn the printer off and try again. You might also try disconnecting it altogether. Printers that are turned on during

Toaster startup may receive print commands and turn out miscellaneous characters. This is merely a side effect, and will not damage the Toaster or printer.

Is there a switchbox connected to the RGB monitor?
If you are using your RGB monitor between two computers, and are using a switchbox to switch the RGB outputs, try removing the switchbox from the system and connecting directly to the RGB port. Switchboxes often connect pins that should not be used, causing the Toaster to not respond.

Ground loops. Ground loops appear as faint, periodic bars that travel up or down the screen. There are three methods for eliminating potential ground loops:

- Power all your equipment from the same outlet. Using a power strip will help, as all devices will share the same ground plug.

- Use a device known in the video industry as a "humbucker." This connects to the video lines between any two pieces of video equipment that are powered from different outlets (and are experiencing ghostly hum bars), and helps eliminate bars.

- Use 3/2 prong adapters on all power cords (with the exception of the Toaster) and plug everything into the same power outlet.

We also recommend the following tips for all video work:

- Use only coaxial BNC video cable for all connections. Don't use RCA cables.

- Keep all cable lengths as short as possible.

General
When a problem occurs in a complex setup that involves several pieces of equipment, try to reduce the complexity of the situation by removing (or disconnecting) one piece at a time to try to locate the source of the problem. This may mean returning to a minimal, bare-bones setup at first, but it will allow you to trouble-shoot more effectively.

Video 101

If the words *time base corrector*, *synchronization*, and *A-B Roll* strike terror in your breast, take heart. Video production isn't that difficult. Really.

If you've spent years in video production, then this appendix won't concern you. Go on, go back to the other parts of the manual. This appendix is for the rest of us. The less experienced ones. This is our place.

Like any field of work, video production has evolved a set of specialized words and ideas that go along with it. These terms are not meant to scare off outsiders. Indeed, they allow video professionals to get their jobs done much more efficiently, since they form a highly specialized language. The problem is just that in order to be able to understand them, it seems you need all their years of schooling and experience too.

This is simply not accurate.

Only if your ultimate goal is to work at a major studio, production house, or network, do you need that kind of knowledge. In order to fully understand how video works, why it works that way, and what that means in the larger scope of things, you need not spend years buried in mountains of books. You just need some background, some direction, and some practice.

This appendix is not intended to be exhaustive. There are at least a dozen good books on video and television, and many of them are listed in the appendix entitled "Recommended Reading." The purpose of this appendix is to give you an overview of the video process, with a clearer understanding of the ideas and equipment involved. It will prepare you for the tutorial and reference sections of this manual.

The concept behind video production is simple:

- Have a terrific idea that people will want to see (pre-production)

- Shoot video footage (production)

- Edit the footage so that it tells the proper story (post-production)

- Sell millions, retire, and suntan (distribution)

This looks great on paper. But when it comes right down to purchasing and hooking up all this alien equipment you're ready to throw in the towel.

Don't give up.

Video is actually very simple when taken a step at a time. This appendix will help you reduce it to a few fundamental ideas which apply almost universally. Once you begin to understand the concepts, you'll start to see connections on your own. A sure sign of your growing awareness and confidence.

There are three phases to producing video - Pre Production, Production, and Post Production.

Pre-Production

The Pre-Production phase oftens takes the longest amount of time. Pre-production is anything that happens before cameras roll. This is where scripts get written, performers are cast, sets are painted and dozens of other details get taken care of.

Pre-production you might use your Video Toaster to create titles in the Toaster's character generator or to create graphics using the frame grabber, ToasterPaint or LightWave. You also might use the Toaster to do a technical rehearsal, so you can discover any problems before you're actually taping. The more time you spend in Pre-Production, the smoother Production will go.

Production

The Production phase is where you record footage for your program, whether it's on location with a camcorder or in your studio with three cameras and the Toaster. During Production, your Toaster is at the heart of all the action. The Switcher lets you switch between video sources, bring up previously created titles and graphics, and add special effects using Chroma Effects and the Luminance Keyer.

Post-Production

Post Production is what happens after the cameras stop rolling. This includes video tape editing, adding music and sound effects, and creating and adding any last minute graphics, titles or animations.

Once again, your Toaster is at the center of it all. In video editing, the Toaster's effects act as transitions between your program segments. When you're finished, use the CG to add your copyright notice, start making distribution copies and wait for the money, fame and good looking groupies to start rolling in.

Simple, eh?

The NTSC VIdeo Signal

The first of our "easy ideas to video" is the video signal. When television first became popular, the picture was black-and-white. Years later, color was invented. Color television had to be compatible with existing black-and-white technology. In other words, if you owned a black-and-white TV, you had to be able to receive and the color signals as well. You simply missed the color.

Composite Video

TV engineers worked out how to transmit both black-and-white and color signals together. If you had a color set, it used portions of both signals to display the picture. If you had a black and white TV set, your TV ignored the color portion of the signal. Therefore, color television is essentially a combination of two signals (the black-and-white one, and the color one) that have been combined (or composited) together. At this important stage, the the word *luminance* was used for the black-and-white signal, and *chrominance* for the color one. The term *composite video*, or just *composite*, was used to describe the signal.

This system is still in use today. The chrominance and luminance signals are converted into a single signal so that they may be broadcast. This processing, or *modulation*, causes a small amount of breakdown in the picture quality, although not much. Radio-TV signals are taken in by your television, decoded (split back into their distinct parts), and displayed on the screen. The picture quality of a composite signal is generally poorer than it otherwise could be due to this modulation. Therefore, engineers are constantly seeking different methods for recording and delivering video signals. This has led to something with which you are no doubt familiar, and may be concerned about: video tape formats.

Video Formats

There are numerous video tape formats. Depending on your level of exposure, you may know of some or all of these: VHS, S-VHS, 8mm, Hi8mm, 3/4", 3/4" SP, BetaCam, BetaCam SP, MII, 1", D-1, D-2, D-3, and others. Each of these formats offers different benefits and side effects for recording and editing videotape.

As a general rule, video is shot on the best format available, edited to the same (or an even better) format, and then duplicated to the "distribution format" (that which the viewers will use to see the tape). When you enter a production studio, all the equipment in the control room (no matter how much) is geared toward doing only a few things. There are machines that play tape, machines that record tape, special effects machines, and signal processing machines that try to maintain the signal's integrity throughout all these connections. Sure, it *looks* like a lot of equipment, but its purpose is still very straightforward.

So What is Editing?

Editing is the act of rerecording the video footage from one tape onto another. In the process of doing so, you reorganize the order in which scenes take place, to tell a more effective story. In a similar sense, if you organize the order of a set of photographs of your trip to another country, you are editing them. This is the same with video, only you are organizing continuously moving scenes rather than still images.

The Most Basic Form of Editing: Cuts-Only

Many newcomers to video are unaware that once a video tape has been recorded, in order to add titles, transitions, or other special effects, it must be edited to another tape altogether. You cannot add these things to the original tape itself. Therefore, the most basic of all editing involves two machines, a Player and a Recorder. The Player serves to play back video tape. The Recorder serves to record the footage. By fast-forwarding and rewinding the Player to the sections you desire, and recording on the Recorder only when you reach them, you create an edited tape.

This is called *cuts-only editing*, because you cannot use special effects like fades and wipes. When you reach the end of an edit, you must stop the VCR. To start another edit, you start the VCR. Unfortunately, this kind of editing can be rough and somewhat crude. If the VCRs you use were not designed for editing, then each edit point will probably have picture breakup where you paused the VCR between recordings. Editing VCRs solve this, as they have *flying erase heads* for producing clean edits.

The Edit Controller

Editing VCRs also have another feature: they can be controlled by other devices. These devices are called *edit controllers*. An edit controller is like a remote control, except it has the ability to tell the two editing VCRs to do different things and coordinate those activities as well. This is important for crucial edits, where an edit must occur within a split-second. If you have ever tried recording a television program, and started the VCR at the moment the program began, you've seen how many seconds of the beginning of the show you missed. Edit controllers have the ability to send those instructions when timing is critical.

Cuts-only editing with an edit controller can yield very good results. In fact, most video is pre-edited (an early "rough cut" is produced) using cuts-only editing.

A-B Roll Editing

The next step up from cuts-only editing is called A-B Roll Editing. This is a fancy term for "cuts-only-plus-one-more-VCR." In effect, you have three VCRs, two Players and one Recorder. Ideally, for greater control, you also have an edit controller. The two Players roll tape, usually sending their signals into a special effects device of some sort. The effects device has the ability to perform wipes, fades, and other effects. It sends out only one signal to the Recorder. Using a combination of buttons on the effects device that changes the outgoing signal to the Recorder, you can go from one Player to the other in a variety of ways. This is how you fade from one moving video source to the other - both of them have to be moving (i.e., rolling tape) in order for you to go from one moving source to the other.

SMPTE Time Code

Controlling all this can be tricky. Another tool that video professionals use is something called *time code*. You may also hear of it called *SMPTE (simp-tee) time code*. Time code is used as an addressing system. To understand how it does this, you need a little different background on the video signal itself....

The picture you see on screen is made up a series of lines that are scanned one by one, at very fast speeds, in a repeating pattern, similar to the way a printer prints one line at a time. Video is recorded to tape as a series of consecutive images, just like the individual frames of a film strip. In fact, video can be thought of as an electronic film strip. Instead of actual pictures, video stores information about how the pictures look. When you play a tape, this information is converted back into a picture that you see on screen.

Fields and Frames

Each individual electronic frame of video is made up of hundreds of scan lines (as if you took the picture and sliced it into hundreds of thin strips). To achieve the illusion of continuous movement, these lines are scanned in a fashion that allows for a steady display of alternating odd and even lines (the method is called *interlace*). One set of these lines is called a field, and a field travels by in 1/60 of a second. Two of these fields comprise a frame, which travels past in 1/30 of a second. It requires one frame to make up a complete picture (hence, the term *freeze frame*).

Time code is used to assign each and every frame a unique location, or address. Frame 1 here, frame 2 here, frame 3 here, and so on. In reality, time code is expressed in terms of hours, minutes, seconds, and frames, like so:

01:20:45:17. The previous number indicates that this tape is currently located at frame 17, which is 1 hour, 20 minutes, and 45 seconds from the beginning. Time code can be recorded onto the tape during or after production in a process called *striping*. For 3D animation, the tape is striped before use.

Using time code, an editor can instruct the edit controller to go to Player VCR A, wind to a specific location and start playing. Player VCR B goes to another location and also begins playing. Then the Recording VCR cues itself up and waits for the signal to start recording. All of this is automated by an edit controller. For accuracy, all machines involved are equipped to read time code from their tapes. In more advanced editing situations, the edit controller can also send instructions to the special effect device directing it to perform certain effects right on cue, to the audio mixer directing it when to trigger sound effects or music, or to other devices.

So if you walk into a studio and one person is able to command a dozen or more pieces of equipment, all rolling at once, take heart and enjoy the show. The operator gave these commands to each piece of equipment one at a time. It's the controller behind it all that runs everything at once.

Hooking it all Together

Connecting video equipment is a simple matter of *out* and *in*. A video signal comes out of one device and goes into another. The same thing happens to the audio signal. The most important thing to keep in mind when looking at mess of cables behind a desk full of equipment is that you should work with one item at a time. Keep it simple. Check each connection as you make it.

We're going to take this idea and, starting with the Video Toaster, plot out several different examples of connecting equipment. Along the way, you'll learn the ideas you need to know to connect most pieces of equipment easily. And you'll know how to add more in the future.

Recognizing Connections

Look at the back of the Video Toaster, a VCR, or your television. You'll notice a collection of connections. They may be labelled Video In, RF, Antenna Out, Audio In, or any number of terms. You don't need to become an expert at what these are, or how they work. All you need to do, when connecting different pieces of equipment together, is remember the name of the thing you're with, and determine where it's going.

For example, if you're planning on copying a tape of the family's trip to the theme park, you connect the Video Out from the VCR that is playing the tape to the Video In of the VCR recording the tape. A signal coming out of one device must go in to another (in order for the second device to work with it). Same goes for the sound, or audio.

Some confusion can enter into the picture when the Recording device has a number of optional "in" connections, such as Antenna In, Video In, or Video 2 In. Usually there is a button somewhere that can be used to select one of these inputs. If you ever connect the video and don't seem to be getting a picture, check that the recording machine has been instructed to use the connection you've hooked up to.

The most common connections you should become familiar with are these:

BNC

A video cable connector. May also carry special kinds of video signals, such as sync. On equipment, would be labelled Video In, Video Out, Genlock In, Genlock Out, Out, Sync In, Sync Out. The Toaster has six BNCs on it: four for video in, and two for video out.

RCA

An audio cable connector. Also used for video connections on consumer level video equipment. On equipment it would be labeled (for audio) Left In, Right In, Left Out, Right out, Audio Out; (for video) Video Out.

RF

This is an older connector. You probably recognize it as the one on the back of the TV for the Antenna connection. It typically carries audio and video together, in a modulated signal. Commonly labelled Antennae In, Antennae Out, on VCRs it may be labelled Out to TV.

S-VHS

This is a recent connector for carrying the two parts of the composite video signal as separate signals (trivia: the S in S-VHS actually stands for Separated video).

The BNC and RCA connectors used for video signals carry the same kind of video. Therefore, if you don't have the right kind of cable, you can use a gadget known as an *adapter* to convert the connection from one kind to another. There are three BNC-RCA adapters shipped with every Toaster, to allow you to connect the Toaster to equipment you may already have that uses RCA connectors.

Recognizing Cables

The first thing you need to know about video is that there are lot of cables involved. Short cables, long cables, video cables, audio cables...it sometimes seems like miles of cables are slowly taking over your studio or office. Nine times out of ten, if you can identify the type of connector on the end of a cable, you can tell what that cable is used for. The ends of all cables have a gender - traditionally called male or female, for lack of a better term. In a pinch, many times you can replace (use place an adaptor on) a cable end, and use that cable for another purpose. Adaptors are small metal fittings that you place on the end of a cable when you need to convert it to fit another piece of equipment.

Here are a few of the exciting species you're likely to run into:

The BNC Cable: This cable is a standard in the world of professional video. After plugging it in, you give it a quarter turn, which securely locks it into place. BNC cables tend to be more rugged and professionaly made than other cables, which is why the pros use them. The six connectors running vertically down the right side of the back of the Toaster are BNC females.

The RCA Cable: If you've ever hooked a tape deck up to a stereo, you've run into the RCA cord. RCA female connectors are very popular on consumer video equipment as well. BNC cables are better than RCA cables, but RCA are very easy to find. That's why we've enclosed a few RCA to BNC adaptors with the Toaster. If you do use RCA cables to work with your Toaster, get the thickest ones you can find.

The Coaxial Cable: Also known as an RF cable, coaxial cables are very popular in consumer equipment. Unlike BNC or RCA cables, a single coaxial cable can carry both audio AND video information at the same time, though not with the same quality that you can achieve by running them separately. You probably used a Coaxial cable to hook your VCR or your cable TV box to your TV. You can convert a coaxial signal into an RCA signal by using a device called an RF Modulator, which will cost about $20 at any electronics store.

The Y/C Cable: Also known as a S-Video or S-Cable, this cable is used on Super VHS and Hi-8 equipment. Many Video Toaster TBCs can accept Y/C cables directly. (If you're not sure what a TBC is, keep reading.)

The 1/4 Inch Cable: This is an audio cable. The term 1/4-inch comes from the diameter of the plug on the end of the male side. You've seen these on older headphones that you used to buy for stereos.

The Mini Cable: This is a 1/8th inch diameter connector. These are commonly used as "pause" control cables for VCRs, camcorders, and the like. They're also the headphone connectors that come with portable AM/FM radios.

Subspecies: These aren't audio/video cables per se, but are connected to your Toaster system.

The Universal Power Cable: This cable gives your Toaster electricity. It's a common cable, and can easily be replaced at any electronics store if lost or damaged.

The Mouse Cable: Aside from hooking your mouse into the Video Toaster, this cable can be spliced to make a trigger cable for an edit controller. If you want to get a longer mouse cable, many electronic stores sell 'Joystick Extension Cables' that will give your mouse more room to roam.

The Keyboard Cable: If you want to move your keyboard further from your Toaster Workstation, you can use a standard 5 pin DIN connector with male to female ends. This is the same type of cable often used for MIDI.

The RGB Cable: This is used to connect your Video Toaster to a computer monitor, such as the Commodore 1084 style monitors. If you do not plan to use an RGB cable on the Toaster, make sure you you place an RGB terminator plug there, so that Toaster graphics are not adversely effect.

The Parallel Cable: This connects from the parallel port to a printer. The term parallel describes the way information is sent through this cable. The word "port" simply means "connection."

The Serial Cable: This connects from the serial port to a printer, a modem, or a scanner. The term serial describes the way information is sent through this cable. The word "port" simply means "connection."

Connecting to the Video Toaster

The Video Toaster is known (in the most basic video terms) as a *switcher.* Several video sources can be fed into it, and it switches between them for a single output signal. The fancier a switcher is, the more effects it can utilize to switch from one source to another. There have been switchers, switcher-faders, mixers, special effects generators (SEGs), and a slew of digital effects devices. The Toaster is a new generation of such devices.

The Video Toaster accepts standard time-base correct video as its input. Why "time-base correct" video? The reason is simple, and requires that you know a bit about how video is recorded, and what the recording process does to the video signal.

Recording Video Signals

An electronic signal coming from a video camera is a very stable thing. When you direct this signal into a VCR, you are using more electronics to record this signal onto a storage medium: the video tape. No problem so far. However, the tape is travelling through the VCR by a mechanical means as it is recorded. The motors, belts, and wheels that handle the tape are constantly moving, turning, and undergoing very, very minor changes in speed. While this sounds minor, in the not-very-long haul it causes difficulties. Let's see why.

As video is recorded, the recorder lays down three basic parts of the video signal: the picture, the sound, and the control track. (In reality, there's more to this, but it's all we're concerned with.) Each has its own location, or *track*, on the tape where it is recorded. The picture and the audio you're already familiar with. The *control track* may be new. It's a steady pulse of counts, the timing signals that let the next VCR that plays this tape know just how fast to play.

If you try to place steady pulses onto a moving target that continuously speeds up and slows down, the result will be a tape with pulses that are always a little bit too close together or a litte bit too far apart. VCRs are very forgiving, and can play back tapes with little difficulty. Video switchers, and professional gear, need greater accuracy. Try connecting a non-time-base corrected signal into the Toaster and you'll see the screen roll and break up, trying to find a signal to "lock onto." You won't harm the Toaster doing so, but you may need the restart the system if it throws off the system timing.

The problem with time-base error is that it is the fault of the mechanism in the VCR. When you play back a video tape, you add the VCR mechanism's time-base error to that which is already on the tape (due to the original recording process). If you are duplicating a tape, the new recording VCR will add its own mechanical error to the whole. You can see how time-base error builds. Its effect on the video: colors that smear, details that get soft and fuzzy, and images that warp or tear in places.

The Time-base Corrector

Therefore, engineers designed the *time-base corrector.* It takes the video from a VCR, removes bad timing pulses, inserts steady timing pulses, and feeds that signal on to the switcher. This allows a switcher to manipulate the signal. Switch it, fade it, twist and bend it. Switchers need that kind of stability in order to work with the video, and they need it for every video source you want to work with.

Synchronization

Generally, a single TBC will correct a single video source. What happens if you have more than one source? Well... it depends on that source. Here's why. A video camera is putting out a "clean" electronic signal with no error. Connect it to the Toaster and away you go. Two video cameras also put out clean video, but if you connect them both to the Toaster, the second one will roll and break up. How come? Because they are not synchronous. They are not *in time* with one another.

Remember that the video image is made up of fine lines that are scanned consecutively. In order to mix two video signals, their scanning needs to synchronized. Otherwise, a video switcher will attempt to switch from Camera 1 (on scan line 27) and Camera 2 (on scan line 184), with poor results. Camera 1 needs to be scanning the exact same part of the screen that Camera 2 is scanning. You need some way to lock them together. Video calls this genlock. A side benefit of TBCs is that they can genlock, so if you need to time-base correct your video *and* you have more than one camera or VCR, a TBC can do double-duty for you.

Genlock

Genlock, in traditional video terms, means synchronization. If a camera can genlock, then it can synchronize its scanning rate to another video source. A "genlockable" camera can sync itself to another camera. When the two cameras are in sync, they can both be hooked up to a Switcher directly, for all kinds of effects. You can genlock up to four cameras in the Toaster.

Here's a chart that may help. It shows different video sources, and whether they're OK to hook up to the Toaster directly.

Incoming Signal	Signal Quality	Result
1 Live Camera	Clean	Works OK with Toaster
1 Laser Disc Player	Usually Clean	Works OK with Toaster
1 Camcorder (in Camera mode)	Clean	Works OK with Toaster
1 Camcorder (in VCR mode)	Time base errors	Works OK with Toaster *using 1 TBC*
2 (or more) genlockable Live Cameras	Clean	Works OK with Toaster *when genlocked*
1 VCR	Time base errors	Broken up picture
2 (or more) VCRs	Time Base Errors	Works OK with Toaster *using 1 TBC per VCR*
1 Live Camera and 1 VCR	Clean Time Base Errors	Works OK with Toaster *using 1 TBC* on the VCR; can also use 2 TBCs but not required.

Essentially, you need to evaluate your video equipment needs and determine if the video source is "clean" or not. If not, then you will require a TBC for it. Also, if you are using more than one source, each "unclean" source will require a TBC.

One more thing about TBCs: a TBC will help maintain the integrity and quality of the video signal, even if you're just copying a tape from one machine to another. When a TBC is doing its job, it should be relatively invisible. You won't really see that it's doing anything. It's just there. But if you remove it, you'll see the difference, either in the Toaster, or in the copies you make.

How do I Work with a TBC?

Fortunately, TBCs are simple to use. They do their job just by being connected to the things you work with. The video signal coming out of the Playback VCR connects to the TBC Video In. The TBC Video Out connects to the Toaster (whichever input you are using; remembering that Input 1 must be used first). The Toaster's Program Out (which means Video Out) connects to the Recording VCR (or TV).

That's it.

It seems to get tricky when you combine "clean" and "unclean" sources. The chart above may confuse you a bit at first. The Toaster uses whatever video you provide on Input 1 to compare to those on Inputs 2-4. They must match Input 1's scanning. You can always have a camera, a clean source, on Input 1, without a TBC. If you added a VCR, you'd need a TBC for it. The camera would send out two video signals: one to the Toaster, and one to the TBC Genlock In (to be used a "scanning reference"). The VCR would connect to the TBC's Video In, and leave via Video Out to Toaster Input 2.

For every VCR you would add to this hookup, you would need to add another TBC and have its genlock *looped* off of the main video reference. (Loop means to connect to one piece of gear, then run that connection on to another device. Some equipment have built-in Lopp-Thru connectors, while others may require a video splitter adapter called a "T".)

If you intended to add another camera to this one-camera/one-VCR combination, you would need to look at its abilities to see what you needed to do. If it can genlock, then it can accept the scanning reference signal and work without a TBC. If it cannot, then it would require a TBC to do the job. (At the moment, the price of TBCs has dropped significantly, so that they are the best device for this purpose.)

Finally, some TBCs, the full-frame kind, offer additional processing or special effects of their own. You may wish to experiment with these as time goes by. Some TBCs may also have a "process" or "don't process" option, so that you can see how the video is affected by the TBC.

What About Sound?

Many people who are relatively new to working with video are concerned about keeping the soundtrack in sync with the video. Unless you get seriously involved with video and editing, this is actually not a major concern. Consider: the sound is recorded at the same time as the video. On the original tape, it is in sync. If you copy this tape, the sound goes along with it, and it remains in sync. When editing, you rerecord specific parts of the original tape in a new order. The audio still goes at the same time. It remains in sync.

Older VCRs and Camcorders recorded one soundtrack only, often called the Mono or Linear track. Then came stereo, with a Left and Right Linear track. Nowadays, there is also Hi-Fi stereo, with its own Left and Right tracks. Higher-level VCRs add more tracks, because the professionals use them for alternate microphones, time code, and special uses of their own. If you want to be able to mix sound, voices, and music together, you should probably consider a VCR with normal (linear) stereo tracks, as well as Hi-Fi tracks, for versatility.

What's important for you to know is that in hooking up a Toaster with your VCRs, the video signal runs through the Toaster while any audio signals go from the Playback VCR directly to the Record VCR. When you perform edits, the audio is recorded at the same time. Studios have fancy mixers that take in many audio sources (like mics, cassettes, cd players, phonogrpahs, and more) and send out a "mix" of these signals to the Record VCR. If you want to *fade the sound out* at the same time that you fade the video out, you'll want to buy an inexpensive audio mixer (from $100 and up) that can do the same thing. As you pull the Toaster T-bar down to go to black, you pull the mixer's audio slider down to fade out sound simultaneously.

What about Animation?

Animation is traditionally drawn by hand, the way cartoons are done, one frame at a time. If you've ever seen a film strip, or a child's toy called a flip book, you've seen a series of images that have very slight changes from frame to frame. When those images are displayed quickly in sequence, the objects in the frame appear to move smoothly. They are animated.

From the broadcasters in your city to the neighbors down the street, this is how animation is still created. On television, supercomputers calculate all that's needed to animate flying logos, station identifications, bumpers, and fall previews with glowing beams of light, chrome lettering, and reflective surfaces. The Toaster can also generate such animations. In order to take full advantage of this capability, you will need two additional things: a *single frame controller* and an editing VCR (one that can perform single frame edits).

How Single Frame Controlling Works

A single frame controller is a device that will control a professional video tape recorder. It connects to both the Toaster and the VCR, and it communicates between the two. It enables the VTR to record one frame (one image) of an animation at a time (remember, there are thirty such images per second of video). This is the technique used in most professional animations.

Basically, after LightWave has finished rendering a frame, it sends information out of the serial port of the Amiga into the Single Frame Controller. The Single Frame Controller instructs the VCR to cue up the video tape. It then plays to the edit point, where it switches to record mode for a split second, records one frame, and shuts down to await the next command. After the frame has been recorded, LightWave will go on to rendering the next frame.

If some or all of the frames have already been rendered to your hard drive, then the process is the same except that LightWave loads and displays each frame from the hard drive, then sends the signal to the single frame controller to record the frame.

Equipment needed

To do single frame animation you are going to need a single frame controller and a video tape recorder capable of one frame edits. Most professional editing decks have this capability. There are also laser disc recorders on the market now which would not require a single frame control as they include elaborate control over their functions. The downside is that typically these recorders are very expensive.

There are a number of powerful, inexpensive single frame controllers available for the Video Toaster. For more information on animation systems see your local Video Toaster dealer or contact NewTek Sales. Refer to the manual included with your single frame controller for the specific commands needed.

The process of single frame recording is relatively simple. To begin, you stripe a video tape with time code. Then, with LightWave, the single frame controller and the VCR powered up, you enter the proper control commands into LightWave, then click Render (with the Automatic option acitve), and away it goes.

You Mean, That's It?

This appendix has given you some background information on the kinds of video equipment and terms used in the production industry. It has also introduced you to some concepts about the video signal, how it works, and how it connects among various pieces of equipment. You now have an overview of video, and how it functions with the Video Toaster. At this point, you should be a bit more comfortable in getting started with the Toaster. Remember to go slowly, work with one element at a time, make sure it works right, then go on to the next element. When troubleshooting, take away one element at a time until you find the thing that's not right. You'll gain confidence and knowledge from the experience.

Appendix 5
Computer 101

Computer 101

If the terms *boot*, *hard drive*, and *initialize* make you cross your eyes in frustration, take heart. Understanding a computer isn't all that difficult. Really.

If you've spent years working with computers, then this appendix won't concern you. Go on, go back to the other parts of the manual. This appendix is for the rest of us. The less experienced ones. This is our place.

Like any specialized field, the computer industry has evolved a set of specialized words and ideas that go along with it. These terms are not meant to scare off outsiders. Indeed, they allow computer professionals to get their jobs done much more efficiently, since they form a highly specialized language. The problem is just that in order to be able to understand them, it seems you need all their years of schooling and experience too.

This is simply not accurate.

The computer is a tool that you use to make certain jobs simpler. That's about it, really. The typewriter, as a tool, made the duty of writing easier and faster. The computer, as an extension of the typewriter, turns this duty into something yet again simpler and faster. And the computer is much, much more than an electronic typewriter. The computer is far more versatile. *Software*, the instructions that tell the computer how to operate, can be created with different purposes in mind. Different software, different function. The computer can *run* (operate) many kinds of *programs* (specific software that serves a certain purpose, from word processors to spreadsheets, to games, to graphics, to video, to audio.

That's where the Video Toaster comes in. And that's one reason why the Toaster is such a versatile video tool. The Toaster is as capable as the software (the controlling programs) that run it. As newer, more advanced software is written, the Toaster takes on greater capabilities. As a relative newcomer to computers, you're probably wondering, "what's a computer?"

Where Do I Start?
The first thing to do with the Video Toaster is confirm that you have received all the items that should be included in your packaging.

You should identify what these things are. As you run down the following checklist, we recommend you connect these items together.

The Video Toaster Workstation consists of the following:

- One Video Toaster Workstation

This is the main unit, a large beige box with the Video Toaster sticker on the front. In the back you'll see a number of different kinds of connections for attached various other devices, both computer and video oriented.

- One Power Cord

Often called a Line Cord, or a Universal Power Cord. One end plugs into the back of the Toaster, and the other into a standard electrical socket.

- One Keyboard (with attached cable)

This plugs into the lower right front of the Toaster. There are three sockets there, one round and two flat. The keyboard connects to the round socket.

- One Mouse (with attached cable)

This plugs into the lower right front of the Video Toaster, in the plug next to the keyboard socket. (As you face the front of the Toaster, from left to right, this is the number two connection.)

- One RGB Terminator Plug

This is a small silvery gray connector. It's designed to connect to the back of the Toaster, where there is a connector with multiple pins labelled "VIDEO" (or possibly "RGB"). If you have an RGB monitor you are using, keep this terminator plug in a safe storage place. Otherwise, if you do not use a monitor, gently and firmly plug it onto the connector.

This plug is not included with the VideoToaster card.

- Three BNC-to-RCA adaptors

These are in a small plastic bag. If the video equipment you will be connecting to the Toaster uses RCA connectors instead of BNC connectors, use these adapters to convert from one connector type to the other.

- One copy of "Revolution," the Video Toaster demonstration tape (VHS)

- One Video Toaster Users Manual

- Program, Preview, Interface, and Toaster Input/Output Stickers

The I/O sticker goes on the back of the Toaster, beside the column of six BNC connectors. This helps to identify each connection. The Program sticker is for the TV you attach to the PGM output of the Toaster. The Preview sticker is for the TV you attach to the PGM output of the Toaster. The Interface sticker is for the TV (or RGB) monitor you use to view the Toaster's control panel.

- One Video Toaster Registration Card. Fill out and mail in the warranty card immediately.

Power On
Once you've connected all these items together (see the first tutorial for setup instructions) you're ready to start the Toaster and begin creating graphics, manipulating video, and being creative. If you're facing the Toaster, you'll find the power switch on the upper back corner of the system, on the right.

Power Off
As long as there is no disk activity, you can safely turn off the system (even if you are currently running the Toaster) at any time. You can tell if there is disk activity by looking at either the hard drive or floppy drive activity lights. For the hard drive, it is on the left, next to the Power light on the Video Toaster sticker. For the floppy drive, it is on the right, beside the drive itself. These lights glow when the computer is actively working with the disk. Turning off the power when these lights are glowing may cause damage to the information on the disk. Always wait for the light to go out before shutting down the power.

Take note, if you are new to using computers, you should always save (to the hard drive) any important work you create. When you work, your artwork (and the display) are in the RAM memory area, which is not a permanent storage location. Remember to transfer your work to the hard drive (or floppy drive,) by saving it, before you power down.

The Parts of the Computer
A computer consists of several different parts that work together. Here's a quick list of the things that are most important.

- The main unit, or *CPU*. This contains all the electronics, plus some extra space for more to be added later. The extra space is pre-wired, with more electronics, so that add-on devices can draw power and communications directly from the computer, by plugging into a pre-wired slot.

- The *hard disk*. These are rated in terms of how much information they can hold. The unit is a megabyte, which is about 1-1/2 floppy disks. Most drives today are 50MB or higher.

- The *hard disk controller*. This is the device that communicates between the hard drive and the computer itself.

- *RAM*. RAM is memory that the computer uses to operate a program.

- A *floppy drive*. This is the device that allows you to add new software to your computer, or to save the information on it as a back up.

- A *RAM memory card*. This card is a circuit used to hold RAM.

- The *monitor*. A monitor is a display screen that shows the computer's status, what it is doing, and what you instruct it to do.

- The *mouse* and *keyboard*. These are the means by which you instruct the computer what to do.

- An *accelerator card*. Your system operates at a certain speed. An accelerator card causes it to run faster, from 10-30 times faster. Such cards are often optional accessories.

So What's a Computer?

A computer is a collection of electronic circuits that have the ability to do many things. In order for them to function properly, they require an *operating system*. You can think of an operating system as a set of rules and regulations governing how the computer works. When you drive a car, you follow the rules of the road and the laws of your country. This is an operating system of sorts. Just as you can use different computer programs on the same computer, you can drive different cars on the road. Yet you still must follow the laws of driving. You must still remain within the operating system.

The Amiga computer uses AmigaDOS. The most recent versions, 1.3 and the newer 2.0, are in popular use today. (The Toaster is compatible with both versions.) When you turn on the computer, it looks for the information contained in the operating system that instructs it how to get ready for work. This information may be on a *floppy disk* that you insert into a *disk drive* on the front of the computer. In the case of the Video Toaster Workstation, this information is on the internal *hard drive*. The hard drive is a rigid disk that can hold information. Think of it as a big stack of floppy disks. Also on the hard disk is the Video Toaster software.

When you turn on the system, the operating system *boots*. That is, it checks for the operating system, follows its instructions, and gets ready for use. When it is ready, the screen will display the Amiga Workbench. (If your Toaster auto-starts the Toaster, you'll see the Workbench when you exit the Toaster and shut it down.) The Workbench is the main screen from which all other programs and functions are operated.

On screen you'll see icons, or pictures, that represent disks and drives the Workbench currently knows about, or *recognizes*. You should have at least the *RAM DISK* and an icon for the hard drive (such as Toaster, Amiga, Workbench, or some such name). Whenever you insert a floppy disk, its icon will appear here as well.

The RAM Disk icon represents the Random Access Memory, or the overhead, that your system has to work with when it runs a progRam. This disk is created automatically by the Amiga when it starts up. When you run a program, a certain amount of RAM is used by it in order to function. Therefore, it is important to have enough RAM for the work you plan to do. You can think of the RAM DISK as an electrical floppy disk, where you can store files, create drawers, or work on files. You can treat it like another floppy disk drive. However, it is not a place to store data files permanently, as it is only electrical memory, and it will "empty" when the power is turned off.

Telling the Toaster What To Do.

The first thing to do is get familiar with the parts of the Toaster and the computer that you will be working with. This familiarity will help you to grow confident in operating the Toaster. Once confident, you can begin to experiment, and discover new features, new tricks, and new skills.

The first skill to master is that of communicating with the computer. How do you make it do what you want it to do? Through the *keyboard* and the *mouse*. Most of your interaction with the computer comes through the keyboard and the mouse. The keyboard you are probably familiar with. You use it to type letters, words, or sentences that will appear on the screen. The mouse is a tool for you to control the movements of an arrow, known as the pointer, on screen. As you move the mouse on the desktop, the pointer on the screen also moves. In this way you can *point* to items on screen. On the mouse there are two buttons, the left button and the right button. When you press one and then let go (*click*), the computer understands that you have done something. Depending on the item that the pointer is over, and the button you press, the computer will respond in some manner.

The objects you'll be pointing at are called *icons*. Icons are simply small images, or pictures that represent something. An icon may represent a computer diskette that you insert into the drive, a program you operate such as the Toaster, or a file you have created such as a picture. Icons are useful tools. Using an icon, you can start a program simply by clicking on it twice.

The left mouse button is the button you use to *select* or *activate* items. Consider it the trigger button. For example, you click it once to select an icon. Click it twice quickly, and the icon is activated (it may start a program, or open a window to display its contents). In the Toaster, for example, the program icons will load the program (making it ready to operate) after the first click, and enter the program (take you to that program's screen) on the second.

The right mouse button is used to access *menus* at the top of a screen (that is, if there are menus to access). In ToasterPaint, there are menus along the bottom of the screen. With the right mouse button, you *pull down* a menu, move the cursor to *highlight* a function, and let go the button to initiate it.

Getting used to the feel of the mouse will be clumsy at first. So will keeping your fingers from pressing the wrong button. However, in a short period of time it will become second nature to you. Remember to work with only one program at a time when learning something new. Once you know how to work with one program, you'll find that learning the next one is that much easier and faster since they function in a consistent manner.

The Toaster's control panels for Switcher, Paint, CG, and others, consist of buttons that you click (and sometimes double-click) with the mouse. Certain things you can click, called *windows,* allow you to type with the keyboard, such as when you enter a name for a freeze frame you want to save. Another common mouse movement is *dragging*, where you hold down the left (or right) mouse button, and then move the mouse up or down. This has the effect of moving a slider control, cycling through a list of items in a window, performing some other function.

Sometimes there will be a shortcut on the keyboard that you can press that is the equivalent of clicking an on screen button. These are called *keyboard equivalents*. For example, if you are operating the Switcher, and you want to trigger an effect at an automatic speed setting, you could press the space bar instead of clicking Auto with the mouse. Keyboard shortcuts are useful for actions you perform repeatedly, like triggering effects.

How Information is Stored on Computers

In order to find files and programs on the computer, there has to be a method of organization on the hard drive. This is often referred to as the *directory structure*. The easiest way to understand the directories on a computer hard drive is to compare them to something that already has a similar structure: your home.

If you had to give someone directions to find something in your home, you would tell them what rooms to go through, what cupboards to open, and what item to find. Assume the item is a radio, in the closet in your bedroom. Here's how the Amiga computer would describe this location, as **Home:Bedroom/Closet/Radio**. As you read this list of items, you can imagine the path that you would follow in order to get to the radio. You'd walk into your home, go to the bedroom, open the closet, and find the radio. The computer uses this form of shorthand to describe the exact location of every file. It's called a *pathname*.

Pathnames are written in a certain style that must be followed exactly when you need to work with files. The first item is the name of the hard drive itself, followed by a colon. The Amiga can use two different names for disks: the disk's logical name, and whatever name you might want to call the hard drive (this is the name that usually appears on the screen when you are in the operating system). The Toaster recognizes logical names, such as DH0:, RAM:, and DF0:. DH0: stands for Drive Hard 0. RAM: stands for the RAM memory you have. DF0: stands for Drive Floppy 0. Computers always count from the number 0, so if you added another hard drive, it would become DH1:, and so on.

On the hard drive, there will be a number of *directories*. Think of these as storage locations. Just as you might put something of value in a box (which is a storage location), and the box in a closet (another storage location), your computer may have several levels of directories for storing similar items. The Toaster software is located on the hard drive, inside a directory called Toaster. For the sake of organization, the different files that are needed by the different Toaster applications are kept within separate directories inside the Toaster drawer. So, the pathname for the Toaster drawer is DH0:Toaster. A file called "Switcher" within the Toaster drawer would be DH0:Toaster/Switcher. Notice that the directory name, Toaster, comes right after the colon for the hard drive's name. Notice also that the name of the file, Switcher, comes right after a slash, which is immediately after the directory name. If there are several levels of directories, then each directory is listed in the pathname, with a slash between directory names. After the final directory, there is a slash followed by the name of the file itself.

If this is looking complex, don't worry. Unless you are pretty serious about understanding computers in-depth, this is not necessarily critical information for you to try to understand right off the bat. The important concept you should remember is that in order to locate a given file, you need to know about directories. If you save a file in one of the Toaster directories named Images, you should go back to that directory to find the file later. If you look in another directory and don't find it, it does not mean that you have lost it forever. You just need to look a little bit more.

The Toaster programs are preset to use certain directories automatically for your ease of use. Here's a list for your information.

Saving Framestores (from Switcher, Paint, LW3D) **DH0:Framestore**
Saving Projects (from Toaster Preferences) **DH0:Project**
Saving CG Books (from Toaster Preferences) **DH0:Project**
Saving ChromaF/X effects (from ChromaF/X)........................**DH0:Toaster/ChromaFX**
Saving CG Buffer Pages **DH0:Framestore/CGPages**
Saving Images (from Paint, LW3D) **DH0:Toaster/3D/Images**
Saving Brushes (from Paint) **DH0:Toaster/3D/Images**
Saving Objects (from LW3D, Modeler) **DH0:Toaster/3D/Objects**
Saving Surfaces (from Lw3D) **DH0:Toaster/3D/Surfaces**
Saving motion paths (from LW3D) **DH0:Toaster/3D/Motion**
Saving envelopes (from LW3D) **DH0:Toaster/3D/envelopes**
Saving Scenes (from LW3D) **DH0:Toaster/3D/Scenes**
Loading Text Files (into CG) **DH0:Toaster/CGTextFiles**

The directory called CGTextFiles is not a directory that the Toaster saves information into. It is intended that the ToasterCG only read information from that location. You would need to use a text editor (or word processor) to create a text file and save it inside this directory in order for ToasterCG to find and load it. If you plan on using the CG a lot, and find it helpful to type your pages into a word processor rather than the CG itself, it may be useful to you. See the CG Appendix on CGTextFiles.

If you are interested in learning more about the Amiga operating system, you may wish to purchase the complete operating system software, the Workbench. Current versions are 1.3 and 2.0, with 2.0 being the most recent upgrade. Also, you may wish to learn more through the books listed under the Recommended Reading appendix.

If you're new to world of 3D graphics, this section is designed to illustrate and explain some basic 3D concepts. This is not a textbook discussion, filled with complex formulae and boring explanations. It's an introduction, using real-world terms to make your experience of LightWave an exciting and simple one.

Explaining the three-dimensional world using two-dimensional media (such as a computer screen) can be difficult enough, but to do so using static two-dimensional media (like a piece of paper in a manual) is even more daunting. Many of the principles discussed here will become very clear once you begin working with LightWave.

The 3D World
When we work in 3D, it's almost as though we are working in another world inside your computer. In this 3D world, you are working with objects, lights and a camera. By moving and rotating these objects, you create what is called a scene. The computer looks at the position of the objects, lights and camera and draws a picture based on what it sees. The process of drawing is called *rendering*, and because of the vast number of calculations involved, it can sometimes take a long time. However, 3D graphics are a tremendous time saver over the traditional hand-drawn animation method.

Why? Because once the scene is set, you can instruct the computer to move the camera "over here" and render another image, then move again and render again. Automatically, without having to redraw and recolor the entire image by hand. In traditional media, like painting or drawing, seeing the picture from an entirely different angle would mean redrawing.

So what does the computer see? Well, it calculates the intensity of lights, the focal length of the camera, and kind of surface used on objects. In short, every visual element in the picture. On the screen, we see shapes that represent the objects, lights, and camera as we work with them. To the computer, these objects, lights and camera are collections of numbers, which is what computers work with.

In a sense, 3D graphics is a color-by-numbers kit. Using three basic colors, red, green, and blue, the computer can create any other color. (This is a different color basis than that of real-life paint, which uses red, blue, and yellow to make all colors.) Mix red and green to make yellow. Mix a little less green with the red to make orange. The computer allows for 256 different amounts of red, green, and blue, ranging from 0-255 (for 16.8 million possible combinations). Therefore, you make color choices in the computer using differing amounts of red, green, and blue. For example, blue-green would be r000, g100, and b150 to the computer.

LightWave 3D uses two types of rendering formulae to create its images: rendering and ray tracing. Rendering is also known as shading. Rendering produces images very quickly, and with simple tricks can "fake" more time-consuming ray tracing techniques. Ray tracing takes a great deal more time, because it actually traces the path of every beam of light to create shadows, refraction and reflection in the scene. Depending on whether you actually need to see reflection or refraction in the rendered image, you can choose to turn on or off ray tracing options, and take advantage of rendering's speed.

Moving Around in the 3D World
The three dimensional world lies along three axes.

X, which runs horizontally (left to right)FOverlay Genlock ⟵⟶ X

Y, which runs vertically (up and down)

Taken together, these two dimensions allow you to draw flat images. By describing different locations, called points, on the X and Y axes, you define a shape. ToasterPaint uses X and Y coordinates to define points on the screen. In this way you can draw lines, shapes, and images with exact specifications. If the X value is 5, and the Y value is 5, then those are the coordinates for a given point.

But what if you want to draw an object, say a chair, in relation to another object, in this case a table. Suppose further that the chair is behind the table. Although the two objects are on the same scale, that is, the chair is a certain size in relation to the table, since it is in the distance it must be drawn in perspective. If you were artistic, you would try to draw the chair slightly smaller and shade it darker, to enhance the appearance of distance. If you weren't artistic, you'd have to struggle with the concept.

In 3D, there is a simpler, more accurate method for this. We add a third axis, which defines the third dimension, called *depth*.

Z, which runs along a line directly from from you to the horizon
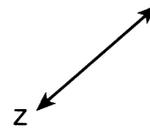
With depth, you could place the chair object some distance away from you, "into" the Z axis. Perspective in 3D is calculated by the computer, therefore the act of moving the chair will cause it to be rendered in the distance, behind the table. If the X, Y and Z values are 5, then those coordinates describe the location of a single point in 3D space ("Five units up, five units over, and five units away").

When all three axes are combined into one system, you can describe exact locations in three-dimensional space.

Another way of describing these three axes is to say that X represents width, Y represents height, and Z represents depth. These labels, X, Y, and Z, are used to represent an object's *location* in the 3D world. The labels H, P, and B are used to describe an object's *orientation* in the 3D world. These refer to Heading, Pitch, and Bank. To understand what these mean, imagine an airplane as you read about them.
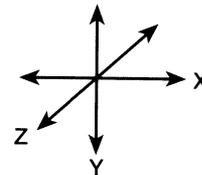
Heading controls which direction the airplane faces (when viewed from the top, looking down on it). It rotates the object around the Y axis. In other words, it's as though someone stuck a pole through the roof of the airplane and down through the floor, and then rotated the plane around that pole.

Pitch controls whether the airplane is facing up, down, or lying flat. As our airplane takes off or lands, it's pitch changes. Pitch rotates the object around the X axis, as though someone stuck a pole through the doors of the airplane, and then tilted the plane forward or backward, rotating it around that pole.

Bank controls whether the airplane is tilted to the left or right. If our airplane did a single barrel roll, it's Bank would change 360°. The bank is the rotation around an object's Z axis, as though someone stuck a pole through the airplane (from the nose to the tail), and then tilted the plane side to side, rotating it around that pole.

So what's next?
Now you're familiar with getting around within the 3D environment. This is all you really need to begin working in LightWave. You'll find it exciting, especially as you grow more skilled. Practice! Experiment! A certain amount of trial and error can't be avoided, but the tips and tricks within the manual will help. There are also magazines and books on computer graphics listed in the Recommended Reading Appendix.

Use the premade objects, scenes, and surface textures that we've provided for you. Modify them, move them, animate them. Be careful not to make too many modifications at one time before rendering. That's like re-decorating your entire house at once rather than trying out new carpeting first, draperies second, and furniture third. A sudden change of everything makes it difficult to see if the important minor changes are to your liking. Better to change one item at a time, such as position, and render. When layout is correct, try color. When the color is right, add a texture pattern. Change one item at a time for greater control and understanding of "what this button really does." You'll soon begin to recognize how effects are achieved on television, and how you can create them at home.

Appendix 7
Compatible Video Equipment

Compatible Video Equipment

There are a wide variety of applications for the Video Toaster, and for this reason, there are many different types of video equipment that can be used with it. This appendix provides a list of various types of video equipment that are compatible with the Video Toaster. This is a general listing. For specific compatiblity, consult your local video dealer or the manufacturer of the equipment.

Monitors
The Video Toaster puts out three separate video signals simultaneously - Preview, Program and control panel. You may have up to three separate video monitors to view these signals. There are three limitations that will help you decide which monitors to use:

1   You must have an RGB monitor (or an RGB terminator) connected to the Amiga's RGB port.

2   You must use a color composite monitor to view the Program video.

3   You must use a color composite monitor to view the Preview video.

You must have an RGB monitor connected to the RGB port for the Toaster's encoder to function properly. There is an important consideration to this rule, however: the cable that connects the monitor to the system must not use either the H sync or V sync lines of the RGB port; instead it should use the C sync line. Any monitor that does not use these lines will work fine, such as the Commodore 1080 and 1084 monitors. Both of these monitors are composite/RGB and can serve to carry any of the Toaster's video signals.

The Program and Preview monitors must both be color composite monitors. The control panels for ChromaF/X, Toaster CG, ToasterPaint (also shows up in full color on an RGB monitor) and LightWave 3D rely on a color Preview monitor to display vital color information.

Cameras
The Toaster will accept a video signal from almost any NTSC color video camera. When you want to use more than one camera, however, a new requirement comes into play: synchronization. Multiple sources must be synchronous, which means that they must be able to synchronize signals to an external source. This somewhat restricts your choice of cameras for multiple camera setups, in that most camcorders and consumer cameras do not have this ability. You can use almost anything from inexpensive closed-circuit TV cameras, many of which are genlockable, up to broadcast cameras. Prices will range from about $1000.00 to over $100,000.00.

VCRs
One of the most frequently asked questions about the Toaster is "Will it work with my VCR?" The answer to that question is "Not without time-base correction." Any video that is played back from a tape inherently has time base errors. These occur because the tape changes speed as it moves across the video heads. The speed change may be exceedingly small, but it affects video switching equipment. Time base error means that the video is not broadcast quality. A time base corrector removes these errors before the signal reaches the Toaster.

There are different grades of VCR: consumer, professional/industrial, and broadcast. Be wary when you are considering a purchase, and be certain that the features you need are available on the machines you want. For single-frame animation, the higher-end professional/industrial decks are popular.

Consumer VCRs are intended for home viewing, and rarely offer the editing features that more expensive decks offer. These decks typically cost under $1000.00. Professional/industrial machines range from low-cost boxes that are little more than fancy consumer decks, to higher-priced editors with built-in time-base correctors. Such machines range from $1000.00 - 6000.00. Finally, there are editing VCRs intended for serious high-end work, costing from $10,000.00 - 100,000.00.

Edit Controllers

In order to edit video, you need to copy scenes from one VCR to another in a different order. For accurate control, an edit controller connects to both VCRs and cues the two machines, directing them when to roll. This allows for split-second editing accuracy. The simplest of edit controllers utilizes the tape's "control track" to maintain its position, knowing when to make the edits you desire. For even greater accuracy, producers use SMPTE Time Code, which assigns a unique number to every frame of every second of video. This allows them to make "frame-accurate" edits, a must for professional production.

If you are planning on using the Toaster for editing with your VCRs, make certain your VCRs work with an Edit Controller for ease and accuracy in editing.

Time Base Correctors

Time base correctors perform two very important functions in video. First, they correct unstable sync on tape deck sources, allowing switchers and special effects generators to operate on video signals. Second, they allow video sources to be genlocked, or synchronized, to another source. In this manner a number of non-synchronous video sources may be made synchronous.

TBCs come in different forms: full-frame, and advance sync (with support for around 16 lines). If your VCRs are professional, they may be able to use the less expensive advance sync kind. If your VCRs are consumer or industrial, they more likely require a full-frame TBC. Full-frame TBCs include internal (plug-in) models designed specifically for the Toaster, and external (outboard) models intended for general video production. TBCs start at around $1000.

They differ in the amount of control over the video signal they allow, and in the features they offer. If you desire more control over the hue, saturation, black level, etc., you will want a slightly more expensive, fuller-featured TBC.

Single Frame Controllers

A single-frame controller is the device that communicates between the Toaster and the VCR. It is different from an edit controller, in that it is a more passive device. It receives a "ready" signal from the Toaster, and in turn instructs the VCR to record one frame. To view 3D animations, you must record them frame-by-frame, then play the finished tape. Personal computers are not yet powerful enough to play 16-million color animations in real time.

Typically, VCRs that can be used for single-frame animation require Time Code, and either a serial or parallel interface port. A Time Code Generator (to generate Time Code) may be needed as well, although some VCRs/Controllers may incorporate this capability.

Single-frame controllers are made by a number of companies, and range in cost from $425.00 to $5000.00. They differ in the number of features they offer, as well as the machines they support. The controller you buy will determine the VCRs that you can use with it. Make certain that you purchase a single-frame controller that supports the VCRs you plan to use.

Appendix 8
Expanding the Toaster

Expanding the Video Toaster

The Video Toaster system can be expanded in many ways. These are listed below. If you have questions, would like information, or want to order expansion products for your Video Toaster, contact NewTek Sales at 1-800-368-5441, or 1-612-881-2862.

Memory (RAM)

• Install additional standard speed (16-bit) RAM. With this memory, the maximum available RAM is 9 megabytes.

Benefits: Additional memory allows the CG, ToasterPaint, and Lightwave more overhead for basic operations (i.e., more fonts, or more objects, etc.). You will notice a difference in the "responsiveness" of the Toaster programs.

Speed (Performance)

• Install an accelerator card that holds faster (32-bit) RAM. With this memory, the maximum available RAM can be well above 9 MB, depending on the manufacturer of the accelerator. Note that if you intend to surpass 9 MB total, all memory on the system should be of the 32-bit variety.

Benefits: An accelerator allows for a significant speed increase in the CG, ToasterPaint, and Lightwave. Minor speed enhancements will also be apparent in Switcher and ChromaF/X.

Memory (Storage)

• Install additional SCSI hard drives inside (or outside) the system case. The SCSI format allows for up to seven drives to be daisy-chained one after another. Drives may be hard drives, removable media (cartridge) drives, or magneto-optical drives.

Benefits: Greater amounts of memory for storage allow you to save a large number of framestore images, rgb files, projects, etc. without "filling up" your main drive.

Software
At the time of this manual going to press, there were many software packages avalable that expanded the Video Toaster's usefulness. The primary software available included additional fonts for Toaster CG, and 3D objects that could be used by Lightwave 3D. Contact NewTek Sales for information on availability, and purchasing these products at 1-800-368-5441, or 1-612-881-2862.

Appendix 9
Converting Fonts for CG

Converting Amiga Fonts to ToasterFonts

For those of you who have Amiga fonts that you would like to use with the Toaster, a method of converting an Amiga font to a ToasterFont has been provided. This is a CLI utility located in the Utilities sub-directory in the Toaster directory. You must double click a shell or CLI and type the appropriate command followed by a Return.

The command format is:

toastfont infile outfile

Where infile is the complete path to the desired Amiga font, and outfile is the complete path to the desired ToasterFont. Here is an example assuming that your fonts directory and Toaster directory are both on dh0:

toastfont dh0:fonts/diamond/20 dh0:toaster/toasterfonts/diamond.10

There are several restrictions on the type of fonts that can be used.

- Only one color Amiga fonts can be converted to ToasterFonts.

- The Amiga font size must be between 20-160 scan lines tall.

- All of the characters in the Amiga font, placed side-by-side, can be no wider than 16383 pixels.

- Each character in the Amiga font must be between 0-159 pixels wide.

The ToasterFont that results from the example given above will be a font 10 scan lines tall. In general, any Amiga font that is converted to a ToasterFont will be halved in size horizontally and vertically; this is similar to using a lores font on a hires screen. For speed of handling, ToasterFonts are constrained to be between 10-80 scan lines tall. If you attempt to convert an Amiga font with illegal characters or one that is out of the size range, you will receive an error message to that effect.

ToasterFonts are somewhat different than Amiga fonts in the way that they are organized in their directory. All fonts of all sizes are in the same ToasterFonts directory. For this reason, we recommend that you follow the convention

ToasterFontname.# of scan lines tall

When you name the new ToasterFont. The example given above would yield the ToasterFont diamond.10, which is the name that will appear in the Fonts Available window the next time that you enter it.

Appendix 10
The Overlay Genlock

The Video Toaster can function as a standard computer genlock, overlaying the computer's graphics onto video. To use this Overlay feature you must exit the Toaster software.

- Click the Toaster Preferences button on the Switcher screen.

- Click Exit.

- A menu requester will pop up. Answer Yes to the requester that appears asking Shut down and exit Video Toaster?

On the Amiga, you will then be returned to the Amiga's Workbench operating system screen. The video that was selected on the Program Bus will have the encoded computer graphics overlaid onto it. This will appear on the Program monitor. The Preview monitor, on the other hand, will display encoded computer graphics only. You may then run your other graphics software as normally, hooking up a record VCR to the Program or Preview outputs if desired.

You will still have to use time-base correct video when using the Overlay Genlock. The Toaster must receive video free of time base errors in order to maintain perfect RS-170A output quality.

Appendix 11
The Genlock Utility

One of the functions that the Video Toaster can perform is that of an overlay genlock. This is a device that takes computer graphics, converts them into a video signal, and then overlays them onto another video signal. Placing a ToasterCG Key Page over video is an example of this function, although the Toaster can do a great deal more. Just by exiting the Video Toaster, you enable the overlay genlock. However, if you want control over certain Toaster functions at that time, you must start the Genlock Utility.

The Video Toaster Genlock Utility is found inside the Toaster drawer on your hard drive. The Video Toaster does not need to be active at the time you start the Genlock Utility. However, you do need to start and exit the Toaster first, so that the utility can communicate with the Toaster. Once the Toaster has started, exit (either by shutting down or switching to the Workbench screen), then double-click the Genlock Utility icon to activate it.

On your monitor screen, the Genlock Utility will open a small window that looks like a miniature version of the Toaster Switcher.
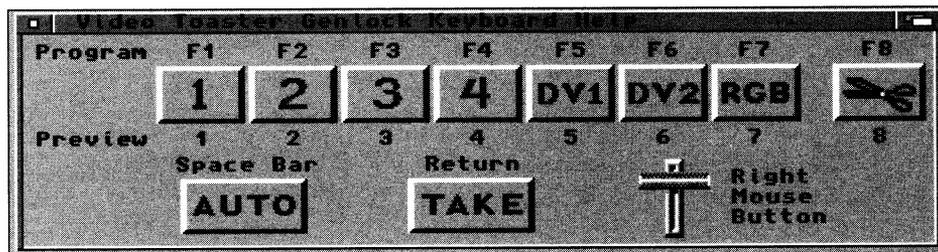
The buttons on this panel cannot be selected using the mouse. Instead you activate its functions from the keyboard. This utility program is known as a "hot-key" utility, which means that while you use other, third-party software to display graphics, you can press special keys on the keyboard that communicate with the Genlock Utility. Since you will probably use the Genlock Utility to show graphics from third-party software, the monitor screen will be displaying those graphics at the time. In this manner, you can dissolve graphics on and off screen, as well as cut or dissolve to other video sources that are connected (and genlocked, remember) to the Video Toaster as if the Switcher were active. All this is controlled via the keyboard.

The hot-key functions in this manner: hold down the hot-key, and press the desired key on the keyboard. You can select any one of several keyboard keys to be the hot-key by accessing the pulldown menus at the top of the Workbench screen. First, click the left mouse button anywhere on the Genlock Utility panel to make it the current window. Next, move the mouse to the bar at the top of the screen and hold down the right mouse button. Three menus will appear: Genlock, Auto Speed, and Activate Key. As you move the mouse over a heading, a menu drops down. The active option under any heading is denoted by a checkmark.
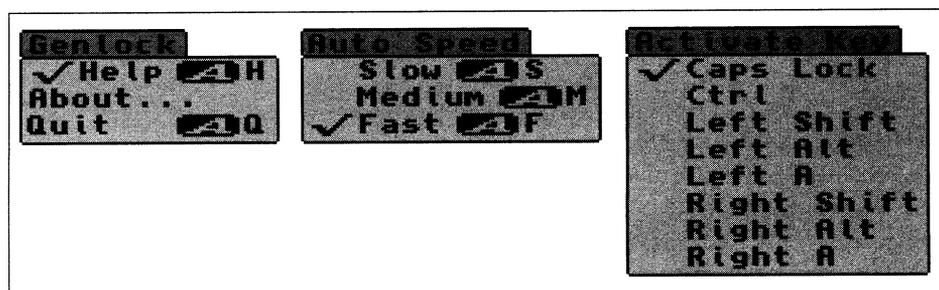
Genlock

This menu governs general operations about the Genlock Utility.

Help. When Help is checkmarked, the Genlock Utility panel is displayed.

About. About shows you information about the utility, such as the release number.

Quit. Quit will exit the Genlock Utility.

Auto Speed.

This menu governs the auto transition speed of dissolves.

Slow. This is the equivalent of Slow on the Toaster Switcher.

Medium. This is the equivalent of Medium on the Toaster Switcher.

Fast. This is the equivalent of Fast on the Toaster Switcher.

Activate Key

This menu selects which keyboard equivalent to use as the hot-key activator.

Caps Lock. The Caps Lock key (on the left side of the keyboard).

Ctrl. The Ctrl key (on the left side of the keyboard).

Left Shift. The shift key on the left side of the keyboard.

Left Alt. The Alt key on the left side of the keyboard.

Left A.The *A* key on the left side of the keyboard.

Right Shift. The shift key on the right side of the keyboard.

Right Alt. The Alt key on the right side of the keyboard.

Right A. The *A* key on the right side of the keyboard.

The Genlock Utility buttons are listed below. You have control over both the Program and Preview outputs of the Video Toaster. Therefore, you can see the Program and Preview sources on your Program and Preview monitors, which is especially useful for setting up shots and graphics. To select a source, hold down the active hot-key and press the key for the input you want.

Hotkey +	Pgm	Pvw	Source
	F1	1	Video source on Toaster input 1.
	F2	2	Video source on Toaster input 2.
	F3	3	Video source on Toaster input 3.
	F4	4	Video source on Toaster input 4.
	F5	5	Toaster framebuffer DV1.
	F6	6	Toaster framebuffer DV2.
	F7	7	RGB video. Computer graphics (foreground *and* background colors).
	F8	8	RGB key. Computer graphics (foreground colors only).

Transition

Return	Triggers a take.
Spacebar	Triggers a dissolve at the selected speed.
Right Mouse button	Triggers a dissolve at the speed you move the mouse.

Using the Genlock Utility

Here is a short tutorial that demonstrates the functions of the Genlock Utility. It uses the unique function of the Caps Lock button to be "switched on," which means you need not hold it down when you press one of the input or transition buttons when it is active. All other hot-keys must be held down in order to activate the other keys. This tutorial assumes you have at least one video source connected to the Toaster.

1 Start the Video Toaster.

2 Once the Toaster has started, load a different still frame into each of the framebuffers. If you don't have any available, the two that are already there will be fine. Go to Toaster Preferences and click Exit. Click on Yes when the confirmation menu pops up.

3 Double-click the hard drive icon, then the Toaster drawer icon, and finally the Genlock Utility icon.

4 Move the mouse to the bar at the top of the screen, hold down the right mouse button, move to the Activate Key menu, highlight the Caps Lock item, and let go of the mouse button.

5 Press the Caps Lock key.

The lamp will illuminate on the keycap. The Genlock Utility is now active from the keyboard.

6 Press F1, F5, F6, or F7 on the keyboard. Watch these sources appear on the Program output of the Toaster. (If you have others connected, try them as well.)

7 Press 1, 5, 6, or 7 on the keyboard. Watch these sources appear on the Preview output of the Toaster. (If you have others connected, try them as well.)

To cut or dissolve between video sources:

8 Select F1 on Program and 5 on Preview.

9 Press Return (cut), the Spacebar (dissolve), or drag with the right mouse button.

To cut or dissolve between video and RGB video:

10 Select F6 on Program and 7 on Preview.

11 Press Return (cut), the Spacebar (dissolve), or drag with the right mouse button.

To overlay cut or dissolve RGB key graphics:

12 Select F1 on Program and 8 on Preview.

13 Press Return (cut), the Spacebar (dissolve), or drag with the right mouse button.

Note that you can use any combination of methods for displaying graphics, or changing sources. You can take one source to Program, then dissolve to Preview, for example.

Final Notes

There is one hot-key that, when used with certain keys on the keyboard, is always active no matter which key you may be using as the activator hot-key. This is the right *A* key in combination with h, q, s, m, or f.

Right *A*-q will quit the Genlock Utility.
Right *A*-h will display the help screen, or shrink it to a tiny window it if it already visible.
Right *A*-s will select the Slow speed setting.
Right *A*-m will select the Medium speed setting.
Right *A*-f will select the Fast speed setting.

Also, remember that you will need to select the hot-key Activate Key every time you start the genlock utility.

Appendix 12
3D Object Formats & TIO

TIO

The Toaster can import data from many other programs and computers through the TIO system. "TIO" stands for Toaster Input / Output.

Through TIO, LightWave can import 3D data from the following formats:

Sculpt 3D/4D
AutoCAD .DXF
Swivel 3D
Wavefront .obj
3D Studio .3DS
ToasterPaint can also load images in the Macintosh "PICT bitmap" format.

The following appendixes detail the process of transferring and importing these files.

For more information about TIO converters to import other formats, contact:
Syndesis Corporation
N9353 Benson Road
Brooklyn, WI 53521
(608) 455-1422
(608) 455-1317 FAX

Swivel 3D

LightWave can import Swivel 3D objects.

First, these files must be copied to the Toaster. For more information about moving files from the Macintosh to the Toaster, please consult the "Sharing Files" section later in this appendix.

Because Swivel 3D stores its 3D data in the "resource fork" of a Macintosh file, it is important to transfer the Swivel 3D file as a "MacBinary" file. Some telecommunications programs offer this ability. Again, consult the "Sharing Files" section later in this appendix.

Wavefront .obj

LightWave can import Wavefront .obj objects. To import a Wavefront ".obj" format file, the file must be moved to the Toaster. For more information about moving files from other computers to the Toaster, please consult the "Sharing Files" section later in this appendix.

Wavefront ".obj" files are ASCII files and may be manipulated in any text editor. In the Wavefront software, all objects are composed of polygonal faces that have between three and five sides.

Wavefront .obj files can reference a "materials file" that describes the surface attributes of a polygonal face. If you transfer the material file to the same directory as the Wavefront object file, then the actual surfaces from the material file will be used to color the polygons in the object. These surfaces will appear in the LightWave surface list.

The Unix-like path for the material file name will be ignored. For example, if your Wavefront files use a material library named "/usr/master/master.mtl," then you will need to move the "master.mtl" file to the same directory as the Wavefront ".obj" file.

3D Studio

LightWave can also import .3DS files from Autodesk's 3D Studio program. (It cannot load any of the other file types that 3D Studio creates.) First, the .3DS files must be moved to a Toaster disk. For more information, consult the "Sharing Files" section later in this appendix.

3D Studio objects include named detailed surface descriptions that will be added to the LightWave surface list.

TIO DXF Converter

This Converter reads "entities only" DXF files.

DXF files often have file name extension ".DXF.". DXF files are a representation of an AutoCAD drawing. The DXF format has become popular format for exchanging CAD drawings and 3D models between many programs. The DXF standard is maintained by Autodesk, makers of the AutoCAD program.

DXF files are ASCII, that is, they are editable in any text editor. They are broken down into four sections: HEADER, TABLES, BLOCKS, and ENTITIES.

The HEADER section contains the state of all AutoCAD variables such as $COORDS and $AXISUNIT. The TABLES section holds information about named items, such as line types and layers. All BLOCK definitions are stored in the BLOCKS section. Finally and most importantly, the ENTITIES section holds all information about the entities that compose the drawing.

Saving DXF files in AutoCAD

To make a DXF file from within AutoCAD, use the "DXFOUT" command. When it prompts "Enter decimal places of accuracy", enter 'e' to save only the ENTITIES section of the DXF file. Only six decimal places of accuracy are needed. In AutoCAD Release 10 and beyond, you should also select "ASCII" format.

If your drawing contains BLOCKs, you need to EXPLODE them before saving the "entities only" file. Select each BLOCK, then execute the EXPLODE command. BLOCKs that contain more BLOCKs must be exploded separately.

Reading DXF files

This does not translate any part of the BLOCKS section of a DXF file, it only converts the entities in the ENTITIES section. Any INSERTed BLOCKs are not present as entities in the ENTITIES section unless you save the DXF file with "entities only".

All entities become part of a single LightWave object.

When reading DXF files, there is no need to worry about the conversion of line ending characters between computers. This accepts Amiga and Unix files that have just "line feed" at the ends of lines, as well as Macintosh files with only "carriage returns," as well as IBM PC files that end with both "carriage return" and "line feed" characters.

Line Translation
In general, line width is ignored. All lines are simply translated as two-point polygons.

Elevation and Thickness
If an entity has an elevation set, the resulting polygons of the entity are displaced upward by that amount.

If an entity has thickness, it is extruded: points become lines, lines become four-sided polygons, triangles become prisms, and polygons become cubes.

DXF Entities

Although the most recent version of AutoCAD is Release 11, there are many other releases in common use today, such as Release 10 and versions 2.6 and 2.5.

The following entities are translated:

POINT

Becomes a polygon with one point. If it has thickness, it becomes a polygon with two points.

LINE

A LINE becomes a polygon with two points. If it has thickness, it becomes a polygon with four sides.

3DLINE

A 3DLINE becomes a polygon with two points.

3DFACE

A 3DFACE becomes a polygon with three or four points.

SOLID and TRACE

SOLID and TRACE become a polygon with three or four points. If it has thickness, it becomes a set of four or six polygons, like a prism or a brick.

POLYLINE

A POLYLINE becomes a series of polygons with two sides. If it has thickness, it becomes a series of polygons with four sides. Curve fitting and bulges are not supported. Starting and ending widths are ignored. POLYLINEs do not become polygons even if they are closed.

Circle and ARC

CIRCLEs and ARCs become a series of at least ten two-point polygons in the shape of a circle or an arc. Each polygon is at most 10 units in length. Each polygon has two points. Adjacent polygons are connected at their endpoints, but each polygon remains a distinct polygon in most 3D formats.

CIRCLEs with thickness become hollow cylinders with that many sides. ARCs with thickness become a series of faces in that shape.

These extruded polygons are oriented such that they point outward, away from the center point. If you want to view the object from the inside, flip the normals in Modeler.

The following entities are not translated:
INSERT
TEXT
SHAPE
DIMENSION
MESH

Arbitrary extrusion directions are not supported. All extrusion directions are assumed to be parallel to the Z axis.

Colors and Textures

When reading a DXF file, all resulting InterChange objects take on a color based on the AutoCAD pen number. The default pen number is 7, which is white. The default pen colors are as follows:

0 Black

1 Red

2 Yellow

3 Green

4 Cyan

5 Blue

6 Magenta

7 White

Pen numbers greater than 7 are translated into these colors, too. Pen 9 is treated as pen 1, pen 10 as pen 2, etc.

PICT bitmaps

Toaster Paint can import Macintosh "PICT bitmap" files.

To import a PICT file, it must be moved to the Toaster. For more information about moving files from other computers to the Toaster, please consult the "Sharing Files" appendix.

If the PICT image is smaller than 752 by 480 pixels (the size of the Toaster screen) then the image will be placed in the upper left corner of the screen, as if you had imported a brush into Paint. If the image is larger, then it will fill the screen and the right and bottom edges will be clipped. For best results, crop your images to fit the Toaster screen.

Tutorial: Sharing Files with other computers

Macintosh

Ironically, the easiest way to move files between the Toaster and the Mac is to use an MS-DOS formatted floppy disk.

If you have a newer Macintosh equipped with the type of floppy disk drive that Apple calls the SuperDrive, you can read and write MS-DOS diskettes. Note that the SuperDrive can work with both 1.44 meg and 720K floppies, and that the Toaster cannot read 1.44 floppies at this time. Instead, use 720K as an exchange medium.

Copy the Mac file to an MS-DOS format 720K floppy, then move the PC file to the Toaster as in the above example for the IBM PC. Similarly, move an Toaster file to the Mac via an MS-DOS disk.

The Macintosh system software includes the Apple File Exchange utility for copying files to and from MS-DOS disks. Or, another convenient alternative is the Dayna DOS Mounter software that lets you transparently access MS-DOS disks.

For some Mac data files, you must move both the "data fork" and "resource fork" parts of the file. For example, Swivel 3D stores its 3D data in the resource fork. If you transfer a Swivel 3D file to a PC disk, you'll think there is nothing there. The file will be zero-length.

One way around this is to use a public domain translation filter for the Apple File Exchange program. This file concatenates both the resource and data forks into a single "MacBinary" file. For more information about this tool, contact NewTek technical support.

Sharing Files

Sharing files with an IBM PC is just as easy. For example, to import a DXF file, you must first move the file to the Toaster.

If you share DXF files with an IBM PC or compatible that is part of a Novell network, you may consider using Commodore's Novell networking software to share files with PCs.

If you share DXF files with a computer that is connected to a DECnet network, you can use Syndesis Corporation's TSSnet, an implementation of DECnet for the Commodore Amiga and Toaster.

Next easiest is sharing a floppy disk with another computer. Several tools are available to read and write IBM PC and

Macintosh disks on the Toaster.

There are commercial products for sharing PC files on disk, too. New Horizons sells Dos-2-Dos, which reads, writes and formats disks in IBM PC format, from both 360K 5-1/4 inch disks and 720K 3-1/2 inch disks. Dos-2-Dos is a standalone program that provides a command-line type prompt for copying MS-DOS files to Toaster disks. Dos-2-Dos can translate between Toaster and MS-DOS line ending characters.

Using an external Macintosh drive, New Horizons' Mac-2-Dos product can read and write Macintosh files, with a "DirUtil"-type mouse-based interface. If you use a Mac II, you can use Apple's File Exchange utility to write a Mac file to an IBM disk, then proceed as above. After the files are moved to an Toaster disk, then they can be selected within the Toaster's file requesters.

New Horizons
PO Box 43167
Austin, TX 78745
(512) 329-6215

Consultron sells CrossDOS, an alternative file system that lets you transparently access MS-DOS disks as if they were ordinary Toaster disks, for reading, writing and formatting. It also works with both 3 1/2 and 5 1/4 inch drives.

For example, instead of selecting drive DF0: in the LightWave file requester, you'd select DI0: and see the MS-DOS files on the disk in drive DF0:. This makes the translation process as simple as it can be. CrossDOS can automatically translate between Toaster and MS-DOS line ending characters.

Consultron
11280 Parkview
Plymouth, MI 48170
(313) 459-7271

If nothing else, if the machines are near each other, you can use a "null modem" adapter with a serial cable and a telecommunication programs to send the file from the Toaster to the other computer. Be sure to use a protocol such as Xmodem or Zmodem to insure that no errors are introduced in the file.

If the two computers are more distant, you can connect them using modems over the telephone line. You could call each other directly, or the DXF file could be uploaded through an intermediate BBS or national network.

Compression

Because DXF files are ASCII, human-readable files, they tend to take up a lot of disk space. The same can be said about image files. If you share files via the serial port, you can save time by reducing the size of the DXF file by using any of the popular public domain file compression utilities such as PKZip, Arc, LHarc, etc., that are available for the PC, Macintosh and the Toaster.

With PKAZip, DXF files are typically compressed to 20 percent of their original size. For the Macintosh, there is a public domain version program that will "unstuff" StuffIt ".SIT" files, as well as Macintosh versions of PKzip and LHarc.

Appendix 13
Single Frame Controllers

This section contains the necessary information to begin using LightWave with a single frame controller.

How single frame controlling works
A single frame controller is a device that will control a professional video tape recorder. It enables the VTR to record one frame of an animation at a time. This is the technique used in most professional animations.

Basically, after LightWave has finished rendering a frame, it sends information out of the serial port of the Amiga into the Single Frame Controller. The Single Frame Controller in turn backs the tape in the VTR up for preroll and starts the tape playing and then at the proper position records one more frame to tape. After the frame has been recorded, LightWave will go on to rendering the next frame.

If all or some of the frames have already been rendered to your hard drive then the process is the same except that instead of having to wait for LightWave to render the frame, it just loads it off of the hard drive and then sends the signal to the single frame controller to record the frame.

Equipment needed
To do single frame animation you are going to need a single frame controller and a video tape recorder capable of one frame edits. Most professional editing decks have this capability. You will also need to decide which tape format you want to work in. Currently you can single frame control in just about any video format including:

SVHS
Hi8
3/4"
3/4"SP
1"
MII
Betacam SP
D-2

There are also laser disc recorders on the market now which would not require a single frame control as they include elaborate control over their functions. The downside is that typically these recorders are very expensive. Lightwave currently works with the following systems:

- BCD 5000 and BCD 2000A from BCD Associates (Single-frame controller)
- DQ-TACO from DiaQuest (Single-frame controller)
- Minivas from Lyon Lamb (Single-frame controller)
- V-Lan from Video Media (Single-frame controller)
- AmiLink from RGB Creations (Editing System with single-frame ability)
- Sundance from Sundance Technologies (Editing System with single-frame ability)

Other controllers will work as well. Refer to the manual included with your single frame controller for the specific commands needed. For more information on animation systems see your local Video Toaster dealer or contact NewTek.

When working with tape, the process would need to begin by striping the videotape with time code, setting up the controller, entering the proper command strings and starting the animation process.

BCD Single Frame Controllers

A recent revision to the freely distributable BCD software simplifies the single frame process that used to require more commands. If you have the BCD 2000A controller, with EPROMS of revision (5.0 1115) or higher, or the BCD 5000 with EPROMS of revision (4.0 1115) or higher, then you should complete your command entries with a . (period) followed by a return. If you do not, then you will need to end each command with ^M (shift-6, m) followed by a return. The following command strings will properly control the BCD 2000A and 5000. You may have to refer to the BCD manual for further information.

BCD 2000A and 5000 New Command Codes

1. Click RECORD SETUP. Type the following: EDOT:HHMMSSFF. and press return. The HHMMSSFF stands for Hours, Minutes, Seconds, Frames. Make certain that you use the colon (:) in front of the time setting but not between numerals; and make certain that you press the period (.) right after the time setting. This sets the Edit Out Point for the edit. Earlier versions of the BCD controllers required more elaborate In and Out Point commands. This is no longer the case. If you have an older model, the previous commands are listed below.

2. Click RECORD COMMAND. Type the following: APND1. and press return. Make certain you press the period (.) at the end of the command. This sets the tape deck to advance by 1 frame following each edit.

Older BCD Controller Commands (Older Software, Older EPROMS)

In the Record Control Panel, select RECORD ON. Open the Record Setup window and enter the following commands:

Each step will require that you open the window again.
1.) TYPE (number) ^m (return)

Whereas number is your deck type number (see BCD manual), the "^" key is a shift-6 and the "m" can be upper or lower case. The "return" is the return key on the Amiga keyboard.
2.) INIT; STAT ^m (return)
This will check for time code.

If each frame takes less than 5 minutes to render then go to step 3. If not, go to step 4.
3.) THRD1 ^m (return)
4.) EDTP5 ^m (return)

This will put the deck in insert mode.
5.) EDIN:30000 ^m (return)

Whereas 30000 is the starting position on your tape.
6.) EDOT:30001 ^m (return)

Whereas 30001 is one frame greater than your starting frame.
7.) EDIT ^m (return)

Now, in the record window type:
8.) APND1 ^m (return)

DiaQuest DQ-TACO Command Codes

Once you are ready to record the animation, go the Record Menu.

Click Recording.
Click Record Setup. Type INIT ^M and press Return.
Click Record Setup. Type SETIN ##:##:##:## INIT ^M and press Return.   (Replace the number symbols with the Time Code location where the animation is to begin.)
Click Record Command. Type EDIT 1FP ^M and press Return.

Note that prior to animating, you may need to use an initialiation command to proplerly prepare your VTR for recording. Also, you may need to use a Record Delay Value with the VTR. See the Diaquest manual for specific information on these items.

Nucleus Electronics Personal Single Frame Controller

The Personal SFC actually communicates with the VCR through its own software, which handles such things as setup and cueing of the recorder. The PSFC software also allows you to create animation files incorporating looping, as well as other editing features, both when recording to tape or playing back images to record to tape.

When recording to tape from LightWave, in the Record control panel:
      1.) Click RECORD COMMAND. Type T# and press Return.
      2.) Set any delay you need with the RECORD DELAY button.

V-LAN Command Codes

The following commands need to be entered in the Record Setup Window: (The window will need to be opened again for each step).

1.) EF ^m (return)
Whereas "^" is a shift-6 on your Amiga keyboard and the "m" can be upper or lower case.

2.) ND1 ^m (return)

3.) SI:300 ^m (return)
Whereas 300 is the frame number that you would like to begin recording at.

4.) SD2 ^m (return)

5.) TS V ^m (return)
Yes, there is a space between the TS and the V.

6.) AI1 ^m (return)
If this doesn't work properly, replace this line with AI2 ^m (return)
The last command is entered into the Record Command Window:

7.) PF ^m (return)

Minivas Command Codes

The commands for the Minvas are as follows:

In the Record Setup window enter:

1.) P1:300:/ (return)

Whereas 300 is the frame number that you wish to begin recording at and return is the return key on your keyboard.

In the Record Command window enter:

2.) R (return)

Hex and ASCII codes

If your single frame controller requires special command or control character sequences, use the following LightWave feature.

^ (shift-6)

The caret followed by an A through Z will be converted to the appropriate control code from 1 to 26.

$ (shift-4)

To send out any ASCII character enter the dollar sign followed by 2 Hex digits. This will send out any ASCII character from 0 through 255.

(shift-3)

The pound sign is equal to the Start Position in the Record Control panel plus the current frame number in your scene. Some single frame controllers require the current frame numbers from the program.

In the unlikely event that your single frame controller would require a "^", "#" or a "$" then place two of that character in the command string and one will be sent out to the controller.

Appendix 14
The GPI Trigger

GPI Trigger

A GPI (general purpose interface) trigger is built into the Toaster in order to provide the Toaster with a way to receive commands from a device such as an edit controller.

There are different types of GPI trigger. The Toaster's is a +5 volt positive trigger. This trigger ability does not support sequencing. Each effect must be set up manually on the switcher control panel. The Toaster interprets a trigger pulse as an Auto command. In other words, when the Toaster receives a trigger, it pulls the T-bar and executes the effect

Each edit event must be manually set up - the correct sources on Program and Preview, the desired effect, the desired Auto speed mode (S,M or F). When it is time for the edit to occur, the editor will send the Toaster the trigger signal and the effect will be executed. This is one way to make frame accurate edits with the Video Toaster.

The physical connection of the GPI cable to the Toaster is done through the Amiga's second joystick port.

The second joystick port

This port uses a female DB-9 connector (jack). You must make a GPI cable according to the wiring diagram shown below in order to use this feature.
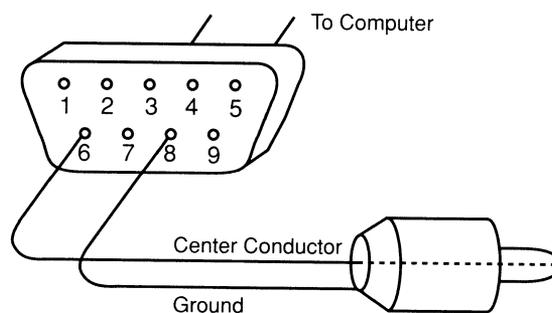
The actual type of connector needed for the edit computer end of the cable varies depending on your edit controller. The cable must be insulated 2-conductor wire. The connecter used on the system end must be a male DB-9 connector (plug). The diagram shows that the center conductor (positive) of the edit computer end must be connected to pin 6 of the joystick port, and the edge conductor (ground) must be connected to pin 8.

All of these parts are readily available at electronics stores such as Radio Shack.

Chapter 12, Section 3 provides information on the correct trigger adjustments so that the trigger reaches the Toaster and the effect is executed at exactly the frame that the edit computer specifies.

Appendix 15
How to Name Files

How To Name Files

Throughout the Video Toaster, you can save different kinds of files (freeze frames, paint brushes, 3D objects, and more). When you go to save them, you will often have the option of giving the file a name. There are a few very important things to know when giving files a name:

- Certain keyboard characters should be considered "off-limits" for use in file names. Using these characters may confuse the Toaster's operating system, and result in losing both important files and the time spent creating them.

- We recommend using the following characters only:

  (.)   the period
  (_)   the underscore
  (-)   the hyphen

- Here are several examples of recommended file naming styles:

Sr.Deus.Krohe	Toaster-Grab-BaseBall
Dave.Proj.Ed	Bob-Fixed-VTC
Character_Set_Gold	Anim.1.Scene
Favorite-Fonts	

- You may also wish to further identify the files you save, especially if you work a great deal within the Toaster environment. Here are some suggestions for "extensions" that you can add to file names to make them recognizable at a glance.

Suggested extensions		Example
.bru	ToasterPaint brush	MyTutorial.bru
.IFF24	ToasterPaint or LightWave 24-bit RGB Image	Fireworks.IFF24
.lwob	LightWave object	F-15.lwob
.surf	LightWave surface	gold.surf
.scn	LightWave scene file	Logo-Zoom.scn
.mp	LightWave motion path	S-Curve.mp

- Avoid using the following characters:

/	forward slash
\	backward slash
#	the number symbol
?	the question mark
$	the dollar sign
%	the percent sign
^	the caret
&	the ampersand
,	the comma
*	the asterisk
	the space bar (do not use spaces between words)
:	the colon

Appendix 16
How to Name Effects

The Naming of Effects

The Toaster's effects banks are arranged so that similar effects are grouped together. The abbreviations used to describe the effects in the Text Window of the keypad control panel are below. Effects are named in the most descriptive way possible. Some of these names are admittedly non-technical, but reminiscent of something found in everyday life.

exp	= expand
sqz/unsqz	= squeeze/unsqueeze
ol	= overlap
FD	= fade
TMB	= tumble
fr	= from
>	= to
L	= Left Edge
R	= Right Edge
T	= Top Edge
B	= Bottom Edge
TL	= Top Left Corner
TR	= Top Right Corner
BL	= Bottom Left Corner
BR	= Bottom Right Corner
C	= Center
H	= Horizontal Center
V	= Vertical Center
TRLS	= with trails
inf	= infinity effect
BKG	= dip to background
TRJ	= trajectory
b	= with border

Push/Pull
In a push, one video signal moves onto the screen replacing another. In a pull, one video signal moves off of the screen to reveal another. The size of the moving video image does not change, just its position.

Squeeze/Zoom
The zoom compresses or expands the Program signal while maintaining its original aspect ratio. Zoom effects are sometimes referred to as Squeezes.

Split
This effect splits the Program signal along an axis and reveals the Preview signal beneath. The two portions of the Program signal travel in opposite directions.

Tumble
In a tumble the Program signal turns around a horizontal or vertical axis, and is often accompanied by some sort of trajectory or zoom. This effect is sometimes called a flip.

Trajectory

Trajectory causes the Program signal to fly around on the screen on a predetermined flight path, and is often accompanied by a squeeze to enhance the effect of movement.

Swap

This effect is very similar to the split, but the two halves of the video cross over each other at some point.

Blinds

Named after the similarity in appearance to window blinds, here the Program signal is split into vertical segments that are pushed or compressed until they disappear.

Mosaic

The Program image is divided into squares like mosaic tile. The color of each tile is the average of all the colors that are present in the image before the effect was started.

Tiles

This effect replicates the Program image in an array of smaller images. The size of the tiles is not fixed, and they can grow to infinite smallness.

Compression

This effect is similar to the zoom but does not retain the original aspect ratio of the image. Instead it compresses the image around a fixed axis.

Switcher + Digital

These effects are typically a combination of trajectories and fades. The image fades in as it grows larger or fades out as it is squeezed.

Trails

There are several TDE's that make a digital trail that is left wherever there has been movement of the image. The trail will remain until some part of the image moves back upon it. Another kind of trail effect is the Analog or Decay Trail, that fades away or decays over time.

Appendix 17
ToasterPaint's Use of Monitors

Preview Mode and Program Output

ToasterPaint is a true 24 bit paint program. It uses 3 different data representations for the picture:

- 24 bits per pixel - internally and with "rgb" files.

- Composite encoding - for video display and framestore.

- Preview mode - for quick feedback on the computer display.

RGB files are the most accurate way to save and load pictures with ToasterPaint. 8 bits are saved for each of the red, green and blue pixel components. This allows each pixel to be one of more than 16 million colors. The RGB files used are standard IFF (Amiga) files, in a format similar to DigiView files.

Composite (video) encoding is used for framestore files and for rendering to a Toaster frame buffer (sending to Program). The primary visual difference between composite and RGB picture saving methods lies in the color filtering. For any given picture, you may notice that the colors are somewhat "smeared" if you load a framestore file. RGB files do not exhibit this color smearing (filtering). The Toaster video display, due to the nature of NTSC video, cannot display the true 24 bits-per-pixel information. RGB files, being of higher (color) quality, are recommended for temporary saving of in-progress work.

ToasterPaint uses Preview mode for quick response on the Control Panel. While Preview mode limits the number of shades of a color to "4 bits," 16 steps between black and the highest color, ToasterPaint simulates a higher color resolution by dithering. ToasterPaint's Preview display effectively simulates 24-bit color, where the color is constant over wide horizontal regions. You will sometimes see streaks of color on the Preview monitor (especially when you are scrolled away from the left edge of the canvas). These streaks will never appear on the Program output or in the RGB files; they are simply artifacts of the economical method that Preview mode uses to display its 4096 colors.

The following keyboard commands instruct ToasterPaint how to send its data to the Toaster frame buffers.

- F8 frame buffer 1 - selects DV1 to receive data from ToasterPaint

- F9 frame buffer 2 - selects DV2 to receive data from ToasterPaint

- F10 render to toaster, on/off switch

- Del on/off switch, continuous-render-to-toaster (each time a change is made to the canvas).

Appendix 18
ToasterPaint and ARexx

ToasterPaint ARexx compatibility

ToasterPaint is ARexx compatible. ARexx is a standard for interprocess communications on the Amiga, and ToasterPaint can communicate with ARexx. This is important for the power user who likes to program; with this capability you can control ToasterPaint completely from other programs you write. This capability can be used to write self-running paint demonstrations.

Please note that ToasterPaint acts only as an ARexx "server." Other applications and ARrexx programs can control ToasterPaint. ToasterPaint, however, does not implement "macros" or any other function that depends upon ARexx.

A drawer labeled heystuff is included with the Toaster software. This drawer contains two small programs that send messages to ToasterPaint: "hey" and "heyline". An example of how to use these programs is given in that drawer. If you have ARexx, you can use it to write more sophisticated commands for ToasterPaint to follow.

This capability could be used for such things as a rendering interface, a way to generate quick color-filled backgrounds, or as an algorithmically precise pattern or painting generator.

ToasterPaint was designed to take advantage of the Amiga's multitasking, interprocess communication and built-in Intuition library. For the "advanced user" (or programmer) we provide the following information regarding the ARexx/remote interface of ToasterPaint.

ToasterPaint handles most of its user interaction through a single, named message port. The 'name' of the port is DigiPaint. All user menu and button selections can be performed by 'sending a message' to ToasterPaint's port. These messages consist primarily of 'action codes' (a list is provided in the following pages). Every Intuition event such as a gadget press or a menu selection has an associated action code. Note that there are more action codes than there are gadgets and menu selections. Also note that these 'action codes' are what is contained in the ToasterPaint__Startup/Keyboard.txt keyboard shortcut) file.

The script capability of ToasterPaint allows complete control over the program's operation by using a 'script' file instead of the 'normal' mouse interface. A script file is a simple text file that can be created with any text editor on the Amiga.

Script commands are available to duplicate the entire Control Panel: everything ToasterPaint does can be done with a script. Another feature is available to the "remote/script" user: the scan-line interface. The scan-line interface is used to deliver a line of pixels to ToasterPaint at "30 bits per pixel" resolution. That is, ToasterPaint will dither 10 bits per color (r,g,b) per pixel, using the selected (matrix/random/none) dither type and plot the result on its "work screen".

Concept: Action Codes
When communicating with ToasterPaint through the 'remote' interface, each message sent to ToasterPaint contains an 'action code'. Action codes are 4 character (1st one capitalized, other 3 lower case) 'commands' to ToasterPaint. There exists an action code for every:

- menu item

- button

- mouse button/move "event"

These SAME action codes are used in the Keyboard.txt shortcut file. Each line in the "keyboard.txt" file contains a "raw" keycode and the action code that's supposed to happen when the particular key (or key combination) is pressed.

Concept: Amiga/Port Technical
ToasterPaint uses a single port for all inter-task communication. This port is used for the 'normal' Intuition (mouse/button/menu) interface. This "exec message port" can also be used by both ARexx and AmigaDOS users. (ARexx is a trademark of Wm. S. Hawes.)

To communicate with ToasterPaint, its 'port name' must be known.

The port name is DigiPaint.

Whereas the Switcher software interfaces with ARexx through a 'function call' interface, ToasterPaint uses a message/command paradigm. ARexx commands for ToasterPaint are ALWAYS 4 characters long, and ALWAYS contain one uppercase character followed by three lowercase characters. This last point is important because ARexx, by default, converts all commands to uppercase. ToasterPaint will not normally recognize all uppercase commands. Therefore, the ARexx programmer should be sure to surround command words (ToasterPaint's "action codes") with single quotes.

The ARexx command 'options results' does not work with ToasterPaint.

ToasterPaint never returns a result. It only returns an error code of 0 (ok) or 20 (failure).

Concept: Sending Messages
The way that action codes are communicated to ToasterPaint is by sending a message (containing the action code) to ToasterPaint's port. Two systems can be used to send these messages: either ARexx (a full-scale script language) or AmigaDOS. As an extension to the DOS method, ToasterPaint can also be controlled from AmigaBASIC or any language that supports message passing.

A program named "hey" is supplied with ToasterPaint. It is a CLI type program whose function is to send a message to a named port. The command line format is:

    1> hey portname message
    ex: 1> hey DigiPaint Undo

This example will cause ToasterPaint to perform an "undo" operation.
Again, please note that ALL functions are available in this manner, including loading and saving of files.

ARexx
The complete script capability is available to ARexx users. With ARexx, the user gains a complete language with many types of control structure support (not possible with simple AmigaDOS command files). ARexx users should note, however, that ToasterPaint does not take kindly to 'decimal points'. All numbers sent to ToasterPaint should be 'integers without a decimal point'. All the same commands apply the same as for AmigaDOS script users.

ToasterPaint acts as a 'server' with regard to ARexx. ToasterPaint will not issue calls to ARexx, since it doesn't have a "macro" capability. Therefore all ARexx applications need to be run from 'outside' ToasterPaint (e.g. from a CLI). The ARexx program should include the statement "address DigiPaint." However, the action code "Exec," which simply calls the AmigaDos execute function, can be used to start up macros by including the AmigaDos "run" command.

Example -

• Exec run rx test.rexx

or

• Exec run execute dostest.txt

The KEYBOARD FILE is named "ToasterPaint_Startup/keyboard.txt". It is a simple (editable) ASCII file. Each line contains a "raw key code," a blank (space character), and an action code to occur when the key is pressed. Multiple lines (actions) can be "tied" to each key by having more than one line per key in the keyboard shortcut file. The action codes are processed in the order that they appear in the file. Note that the action codes for the ARROW KEYS are somewhat tied to the real-time Control Panel: they either move the screen, or they move the magnify view, depending on the mouse position. The keyboard shortcut file also contains another type of entry: "BOOT" codes. There are two "BOOT" code classes, "BOOT" and "Boot." "BOOT" codes only "happen" once, as the program is starting, before any screens are opened. They're used primarily to setup default conditions. "Boot" codes occur after the screens are opened, and every time the program is re-entered from the switcher.

Exiting ToasterPaint
On ToasterPaint's Picture menu, there's a Quit option and a Switcher option. Quit, also called "super-quit" is available as a keyboard shortcut (~ key). It quits and unloads the program from memory. The Switcher option (Q on the keyboard), however, saves the current rgb buffers and allows you to continue working on the same picture, the very next time you restart ToasterPaint from the Toaster's Switcher. Please note, though, that the Switcher option "loses" the current color, cut-out brush, paint mode and swap screen. Also, if you load in a different project while using the Switcher, ToasterPaint will re-start from "scratch" - with a blank canvas and buffers.

Examples - File Requester, Font Loading, Making Text Brushes, Painting
These examples can be executed as CLI/Shell command files. Place the code in a file named "testcode." Then use the AmigaDOS command "execute testcode."

Outline, with 1 pixel, a rectangle from 50,49 to 100,99

- hey DigiPaint Drre
- hey DigiPaint Dotb
- hey DigiPaint 8rgb 160 160 160
- hey DigiPaint Pend 50 49
- hey DigiPaint Penu 100 99

Load a file named "DEF" from disk named "ABC:"

- hey DigiPaint Load
- hey DigiPaint DnamABC:
- hey DigiPaint Dsel
- hey DigiPaint FnamDEF
- hey DigiPaint Okls; load font from file named "FONTS:TOPAZ/11"
- hey DigiPaint Font
- hey DigiPaint Dnam FONTS:TOPAZ
- hey DigiPaint Dsel
- hey DigiPaint Fnam11
- hey DigiPaint Okls
- hey DigiPaint Clbx

Put "dropshadow"ed text on picture;.by making a dark gray brush, pasting it, then doing same with light gray.

- hey DigiPaint 8rgb 80 80 80
- hey DigiPaint TvarHello
- hey DigiPaint Tstr
- hey DigiPaint Pend 100 99
- hey DigiPaint 8rgb 160 160 160
- hey DigiPaint Tstr
- hey DigiPaint Pend 98 97

ToasterPaint, being a true 24 bit RGB paint program, operates on every pixel with (more than) 24 bit resolution. Each red, green and blue component is treated as an 8 bit quantity, with an additional 8 bits used for blending. ToasterPaint can be used as a rendering utility. External programs can generate 24-bit rgb data and send the data into ToasterPaint's

buffers. The data can then be saved as rgb files, framestores, rendered to a Toaster frame buffer, or otherwise processed. The "Dlvb" action code (explained further on in this section) is used for this.

The following examples are given in the format used for ARexx scripts.

Drawing lines
Instead of the 'Drln' mode, it's best to use the "Bsmo" (connected brushstroke) mode in order to draw lines. Instead of

'Drln'
'Pend' 50 50
'Penu' 100 100

it's better to use

'Bsmo'
'Pend' 50 50
'Penu' 100 100

The ('Bsmo') "be smooth"/connected brushstroke mode will paint all of the in-between positions, by drawing a line between the starting ('Pend') and ending ('Penu') brush positions. 'Drln' is fairly unusable from ARexx. It's only available from ARexx for the sake of 'logical completeness'.

Framestore save filenames
The (minimal) "correct" way to save a framestore is with the following action codes:

'Saco'
'Fnam123.FS.Test'
'Okls'

Note that the filename *must* be prefixed with "###.FS." if the switcher is to recognize this framestore file. If you do not include this string at the beginning of a framestore filename, then the switcher will not be able to load the file (although ToasterPaint still can). Also, be sure not to use duplicate frame numbers because the switcher will only recognize 1 framestore file per frame number.

Paint Colors
"Prgb"/DigiPaint(old) is for setting up a 12 bit paint color.
"8rgb"/ToasterPaint   is for setting up a 24 bit paint color.
For "Prgb r g b", each r,g,b value is a 4 bit number (0-15 range).
For "8rgb r g b", each r,g,b value is an 8 bit number (0-255 range).

Scanline Interface
The 'Dlva' and 'Dlvb' action codes (commands) are similar.
'Dlvb' takes binary numbers (UWORDs) as parameters.
'Dlva' takes ascii (normal string) arguments.
'Dlva' is somewhat slower because of the ascii->binary (internal) conversion. It's format is:
  Dlva #pixels line# r g b r g b r g b r g b r g b .. r g b

'Dlvb' was designed to be a quick machine language interface for scan line rendering. (DigiView4 uses this exact same command to send its image into DigiPaint's "buffer." DigiView and DigiPaint are two other NewTek products.) The 'Dlvb' format looks some-thing like:

ULONG 'Dlvb'
UWORD nbr_pixels
UWORD line_nbr
UWORD red_0
UWORD green_0
UWORD blue_0

—- "many" groups of red,green,blue values, 1 group per pixel
UWORD red_n
UWORD green_n
UWORD blue_n

Remember, the "r g b" numbers are 10bit values (range of 0-1023). (Bright white's rgb data would be "1023 1023 1023", not "15 15 15".)

Here's an example program..

—-
```
/* "Dlva" test program, Arexx to DigiPaint interface **************/

address 'DigiPaint' /* host name */

nlines = 128 /* # of lines to display */

row = 20     /* (starting) line #, used by the 'Dlva' message */
gray = 0

do nlines    /* for each of 128 lines */

/* setup r,g,b values for current lines */
r = gray
g = gray
b = gray

/* setup 32 pixels on this row */
msg$ = "
do 32
msg$ = msg$ r g b
end

/* setup 320 pixels = 10 groups of 32 pixels */
msg$ =  msg$ msg$ msg$ msg$ msg$ msg$ msg$ msg$ msg$ msg$

/* send 'Dlva' msg to DigiPaint/ToasterPaint */
'Dlva' '320' row msg$

gray = gray + 1024/nlines  /* rgb values range from 0.1023 */
row = row + 1        /* used by the 'Dlva' message */
end    /* 128 lines of 'gray' */

return
/************************** end of program **************************/
```

Command Summary
In general, there are 4 groupings of action codes: mouse, menu, button, and 'other' - codes that have no direct 'normal intuition interface' counterpart:

Mouse action codes are:
- Move x y
- Pend x y (pen down)
- Penu x y (pen up)

These work exactly as if the mouse (normal) pointer initiated the action.

Some of the more common button action codes are:
- Undo; performs an undo operation
- Scis; goes into scissors/cut-out-a-brush mode (Pend, Move and Penu action codes actually do the cut)
- Redo; does a 'repeat' or 'again'-type operation
- Prgb r g b; sets the paint color, 4-bit RGB values
- 8rgb r g b; sets the paint color, 8-bit RGB values
- Drre; draw rectangles" mode
- Drci; "draw circles" mode
- Dotb; "dotty (vs. smooth) brush" mode

More Action Code Notes

"Rdit" and "Dith" action codes: setup the dither modes. Dither only applies to Preview encoding. (Current printer drivers only allow for 4 bits per r,g,b color component.) ToasterPaint uses "random" dither by default. The "Ugad" action code updates the user gadget display. Many options can be set (or toggled) before forcing the display to update. The display is not updated if there are any messages pending, which is the usual case with ARexx, so the "Ugad" code offers a way to update the display under "programmer control".

When using the file requester from ARexx, filenames and directory names are set up with the "Dnam" and "Fnam" action codes (messages). Directories are actually "cd"d to when the "Dsel" action code is received. The "Okls" action code acts like the "load/save,rgb/framestore/brush" button on the upper right side of the file requester. It is used to actually begin the file loading or saving operation.

Action Code List

8rgb ....paint color, 8 bit numbers, set bright white with "8rgb 255 255 255"
Aali ....anti-alias toggle
Aaof ....anti-alias OFF
Aaon ....anti-alias ON
Al24 ....alloc 24-bit
Aoff ....all modes off
Arof ....always render - off
Aron ....always render - on
Aroo ....always render mode toggle

Babx ....back box gadget, moves screens to back of display
Bcmo ....brush color mode toggle
Bcop ....copy brush
Bdel ....delete brush
Blur ....blur effect
Blu2 ....blur effect, mode 2, "heavier blur"
Boot ....performs "keyboard file" "boot" codes
Bres ....restore brush
Brgb ....r,g,b background
Brt2 ....- standard brush type
Brt3 ....| brush
Brt4 ....\ brush
Brt5 ..../ brush
Brt6 ...."squares"
Brt7 ...."circles"
Bsmf ...."filled in freehand"..flood on, bsmooth..
Bsmo ...."smooth-connected" std brush (vs. dotty-disconnected)
Bswa ....swap the "swap brush"
Bsz1 ....standard brush size select
Bsz2 ....brush size 1
Bsz3 ....brush size 2
Bsz4 ....brush size 3
Bsz5 ....brush size 4

Bsz6 ....brush size 5
Bsz7 ....brush size 6
Bszl ....brush size, one larger
Bszs ....brush size, one smaller
Btog ....brush shape toggle,flips btwn brush shapes
Bwpa ....black and white palette for Preview

Cbx0 ....color box 0, palette color select
Cbx1 ....color 1
Cbx2 ....color 2
Cbx3 ....color 3
Cbx4 ....color 4
Cbx5 ....color 5
Cbx6 ....color 6
Cbx7 ....color 7
Cbx8 ....color 8
Cbx9 ....color 9
Cbxa ....color 10
Cbxb ....color 11
Cbxc ....color 12
Cbxd ....color 13
Cbxe ....color 14
Cbxf ....color 15(last "real" palette color)
Cbxg ....'current/front/ color, left range color
Cbxh ....'background/shadow' color, right range color
Cbxi ....PAINT color (de-selects range front/back color)
Clbx ....escape button, hires closebox
Clrs ....CLeaR Screen
Coof ....coords off
Coon ....coords on
Coor ....toggles coord flag
Cpic ....Copy picture to swap screen
Ctrl ....control tools/sliders on/off

Dela ....delay on bottom of screen, before scroll
Delo ....delay off

Depa default palette
Dflt ....load default files keyboard.txt and gadget.pic
Dir0 ....df0: directory selection for file requester
Dir1 ....df1: directory selection for file requester
Dir2 ....df2: directory selection for file requester
Dir3.......................................   RAM: directory selection for file reqeuster
Dir4.......................................   dh0: directory selection for file requester
Dirp ...."/" parent directory selection for file requester
Dirr ....":" root directory selection for file requester
Dith ....matrix dither toggle
Dlva ....DeLiVer" a line of ASCII rgb's to ToasterPaint {n,line#,n(r g b)} all
....parameters are ascii, for example, " 320 10 60 20 180 .." " #pts line#
....60=1st red valu 120=green 180=blue"
Dlvb ...."DeLiVer" a line of BINARY rgb's to ToasterPaint {n,line#,n(r.w,g.w,b.w)}
Dnam ....dirname string
Dotb ....single dot brush
Doty ....dotty brush (vs. 'smooth')
Drar ....ellipse
Drci ....circle
Drln ....line mode
Drre ....rectangle
Drrf ....filled rectangles (1x mode tools)

Magn ....magnify gadget
Maxc ....max buttons for blend center
Maxe ....max for blend Edge
Maxw ....max for TxMap amt
Meof ....memory display - off
Meon ....memory display - on
Meoo ....memory display mode toggle
Midc ....middle setting for blend center
Mide ....middle setting for blend Edge
Midw ....middle setting for TxMap amt
Minc ....min buttons for blend center
Mine ....min for blend Edge
Minw ....min for TxMap amt
Move ....x,y position
Mswa ....Merge swap screen

Noef ....no effect, turn off all effects

Okls ....ok load/save button

Pale ....turn on/off PALETTE tools
Pcca ....print - cancel
Pcfe ....print - "fewer" copies
Pcmo ....print - "more" copies
Pcok ....print - ok button; initiate printing
Pend ....x,y pen down, big pic assumed
Penu ....x,y pen up
Pick ....turn on/off pick mode
Pixy ....pick from x,y (in message - remote/arexx only)
Pmad ....paint mode - add
Pman ....paint mode - and
Pmcl ....paint mode - clear (normal)
Pmco ....paint mode - colorize
Pmdn ....paint mode - darken
Pmln ....paint mode - lighten
Pmor ....paint mode - or
Pmso ....paint mode - solid/normal
Pmsu ....paint mode - subtract
Pmxo ....paint mode - xor
Pot0 ....center blend slider setting pot
Pot1 ....edge blend slider setting pot
Pot5 ....TxMap amt, slider setting
Poth ....shade hor pos, blend hotspot
Potv ....shade ver pos, blend hotspot
Prfl ....prop gadget for scrolling file/dir names,on file requester
Prgb ....r,g,b paint (4 bit/Preview mode colors)
Prin ....Print requester
Pro0 ....refresh blend sliders
Pro1 ....prop routines, handle 'auto increment by one'
Pro5 ....TxMap amt prop
Pund ....Palette Undo

Quia ....Quit - but ask with requester
Quit ....Quit - return to switcher without unloading

Rang ....range mode immediate, combo w/other paint modes
Rdit ....flip random dither

Redo ....again/redo button
Rema ....Remap to new palette
Rotm ....Brush rotation MINUS 90 degrees (counter-clock)
Rotp ....Brush rotation PLUS 90 degrees
Rubi ....simple rub thru on
Rubt ....rub thru paint mode

Sa24 ....save 24-bit
Sabr ....save Brush
Saco ....save-composite - render toaster-24 bit to a frame-store file
Sbru ....source - brush image instead of paint color
Scis ....scissors/cut gadget
Scof ....scroll lock - off
Scon ....scroll lock - on
Scoo ....scroll lock mode toggle
Shar ....toggle 1 way horizontal
Shcf ....show composite OFF
Shco ....show composite
Shof ....shift off, for locking rectangle->swap brush aspect ratio
Shon ....shift on, for un-locking rectangle->swap brush aspect ratio
Shoo ....show overscan
Shva ....toggle button, 2 way h/v TxMap mode
Sizi ....TxMap/sizing effect
Snap ....'snap centered view'..keeps toaster hires pic centered
Snof ....snap off
Spoh ....hor pos - TxMap hotspot
Spov ....ver pos - 2 way TxMap hotspot
Squt ....~ keyboard..super-quit..asks switcher for "unload from memory"
Srgb ....source - rgb color instead of brush image (default)
Svar ....toggle vertical TxMap mode
Swap ....swap screens menu option

Tbbo ....text button bold
Tbit ....text button italic
Tbun ....text button underline
Tdv1 ....toaster dv1 (1st frame buffer)
Tdv2 ....toaster dv2 (2nd frame buffer)
Tgof ....toaster gadgets off (no render button)
Tgon ....toaster-type gadget handling (default)
Toof ....1x mode off
Toon ....x mode on..this is for "hires display"
Tran ....transparent on/off (menu item)
Trgb ....r,g,b transparent
Trof ....transparent background color off
Tron ....transparent background color on
Tstr ....text string gadget
Ttog ....blend 2-way direction toggle
Tvar ....data for text string (ascii)
Txbt ....text tools select
Txdn ....Tile X value, decrement
Txma ....txmap mode immediate
Txup ....Tile X 'up' - increment
Txva ....Tile X value 16 bit << 4 (in increments of 1/16)
Tydn ....Tile Y value - decrement
Tyup ....Tile Y 'up' - increment
Tyva ....Tile y value 16 bit << 4 (in increments of 1/16)

Ugad ....redo user gadget (hires+hamtools) display, waits for rendering to finish
Undo ....undo button

Varr ....toggle vertical blend
Vwco ....view composite - render to Toaster
Warp ....(INTERNAL only) simple turn on TxMap
Wexp ....whole screen expand..go "zoom", non-interlace, superbitmap
Wham ....whole Preview screen re-do (from rgb data), re-displays entire Preview image
Whoo ....whole screen toggle (1x/2x button's action code)
Wshr ....whole screen shrink..go skinnier, interlace
Wtog ....TxMap 2-way direction toggle

Keyboard.txt Listing

BOOT ....Tgon toaster-gadgets on
BOOT ....Size 752 480
BOOT ....Nsok ,new size..open screen
BOOT ....Opsc open screen..do it *now*
BOOT ....Al24, allocate rgb
BOOT ....Ke24, keep 24 bit buffers in between 'select's from switcher
BOOTD.....................................ela, cause a .3 second delay, on bottom of screen, before scroll
Boot...Brt7, 'little' circle brushes selected at startup
Boot...Bsz3, '3rd smallest size'
Boot...Cbx1, 2nd palette color (white, default)
a ....Redo
A ....Redo
b ....Scis, brush/scissors
B ....Bswa, brush swap//restore alternate when no cutout-brush
c ....Drci, draw mode circles
c ....Flof, fill off
C ....Drci, draw mode circles
C ....Flon, fill on
d ....Bsmo, draw mode "smooth"
d ....Flof, fill off
D ....Bsmo, draw mode "smooth"
D ....Flon, fill on
e ....Drar, draw mode ellipse
e ....Flof, fill off
E ....Drar, draw mode ellipse
E ....Flon, fill on
f ....Flof, flood fill off
F ....Flon, flood fill on (action code "Floo" will flip it, just like gadget)
g ....Coor, coordinates mode toggle
G ....Grto, grid toggle on/off
h ....Grmo, grid mode..mouse set
H ....Cpic, copy picture to swap
i ....Font, load font requester
j ....Swap, swap screens
J ....Bswa, swap brushes
K ....Cbx0, choose color zero; 'K' clears screen to color zero
K ....Clrs, clear screen
K ....Cbx1, choose color 1 ;then resets to color one
l ....Frbx, screen arrange
l ....Loco, load composite (framestore) requester
L ....Frbx, screen arrange
L ....Saco, save composite (framestore) requester
m ....Magn, magnify
m ....Ugad
m ....Move
m ....Ugad
m ....Penu

M ....Meoo, memory display on menu screen, on off toggle
n ....Poth $8000 ;'n' sets the 2 way blend slider to 'center' position
n ....Potv $8000
n ....Spoh $8000 ;'n' ALSO sets the 2 way warp slider to 'center'
n ....Spov $8000
N ....Bcop, brush copy to swap
o ....Frbx, screen arrange
o ....Lobr, load brush requester (
O ....Frbx, screen arrange
O ....Sabr, save brush requester
p ....Frbx ;screen arrange
p ....Load, load 24-bit rgb picture requester
P ....Frbx ;screen arrange
P ....Sa24 save 24-bit rgb picture requester
Q ....Quit *watchout* immediate quit, return to switcher
r ....Drre, draw mode rectangle Flof fill off
R ....Drre, draw mode rectangle
R ....Flon, fill on
s ....Doty, draw mode "dotty"
S ....Snoo, snap mode on/off, centers overscan in 1x mode
t ....Trof transparency off (action "Tran" will flip it, like the menu-item)
T ....Tron transparency on
u ....Undo
v ....Drln draw mode polygon
v ....Flof fill off
V ....Drln draw mode polygon
V ....Flon fill on
w ....Whsc whole screen "brushstroke"
x ....Flix brush flip x-horizontal
y ....Fliy brush flip y-vertical
Y ....Flpy brush/screen flip y-vertical
z ....Rotp rotate brush "plus" 90 degrees clockwise
Z ....Rotm rotate brush "minus" 90 degrees counter-clockwise

$9b 0~ ....Ctrl F1 control screen select
$9b 0~ ....Frbx F1 also does 'screens to front'
$9b 1~ ....Txbt F2 text screen button..'Abc'
$9b 1~ ....Frbx F2 also does 'screens to front'
$9b 2~ ....Pale F3 palette screen
$9b 2~ ....Frbx F3 also does 'screens to front'
$9b 3~ ....Undo F4
$9b 4~ ....Redo F5
$9b 5~ Pot1 $0000 F6
$9b 5~ ....Pot0 $0000 F6 100% blend center, edge
$9b 6~ Pot1 $8000 F7
$9b 6~ ....Pot0 $8000 F7 50% blend
$9b 7~ ....Tdv1 F8 = DV1 buffer
$9b 8~ ....Tdv2 F9 = DV2 buffer
$9b 9~ ....Vwct view composite; F10

$08 ....Undo 8=BACKSPACE
$7f ....Aroo ;oggle "always render mode" on/off Undo 7F=DELETE
$9b ?~ ....Scoo scroll lock on/off with the HELP key
$9b A ....Ksup,ARROW KEYS
$9b B ....Ksdn
$9b C ....Ksrt
$9b D ....Kslt
$9b T ....Gyup SHIFTED ARROW KEYS for grid spacing inc/dec

```
$9b S ....................................Gydn
$9b $20 @ ...........................Gxup
$9b $20 A .............................Gxdn


~ ...........................................Squt, super-quit..asks switcher for "unload from memory"
` ...........................................Aoff, "all modes off"
` ...........................................Pmcl, paint mode default "clear"
1 ...........................................Pmso, paint mode range
2 ...........................................Pmln, paint mode lighten
3 ...........................................Pmdn, paint mode darken
4 ...........................................Pmco, paint mode colorize
5 ...........................................Rubt, paint mode rub thru
6 ...........................................Blur, paint mode blur
7 ...........................................Warp, txmap source on..was Sizi paint mode "txmap"
8 ...........................................Pman, paint mode and
9 ...........................................Pmor, paint mode or
0 ...........................................Pmxo, paint mode xor


! ...........................................Dith, "!" will turn off dither
! ...........................................Rdit
! ...........................................Rdit
@ ...........................................Rdit
@ ...........................................Dith matrix/ordered dither
# ...........................................Dith
# ...........................................Rdit random dither
$24 .......................................Aali, anti-alias toggle
$$25 .....................................Tbbo, text bold
%$5e .....................................Tbit, text italic
^$26 .....................................Tbun, text underline
$1b .......................................Clbx, ESCAPE KEY = CLOSEBOX ON TOOL SCREENS
$09 .......................................Pmcl, 09=TAB key does paint mode normal
$09 .......................................Pot0 0  blend sliders "full up"
$09 .......................................Pot1 0
$09 .......................................Poth $8000, set the 2 way blend slider to 'center' position
$09 .......................................Potv $8000
/ ...........................................Aaof, anti-alias/smoothing off
? ...........................................Aaon, anti-alias/smoothing on
, ...........................................Pick
< ...........................................Blu2, a heavier blur mode..WAS 'Pick'
. ...........................................Dotb, single dot brush
> ...........................................Dotb, single dot brush
" ...........................................Wtog, warp direction toggle
' ...........................................Wtog, warp direction toggle
\ ...........................................Btog, brush shape toggle
| ...........................................Btog, brush shape toggle
= ...........................................Bszl, brush size larger
+ ...........................................Bszl, brush size larger
- ...........................................Bszs, brush size smaller
_ ...........................................Bszs, brush size smaller
```

This ARexx appendix includes a sample script for use with ToasterPaint and ARexx. You will find more samples in a drawer called ARexxExamples.

```
/* ShrinkPic.rexx Shrink screen in ToasterPaint */
/* By Arnie 'ARexx' Cachelin © 25 Nov 1991 */
/* Warning, stomps ruthlessly on your swap screen and swap brush! */

Rfactor=3   /*  reduction factor, size =1/rfactor, set this to 2,3,4... */
w=752
h=480
w2=(w%RFactor)
h2=(h%RFactor)

Address "DigiPaint"  /* Tell ARexx where commands go  */

t=CutBrush(0,0,w-1,h-1) /* Cut out whole screen */
'Swap'              /* jump to swap screen! */
'Cbx0'                                          /* Pick color zero to clear  */
'Clrs'                                          /* Clear screen  */
t=MapBrush(0,0,w2,h2)   /* Place resized brush on screen */
t=CutBrush(0,0,w2,h2)   /* Cut resized brush */
'Bcop'                                          /* Copy brush to swap brush  */
'Swap'              /* jump back to original screen */
exit

CutBrush: Procedure  /* Cut out a brush with corners at (x1,y1) and (x2,y2) */
 arg x1, y1, x2, y2
 'Brt2'       /* std brush shape */
 'Bsz2'       /* smallest brush size */
 'Drre'       /* Rectangle mode  */
 'Scis'       /* Scissors on, for cutting a brush  */
 'Pend' x1 y1  /* Get in top Left corner  */
 'Move' x2 y2  /* move down to bottom right  */
 'Penu' x2 y2  /* lift pen to get brush!  */
 return 0

MapBrush: Procedure  /* Size current brush into rectangle with corners at (x1,y1) and (x2,y2) */
 arg x1, y1, x2, y2
 'Txma'       /* Texture mapping on, fill on, draw rectangles  */
 'Flon'
 'Drre'
 'Pend' x1 y1  /* Get in top Left corner  */
 'Move' x2 y2  /* move down to bottom right  */
 'Penu' x2 y2  /* lift pen  */
 'Flof'       /* fill off  */
```

This ARexx appendix includes a sample script for use with ToasterPaint and ARexx. You will find more samples in a drawer called ARexxExamples.

```
/*  Toaster Test Template */
OPTIONS RESULTS
TOASTERLIB="ToasterARexx.port"
REXXLIB = "rexxsupport.library"
WaitFrames=0      /*  delay between 'slides' */

IF POS(REXXLIB , SHOW('Libraries')) = 0 THEN
  IF ~ADDLIB(REXXLIB , 0 , -30 , 0) THEN x=Bummer(" I don't get no support!")
IF POS(TOASTERLIB , SHOW('Libraries')) = 0 THEN
  IF ~ADDLIB(TOASTERLIB , 0) THEN x=Bummer(" Me No Find Toaster Library!")

Switcher(TOSW) /* bring Switcher to front so commands execute immediately  */
Switcher(MDV1) /* put Program and Preview outputs on framestores */
Switcher(PDV2)

say ok

do fs=0 to 20 /* No way to break out of this loop!  Gotta watch all those framestores */
  if Switcher(FMXI,fs) then Do    /* If frame # fs exists... */
Switcher(FMLD,fs)
/* load it! */
  Switcher(FRES)
/* reset frame counter to zero */
  call RandomCrouton
/* pick an effect at random */
  if WaitFrames then Switcher(WAIT,WaitFrames)
/* kill some time */

  Switcher(AUTO)
/* and go for it          */
end
end

exit


RandomCrouton: PROCEDURE
/*  Select a random crouton!, some may not do the right thing! */
  grd=translate(random(1,6),"ABCDEF","123456") /* random letter generator! */
  TOASTCmd= "t=Switcher(Grid,"GRD||RANDOM(1,4)||RANDOM(1,8)||")"
      SAY TOASTCmd
  INTERPRET TOASTCmd
  return t
```

```
Bummer: PROCEDURE
 arg etxt
 say etxt
 EXIT
 return 0
```

Appendix 21
Video Toaster Specifications

Specifications

This appendix contains a complete list of the Video Toaster's hardware specifications.

Video Standard:	NTSC
Inputs:	(4) composite synchronous input BNC connectors. 1 Volt p-p coherent chroma. Software controllable 75Ω termination or high impedance for loop-through on each input. Keyed clamping DC restore.
Program Video Output: **Preview Output:**	1 Volt p-p composite into 75Ω. 1 Volt p-p composite into 75Ω.
Reference Video:	Composite color or blackburst on video input #1.
Sequence Trigger:	GPI trigger with optional cable.
Insertion Delay:	400ns Video in to Program Out.
Sync Generator:	Sync, burst and blanking internally regenerated. Meets all FCC and RS-170a specs
Signal to Noise:	> 55 dB.
Sampling Rate:	14.31818 MHz.
Quantizing:	8 bits.
Differential Phase:	< 3°
Luminance Bandwidth:	+0 / -3 dB to 5 MHz.
Luminance Resolution:	> 400 lines.
Memory:	8 fields (expandable).
Frame Store: **Load Time:**	Dual outputs independently routed to switcher. Stores 1,2,4 or 8 fields. From Hard Disk: <3 seconds.

Switcher:	7 inputs:
	External Video 1-4.
	Digital Channel 1.
	Digital Channel 2.
	Matte Generator.
	Independent software control of input channel at every pixel (70 ns).
Linear Keyer:	16 steps @ 70 ns resolution.
	256 steps @ 280 ns resolution.
Still Store Alpha Channel:	256 step @ 70ns resolution
Dual Luminance Key:	Dual keyer for dual threshold keying or two independent keys.
	Dual clip level control with 256 steps.
	Key input switchable to any input or digital still store.
	Independently selectable Preview output.

Digital Effects:	Arbitrary geometric remapping @ 60 fps.

Host Computer:	Amiga 2000 or 2500 with 7 megabytes of RAM (1 meg chip RAM) and 50 meg hard disk.

Power Requirements:	All power supplied by host computer.

Dimensions:	13.5 x 5 x 1 inches.

Appendix 22
Switcher and ARexx

The Video Toaster and ARexx

For those of you who are inclined to use AmigaDos, and are familiar with the ARexx command language, this appendix will briefly describe using the Video Toaster's ARexx interface. Using ARexx with the Toaster will allow you to automate processes, sequence effects and images, or link the Toaster to other software and hardware which has Arexx capabilities.

The Switcher Arexx interface has been implemented as a function host, rather than the more common command host interface (e.g. ToasterPaint). Arexx function hosts are initialized using the addlib() function with the name of the host or library. The name of the switcher host is "ToasterARexx.port" and it is case-sensitive. ARexx messages sent to the Switcher must be in function call format. This means that all commands must be given as arguments to the function Switcher(), rather than being sent as direct commands to an ARexx command host. If the switcher command has any parameters, then they too must be given as arguments to Switcher() or the command will fail. Furthermore, all parameters should be uppercase. Unless otherwise noted, all function commands return 0 if they were sucessfully executed, and 10 if a failure occurred. ARexx messages will only be accepted and processed when the main Switcher control panel is active. At other times, ARexx messages will be accepted and will remain in the Switcher's ARexx message port queue until the primary switcher control panel is active, at which point they will execute.

Most of the commands that directly impact the Switcher will also show up on the Switcher interface. Almost all ARexx commands that impact the Switcher behave exactly like their corresponding manual user interface functions from the Switcher interface. In particular, they are restricted by the active controlling effect as to whether or not their requested function will be granted. If an ARexx command function is aborted by a controlling effect, an OK return code may still be returned. In the case of a failure code, the current Switcher settings remain unchanged.

        Switcher(AUTO)

This command will invoke an AUTO transition.

        Switcher(TBAR, <TBar level>)

This command will invoke a TBar jump movement to the specified level (0-511).
A failure code will be returned if the level argument is invalid.

        Switcher(TAKE)

This command will invoke a TAKE.

        Switcher(SLOW)
        Switcher(MEDM)
        Switcher(FAST)

The above commands set the speed active for the transition that is currently in effect.

        Switcher(FREZ)

This command toggles the current video state of the Switcher between live and frozen digital video.

Switcher(NOPR)

This command is a NOP.

Switcher(FRES)

This command resets the frame base count to the moment this command was processed.

Switcher(WAIT, <Frame count> or GPI)

This command can wait for either a specified frame count or for a GPI trigger. If 'GPI' is the specified argument, this function will wait for a GPI trigger to occur before continuing. The trigger can be either a positive or negative trigger. In the case of GPI triggering being disabled, this function will become a NOP. If 'GPI' is not the specified argument, then the argument is assumed to be a digit field specifying a frame count. In this case the command will wait until the specified frame count from the last frame base count is reached. In the case of specified frame count already exceeded, this function will return immediately.

Switcher(CLIP, <Clip level>)

This command will invoke a Clip jump movement to the specified level (0-257). A failure code will be returned if the level argument is invalid.

Switcher(KEYM)

This command toggles the current key mode state of the Switcher.

Switcher(M001)
Switcher(M002)
Switcher(M003)
Switcher(M004)
Switcher(MDV1)
Switcher(MDV2)
Switcher(MBKG)

The above commands select the specified video source for the Main output.

Switcher(P001)
Switcher(P002)
Switcher(P003)
Switcher(P004)
Switcher(PDV1)
Switcher(PDV2)
Switcher(PBKG)

The above commands select the specified video source for the Preview output.

Switcher(O001)
Switcher(O002)
Switcher(O003)
Switcher(O004)
Switcher(ODV1)
Switcher(ODV2)
Switcher(OBKG)

The above commands select the specified video source for the Overlay output.

Switcher(GRID, <ToolBox Effect>)

This command selects the specified ToolBox Effect as the currently active Effect in the Switcher. The ToolBox Effect

address is a 3 character code. The first character is the grid selector code A-F for the six ToolBox grids. The second character is the grid row selector 1-4, and the the third character is the column selector 1-8. This function will return a failure code if the specified ToolBox Effect does not exist.

Switcher(PAGE, <Page number>)

This command activates the specified CG page (0-99). This function will return a failure code if the CG is not active or the specified page is empty.

Switcher(FMLD, <FrameStore number>)

This command loads the specified FrameStore (0-999) from the active FrameStore device. This function will return a failure code if the specified FrameStore is not found.

Switcher(BKLD, <Project number>)

This command loads the book from the specified Project of the active Project device. This function will return a failure code if the CG is not active or the specified book does not exists.

Switcher(PJLD, <Project number>)

This command loads the specified Project of the active Project device. This function will return a failure code if the specified Project is not found. Note that this function DOES NOT update the CurrentProject file to denote the newly loaded Project as the active Project.

Switcher(PJDV, <Project device string>)
Switcher(FSDV, <FrameStore device string>)

The above command designates a new Project or FrameStore device respectively. The device string must be a physical device name, not a logical or volume name. This function will return a failure code if the specified device could not be found or was found without a Project or FrameStore directory respectively.

Switcher(TOWB)

This command will pop the WorkBench screen up to the front and disables the Switcher/Toaster system. This function will return a failure code if WorkBench could not be opened.

Switcher(TOSW)

This command will pop the Switcher screen up to the front and enable the Switcher/Toaster system.

Switcher(QUIT)

This command will completely shut down the Switcher/Toaster system upon its arrival. All Switcher/Toaster resources will be freed and the program exited.

Switcher(BACK , <Index # or -1> [, <Custom BG color>])

This command will select the specified matte (background) color either from indexing the current config slice matte color FGs (0-8) or a specified custom matte color if the index is specified as -1. Custom color specifications have a valid range of 0-4096. If you want to directly specify snow, specify your custom color as a negative 16 bit word value.

Switcher(BORD , <index #>)

This command will select the specified border color via the index specified for the current config slice border color FGs (0-7).

Switcher(KOFF)
Switcher(KBLK)
Switcher(KWHT)

The above commands forces the Key mode to be off, on with black enabled, and on with white enabled respectively. Issuing this command does not guarantee that the key mode will be forced to the desired mode. If it doesn't work, the function will return a failure code.

    Switcher(LVID)
    Switcher(FVID)

The above commands forces the Video mode to be live or frozen respectively. Issuing this command does not guarantee that the video mode will be forced to the desired mode. If it doesn't work, the function will return a failure code.

    Switcher(NOMO)

The above command does a frame capture along with motion removal.

    Switcher(PJSV, <Project number>, <Comment>)
    Switcher(FMSV, <FrameStore number>, <Comment>)

The above commands save the specified Project or FrameStore respectively. In the case of project saving, the CurrentProject file IS NOT updated to reflect the saving of the specified project.

    Switcher(PJDL, <Project number>)
    Switcher(FMDL, <FrameStore number>)

The above commands delete the specified Project or FrameStore respectively. These functions will fail if something goes wrong. In the case of project deleting, the CurrentProject file IS NOT removed to reflect the deleting of the specified project when it is also the currently active project.

    Switcher(PJRN, <Project number>, <Comment>)
    Switcher(FMRN, <FrameStore number>, <Comment>)

The above commands rename the specified Project or FrameStore respectively.

    Switcher(SGPI, OFF or POS or NEG)

The above command sets up the Switcher GPI trigger system. 'OFF' disables the system, 'POS' enables the system for positive GPI triggers, and 'NEG' enables the system for negative GPI triggers. The changes to the Switcher GPI trigger system made by this function WILL NOT be reflected in the HardSets file. Tech note: GPI input occurs on pin 6 of the second gameport (bit 7 of CIAA port A).

    Switcher(DISW)
    Switcher(ENSW)

The above commands are for disabling/enabling return of control from the ARexx environment back to the Switcher. The primary use of these commands is in running the Switcher entirely from ARexx scripts without allowing input from the Switcher interface (keyboard, mouse, etc.) to interfere with the execution of the ARexx script. Only diskchanges will still be processed.

    Switcher(DIIM)
    Switcher(ENIM)

The above commands are for disabling/enabling rendering, the SoftSprite system, and the mouse and keyboard IDCMP. These calls can be used to speed up the processing of ARexx switcher commands at the expense of visual feedback of the transition. When enabled, the Switcher display will be completely redrawn.

    Switcher(MEMC [, "L"])

The above command returns the amount of free CHIP memory or the largest CHIP chunk if the "L" option is used. This command is ARexx dependent.

       Switcher(MEMF [, "L"])

The above command returns the amount of free FAST only memory or the largest FAST only chunk if the "L" option is used. This command is ARexx dependent.

       Switcher(CKTP)
       Switcher(CKCG)
       Switcher(CKLW)

The above commands check for the existence of ToasterPaint, CG, and LightWave respectively. They return a 1 if the program entity is currently loaded and 0 if not. These commands are ARexx dependent.

       Switcher(LDTP)
       Switcher(LDCG)
       Switcher(LDLW)

The above commands attempt to load ToasterPaint, CG, or LightWave respectively if those program entities are not already loaded. These commands can be dangerous if the load fails and a requester comes up, hanging ARexx.

       Switcher(DPTP)
       Switcher(DPCG)
       Switcher(DPLW)

The above commands will unload ToasterPaint, CG, or LightWave respectively if those program entities are loaded.

       Switcher(STTP)

This command will enter ToasterPaint if and only if it is currently active, otherwise this command is a NOP. Once entering ToasterPaint, your ARexx message will not be returned until ToasterPaint exits back to the Switcher. So be careful that you don't hang yourself.

       Switcher(PJXI, <Project number>)
       Switcher(FMXI, <FrameStore number>)

The above commands test the existence of the specified Project or FrameStore respectively, returning a 1 if the entity exists, 0 if not. These commands are ARexx dependent.

       Switcher(PJNM)
       Switcher(FSNM)

The above commands return the current device name string of the Project and FrameStore systems respectively. These commands are ARexx dependent.

       Switcher(PJCK, <Project device string>)
       Switcher(FSCK, <FrameStore device string>)

The above commands check for the existence of a Project or FrameStore directory on the specified Project or FrameStore device respectively. Returns a 1 if the directory exists, 0 if not , or -1 if the specified device is invalid. These commands are ARexx dependent.

       Switcher(PJMK, <Project device string>)
       Switcher(FSMK, <FrameStore device string>)

The above commands attempt to make a Project or FrameStore directory on the specified Project or FrameStore device. They return a 1 if the directory was created or already existed, 0 if something went wrong. These commands are ARexx dependent.

Switcher(PJBD)
Switcher(FSBD)

The above commands force the Switcher internal string tables for the Project or FrameStore respectively to be rebuilt and updated. The above commands are useful when you happen to babble directly in the active Project or FrameStore directory. The changes you might make will most likely be missed by the Switcher. These commands insure that the Switcher (and other hosted entities) will know of these changes.

Switcher(FSCT, <FrameStore device string>)

The above command returns the number of FrameStores the specified FrameStore device can hold. Returns a -1 if something went wrong with device access. This command is ARexx dependent.

Don't include***********************************
Switcher(OGPI)

This command causes an output GPI trigger to occur in accordance to the current settings of the GPI system. This command is a NOP if GPI triggering is disabled. Tech note: GPI output occurs on pin 9 of the second gameport (potentiometer circuit).
Don't include***********************************

Switcher(CKGD, <ToolBox Effect>)

This command checks the specified ToolBox Effect to see if it exists. The ToolBox Effect address is a 3 character code. The first character is the grid selector code A-E for the five ToolBox grids. The second character is the grid row selector 1-4, and the the third character is the column selector 1-8. This function will return a failure on a bogus ToolBox Effect address. Returns a 1 if the specified ToolBox Effect exists, 0 otherwise. This command is ARexx dependent.

Switcher(RDGD, <ToolBox Effect>, <S | M | F>)

This command reads the FrameCount of a ToolBox Effect's specified speed mode. The ToolBox Effect address is a 3 character code. The first character is the grid selector code A-E for the five ToolBox grids. The second character is the grid row selector 1-4, and the the third character is the column selector 1-8. The speed mode must be specified as S (SLOW), M (MEDIUM), or F (FAST). The above arguments must be specified correctly and the specified ToolBox Effect exist or this function will return a failure. If all goes well, a FrameCount value will be returned. This command is ARexx dependent.

Switcher(WTGD, <ToolBox Effect>, <S | M | F>, <FrameCount>)

This command writes the specified FrameCount to the specified ToolBox Effect's specified speed mode. The ToolBox Effect address is as mentioned in the above command. The speed mode must be specified as S (SLOW), M (MEDIUM), or F (FAST). The FrameCount should be a value in the interval of 1-65535. The above arguments must be specified correctly and the specified ToolBox Effect exist or this function will return a failure. If all goes well, the FrameCount value will be placed and ready for use. IMPLEMENTATION NOTE: If you are changing the FrameCount of a ToolBox Effect which is currently active using the speed mode that you are changing, you will need to change the speed mode of that ToolBox Effect to another mode and then back for the new FrameCount to take effect.

Here's a sample ARexx program that accepts input commands from the user on the AUX: device:

```
/* Control the Switcher using AUX: */

TRUE = 1
FALSE = 0

Switcher = 'ToasterARexx.port'
addlib(Switcher,0)          /* address Switcher's ARexx port */
```

```
address command /* send unknown commands to DOS */

if show(port,Switcher) = FALSE  /* if the Switcher is not around, */
then    /* startup the Switcher */
do
'Run ARexxWait'
'Run Switcher'
address 'ARexxWait.port' 'wait'
end

address /* stop passing unrecognized commands to DOS*/

say 'READY'     /* we're ready for input */

do forever      /* accept user input till he wants out */

pull Arg1 Arg2 Arg3 Arg4 Arg5   /* get input from user */

select /* do what is requested */

when Arg1 = 'Q'      /* user wants to quit */
then
leave

when Arg1 = 'QUIT'    /* user wants to shutdown Switcher */
then /* then quit */
do
Switcher(Arg1)
leave
end

when Arg1 = 'EXECUTE' /* user wants to invoke a script of */
then /* Switcher requests */
do
open(input,Arg2,'R')
Script = readch(input,99999)
close(input)
say 'START'
interpret Script
say 'STOP'
end

when Arg1 = 'DOS'     /* user wants to do a DOS command */
then
do
address command
interpret Arg2 || Arg3 || Arg4 || Arg5
address
end

otherwise Switcher(Arg1,Arg2,Arg3,Arg4)   /* a Switcher request */
end
end

say 'EXITING'

exit
```

Input and Output
Hooking Up Video to the Toaster

The Video Toaster Card has six BNC connectors: four for input, and two for output. The input connectors are numbered 1-4 from top to bottom.   The outputs, Program and Preview, are connectors 5 and 6.
Toaster Inputs and Outputs

Video Inputs
*Note: The following sections may use video terms with which you are not familiar. See the appendix entitled **Video Terminology** for clear explanations of these terms.*

There are two very important principles that apply to the Video Toaster inputs:

1) The first video source connected to the Video Toaster must always go to Input 1, and must have stable sync.

2) The second, third, and fourth video sources connected to the Video Toaster must be "in sync" with the source on Input 1.

To connect a video source, simply plug one end of a cable into Video Toaster Input 1 and the other end into your video source. If you are connecting more than one video source to the Toaster, the sources must genlocked together so that they are in sync with one another.

The Toaster's connectors are known as BNC connectors. Included with the Video Toaster are three BNC-to-RCA connectors, in case you wish to convert the BNC connection to an RCA connection (should you use RCA cables with your equipment). *Do not use RCA audio cables from your stereo for video signals. Audio cables are neither designed nor intended for video use, as they are not well-shielded and have a different impedance from that of genuine video cables.*

Video Outputs
The Toaster's outputs are Program and Preview. Connect Program to the recording VCR, and then to the Program Monitor. Connect Preview to the Preview monitor.

Using the Toaster with More Than One Video Source
Using more than one video source with the Toaster requires each source to be in sync, or synchronous. The Toaster is programmed to synchronize itself to the video signal present on input 1. Therefore, other signals fed into the Toaster must be in sync with input 1. A non-synchronous video source on Inputs 2-4 will cause the picture to roll and break up. An un-synchronized video camera input on the Program output

If you plan on using multiple cameras, they must be able to accept an external sync signal. Such cameras are genlockable. Genlock inputs may be labeled in different ways:
- **Video In**
- **Sync, External Sync** or **Sync In**
- **Genlock** or **Genlock In**

Genlock input on video camera

Note: This is a different use of the term "genlock" than computer owners may know. Don't confuse this with the function of standard computer "genlocks". The Toaster's overlay genlock is covered in section entitled The Overlay Genlock.

Hooking up multiple genlockable cameras can be accomplished in one of several ways, depending on the equipment involved. Here are two methods. For both methods, you may need to "phase" and "time" the system for camera colors to match. *(For an understanding of phasing and timing, see "Video Terms" in this chapter.)*

Method One: Baseband video distribution amplifier (DA).

Connect Camera 1 Video Out to the DA Input.
Connect one Output from the DA to the Video Toaster Input 1.
Connect the remaining DA Outputs to the genlock inputs on the video cameras.
Connect the Camera Outputs to the remaining Video Toaster Inputs.

Diagram: multiple camera set-up using external sync generator.

Method Two: Sync generator and distribution amplifier.

Connect the Sync Generator Output to the DA Input.
Connect one Output from the DA to the Video Toaster Input 1.
Connect the remaining DA Outputs to the genlock inputs on the video cameras.
Connect the Camera Outputs to the Video Toaster Inputs.

Diagram: multiple camera set-up using external sync generator.

Phasing a Video System
At any time you have a piece of equipment that does as much as the Video Toaster, with so many possible connections to other pieces of equipment, then there are sometimes problems getting it all to work together. This appendix will hopefully find and remove any problems that you may be experiencing.

Phasing
Phasing is a neccessary process whenever you are running more than one source into the Toaster. Typically, video source 1 is the reference video signal. Its output goes to a distribution amplifier, and then on to input 1 of the Toaster and to the genlock/sync inputs of the other sources. The phase of the other sources will be different from the reference video signal because of the different cable lengths involved for each source. There are two sorts of phasing that you will need to be concerned with: Horizontal phase (H phase), and subcarrier phase (sc phase).

Horizontal Phase
You may notice the following symptoms when there is an H phase difference.

• The additional video sources (2-4) will be horizontally shifted, with respect to input 1, the reference video.

• Horizontal banding in the image which matches whatever motion is occurring in the video signal along the left edge.

• A black band along the left edge of the signal.

The way to resolve these problems is to adjust the H phase setting of the video source (camera, TBC or VCR) until the symptom disappears. Do not attempt to adjust the H phase of the source connected to input 1. This is the reference video and *you will not be able to affect it*; only video sources that are being genlocked by an master reference video signal can be out of phase.

Subcarrier Phase
The other type of phase shifting that can occur happens to the subcarrier portion of the video signal. The hue in the additional video sources (2-4) will be shifted with respect to input 1's hue. This problem is remedied in exactly the same

way as the H phase problem: by adjusting the sc phase control on the cameras, VTRs or TBCs connected to inputs 2-4 of the Toaster. The following guidelines will help in this task.

- If you are using cameras, make sure that they are all white balanced. Try to white balance them by pointing them all at the same object, if possible.

- Focus the cameras on a person's face or run tape that shows a lot of flesh tones, as this is the easiest way to adjust sc phase.

- Adjust the sc phase control of the phase shifted source.

Once again, *adjusting the sc phase of the reference (input 1) video will have no effect*, only in the sources that are genlocked to this signal can sc phase shifting occur.

When you are attempting to integrate the Toaster into an existing studio, for use with another switcher, there is one important spec that you need to keep in mind:

There is a 400 ns delay from video in to Program out on the Video Toaster.

This is not a large delay as far as production switchers go, but it does cause a noticeable phase shift. This means that you must provide for 400ns of delay on any video that does not run through the Toaster but which goes to the same device as the Toaster's output. The simplest way to do this is by adding an adjustable delay box to the other signal. See Appendix XX for Video Products.

One other thing that you should keep in mind when using the Toaster's background matte generator is that the colors are not neccessarily exactly those found in the standard SMPTE color bars (although the Color Bars effect is exactly SMPTE color bars), so don't use the matte generator to do any sort of level calibration.

Caution: The Video Toaster cannot drive its video outputs over extremely long cable runs. Try to keep such cable lengths under 20 feet. If you need to use more cable than this, you will need a distribution amplifier to boost the output.

The Amiga Computer Sources

The host computer for the Video Toaster is the Amiga 2000 or 2500.

Toaster-Specific

Magazines

Bread Box
859 North Hollywood Way
Suite 225
Burbank, CA 91505
(818) 505-1464

Video-Specific Amiga

Magazines

AVID - The Amiga Video Journal
AVID Publications
415-112 N. Mary Avenue #207
Sunnyvale, CA 94086
(408) 252-0508

General Amiga

Magazines

Amazing Computing
PiM Publications Inc.
Currant Road
PO Box 2140
Fall River, MA 02722
(508)-678-4200

AMIGAWorld
IDG Communications/Peterborough, Inc
80 Elm Street
Peterborough, NH 03458
(603) 924-0100

.info
.info Publications
705 Hiway 1 Youst
Iowa City, IA 52246
(319) 338-0703

Books

AmigaDOS Inside and Out
Abicus Software
5370 52nd Street SE
Grand Rapids, MI 49512
(616) 698-0330

Amiga World Official AmigaDOS 2 Companion
IDG Books Worldwide, Inc.
155 Bovet Road, Suite 730
San Mateo, CA 94402
(415) 358-1250
1990

Software

Workbench 1.3 Operating System Software
Commodore Business Machines
(available from Amiga Computer Dealers)

Computer Graphics/Business Graphics

These books range from business presentation graphics to video production graphics.

Computer Graphics: Principles and Practice
James D. Foley, Andries van Dam, Steven K. Feiener, John F. Hughes
Addison-Wesley Publishing Co.
Reading, MA
ISBN 0-2-1012110-7
1990

Intended more for the computer graphics programmer, this is probably the most authoritative volume on computer graphics available. A lengthy, thorough, and fairly technical book, it discusses programming methods, hardware and software, rendering and modeling code, animation concepts and systems.

Dynamics of Presentation Graphics
2nd Edition
by Dona Z. Meilach
ISBN 0-87094-656-0
Dow Jones-Irwin, Publishers
Homewood, IL 60430
1990

A business-oriented book, with extensive examples supported by thorough studies.

The Presentation Design Book: Projecting a Good Image with your Desktop Computer
Margaret Y. Rabb
Ventana Press
ISBN 0-940087-37-5
1990

Another very effective volume on creating successful business graphics. Geared more toward slide presentation, yet full of tips on color usage, layout, and basic techinques of effective presentations.

Professional Video Graphic Design
by Ben Blank, Mario R. Garcia
ISBN 0-13-725797-X
Prentice-Hall, Inc.
Englewood Cliffs, NJ 07632
1986

Extensively-illustrated with examples from the author's work in British television, this book is an excellent compilation of ideas and stories on graphics production for broadcast.

Television Graphics from Pencil to Pixel
by Douglas Merritt
ISBN 0-442-26469-0
Van Nostrand Reinhold Company
115 Fifth Avenue
New York, NY 10003
1987

A thorough "how-to" book discussing television graphics from the authors' work in education and network television. Although examples shown are older cut-and-paste graphics rather than strict computer work, the design elements and their impact remain the same today, no matter the medium.

Using Computer Color Effectively: An Illustrated Reference
by L.G. Thorell, W.J. Smith
Prentice-Hall
College Technical and Reference Division
Englewood Cliffs, NJ 07632
1990

This technical book discusses computer color, technical aspects of vision, and color guidelines based on human color perception. At times technical, this is an informative book if you are interested in using color more effectively in graphics.

The Verbum Book of Digital Painting
by Michael Gosney, Linnea Dayton, Phil Inje Chang
ISBN 1-55851-090-7
M&T Books
501 Galveston Drive
Redwood City, CA 94063
1990

From the producers of Verbum Magazine, this book delves into the graphic styles and media of numerous artists, all of whom divulge tips and tricks of their work. A terrific book from which to gain insights and ideas for computer graphics.

The Verbum Book of Scanned imagery
by Michael Gosney, Linnea Dayton, Phil Inje Chang
ISBN 1-55851-091-5
M&T Books
501 Galveston Drive
Redwood City, CA 94063
1991

An extension of Verbum's first volume, this book goes in-depth into the procees of combining scanned (i.e., digitized) images and ideas in graphics paint systems. Professional designers walk you step-by-step through different projects intended for a variety of output formats.

Magazines

This magazine covers 3D and 2D computer graphics from the professional view-point, much of this will be esoteric to the videographer, but this magazine is considered to be the industry standard.

Computer Graphics World
Penn Publishing Company
One Technology Park Drive
PO Box 987
Youstford, MA 01886
(918) 831-9400

This magazine covers computer graphics in many forms and industries, from print to video to film and more.

Verbum, The Journal of Personal Computer Aestheitics
P.O. Box 15439
San Diego, CA 92115
(619) 233-9977

Traditional Animation Techniques

The following books may be of interest to those who are new to animation in general and wish to know more about the basic techniques used in all forms of animation.

Animation from Script to Screen
Shamus Culhane
St. Martin's press
17 5 Fifth Avenue
NY, NY 10010
ISBN 0-312-05052-6
1988

Written by a man who had part in Walt Disney's *Snow White and the Seven Dwarfs,"* this book discusses traditional hand-drawn film animation, including writing, recording, acting, and dialog.

The Animator's Workbook
Tony White
Watson-Guptill Publishing
1515 Broadway
NY, NY 10036
ISBN 0-8230-0229-2
1986

This volume covers traditional hand-drawn animation, including the concepts of tweening, exaggeration, dialog, effects, backgrounds, and principles of animation.

Television and Video Production

Books

The Business of Television
Howard J. Blumenthal, Oliver R. Goodenough
Billboard Books
Watson-Guptill Publishing
1515 Broadway
NY, NY 10036
ISBN 0-8230-7762-4
1991

Probably the most authoritative book on television business available. Covers regulations, contracts, unions, networks, and the day-to-day business duties involved at all levels of broadcasting. Required reading for braodcasting students; recommended for anyone interested in how television operates.

A Beginner's Guide to Producing TV
by James R. Caruso, Mavis E. Arthur
ISBN 0-13-944091-7
Prentice-Hall, Inc.
College Technical and Reference Division
Englewood Cliffs, NJ 07632
1990

Primarily of interest to educators, this book provides a detailed outline of the video production process. Includes technique, editing, sample forms, and scripts.

Mastering Television Technology: A Cure for the Common Video
by Coleman Cecil Smith, P.E.
ISBN 0-929549-00-7
Newman Smith Publishing Company, Inc.
2116 East Arapaho Road, Suite 479
Richardson, TX 75081
(214) 231-6804
1990

This book does an excellent job of explaining the technical side of video in a manner that creative people can understand. It provides a thorough understanding of television and video technology in plain English.

Progressive Video Programming
by Jeffery Glasser, Stephen Gach and Pamela Levine
Videowares Publishing Co.
PO Box 1096
Hermosa Beach, CA 90254

The emphasis of this book is on-location video production. It covers every aspect of video production from storyboarding to make-up and lighting.

Television and Audio Handbook for Technicians and Engineers
by K. Blair Benson and Jerry Whitaker
ISBN 0-07-004787-1
McGraw-Hill Publishing Company
1221 Avenue of the Americas
New York, NY 10020
(800) 2-MCGRAW

This is a very comprehensive and very technical book that covers almost every issue in audio and video from the

engineer's stand-point.

Television Production Handbook, Fourth Edition
by Herbert Zettl
ISBN 0-534-01464-X
Wadsworth Publishing Company

This is a comprehensive and not overly technical book on the entire television production process. ENG/EFP, editing and studio setup are all covered.

Today's Video Equipment, Setup & Production, by Peter Utz
Publisher: Prentice-Hall

This easy-to-understand book concentrates on all of the equipment found in the video studio, how to set it up and how to use it.

Magazines

These magazines are all professional and industrial video (and in some cases film) magazines that cover the full spectrum of video from pre- to post-production.

AVVideo
Montage Publishing Inc.
25550 Hawthorne Blvd., Suite 314
Torrance, CA 90505
(213) 373-9993

Broadcast Engineering
Intertec Publishing
9221 Quivira Rd
Overland Park, KS 66215
(913) 888-4664

Millimeter
Penton Publishing, Inc.
PO Box 95759
Cleveland, OH 44101

Post
Post Pro Publishing, Inc.
25 Willowdale Avenue
Port Washington, NY 11050

Videography
P.S.N. Publications
2 Park Avenue, Suite 1820
New York, New York 10016

Video Systems
Intertec Publishing
9221 Quivira Rd
Overland Park, KS 66215
(913) 888-4664

These magazines are all consumer-video oriented. They offer helpful tips on production techniques as well as reviews of the latest equipment.

Video
Reese Communications, Inc.
Box 56293
Boulder, CO 80322-6293

Video Review
Viare Publishing Corp.
Box 57751
Boulder, CO 80322-7751
(800) 234-8193; In AK, CO, HI
and Canada (303) 447-9330

Videomaker
Videomaker, Inc.
PO Box 558
Mt. Morris, IL 60154
(815) 734-6309

Publishers' Catalogs

The following publishers offer extensive catalogs of books on video and television production, as well as computer graphics. Several of the books listed above come from these sources. Contact the publishers for a full catalog.

Focal Press
Butterworth Publishers, a division of Reed
Publishing, Inc.
80 Montvale Avenue
Stoneham, MA 02180

Knowledge Industry Publications, Inc.
The Video Bookshelf Catalog
701 Westchester Avenue
White Plains, NY 10604

Glossary

This glossary lists the video, Amiga and Toaster-specific terms that are used in this manual. General definitions, rather than technical details, are given. Each entry follows a consistent format: the word itself, the Toaster application to which it applies, and the definition. Additional programs to which it may apply to are listed as subsequent entries.

Key to listings:

Video	*Video Industry term. May also apply to the Switcher.*
General	*A term that may apply to Computers, Computer Graphics, and Video.*
Toaster	*A term that applies to all Toaster programs.*
Switcher	*A term that applies to the Switcher.*
ChromaF/X	*A term that applies to ChromaF/X.*
CG	*A term that applies to the CG.*
ToasterPaint	*A term that applies to ToasterPaint.*
Lightwave	*A term that applies to LightWave Renderer/Modeler.*

Numerals

1x
ToasterPaint. The ToasterPaint viewing mode 1x allows almost the entire canvas to be viewed on the Control Panel at once. This mode does not allow for full use of all of ToasterPaint's tools.

24-bit
General. See framebuffer.

2x
ToasterPaint. The default ToasterPaint viewing mode. In this mode, the canvas is viewed under 2x magnification. Hidden areas are viewed by auto-scrolling the canvas.

3D
LightWave. The making of graphics with three apparent dimensions - width, height and depth - so that as the camera moves the point of view moves within the graphic world. LightWave 3D is capable of generating and animating 3D graphics in conjunction with single-frame controllers and editing VCRs.

A

A-B Roll
Video. A-B Roll editing refers to two separate playback videotapes rolling at the same time. They feed into a switcher, which sends one signal out to a recording VCR, allowing the editor to make transitions between the two sources during edits.

Alt Key, Alternate Key
Amiga, Toaster. The left and right Alt keys are two keys on the keyboard, found on both sides of the space bar. They are used in conjunction with other keys, to allow for additional functions.

Altered Effects
Switcher. This class of effect happens when you try to do a digital effect with live video when you have digital video in one of the frame buffers as the background. Results in the Toaster performing the wipe closest in appearance to the effect that you requested.

Amiga Key (Left and Right)
General, Toaster. The left and right Amiga keys are two keys on the keyboard, found on both sides of the space bar. They are used in conjunction with other keys, to allow for additional functions.
Analog
Video. A continuous, varying wave signal. Unlike digital, which is made of discrete elements or steps.

And
ToasterPaint. This drawing mode is similar to using a colored filter on the area of the Canvas affected. The effect of And is to push the affected colors in the direction of the paint you're using.

Animation
LightWave. Animation is the appearance of movement by playing back single frames of film or video at a certain speed. Small increments of movement from one frame to the next are not noticed, so the movement seems smooth and fluid.

AntiAliasing
LightWave. Since computer displays utilize square-element displays to represent imagery, edges that are angular or circular will display noticeably jagged, stair-stepped edges. This is called aliasing. Antialiasing is a method of correcting these jagged edges.

ARexx
Switcher, ToasterPaint. This is a computer language that is used with ToasterPaint and the Switcher to perform automated tasks based on scripts you create.

Auto
Switcher. An automatic transition of the Switcher's T-bar. Results in the selected effect being executed at a constant speed.

Auto-booting
Amiga. Refers to an operating system that automatically starts up the Amiga when the power is turned on. A requirement if you want the Toaster to run as a turnkey system. For the Amiga, this is a function of the hard drive controller and the 1.3 (or higher) operating system.

Auto-mounting
Amiga. Refers to a hard drive controller with devices (drives) that the Amiga automatically recognizes, without special software, when the power is turned on. A requirement if you want the Toaster to run as a turnkey system.

Auto-scrolling
ToasterPaint. This feature automatically reveals the hidden part of the canvas that lies beyond the edge of the screen to which you move the pointer.

Axis
Lightwave. A line, used as a reference point, from which information regarding other items (such as location, rotation, etc.) can be determined.

Axis Indicator
LightWave. This is a light gray bar/crosshair that indicates the axis upon which a Modeler function is based. For example, you might place it beside a polygon shape to lathe an object around a certain axis.

B

Background
CG. The part of a Framestore page over which the text and graphics appears
Switcher. See BKG.
B
LightWave. One of the three axes used to determine an object's orientation. Stands for Bank, which is the sideways (left or right) tilt of an object.

B&W
ToasterPaint. This feature, located in the Palette menu, replaces whatever colors are in the 16-color palette with a palette consisting of gray scale values.

Bend
LightWave. This function allows you to bend objects. Note that the more segments that make up the object, the more smooth the bend will appear.

Bias
LightWave. Bias is a spline control for use in animation. It allows the animator to control the an objct's movment by adjusting spline path "slack" to accentuate the movement just before (or after) the key frame.

BKG
Preferences. The background color (or matte) generator of the Toaster. It can generate one of eight preset colors plus video noise (snow). BKG is selectable on any of the Toaster's Busses.

Black Burst (also called **Color Black**)
Video. One type of composite video that is commonly used for synchronizing is Black Burst. This is a full video signal, yet is putting out only the color black. It contains the information necessary for the Toaster to genlock successfully.

Blank Page
Switcher. A ToasterCG page type (before it has been formatted to one of the other page types that can hold text or graphics).

Black burst
Switcher. A signal, usually generated by a sync generator, which outputs a master synchronization signal to go into the external sync input of video sources. This signal consists of all of the normal sync information of the NTSC video signal plus a pure black signal in the active picture area.

Blinds
Switcher. An effect in which the video is divided into two or more vertical slats and compressed off or expanded on when the effect is executed.

Blur
ToasterPaint. This drawing mode causes the colors on the affected area of the canvas to become blurred, and the boundaries between them less distinct. Repeated applications of this mode cause progressively more and more blurring.
LightWave. See Motion Blur.

BNC
Switcher. The standard connector in the video industry which is used to connect most of professional video equipment. Preferred over the standard RCA connector found on most home equipment (such as CD players, cassette decks). The Toaster has six BNC connectors for video inputs and outputs.

Book
CG. This is the part of ToasterCG that contains the pages you create. Each book contains 100 pages, and is saved as part of the project.

Boot
Amiga. The industry term for starting up a computer.

Bounding Box
LightWave. A method of representing a more complex 3D object on screen with a simple six-sided box, thus saving time when previewing animations for movement and timing.

Border
CG. Borders are outlines which appear on the outside edge fonts and shadows. They help make characters stand out against the background. Borders can be in color in Framestore pages and black-and-white elsewhere.
Switcher. In a video switcher, a border is an edge which leads or trails a video wipe. Some Toaster effects incorporate a color border. Border colors are accessed from Toaster Preferences, and can be one of eight preset values.

Bottom Line
ChromaF/X. The bottom of the ChromaF/X color table, used can be put in the Palette Map and altered, thus defining the color at the bottom of the Color Table.

Brightness
ChromaF/X. The overall luminance value of a video signal.

Brush
ToasterPaint. An electronic brush tip for drawing in a computer paint system. There are several shapes and sizes of brushes that can be applied to the canvas as well as any number of custom brushes that may be "cut out" from the image itself.

Brush Shapes
ToasterPaint. These are the built-in brush shapes available in ToasterPaint. They are the circle, square, slant left, slant right, horizontal line, vertical line and single pixel.

Brush Size Selector
ToasterPaint. This part of the tool box determines the size of the selected brush shape (with the exception of the single-pixel brush). Seven different sizes are available.

Bus, Busses
Video, Switcher. There are three of these on the Toaster: Program, Preview and Overlay. Each contains seven buttons that corresponds to the seven channels of the Toaster's Switcher (1, 2, 3, 4, DV1, DV2 and BKG). The Busses work in combination to produce the various Toaster Switcher and Digital effects between the channels selected on the two.

C

Canvas
ToasterPaint. This is where all painting is done in ToasterPaint. The size of the canvas is 736 pixels horizontally, and 480 pixels vertically.

Cast Shadow
CG. An effect where a distinct, detached shadow appears behind a letter to enhance its visual impact and the appearance of depth. Cast shadows appear to be cast in the distance by the text itself, as if it were lit.

CG
CG. The slice of the Toaster that makes and outputs high-quality text and backgrounds for text to the Toaster's Program output, and frame buffers. This text is used for everything from titles to credits to advertisements.

CGI
General. Television and film industry shorthand for Computer Generated Imagery. Loosely used to refer to all computer graphics.

Channel
Switcher. One of the seven different sources of video available on the Toaster's switcher, they are Video Inputs 1-4 (corresponding to the Toaster's four BNC-terminated inputs), DV1 (frame buffer 1), DV2 (frame buffer 2) and BKG (the background color generator).

Character Generator
Switcher. The slice of the Toaster that makes and outputs high-quality text and backgrounds for text to the Toaster's Program output, and frame buffers. This text is used for everything from titles to credits to advertisements.

Chip RAM
Switcher. The type of RAM that the Amiga can use to hold the graphics that it displays. Your Amiga must have 1 full megabyte of CHIP RAM in order to host the Toaster.

Chroma
Video. See Chrominance.

ChromaF/X
Switcher. The slice of the Toaster that allows for luminance mapping of new colors onto the incoming video signal. A wide variety of effects are possible with ChromaF/X including posterization, photographic filter and chrome video.

Chrominance
Switcher. Refers to the saturation and hue of a clor, without the brightness. The color portion of the NTSC video signal.

Circle
ToasterPaint. This drawing tool applies the current mode to the canvas in a circular pattern, using the current brush shape and size. These circles can be either filled or un-filled.

Clapboard
ChromaF/X. This button renders the ChromaF/X effect if it is not already rendered, or pulls the T-bar (auto) if it has.

Clear
ToasterPaint. This command erases whatever is on the canvas. It can be undone using the Undo command.

CLI
Switcher. Command Line Interface. A function of the Amiga's operating system that allows for commands to be entered into the Amiga by typing from the keyboard, instead of the usual pointing and clicking with the mouse method.

Click
Click means to press and then quickly release the left mouse button. Buttons and icons may change shape or color when clicked on in this manner. The word "select" may also be used for click (as in, "select the Load Frame button," which means for you to click on it).

Clip Level
Switcher. The actual luminance value at which the luminance key is occuring. Adjustable with the Numeric Window above the scissors icon.

Clip Level Indicator
Switcher. The window with the three digit number just above the scissors button in the Luminance Key Box that shows the current luminance value at which the luminance key is occuring.

Clone
LightWave. Clone allows you to make exact duplicates of objects in the Modeler. The most useful feature of Clone is its ability to automatically space any number of copies at regularly-spaced increments. For instance, after making one step, you could clone 15 more in a spiral pattern to create a spiral staircase.

Close Box
ToasterPaint. This button causes the Toolbox to disappear when it is clicked, so that you can see and paint on the part of the canvas that it normally covers. While the Toolbox is invisible, pressing the right mouse button will bring it back.

Coax
Video. Coax, short for coaxial cable, is designed to provide interference-free signals. It is used for video signals, as well as computer network signals.

Color Bars
Video. A standard screen of colored bars used to adjust and monitor color values so that all colors are represented accurately.

Color Fonts
CG. These are ToasterFonts in which the full NTSC color spectrum can appear. These fonts can be graphic images as in the ChromaToaster font, or just colorful fonts as in the ChromaRainbow font.

Color Selectors
ToasterPaint. This part of the Palette toolbox allows you to select the current color. When you click inside these and hold down the left mouse button and move the pointer over the desired color. by clicking inside them, and while holding down the left mouse button

Color Sliders
CG, ChromaF/X. The color sliders allow you to select colors for text, shadow, border, or backgrounds.

Color Strip
ToasterPaint. This part of the toolbox contains the 16 color palette, current color bar and range colors. It is always available with any of the four Toolbox sections, provided that the Toolbox has not been hidden.

Color Table
ChromaF/X. This part of the ChromaF/X control panel displays the colors that will be added to the video signal when the ChromaF/X effect is rendered and applied.

Colorize
ToasterPaint. This drawing mode replaces the colors on the affected area of the canvas with the current color. Colorize does not affect the brightness of the colors in this area, just the hue.

Component Video
Video. The component video signal is made up of the same two signals that make up composite video (chrominance and luminance). The difference is that these two signals are not combined into a single signal. They remain separate and distinct.

Composite Video (Composite)
Video. The video signal is actually a composite of two signals: a color signal (called chrominance) and a black-and-white signal (called luminance). It is often called composite, or baseband video, because the two signals are mixed together into one "composite" signal. This process is known as "modulation."

Compositing
ToasterPaint. The process of taking two or more video frames (or other images) and combining various parts onto the same frame.

Compression
Switcher. A type of digital effect in which the size of the video is altered in one direction (horizontally or vertically) only. Often part of another effect.

Continuity
LightWave. Continuity is a spline control allowing additonal control over the smoothness of a spline path's continuuing motion.

Contrast
ChromaF/X. The difference (in luminance) between the lightest parts of a video signal and the darkest.

Coordinates
ToasterPaint. This feature tells the exact position of the pointer on the canvas by displaying the number of the horizontal and vertical pixel of the center of the pointer (brush) at any time the pointer is over the canvas.
Lightwave. A method for describing a location using numeric values based on a common reference point. Lightwave uses X, Y, and Z to differentiate the three axes.

Control Panel
Toaster. Most of the Toaster's program screens are separated into control panels that contain like functions.

Copy Color
ToasterPaint. This feature, located in the Palette menu, is used to move colors from one part of the palette to another.

Crawl Page
CG. The ToasterCG page that keys a single line of text moving across the screen from right to left, over the Program output of the Video Toaster. This single line of text can appear in the middle of the screen or at the bottom.

Cross-Fade
Video. See Dissolve.

Current Color Box
ChromaF/X. This part of the ChromaF/X control panel displays the color that is at the Palette Marker. As you move the Color sliders, the color in this box changes to reflect this.
ToasterPaint. This part of the Color Strip displays the current color that will be applied to the canvas in Normal mode. This color is affected by the Transparency settings.

Cursor
General. An on screen display device that enables the user to select, or point at, various screen elements. A word processor shows a flashing line or box where text will be entered. A paint system shows a crosshair or arrow where paint will be applied.

Custom Brush
ToasterPaint. Any brush that has been made using ToasterPaint's Scissors. Custom brushes can be any shape or size, up to 736 x 480 pixels (depending on available memory).

Cut
Switcher. The most common effect in video - an instantaneous transition from one source of video or camera angle to another.

Cut and Paste
ToasterPaint, LightWave. A term borrowed from word processors, this refers to copying or moving a graphic, 3D object, or text, to another location.

Cycle
ChromaF/X. This type of ChromaF/X effect applies successive lines of the Color Table to the video signal automatically. The effect can travel up the table, down or bounce up and down.

D

Darken
ToasterPaint. This mode, located on the Mode menu, causes the color or colors on the affected portion of the canvas to become darker. The setting of the Transparency controls affects this mode.

Darkest Box
ChromaF/X. This part of the ChromaF/X Control Panel displays the color that the darkest parts of the video signal will contain when the ChromaF/X effect is rendered and applied.

Device
Amiga. A device is a drive, hard or floppy. If a hard drive has been divided into several large portions, called partitions, each is considered a separate device.

Directory
Amiga. A location on either a hard drive or a floppy drive. The Amiga may have many directories, some inside of others for greater organization. For example, inside a word processor directory, you might have separate directories for Letters, Forms, Book Chapters, Outlines, etc.

Distribution Amplifier (DA)
Video. A distribution amplifier is used to distribute one signal to a variety of destinations. It generally has one input and several outputs. There are distribution amps for audio as well as video signals.

Default
Toaster. Refers to the normal settings of a given program whenever you enter it for the first time.
ToasterPaint. This feature, located in the Palette menu, is used to restore ToasterPaint's default 16 color palette.

Dissolve
Switcher. In video editing, it means to blend slowly from one video image to another. As one source fades out, the other fades in. Also called Cross-Fade.

Dithering
ToasterPaint. A blending technique for simulating a great number of colors from a lesser number. For example, dithering small amounts of the two colors between a solid black and a solid white would create the appearance of a grey band in the middle when there is actually no gray color at all.

Dolly
Video/LightWave. To dolly is to move the camera closer to the subject (dolly in) or further away from the subject (dolly out).

Double-click
Double-click means to press and then quickly release the left mouse button twice. In the Video Toaster, you double-click some buttons to activate their functions (as in, "double-click the Load Frame button to load a still frame").

Drag (also Dragging)
Dragging is holding down the left mouse button and moving the mouse.

Drawer
Switcher. An Amiga Workbench term. Basically a drawer is an icon appearing on the Workbench screen that, when double-clicked, opens to reveal its contents, usually other AMIGA programs or files. The Toaster is started up (if you elected the start from Workbench option when you installed the software) by clicking the Switcher icon in the Toaster drawer.

Drawing Mode
ToasterPaint. The drawing mode determines how the current brush (shape, size and brush tool) will affect the canvas. The drawing mode is selected from the Mode menu; there are 11 different modes available and the Transparency controls provide for countless variations of these.

Drop Shadow
CG. An effect where a distinct, attached shadow appears behind a letter to enhance its visual impact and the appearance of depth. Drop shadows appear to be cast from the text itself.

DV1
Toaster. The Toaster's first frame buffer.

DV2
Toaster. The Toaster's second frame buffer.

E

Effect, Effects
Switcher. The manipulations that the Video Toaster performs on video. This include switcher effects, digital effects, organic effects, ChromaF/X effects, and key effects.
ToasterPaint. A menu option that controls flipping and rotating of the custom brush.
ChromaF/X. These are the ways that ChromaF/X can affect the video signal; there are Transition, Filter, Cycle, and others.

Effects Bank
Switcher. The part of the Switcher control panel which houses the effects for the Toaster's effects. There are six of these (A, B, C, D, E, F) each containing 32 effects.

Eight-Field Effects
Switcher. These are a special class of effect with digital trails. These effects can be saved on the Framestore as two frames that load at the same time.

Ellipse
ToasterPaint. This drawing tool applies the current mode to the canvas in an elliptic pattern, using the current brush shape and size. These ellipses can be either filled or un-filled.

Encoding
Switcher. The conversion of RGB computer graphics into composite NTSC video.

Enter
Amiga, Toaster. A key on the keyboard. Generally, you use Enter to activate a function (as in, saving a Frame).

Error Message
Switcher. These appear on the Amiga Workbench screen if there is a problem loading or running the Toaster software.

External Sync
Switcher. This is an input on a video device that allows the device to take its sync signal from another source outside itself. Essential for video sources used in multiple source Toaster setups.

Extrude
LightWave. This model-making function allows you to stretch a flat object (such as a company logo) into a three-dimensional one by adding depth.

F

Fade
Switcher. The Toaster effect in which the video on the screen fades out to reveal the source behind. The opposite (the background video fading in) is also possible.

Fast
Switcher. The fastest relative speed setting used with the Auto button. Denoted by the letter F on the Switcher screen.

Field
Video. A field is 1/60th of a second of video signal. Two fields make up a frame; therefore a field has half the resolution of a frame. Four fields make up a color frame, containing one full cycle of the color signal in NTSC video.

File Requester, File Selector
Amiga, Toaster. A file requester is a menu box that appears on screen when you select a load or save function. It allows you to select among the different Toaster storage devices on your system to load or save files.

Fill
ToasterPaint. This feature allows you fill the area inside any drawing tool applied to the canvas with the current color and mode, as it is drawn.

Filter
ChromaF/X. The type of ChromaF/X effect which applies the entire Color Table, from top to bottom, to the video signal from top to bottom.

Flip Horizontal
ToasterPaint. This feature, located in the Effect menu, flips the custom brush around a horizontal axis.

Flip Vertical
ToasterPaint. This feature, located in the Effect menu, flips the custom brush around a vertical axis.

Flood Fill
ToasterPaint. This feature allows you to fill any color or colors inside an area already on the canvas with the current color and drawing mode.

Floppy Drive
Switcher. A type of storage medium that the Toaster can use for its Framestore images and projects that employs a 3.5" diskette. Floppy drives are very slow to use, but the data they contain is easily portable.

Font
CG. A set of alphabetic and numeric characters in a single typeface and size.

Fonts
ToasterPaint. The sets of alphanumeric characters that ToasterPaint uses in its Text rendering section.

Format
Amiga. A computer term for preparing a floppy or hard disk to hold data files. When you go to save Framestores or Projects from Toaster Preferences, if you insert a blank disk and click on the operation, you will have the option of formatting the floppy.

Frame
Switcher. 1/30th of a second of video. Made up of two fields (one even, one odd).

Frame buffer
Toaster. A dedicated section of memory where an image may be stored. The Toaster has two frame buffers. Each can hold one frozen video frame, or manipulate live digital video when used together.

Framestore Page
CG. The ToasterCG page that appears on its own background and can be saved in the Framestore.

Framegrab, Framegrabber
Switcher. The part of the Toaster that allows you to capture and freeze video from an external source, digitizes it, and displays it.

Framestore
Switcher. A device that can store single images of video.

Frame ->DV1, Frame ->DV2
ToasterPaint. This option, located in the Prefs menu instructs ToasterPaint to send its rendered output to the Toaster's first frame buffer, DV1, which becomes selected on the Toaster's Program output.

Freeze
Switcher. The button on the Switcher control panel that toggles the Toaster between displaying live and frozen video in the Toaster framebuffers..

Freehand
ToasterPaint. This drawing tool puts single copies of the custom brush on the canvas in any pattern that you move the mouse. If you move the mouse quickly when using this tool, these copies will be separated. This tool cannot be used with the Fill feature.

Freehand Continuous
ToasterPaint. This drawing tool uses the current brush to draw any random shape on the canvas. The drawn shape always keeps up with the pointer, no matter how fast you move the mouse. If you are using this mode with the Fill feature, any shape that you draw that is not closed will automatically be closed with a straight line from the beginning of the shape to the end.

Function Keys
Keys on the keyboard, usually designated with the letter F followed by a number, that permit shortcuts to other commands.

G

Generation
Video. Original film and video footage is known as the first generation. Copies are called the second generation. Copies made from the second generation are known as the third generation, and so on. Analog signals degrade with each generation. Digital signals can go many generations beyond analog before showing degradation.

Genlock
Video. An internal or external device that synchronizes video from one source with video from another. When genlocked, sources may be manipulated without picture breakup (loss of sync).

Graphic Separator
CG. Special graphics character that ToasterCG generates; consists of a line whose length and thickness you specify. It is used to separate different elements of the page.

Grid
ToasterPaint. This feature constrains the pointer to apply paint to the canvas in selected areas (a rectangular grid of points whose size you set) only.

Grid & Mode/Coordinates Indicator
ToasterPaint. This feature appears on the Tools section of the Toolbox and displays the coordinates of the brush on the canvas, or the current mode selected in the Mode menu. If ToasterPaint's grid is turned on, this feature will reflect that in either case.

Genlock
Video. In video, genlock is a term that describes a function. Genlock refers to the timing pulses of multiple video signals and arriving in sync with one another at a destination (usually a switcher). A device that can "genlock" has an input that will sync itself to the timing pulses of another device. It is then said to be "genlocked" to the other device. *Computer.* In the computer field, a "genlock" is a device that will synchronize the computer's timing pulses to an incoming video signal.

GPI Trigger
Switcher. This is a means by which an external device can, with frame accuracy, cause one of the Toaster's effects to be executed. GPI stands for General Purpose Interface.

Grab <— DV1 (also Grab <— DV2)
ToasterPaint. These menu options allow you to load into ToasterPaint one field of video from either frame buffer.

Ground Loop
Switcher. These occur when current is flowing through the ground connectors of any AC powered system. If there are ground loops in your system, you will see faint, periodic noise bars in the video. Remove ground loops by keeping cable lengths to a minimum and using 3/2 prong power adapters on all components of the system save the Amiga.

H

H
LightWave. One of the three axes used to determine an object's orientation. Stands for Heading, which is the left-right direction an object faces.

H Phase
Switcher. The relationship of the horizontal sync signals of two video sources. If a particular source is out of H phase with the reference video, then it will appear shifted horizontally on the screen.

Hard disk (hard drive)
Computer. Mass storage of data for a computer, whose capacity is measured in megabytes. For the Video Toaster, the hard disk is the best way to store large numbers of Framestore images on a permanent basis. Currently the most common sizes of hard drives are between 50 and 200 megabytes, although much larger drives are available.

Hardware
Amiga. Generally refers to the main computer unit, the monitor, and peripherals (printers, modems, etc.) that you connect to the computer itself.

Highlight
LightWave. See Specular Highlight.

Horizontal Phase (H Phase)
Video. Horizontal Phase refers to the left-right positioning of the onscreen image (and therefore the signal). An error in horizontal phasing shows up as a shift in the horizontal position of the picture.

Horizontal Spectrum
ChromaF/X. This tool allows you to place a spectrum of color between any two points on the Top or Bottom Line while it is in the Palette Map.

Horizontal Spread
ChromaF/X. This tool allows you to make a smooth transition from the color at one point on the Top or Bottom Line, to the color at the next, while it is in the Palette Map.

Hotspot
ToasterPaint. In Transparency, the area which is defined as the center of the region affected, and in Range mode the area that will receive the left-hand range color. The shape and location of the hotspot is controlled using the Transparency controls.

HSI
ChromaF/X. This button allows the Color Editing Sliders to control the Hue, Saturation and Intensity components of the color.

Hue
ChromaF/X. The actual color of an object; a banana has a yellow hue and an apple has a red hue.

I

Icon
Switcher/Toaster. There are picture symbols. They appear representing drawers or programs. Icons generally look like the function they perform: i.e., a drawer contains other files, and a program is activated by its icon.

IFF
ToasterPaint/LightWave. Interchange File Format. The standard format for Amiga graphics files. IFF images that may load into the Toaster may range from 2-bit (black-and-white) to 24-bit (16 million colors), from 1x1 pixel to 752x480 pixels.

Image Mapping
LightWave. The process of taking an image and applying it to an object's surface (by projecting, wrapping, stretching, etc.).

In-betweens, In-betweening
LightWave. An animation process whereby frames are added in between specific frames or positions. The number of frames added will affect the apparent smoothness and speed of the motion.

Incomplete Effect Indicator
Switcher. Small triangle on the Switcher screen that flashes whenever there is an incomplete effect in progress. May flash beside the T-bar, or on effects icons when combined with other transitions.

Initialize
See Format.

Intensity
ChromaF/X. The brightness of a color or an image. An object seen in the afternoon sun will be much brighter than that same object seen at dusk, although it is the same color.

Interface
Switcher. This is the screen on the computer that houses all of the buttons that activate the Toaster's features. The buttons are activated using the mouse and pointer. Each slice of the Toaster has its own interface.
ToasterPaint. The ToasterPaint control panel which gives you access to all features, tools and menus.

I/O
General. Stands for Input and Output. The Toaster has four external inputs, and two outputs.

J

Jump
LightWave. This keyboard-only command causes the currently selected point to jump to the mouse cursor.

Justify
CG. Refers to the position of a line of text in relation to the borders of the page. Left justification starts each line at the left border. Right justification starts each line at the right border. Center means that each line is centered on the page. None means that the lines do not have a specified relationship to the page borders.

K

Kerning
CG. Kerning is the process of altering the spacing between individual characters on a line to produce a more professional, type-set look for the text.

Key
Switcher. The process of electronically "cutting a hole in one video picture and replacing it with another video image."

Key Frame
LightWave. In animation, a key frame is a particular frame wherein an object has a specifically defined location, orientation, etc. By setting key frames, you have LightWave perform the in-betweening necessary to create smooth animations.

Key Page
CG. The ToasterCG page that keys stationary text or graphics over video.

Keypad control panel
Switcher. The section of the Toaster's Switcher control panel that handles the selection of effects (from the keyboard), the loading of pre-made pages from the CG book or the loading and saving of Framestore images.

L

Lathe
LightWave. This function allows you to take a polygon shape and spin it around a certain axis, creating a rounded object quickly and easily. Use it to create candlesticks, chair legs, cans, glasses, anything that can be created by lathing.

Layer (Layer Button)
LightWave. Modeler offers several concurrent workspaces, called layers. Using the layer buttons you can view a layer, edit a layer, or turn off a layer. Multiple layers may be viewed, eidted, or off at any time.

Layout
LightWave. The screen where objects, camera, and lights are set up for 3D rendering.

Lighten
ToasterPaint. This mode, located on the Mode menu, causes the color or colors on the affected portion of the canvas to become lighter. The setting of the Transparency controls affects this mode.

Lightest Box
ChromaF/X. This part of the ChromaF/X Control Panel displays the color that the lightest parts of the video signal will contain when the ChromaF/X effect is rendered and applied.

LightWave 3D
Switcher. The Video Toaster's 3D animation, rendering, and modeling slice.

LightWave Modeler
LightWave. The portion of LightWave 3D where you create 3D objects for still frames and animations.

LightWave Renderer
LightWave. The portion of LightWave 3D where you determine surface colors and textures, lighting, camera settings, and object motions.

Linear Key
CG. A type of luminance key that allows for transparent shadows on Key and Framestore pages.

Linear Movement
LightWave. Linear movement is movement in a given direction at a constant speed. May appear sharp and angular. As opposed to spline movement, which appears to speed up, slow down, and "round off" motion in a more natural manner.

Loop
A series of frames in an animation that repeats itself. The number of loops is the number of repetitions.

Luminance
Switcher/ChromaF/X. The Black-and-White or brightness part of the NTSC video signal. What you would see on a black-and-white video monitor or television set with the color turned down. Used to determine "key" hole values. Also used for Luminance Mapping.

Luminance Mapping
The method by which ChromaF/X maps colors into the different brightness levels of the video source.

Luminance Key
Switcher. The process of electronically "cutting a hole in one video picture and replacing it with another video image, based on the luminance or brightness of the first picture.
CG. The process of electronically "cutting a hole in one video picture and replacing it with another video image, based on the luminance or brightness of the first picture.

Luminance Key Box
Switcher. The section of the Toaster's Switcher control panel that controls the Luminance key feature. This allows you to select the exact clip level and set the key for the darker or brighter parts of the image.

Load Frame
ToasterPaint. Allows you to load frames from the current Framestore directory into ToasterPaint.

Load RGB
ToasterPaint. allows you to load Amiga graphics in the form of RGB IFF files into ToasterPaint from computer RAM, floppy disk or hard disk.

M

Magnet
LightWave. This function allows you to stretch portions of an object as if the object were magnetic and you were placing a magnet near its surface, pulling it outward.

Magnify
ToasterPaint. This feature allows you to view small areas of the screen under 16x magnification (8x in the 1x viewing mode) and is ideal for doing precision close-up work.
LightWave. A Modeler tool for zooming in or out on a portion of the 3D model.

Mapping
LightWave. A method for taking a two-dimensional image and applying it (as if it were a surface) to a three-dimensional object. LightWave supports several kinds of mapping, all of which may be mixed.

Medium
Switcher. The middle relative speed setting used with the Auto button. Denoted by the letter M on the Switcher screen.

Megabyte
Computer. a unit of computer storage space equal to 1048576 bytes of storage. Each Framestore image requires about 722008 bytes or 7/10 ths of a megabyte of storage space.

Menu Button
LightWave. In Renderer, the command buttons appear on the left side of the screen. When selected, they enable different control panels for you to work with. In Modeler, the buttons across the top of the screen are menu buttons. When selected, they enable different groups of commands, whose buttons appear on the left edge of the screen.

Menus
ToasterPaint. Menus are areas of ToasterPaint which contain features and commands of a similar nature. The name of a menu appears on the Menu bar whenever the right mouse button is held down. Individual commands are activated while the right mouse button is pressed by moving the pointer over the menu title and then moving it down until the desired command is highlighted and releasing the mouse button.

Microprocessor
Switcher. The "brain" or central processing unit (CPU) of a computer. Generally, the more bits that the microprocessor can handle at one time the more powerful it is. The Amiga is powered by the Motorola 68000 16-bit microprocessor. Accelerator cards for the Amiga use the more powerful 68030 or even more powerful 68040 32-bit microprocessors.

Mirror
LightWave. This Modeler function allows you to make exact mirror-image copies of an object (on the opposite side of an axis you select).

Morph
LightWave. In Renderer, this function is used to "bend" objects into other shapes, using a starting object and a target object. In Modeler, this function will create a series of linked polygons between one shape and another.

Mode
ToasterPaint. The mode determines how the current brush (shape, size and brush tool) will affect the canvas. The mode is selected from the Mode menu; there are 11 different modes available and the Transparency controls provide for countless variations of these.

Mono Video Out
Switcher. A connector on the Amiga that outputs a monochrome video image of the Toaster's control panel.

Mosaic
Switcher. A Toaster effect in which the video image is broken up into larger and larger squares whose color is the average color of all of the individual pixels it replaced.

Motion Blur
LightWave. An imaging technique for causing a surface to appear blurred, to enhance the appearance of motion or movement.

Motion Path
LightWave. The path that an object will follow in the course of an animation. Paths may be saved separately from the object, and applied to other objects.

Motion Removal
Switcher. The process of removing any motion that may have occured during the 1/15 of a second that it takes the Toaster to capture a four field (color) frame. There are two types of removal, field and frame.

Mouse
Toaster. The two button device on the Amiga that controlls the pointer on the Control Panel screen.

N

Negative Video
ChromaF/X. This results when the Palette Map is inverted - the Lightest Box contains black and the Darkest Box contains white.

Normal Video
ChromaF/X. This results when the Palette Map is un-altered - the Lightes Box contains white and the Darkest Box contains black.

NoBackground
ToasterPaint. This feature, located in the Brush menu, allows you to cut a custom brush without picking up any of the (same-colored) background around it.

Noise
Video. Random variation in a signal that often appears as interference.
LightWave. A technique for adding apparent roughness to a surface, or removing the "clean" look of CGI.

Normal
ToasterPaint. This drawing mode uses the color displayed in the Current Color Bar to apply paint to the canvas, according to the brush shape, tool and size as well as the Transparency settings.

NTSC, PAL, SECAM
Video. These are the common television standards in the world today. Different countries use one of these standards, or a slight variation of one of these. The Video Toaster is an NTSC device, the type of television signal that is broadcast in the United States and Japan.

Numeric, Numeric Menu
LightWave. In Renderer, the numeric menus allow you to type in exact values for certain functions (such as rotating an object exactly 33.3 degrees). In Modeler, the numeric menus allow you to adjust the particular settings of a function's operation, allowing you greater control over it.

Nu - Numeric Window
This is a small black bar that displays three-digit numbers.

O

Object
LightWave. An object is a geometric model representing an everyday thing, such as a chair, a plant, or a ball. The rendered appearance of an object is defined by the color and texture qualities of the surfaces that make up the wireframe.

Open
Computer. Refers to locating a file or program, loading it into the computer's operating memory, and displaying it for use on screen.

Or
ToasterPaint. This drawing mode is similar to blending light sources (of the Current Color) on the area of the Canvas affected. The effect of Or is usually to add color, but this will vary depending on the RGB values of your paint.

Organic Effect(s)
Switcher. A class of effects that appears to imitate naturally occurring motions found in nature.

Operating System
Computer. The master software program that manages all other programs on a computer. The basic "thought-processes" of a computer, allowing it to run other software.

Overlay
Video, Switcher. To mix one signal "on top of" another. The image underneath contains a cutout hole, and the overlay image is cut out to fill the hole. The Overlay Bus on the Switcher is used to perform this function.

Overlay Genlock
Switcher. When the Toaster software is exited, this feature overlays encoded AMIGA graphics on the Program video and puts pure encoded Amiga graphics on the Preview monitor, so that they can be recorded to video tape.

Overlay Bus
Switcher. The Bus of the Toaster that contains the source to be used as the foreground video in a key effect.

Overlay Bus
CG. The bus of the Toaster that contains the source to be used as the foreground video in a key effect.

P

P
LightWave. One of the three axes used to determine an object's orientation. Stands for Pitch, which is the up and down (forward and backward) tilt of an object.

Page
CG. The part of ToasterCG which you can format to hold text and graphics. There are 100 pages available at a time in ToasterCG, and they can be Blank, Key, Framestore, Scroll and Crawl pages.

Palette
ToasterPaint. This part of the Toolbox gives you access to all of ToasterPaint's color Tools including the RGB sliders, tone selectors and Pick Color.

Palette Map
ChromaF/X. This part of the ChromaF/X Control Panel displays either the Top or Bottom Line of the Color Table and allows you to edit the colors that either contain with a variety of tools.

Palette Marker
ChromaF/X. This shows the part of the Palette Map which is currently being affected. The color at the Palette Marker appears in the Current Color Box.

Palette Tools
ChromaF/X. These tools allow you to specify how the line in the Palette map will be affected, with tools like Random Color, Horizontal Spread and Snow available.

Pan (Left or Right)
Video. The video term for turning the camera to the left or the right, generally to follow action, or to lead it.

Particles, Particle System
LightWave. Imaging which renders particles of different size to represent acceleration, velocity, or position. A single point which has been made into a polygon is a single particle. Many such points can be used as fireworks, stars, etc.

Pedestal (Up or Down)
Video. An industry term for physically lifting the camera up or lowering it down.

Phong Shading
LightWave. A method of realistically shading polygonal surfaces that smooths over edges, resulting in rounded surface appearance.

Pick Color
ToasterPaint. This feature is used to make any color that appears anywhere on the canvas the current color.

Pixel
ToasterPaint. The smallest unit in the frame. Each of the 353280 pixels on the ToasterPaint canvas can be assigned any one of 16777216 colors - either individually (very tedious) or in groups.

Point
CG. Refers to the height of a font. A 12-point font is 12 video scan lines high, for example.
LightWave. Points anchor the "corners" of polygons. Groups of points can be connected and made into a polygon. Note that a point that has been connected to form a polygon is known as a vertex.

Polygon
Polygons define the surface of an object. A triangle, for example, is a simple polygon made up of three points and three lines. Polygons may have many points and lines. They can be assigned color and texture, and can be shaded realistically by LightWave Renderer.

Polygon/Straight Line Tool
ToasterPaint. This drawing tool uses the brush to draw either filled or un-filled straight lines or polygons with any number of vertices.

Positioner Effect(s)
Switcher. Effects whose positions you can adjust. These are actually transitions which give you the ability to position each effect at one point in its path of travel. (A straight line proceeding from the center of the full-screen image through the point you indicate will determine the actual direction of that path.)

Preferences
Preferences refers to "your preferences," how you would prefer that certain functions should operate. Toaster Preferences allows you to select among certain features of the Toaster's operation. It also allows you to load and save certain files.

Prefs
ToasterPaint. This menu provides commands for various optional settings such as the grid controls and rendered output control.

Preview Bus
Switcher. This Bus holds the video that will become the Program video after a transition effect is executed. The Preview Bus allows the director to preselect from among his video inputs, transitioning to one when appropriate.

Preview Display
ToasterPaint. This is where the ToasterPaint control panel appears. The canvas is viewed in 4096 colors under 2x magnification.

Preview Monitor
Switcher. The monitor that displays the source selected on the Toaster's Preview Bus.
CG. The output of the Toaster which displays the ToasterCG Control Panel, and any rendered page before it is taken to program.
ChromaFX. The monitor that displays the source selected on the Toaster's Preview bus.

Primary Colors
Video. A set of three colors from which all other colors can be created. In video, they are light-based colors: red, green, and blue.

Print
ToasterPaint. This feature, located in the Picture menu, allows the canvas to printed on a compatible Amiga printer.

Program Bus
Switcher. The Bus which contains the Video Toaster's primary output. All of the Video Toaster's effects involve the Program Bus.

Program Monitor
Switcher. The monitor that displays the source selected on the Toaster's Program Bus. All effects that are executed will appear on the Program monitor.

Project
Switcher. The project is the collection of whatever you youre working on in the Toaster when the project was saved; it includes all of the effects in the Effects bank, any custom ChromaF/X effects and the CG book.

Pulldown Menu
A pulldown menu is one that appears to "drop down" as the pointer passes over it. Usually appears when holding down a mouse button and moving to certain area of the screen.

Push/Pull
Switcher. An effect where the source selected on the Preview Bus is comes onto the Program from one of the sides or corners in a push, or the Program video exits to one of the corners or sides, revealing the Preview video in a Pull.

Program
ToasterPaint. The Video Toaster's primary video output. All rendered frames from ToasterPaint are sent to the Toaster's Program output.

Q

Quit - (ToasterPaint) This command instructs the Toaster to shut down the ToasterPaint slice and also to remove it from RAM.

R

RAM
Amiga. Random Access Memory. A type of computer storage which provides temporary storage of data, whose chief advantage is fast loading times. The RAM Framestore device provides rapid access to a few Framestore images. Anything saved to RAM is lost whenever the power to the computer is turned off.

Random Color
ChromaF/X. This Palette tool places bars of random color in the Palette Map between the Palette Marker and the point on the map at which next click the mouse.

Range
ToasterPaint. This mode uses the Range colors to fill the affected area of the canvas according to the current brush shape and tool and the settings of the Transparency controls.

Range Colors
ToasterPaint. located on the Color Strip, these are the two colors that will be used in the Range mode.

Ray Tracing
LightWave. A complex method for computing an image based on the path that light rays travel. Requires additional computational time, yet allows for true reflection and refraction of surfaces.

Real Time
CGI. A measure of performance. If a computer system's response is immediate as you draw, for example, it is considered real time. If there is a delay, it is not.

Rectangle
ToasterPaint. This drawing tool applies the current mode to the canvas in a rectangular pattern, using the current brush shape and size. These rectangles can be either filled or un-filled.

Redo
ToasterPaint. This command repeats the last action which you have performed. This is very useful when you change drawing modes or colors or alter the setting of the Transparency controls.

Remap
ToasterPaint. This command, located in the Palette menu, makes a smooth transition from one color to the next in any custom 16 color palette that you set up.

Remove Color
ChromaF/X. The Chroma Stripping option which does not remove the color from the incoming video signal before applying the ChromaF/X effect.

Render
Switcher. The process of converting Toaster graphics into a video image in a framebuffer. ToasterPaint, LightWave 3D, Toaster CG and ChromaFX all must render their graphics to a frame buffer for 24-bit display or output.
LightWave. To render an image is to have LightWave calculate a picture based on the camera's point of view and the objects it "sees." (Note: If you experience odd results when rendering, it may have to do with the design of your object. See "How to Make Objects" at the back of this reference.)

Render to Program
ToasterPaint. This command tells ToasterPaint to take whatever is on the canvas on the Preview display and send it to one of the Toaster's frame buffers to be viewed in full video resolution.

Requester
Switcher. A message box that the Toaster system generates and places on the screen when it needs further input from you to complete a function. You are usually given a choice of responses (Yes or No, for example) in the form of smaller boxes inside the requester. When you click the mouse button on one of these boxes the requester will go away and the response you gave will be executed.

Resolution
LightWave. Refers to the sharpness of the image that you want to render. The higher the resolution, the sharper the imge (and the lengthier the rendering time).

Return
Amiga, Toaster. A key on the keyboard. Generally, you use Return after typing text in order to restore the mouse pointer.

RGB
General. RGB graphics must be rendered before they can be displayed on the Toaster.Switcher. A method of storing graphics that keeps the red, green and blue components of the image seperate. An RGB monitor is one that is able to accept this
ChromaF/X. This button allows the Color Editing Sliders to control the Hue, Saturation and Intensity components of the color.

RGB Sliders
ToasterPaint. These controls allow you to individually adjust the Red, Green and Blue components of the Current Color.

Rotate
ChromaF/X. This Color Table tool rotates and inverts the color of the Top Line of the Color Table all the way down the Color Table. Generally, this tool creates a much more radical effect than the Shift tool.

Rotate 90 degrees
ToasterPaint. This command, located in the Effect menu, rotates the custom brush 90 degrees in a clockwise or counter-clockwise direction.

RS-170a
Video. This is the ANSI (American National Standards Institute) specification for the NTSC video signal. The Video Toaster conforms to this specification. A video standard that defines a color frame of video, it refers only to the synchronizing pulses of video. It does not actually refer to active video (the visible picture area).

RubThru
ToasterPaint. This drawing mode brings whatever is on the swap screen directly under the affected area of the canvas to the canvas, depending on the setting of the Transparency controls.

S

Saturation
ChromaF/X. The amount of color present. Low saturation means pale, whited-out colors, and high saturation means vivid, bright colors.

Save Frame
ToasterPaint. This command, located in the Picture menu, allows you to save the canvas as a Framestore image on the current Framestore device.

Save RGB
ToasterPaint. allows you to save the ToasterPaint canvas in the form of an RGB IFF file into computer RAM, floppy disk or hard disk.

Scale
LightWave. This function allows you to re-size an object equally in all three dimensions with one operation.

Scissors
Switcher. These are located in the Luminance key box. Click on them to determine where in the luminance range the key will begin. The scissors are highlighted in white when the key begins at the brighter part, and black when it begins at the darker.
ToasterPaint. This feature is used to make custom brushes; it allows you to "cut" selected areas of the canvas according to the current drawing tool as well as brush size and shape.

S/C Phase (Color Phase)
Subcarrier Phase is very, very fine adjustment of Horizontal Phase. The relationship of the chrominance subcarrier signals of two video sources. It also affects color hue. If a particular source is out of SC phase with the reference video, then all of the hues in the image will be incorrect.

S/CH Phase
The relationship between horizontal phasing and color phasing. It's what defines the RS-170A spec as different from RS-170. It is necessary to have this remain accurate when editing.

SCSI
Switcher. Small Computer Systems Interface. The format for a type of hard drive available for the Amiga that can provide fairly rapid access to stored Framestore images.

Scroll Page
CG. The ToasterCG page that keys text moving from the bottom of the screen to the top over the Program video.

Select
See Click.

Select
Switcher. The process of highlighting a button or icon by clicking on it once with the left mouse button.

Set Grid
ToasterPaint. This command, located in the Prefs menu, allows you to determine the horizontal and vertical spacing between the points that make up the ToasterPaint grid.

Shadow
CG. An optional part of the fonts in Key and Framestore pages, the shadow can be drop or cast, solid or transparent.

Shear
LightWave. This Modeler function allows you to angle objects, such as making a text letter object italic.

Shift
ChromaF/X. This Color Table tool shifts the color of the Top Line of the Color Table all the way down the Color Table.

Shift Key
Amiga, Toaster. The left and right Shift keys are two keys on the keyboard, found on both sides of the space bar. They are used in conjunction with other keys, to allow for additional functions.

Shift-click
Amiga. Shift-click means to hold the shift key on the keyboard, then quickly press and release the left mouse button.

Size
LightWave. This function allows you to re-size an object on a selected axis, rather than affecting all three at once.

Skin
LightWave. This Modeler function allows you to create a connected outer surface for a series of polygons. Similar to stretching a covering over the skeleton-like framework of an airplaice body.

Single-frame Animation
LightWave. The process of recording images onto videotape "frame-by-frame."

Slider
Toaster. Any control which allows you to adjust the setting of a feature by clicking on the bar inside the slider and moving it around.

Small
Switcher. The slowest relative speed setting used with the Auto button. Denoted by the letter S on the Switcher screen.

Smoothing Off/On
ToasterPaint. In Text rendering and Texture mapping controls, this feature turns the smoothing controls on or off. In Texture mapping, smoothing on provides the best results, while smoothing off provides faster feedback.
LightWave. Causes Phong Shading to be used to smooth over the edges of polygons.

Snow
ChromaF/X. This is random noise, similar to what you would see on a channel on your television for which there was no station.

Software
Amiga. Software refers to a program stored on a disk. A program is a set of instructions written in code, for greater speed, that tells the computer what to do.

Solarize
ChromaF/X. The process of adding false color to a video signal. ChromaF/X excels at this feature, with many powerful and flexible tools.

Space Bar
Amiga. The space bar is a key found on the keyboard. It performs certain Toaster functions, such as triggering auto transitions from the Toaster.

Specular Highlight
LightWave. A highlight is the small, bright reflection of a light source on the surface of an object. The nature of the object's surface determines how bright, and how small the highlight is.

Spline
LightWave. A means for calculating smooth curves. Whereas you may draw a triangle with three straight lines, they would appear more rounded off as a circle if treated as splines.

Split
Switcher. An effect which divides the video signal in two pieces.

Storage Device
Switcher. A part of the Amiga which the Toaster can use to load or store Framestore images or projects. These can be hard drives, floppy drives or RAM.

Stretch
LightWave. This function allows you to stretch a polygon or object along a given axis.

Squeeze/Zoom
Switcher. An effect which shrinks, in the case of a squeeze, or expands, in the case of a zoom, the video equally in the horizontal and vertical axes.

Style Selectors
ToasterPaint. Allows you to adjust the typeface of the font in the Text Rendering section. Included are **bold**, <u>underline</u> and *italic*.

Superimpose, "Super"
Video. Refers to keying text over a video image. Also used to describe the element being keyed.

Surface
LightWave. The qualities that make up the appearance of an object, such as color, glossiness, shininess, etc. Surfaces may be saved separately from objects, and applied to other objects. Also called Surface Patches.

Surface Normal(s)
LightWave. A surface, made of polygons, may be visible from one or both "sides." The surface normal is a small line that indicates from which direction a surface is visible.

Swap
ToasterPaint. This command allows you to access ToasterPaint's Swap picture or Swap brush and make either the active item, while the previous active item becomes the Swap item.

Swap
Switcher. An effect which divides the video into two or more pieces which cross each other as they come on or leave the Program.

Switcher
Toaster. The Toaster's base of operation, from which all other programs are entered.

Switcher Effects
Switcher. Generally any Toaster effect which reveals the Preview video source without actually changing the size or position of the current Program video. These effects include fades and wipes.

Sync
Switcher. The part of the video signal that keeps the picture information stable on the screen with the correct colors.

Sync Generator
Video. A sync generator is a device that outputs a sync signal for other equipment to genlock to. There are different types of sync generators and sync signals. Sync generators can output up to four different signals: composite video,

sync (4v p to p), color burst (2v p to p), and video (1v p to p). A sync generator usually feeds a signal called blackburst to the external sync inputs of the video signal. The Toaster requires a composite video sync signal. Do not use 4 volt peak-to-peak (4v p to p) sync.

Sync In
Switcher. The connector on a video source that is used to feed that device an external sync signal.

Synchronization
This term refers to timing, and there are two definitions of sync that the Toaster is concerned with. The first definition concerns the unstable sync on prerecorded video, and may be referred to as "bad sync" or "unstable sync." This is generally corrected with a TBC.

The second definition has to do with another aspect of the video signal. A video signal carries certain timing pulses. The timing pulses of different video sources must match in order to be utilized by a video switcher. Images will shift, roll, and break up when you attempt effects if they are not in sync. Generally, when timing pulses are matched, this is referred to as "being in sync."

Synchronous
When two or more video devices are genlocked together, they are said to be synchronous.

T

Take
Switcher. The button on the Toaster that performs the effect known as the cut, which is an instantaneous transition from the video on the Program Bus to the selected video on the Preview Bus.

Taper
LightWave. This Modeler function allows you to taper one end of an object with certain attributes. Modeler supports two types of tapering.

TBC
Video. See time base corrector.

T-bar
Switcher, Video. Used to manually execute a Toaster effect. Instead of an actual lever with a handle for you to grab, the T-bar is represented on screen and can be grabbed with the mouse.
ChromaF/X. A duplicate of the Switcher T-bar, this is used to manually control a color effect.

Tension
LightWave. An animation term that refers to the feeling of tension in an animation. Is an object's movement smooth and easy, or more taut and direct? Further controls over tension may be exerted through the use of additional spline controls (see continuity and bias).

Termination and Looping (Loop Thru)
Video. This term has to do with video signal routing. When video signals are run through several devices, they are always terminated at the destination device (the last one in the chain). Generally, there is a "termination switch" on video devices that is set to "terminate (75ohm)" or "loop thru (HiZ)" the incoming video. A device that receives and passes on the video signal should be set to "loop thru."

If a chain of signals is terminated more than once (double-terminated), images will appear very dim or weak. If a chain of signals is un-terminated, images will appear "hot" and the colors "washed out." The Video Toaster automatically sets itself to terminate all four video inputs, and has a "loop thru" option for each.

Text Window
This is a small black bar that displays the names of files, objects, or options.

Texture Mapping
LightWave. A process of applying an image to an object, giving it a more realistic surface.

Tile
Switcher. An effect which squeezes the video signal and replicates it in a matrix around itself. The size and number of tiles is controlled with the position of the T-bar.

Tilt
Video. An industry term for tilting the camera upward or downward.

Time Base Corrector
Switcher. An electronic device that stablizes the video signal produced by a VTR so that it can be processed by a switcher. A Time Base Corrector's basic function is to correct the instability in playing back recorded video signals. This instability is the nature of VCRs. Once a signal is on tape, it contains time base error. Certain TBCs also have the ability to genlock one video source to another. Essential for all video tape inputs to the Toaster.

Time Base Errors
Switcher. Errors generated by a VCR occuring when the tape varies in speed and stretches as it travels across the video head. These errors must be removed by a time base corrector before being used with the Toaster.

Timing and Phasing
Timing generally refers to horizontal phase, while phasing generally refers to color phasing. Both refer to adjustment of the signal so that it arrives at the switcher simultaneously with the reference signal.

Tint
ChromaF/X. The process of slightly changing the color of a video signal by adding a ChromaF/X filter effect to it.

Toaster Preferences
Switcher. The slice of the Toaster where projects, border & background colors, termination, control panel Preferences and other settings for the Toaster' system are selected.

ToasterPaint
Switcher. The slice of the Toaster that allows you to create 2D graphics or alter frame grabbed images.

Top Line
ChromaF/X. The bottom of the ChromaF/X color table, used can be put in the Palette Map and altered, thus defining the color at the bottom of the Color Table.

Trails
Switcher. An effect which trails of moving video are left behind the affected image as it moves about on the screen.

Trace Reflections
LightWave. An option for selecting realistic reflections in LightWave.

Trace Refraction
LightWave. An option for selecting realistic refraction in LightWave.

Trace Shadows
LightWave. An option for selecting realistic shadows in LightWave.

Trajectory
Switcher. An effect where the video is squeezed and appears to fly around the screen.

Transition
Switcher, Video. The manner in which the Program video is replaced with the Preview video. A smooth fade, a digital trail, an organic wipe, all these are transitions.
ChromaF/X. This type of ChromaF/X effect applies successive lines of the Color Table to the video signal as the T-bar is dragged up or down.

Transparent Shadow
CG. A type of shadow available for Key and Framestore pages which uses the Toaster's linear keyer to provide a shadow through which the video it is keyed over is visible.

Transporter
Switcher. An effect in which any object which moves in the image appears to be in a transporter beam.

Tumble
Switcher. An effect where the affected video flips around a horizontal or vertical axis. Often accompanied by a trajectory.

Text Window
ToasterPaint. This window on the Text Rendering section of the Toolbox is where all text that you wish to turn into a custom brush is entered.

Text Rendering
ToasterPaint. The section of ToasterPaint that allows you to enter text and use it as a custom brush. These text brushes are subject to the current mode as well as the setting of the Transparency controls, as is any other custom brush.

Texture Mapping
ToasterPaint. The process of mapping arbitrary regions with custom brushes. This is accomplished in ToasterPaint using TxMap mode.

Tile Controls
ToasterPaint. These controls, located in the Transparency and Warping portion of the Toolbox allow you to make up to 9 copies of the custom brush in each direction to be drawn when using TxMap mode.

Toaster Preferences
Toaster. The slice of the Toaster where projects, border & background colors, termination, control panel preferences and other settings for the Toaster system are selected.

ToasterPaint
ToasterPaint. The Video Toaster's 2D graphics and compositing slice, used to create original video graphics or modify captured or rendered frames.

Tone Selectors
ToasterPaint. These controls, located under the 16 color palette in the Palette portion of the Toolbox, allow you to select different shades of the colors in the 16 color palette.

Transparency & Warping
ToasterPaint. The section of the Toolbox which contains the controls used in TxMap mode as well as the transparency controls.

Twist
LightWave. This Modeler function allows you to twist objects. For example, a roman column might be twisted from top to bottom to create a column with spiraling fluted edges.

Truck
Video. The industry term referring to physically moving the camera from side to side. While panning means turning the camera, trucking means actually moving it.

Twist
LightWave. This Modeler function allows you to twist objects. For example, a roman column might be twisted from top to bottom to create a column with spiraling fluted edges.

TxMap
ToasterPaint. This mode allows you to map or warp the custom brush into any arbitrary shape. This mode is affected by the setting of the Transparency controls

U

Undo
ToasterPaint. This command removes the last brushstroke from the canvas or in general undoes the last command enacted.

Use Grid
ToasterPaint. This command, located in the Prefs menu, turns on ToasterPaint's grid, which you can adjust with the Set Grid command.

V

VCR
Video. Video Cassette Recorder. In the video industry, generally known as VTR for Video Tape Recorder (before cassettes were in use).

Vertical Spectrum
ChromaFX. This tool places a spectrum of color between each point on the Top Line of the Color Table to each point on the Bottom Line.

Vertical Spread
ChromaFX. This tool places a smooth transition from the color at one point on the Top Line of the Color Table, to the color at the same point on the Bottom Line.

Video Formats
Video. There are numerous formats for recording video signals. In general, they are: VHS, S-VHS, 8mm, Hi8mm, 3/4, 3/4SP, BetaCam, BetaCam SP, MII, 1-Inch, D-1, and D-2. Many of these formats sport special cable connectors, yet all have composite output connections as well. Interestingly, each of these formats is available in NTSC, PAL, and SECAM (making for some 36+ formats in all!). The Toaster supports all NTSC video formats.

Video Distribution Amplifier (VDA)
Video. A VDA is a device used to provide some number of exact duplicates of one incoming signal. Higher quality VDAs will also provide controls over the quality of the duplicate signals. Generally, they are spoken of as "1 in, 4 out," or something similar, which indicates one incoming signal may have up to four outgoing copies.

Video Input
Switcher. One of the four BNC connectors on the Toaster (1-4) that accepts synchronous video from external video sources, for use by the switcher.

Video Output
Switcher. One of the two BNC connectors on the Toaster PC board (Program and Preview) which sends the Toaster's output to monitors for viewing or VTRs for recording.

Video Source
Switcher. Any device which generates a video signal that can be connected to one of the Toaster's video inputs. These include cameras, VTRs (time base corrected) and laser disk players.

VTR
Video. See VCR.

W

Warping
ToasterPaint. A ToasterPaint effect allowing you to warp, or twist imagery. Uses TxMap mode to map a custom brush into an arbitrary new shape, the same as texture mapping.

Window
Amiga. This is a part of the Amiga's Workbench that contains icons and drawers for Amiga programs or where you

can enter commands from the keyboard.

Toaster. Windows in the Toaster display information. Often, there will be serial options for you to choose from. A window is a "window" on that list, showing only one option at a time. Various buttons or options allow you to change selections within the window.

Wipe
Switcher. A Toaster effect in which one video image replaces another on the Program. This is a switcher effect in which neither image actually moves.

Workbench
Switcher. The Amiga's operating system which uses windows, icons, mouse and pointer to control the computer.

X

X
ToasterPaint. In the coordinates, the position (in pixels) of the exact center of the pointer from the left edge of the screen. Values range between 0 and 752.
LightWave. One of the three axes used to determine an object's position. The X axis runs from the viewer's left to right.

Xor
ToasterPaint. This is perhaps the strangest of all of the modes. For the most part, Xor will reverse the colors of the affected area; this is especially the case if you use a white brush (r255, g255, b255). This mode is affected by the setting of the Transparency controls

Y

Y
ToasterPaint. In the coordinates, the position (in pixels) of the exact center of the pointer from the top edge of the screen. Values range between 0 and 479.
LightWave. One of the three axes used to determine an object's position. The Y axis runs up and down.

Z

Z
LightWave. One of the three axes used to determine an object's position. The Z axis runs in and ot of the screen (toward you and away from you, it is the screen depth).

Index